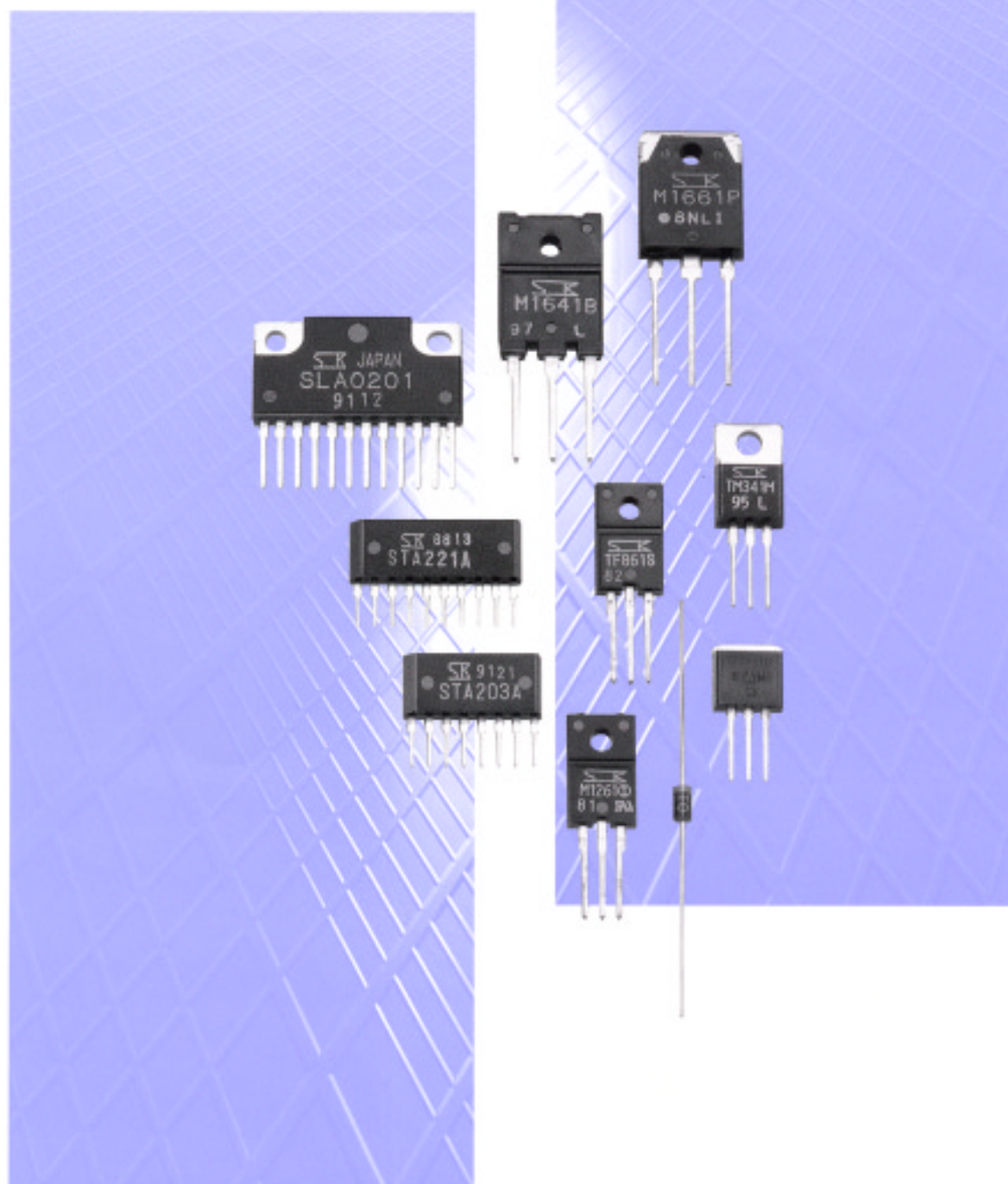


THYRISTORS & TRIACS





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For resistive load, 5A, TO-220F	TM541S-R/561S-R	54
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Notes regarding Storage, Characteristics inspection, and Handling precautions

Since reliability can be affected adversely by improper storage environment and handling methods during Characteristic tests, please observe the following cautions.

(a) Cautions for Storage

1. Ensure that storage conditions comply with the standard temperature (5 to 35°C) and the standard relative humidity (around 40 to 75%) and avoid storage locations that experience extreme changes in temperature or humidity.
2. Avoid direct sunlight, and locations where dust or harmful gases are present.
3. Reinspect the product, which have been stored for a long time, for rust in leads and solderability.

(b) Cautions for Characteristic Tests and Handling

1. When characteristic tests are carried out on a product during an incoming inspection and other standard inspections, protect the product from surges of power from the test equipment, shorts between terminals, and faulty connections. Avoid testing that exceeds standard ratings.

(c) Silicone Grease

When silicone grease is used for mounting a product on a heat sink it should be applied on the product's back side and on both sides of the insulating plate in a thin and even way. Depending on the kinds of silicone grease, base oil permeates into the product, resulting in shortening product's service life. Therefore, careful selection should be made.

Recommended Silicone Grease

- **G-746** Shin-Etsu Chemical Co., Ltd.
- **YG6260** GE Toshiba Silicones Co., Ltd.
- **SC102** Dow Corning Toray Silicone Co., Ltd.

(d) Fastening Torque

When fastening torque is lower than recommended, thermal resistance increases and radiation effects decrease. On the contrary, when it is too high, the screw might be cut down and / or the heat sink might be deformed. As a result of that, distortion of the product's frame could arise. In order to avoid these problems, recommended fastening torque for each product type is shown in the following.

●Fastening Torque

Package	Fastening Torque
MT-25 (TO-220)	0.490 to 0.686N·m (5 to 7kgf·cm)
FM20 (TO-220F)	
MT-100 (TO-3P)	0.686 to 0.882N·m (7 to 9kgf·cm)
FM100 (TO-3PF)	

- * When the surface of the heatsink where the Full Mold package is to be mounted is not flat and/or burrs exist around the mounting hole of the heatsink, the resin of the package might be cracked even if the torque is lower than the recommended value.
- * When a screw is fastened with an air driver for the Full Mold package, a large impact is generated at the time of stop, and the resin may crack even if the torque is lower than the recommended value. An electric driver, therefore, should be used instead of an air driver.

(e) Soldering Temperature

In general, the product is subjected to high temperature when it is mounted on the printed circuit board, mainly whether by either flow solder from a Solderbath or manual soldering with a soldering iron. The testing method and conditions (JIS-C-7021 standards) for the product's heat resistance during soldering are:

“Apply 260°C for 10 seconds, and 350°C for 3 seconds at a distance of 1.5mm from the product's body.” It is highly recommended soldering in as short a time as possible under the conditions.

Part-Numbering Systems (except for Array and PNPN Switch)

■ Ex. TM1641S-L

TM 16 4 1 S - L

Product series

TF: Reverse blocking three-terminal thyristor
 TM: Bidirection three-terminal thyristor (triac)

Add function

C: With built-in reverse diode
 D: With built-in Avalanche diode

Current rating
 Ex.16: 16A

Reverse voltage
 Ex.4: 400V

Version No.

Package
 M: TO-220 (MT-25)
 S: TO220F (FM20)
 P: TO-3P (MT-100)
 B: TO-3PF (FM100)

Commutation characteristic, etc.
 TF series (thyristor)
 A: High sensitivity type
 TFD series (Thyristor with built-in Avalanche diode)
 VBO rank indication (See selection guide)
 TM series (triac)
 L: For inductive load
 R: For resistive load

Selection Guide

Thyristors

Type	Rated Current	Reverse Voltage			Gate trigger current I _{GT} (mA) max	Package	Page
		200V	400V	600V			
General purpose	3A	TF321M	TF341M	TF361M	10	TO-220	6
		TF321S	TF341S	TF361S	15	TO-220F	8
	5A	TF521M	TF541M	TF561M	15	TO-220	10
		TF521S	*TF541S	*TF561S	15	TO-220F	12
	8A	TF821M	TF841M	TF861M	15	TO-220	14
		TF821S	*TF841S	*TF861S	15	TO-220F	16
High sensitivity	3A	TF321M-A	TF341M-A	TF361M-A	0.1	TO-220	18
	5A	—	TF541S-A	TF561S-A	0.2	TO-220F	20
Array	5A×4 circuits	—	—	SLA0201	10	SLA12Pin	22

*UL approved type available

Thyristor with built-in reverse diode for HID lamp ignition

V _{DRM} (V)	I _{TRM} (A)	di/dt	Part number	Package	Page
600	430	1200A/μs	TFC561D	TO-220F	24

Thyristor with built-in Avalanche diode

V _{BO} (V)	V _{DRM} (V)	Part number	I _{T(AV)} (A)	Package	Page
30±3	20	TFD312S-C	3	TO-220F	26
55±5	35	TFD312S-F			
65±5	45	TFD312S-G			
100±10	80	TFD312S-J			
125±10	100	TFD312S-K			
150±10	120	TFD312S-L			
175±12	145	TFD312S-M			
200±15	170	TFD312S-N			
225±15	190	TFD312S-O			

Triacs (Bidirection three-terminal thyristor)

Type	Rated Current	Reverse Voltage		Gate trigger current I _{GT} (mA) max	Package	Page
		400V	600V			
For inductive load	3A	TM341M-L	TM361M-L	20	TO-220	28
		*TM341S-L	*TM361S-L	20	TO-220F	30
	5A	TM541M-L	TM561M-L	20	TO-220	32
		*TM541S-L	*TM561S-L	20	TO-220F	34
	8A	TM841M-L	TM861M-L	30	TO-220	36
		*TM841S-L	*TM861S-L	30	TO-220F	38
	10A	*TM1041S-L	*TM1061S-L	30	TO-220F	40
	12A	*TM1241S-L	*TM1261S-L	30	TO-220F	42
	16A	*TM1641S-L	*TM1661S-L	30	TO-220F	44
		TM1641P-L(L)	TM1661P-L(L)	30	TO-3P	46
		*TM1641B-L	*TM1661B-L	30	TO-3PF	48
		*TM2541B-L	*TM2561B-L	30	TO-3PF	50
For resistive load	3A	*TM341S-R	*TM361S-R	12	TO-220F	52
	5A	*TM541S-R	*TM561S-R	12	TO-220F	54
	10A	*TM1041S-R	*TM1061S-R	7	TO-220F	56
	12A	*TM1241S-R	*TM1261S-R	8	TO-220F	58
Array	1.2A×3 circuits	STA203A	—	3	STA8Pin	60
	1.0A×4 circuits	STA221A	—	3	STA10Pin	62

*UL approved type available

PNPN Switch

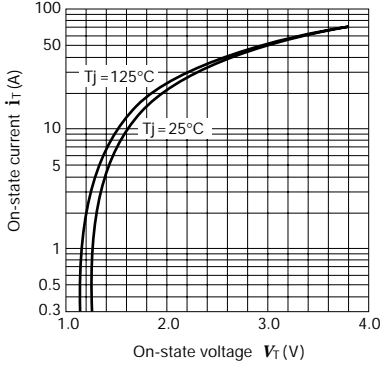
V _{BO} (V)	V _{DRM} (V)	Part number	I _{T(RMS)} (A)	Package	Page
120 to 138	90	ET013	0.6	Axial	66
133 to 147	115	ET014			
142 to 157	115	ET015			
190 to 170	170	ET020			

Index by Part Number

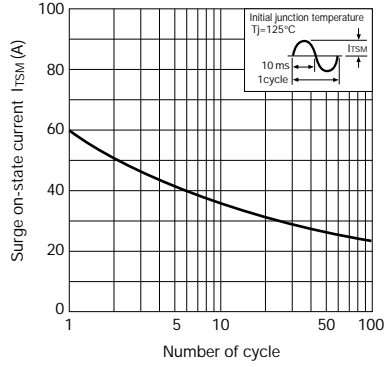
Part number	Explanation	Page
ET013	PNPN Switch, $V_{BO}=120$ to 138V, Axial package	64
ET015	PNPN Switch, $V_{BO}=142$ to 157V, Axial package	64
ET020	PNPN Switch, $V_{BO}=190$ to 210V, Axial package	64
SLA0201	Thyristor array, 600V, 5A×4 circuits , SIP12Pin package	22
STA203A	Triac array, 400V, 1.2A×3 circuits, SIP8Pin package	60
STA221A	Triac array, 400V, 1.0A×4 circuits, SIP10Pin package	62
TF321M	General purpose thyristor, 200V, 3A, TO-220 package	6
TF321M-A	High sensitivity thyristor, 200V, 3A, TO-220 package	18
TF321S	General purpose thyristor, 200V, 3A, TO-220F package	8
TF341M	General purpose thyristor, 400V, 3A, TO-220 package	6
TF341M-A	High sensitivity thyristor, 400V, 3A, TO-220 package	18
TF341S	General purpose thyristor, 400V, 3A, TO-220F package	8
TF361M	General purpose thyristor, 600V, 3A, TO-220 package	6
TF361M-A	High sensitivity thyristor, 600V, 3A, TO-220 package	18
TF361S	General purpose thyristor, 600V, 3A, TO-220F package	8
TF521M	General purpose thyristor, 200V, 5A, TO-220 package	10
TF521S	General purpose thyristor, 200V, 5A, TO-220F package	12
TF541M	General purpose thyristor, 400V, 5A, TO-220 package	10
TF541S	General purpose thyristor, 400V, 5A, TO-220F package	12
TF541S-A	High sensitivity thyristor, 400V, 5A, TO-220F package	20
TF561M	General purpose thyristor, 600V, 5A, TO-220 package	10
TF561S	General purpose thyristor, 600V, 5A, TO-220F package	12
TF561S-A	High sensitivity thyristor, 600V, 5A, TO-220F package	20
TF821M	General purpose thyristor, 200V, 8A, TO-220 package	14
TF821S	General purpose thyristor, 200V, 8A, TO-220F package	16
TF841M	General purpose thyristor, 400V, 8A, TO-220 package	14
TF841S	General purpose thyristor, 400V, 8A, TO-220F package	16
TF861M	General purpose thyristor, 600V, 8A, TO-220 package	14
TF861S	General purpose thyristor, 600V, 8A, TO-220F package	16
TFC561D	Thyristor with built-in reverse diode for HID lamp ignition, TO-220S package	24
TFD312S-C	Thyristor with built-in avalanche diode, 3A, $V_{BO}=30V$, TO-220F package	26
TFD312S-F	Thyristor with built-in avalanche diode, 3A, $V_{BO}=55V$, TO-220F package	26
TFD312S-G	Thyristor with built-in avalanche diode, 3A, $V_{BO}=65V$, TO-220F package	26
TFD312S-J	Thyristor with built-in avalanche diode, 3A, $V_{BO}=100V$, TO-220F package	26
TFD312S-K	Thyristor with built-in avalanche diode, 3A, $V_{BO}=125V$, TO-220F package	26
TFD312S-L	Thyristor with built-in avalanche diode, 3A, $V_{BO}=150V$, TO-220F package	26
TFD312S-M	Thyristor with built-in avalanche diode, 3A, $V_{BO}=175V$, TO-220F package	26
TFD312S-N	Thyristor with built-in avalanche diode, 3A, $V_{BO}=200V$, TO-220F package	26
TFD312S-O	Thyristor with built-in avalanche diode, 3A, $V_{BO}=225V$, TO-220F package	26
TM1041S-L	Triac for inductive load, 400V, 10A, TO-220F package	40
TM1041S-R	Triac for resistive load, 400V, 10A, TO-220F package	56
TM1061S-L	Triac for inductive load, 600V, 10A, TO-220F package	40
TM1061S-R	Triac for resistive load, 600V, 10A, TO-220F package	56
TM1241S-L	Triac for inductive load, 400V, 12A, TO-220F package	42
TM1241S-R	Triac for resistive load, 400V, 12A, TO-220F package	58
TM1261S-L	Triac for inductive load, 600V, 12A, TO-220F package	42
TM1261S-R	Triac for resistive load, 600V, 12A, TO-220F package	58
TM1641B-L	Triac for inductive load, 400V, 16A, TO-3PF package	48
TM1641P-L(L)	Triac for inductive load, 400V, 16A, TO-3P package	46
TM1641S-L	Triac for inductive load, 400V, 16A, TO-220F package	44
TM1661B-L	Triac for inductive load, 600V, 16A, TO-3PF package	48
TM1661P-L(L)	Triac for inductive load, 600V, 16A, TO-3P package	46
TM1661S-L	Triac for inductive load, 600V, 16A, TO-220F package	44
TM2541B-L	Triac for inductive load, 400V, 25A, TO-3PF package	50
TM2561B-L	Triac for inductive load, 600V, 25A, TO-3PF package	50
TM341M-L	Triac for inductive load, 400V, 3A, TO-220 package	28
TM341S-L	Triac for inductive load, 400V, 3A, TO-220F package	30
TM341S-R	Triac for resistive load, 400V, 3A, TO-220F package	52
TM361M-L	Triac for inductive load, 600V, 3A, TO-220 package	28
TM361S-L	Triac for inductive load, 600V, 3A, TO-220F package	30
TM361S-R	Triac for resistive load, 600V, 3A, TO-220F package	52
TM541M-L	Triac for inductive load, 400V, 5A, TO-220 package	32
TM541S-L	Triac for inductive load, 400V, 5A, TO-220F package	34
TM541S-R	Triac for resistive load, 400V, 5A, TO-220F package	54
TM561M-L	Triac for inductive load, 600V, 5A, TO-220 package	32
TM561S-L	Triac for inductive load, 600V, 5A, TO-220F package	34
TM561S-R	Triac for resistive load, 600V, 5A, TO-220F package	54
TM841M-L	Triac for inductive load, 400V, 8A, TO-220 package	36
TM841S-L	Triac for inductive load, 400V, 8A, TO-220F package	38
TM861M-L	Triac for inductive load, 600V, 8A, TO-220 package	36
TM861S-L	Triac for inductive load, 600V, 8A, TO-220F package	38

TF321M / TF341M / TF361M

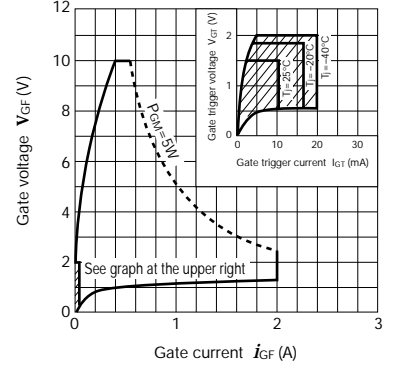
$V_T - I_T$ Characteristics (max)



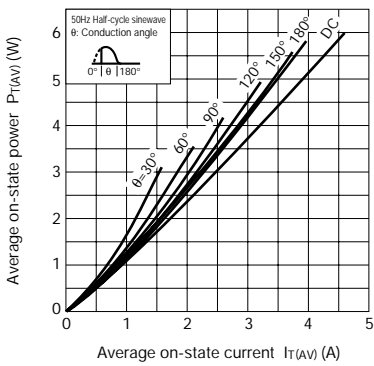
I_{TSM} Ratings



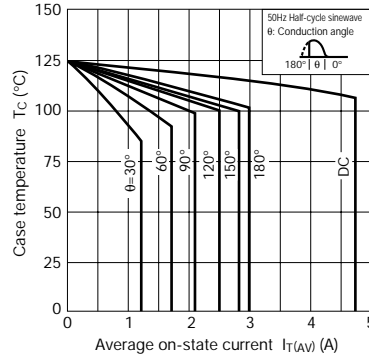
Gate Characteristics



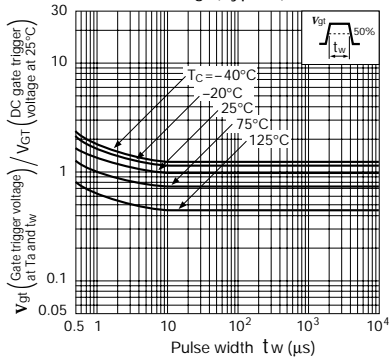
$I_T(AV) - P_T(AV)$ Characteristics



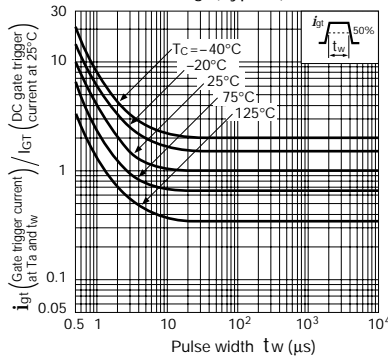
$I_T(AV) - T_C$ Ratings



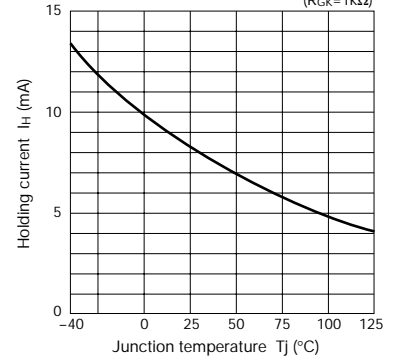
Pulse trigger temperature Characteristics V_{gt} (Typical)



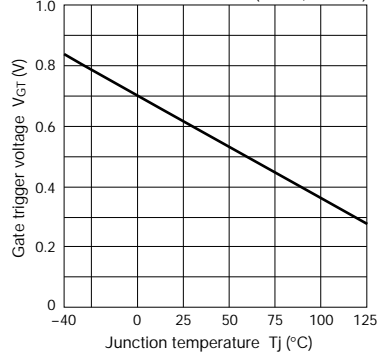
Pulse trigger temperature Characteristics I_{gt} (Typical)



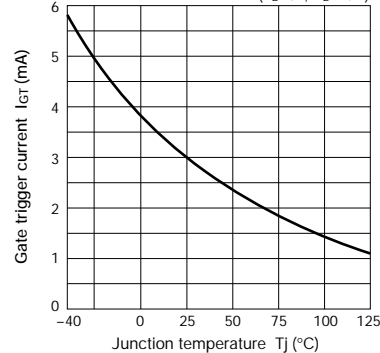
I_H temperature Characteristics (Typical)



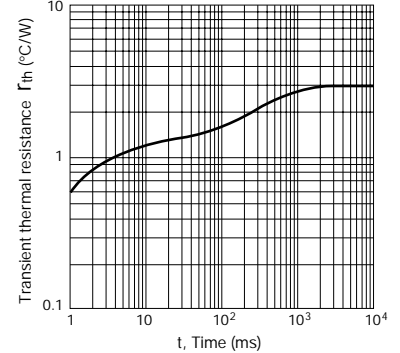
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)



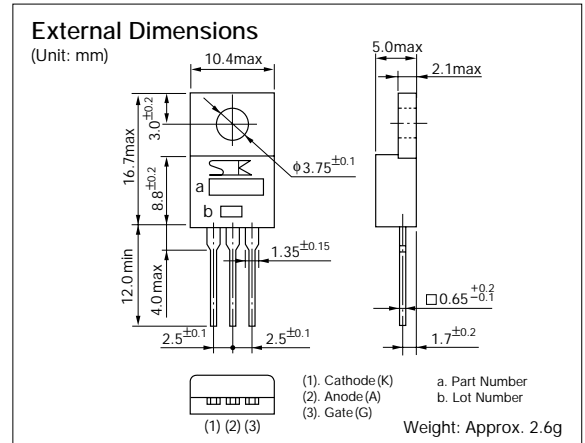
TF321S, TF341S, TF361S

TO-220 5A Thyristor

TF521M, TF541M, TF561M

Features

- Repetitive peak off-state voltage: $V_{DRM}=200, 400, 600V$
- Average on-state current: $I_{T(AV)}=5A$
- Gate trigger current: $I_{GT}=15mA$ max



Absolute Maximum Ratings

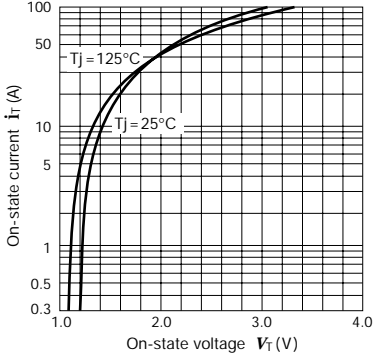
Parameter	Symbol	Ratings			Unit	Conditions
		TF521M	TF541M	TF561M		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	$T_j = -40$ to $+125^\circ C$, $R_{GK} = 1k\Omega$
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	5.0			A	50Hz Half-cycle sinewave, Continuous current, $T_c = 96^\circ C$
RMS on-state current	$I_{T(RMS)}$	7.8			A	
Surge on-state current	I_{TSM}	80			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, $T_j = 125^\circ C$
Peak forward gate current	I_{FGM}	2.0			A	$f \geq 50Hz$, duty $\leq 10\%$
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	$f \geq 50Hz$
Peak gate power loss	P_{GM}	5.0			W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	T_j	-40 to +125			$^\circ C$	
Storage temperature	T_{stg}	-40 to +125			$^\circ C$	

Electrical Characteristics

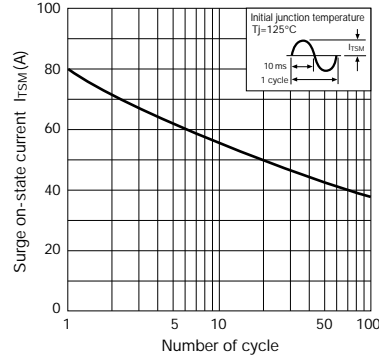
Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	$T_j = 125^\circ C$, $V_D = V_{DRM}(V_{RRM})$, $R_{GK} = 1k\Omega$
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	$T_c = 25^\circ C$, $I_{TM} = 10A$
Gate trigger voltage	V_{GT}			1.5	V	$V_D = 6V$, $R_L = 10\Omega$, $T_c = 25^\circ C$
Gate trigger current	I_{GT}		3.0	15	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$
Holding current	I_H		4.0		mA	$R_{GK} = 1k\Omega$, $T_j = 25^\circ C$
Critical rate-of-rise of off-state voltage	dv/dt		50		$V/\mu S$	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$, $C_{GK} = 0.033\mu F$
Turn-off time	t_q		30		μS	$T_c = 25^\circ C$
Thermal resistance	R_{th}			3.0	$^\circ C/W$	Junction to case

TF521M, TF541M, TF561M

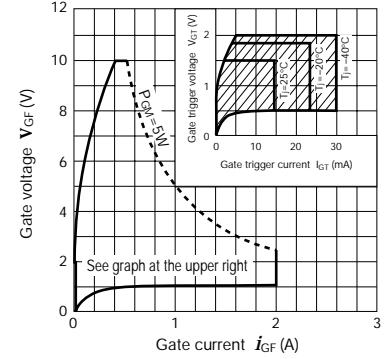
$V_T - I_T$ Characteristics (max)



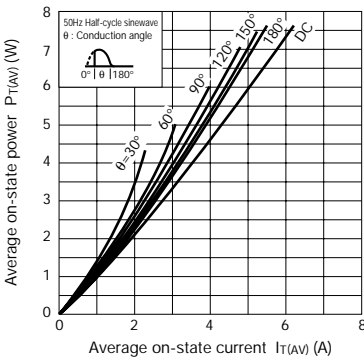
I_{TSM} Ratings



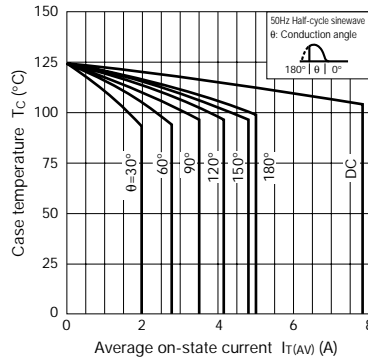
Gate Characteristics



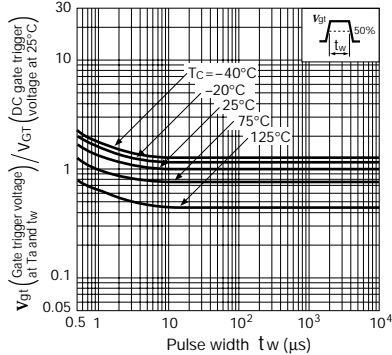
$I_T(AV) - P_T(AV)$ Characteristics



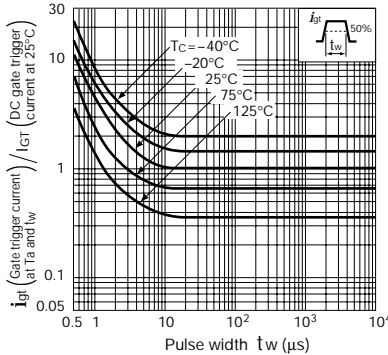
$I_T(AV) - T_C$ Ratings



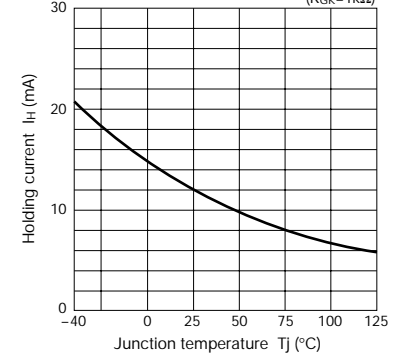
Pulse trigger temperature Characteristics V_{GT} (Typical)



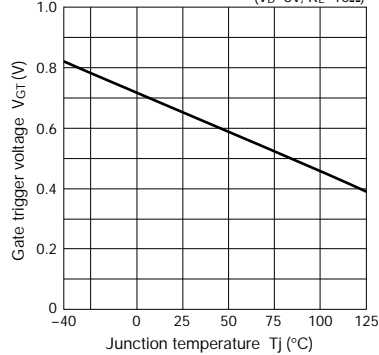
Pulse trigger temperature Characteristics I_{GT} (Typical)



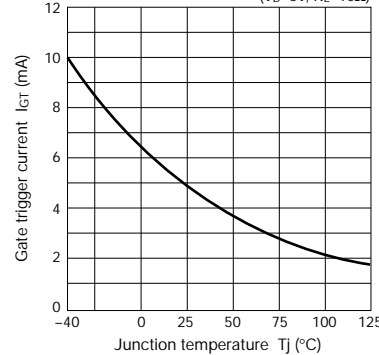
I_H temperature Characteristics (Typical)



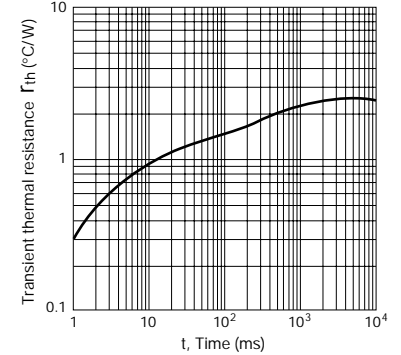
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)

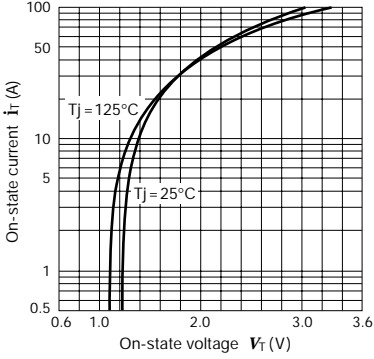


Transient thermal resistance Characteristics (Junction to case)

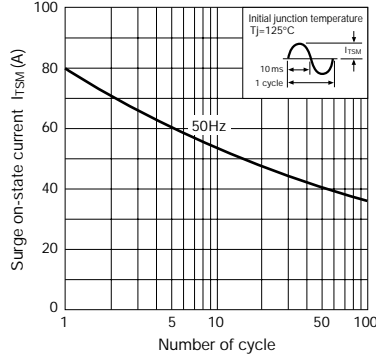


TF521S, TF541S, TF561S

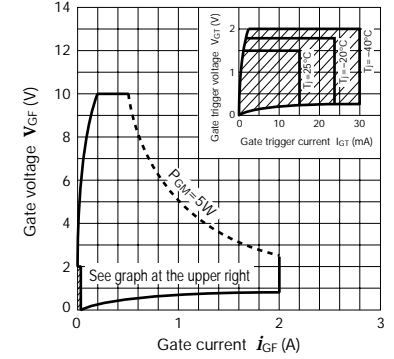
$V_T - I_T$ Characteristics (max)



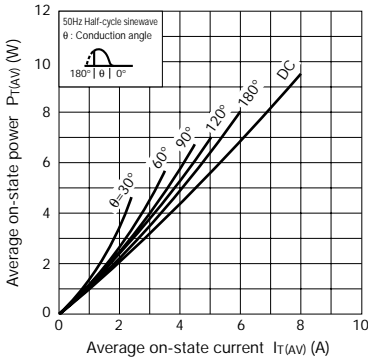
I_{TSM} Ratings



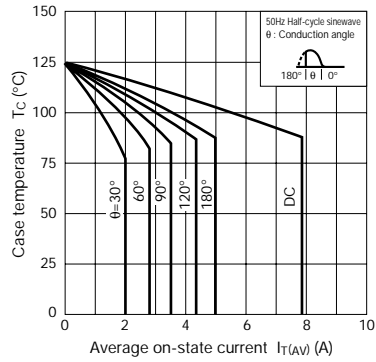
Gate Characteristics



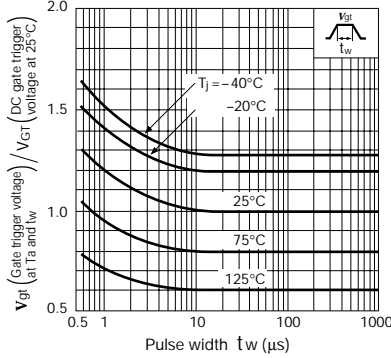
$I_T(AV) - P_T(AV)$ Characteristics



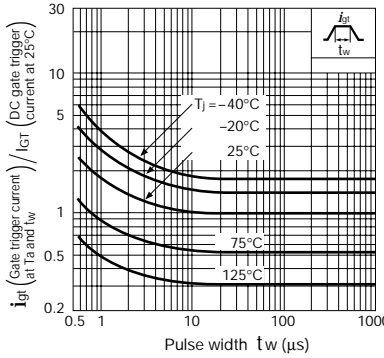
$I_T(AV) - T_C$ Ratings



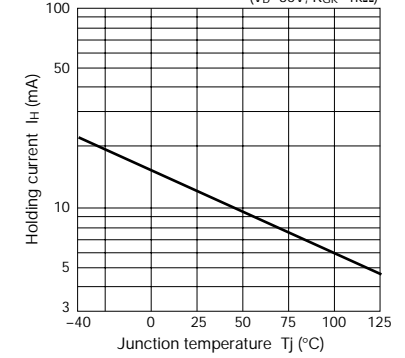
Pulse trigger temperature Characteristics V_{GT} (Typical)



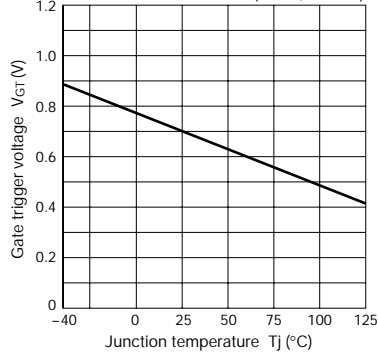
Pulse trigger temperature Characteristics I_{GT} (Typical)



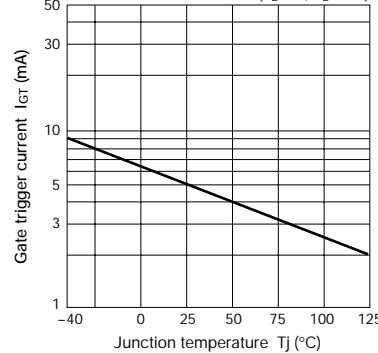
I_H temperature Characteristics (Typical)



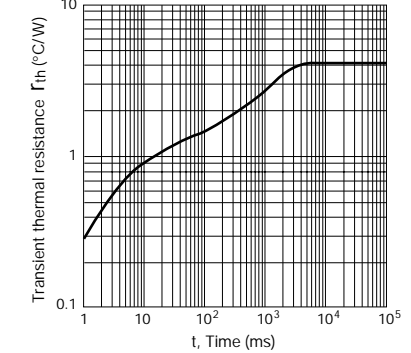
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)

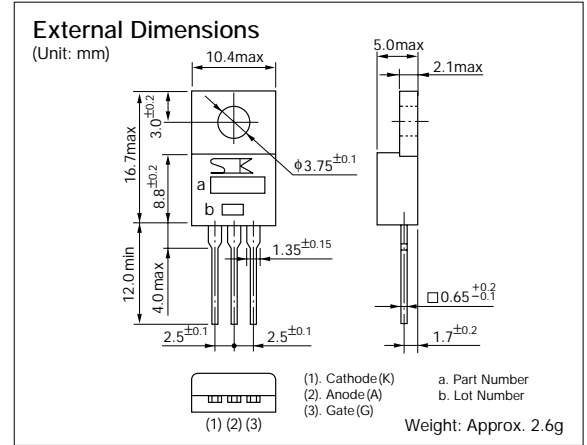


TO-220 8A Thyristor

TF821M, TF841M, TF861M

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=200, 400, 600V$
- Average on-state current: $I_{T(AV)}=8A$
- Gate trigger current: $I_{GT}=15mA$ max



■ Absolute Maximum Ratings

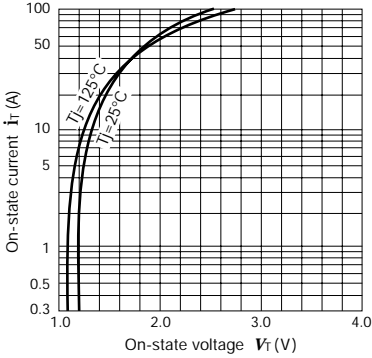
Parameter	Symbol	Ratings			Unit	Conditions
		TF821M	TF841M	TF861M		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	$T_j = -40$ to $+125^\circ C$, $R_{GK} = 1k\Omega$
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	8.0			A	50Hz Half-cycle sinewave, Continuous current, $T_c = 83^\circ C$
RMS on-state current	$I_{T(RMS)}$	12.6			A	
Surge on-state current	I_{TSM}	120			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, $T_j = 125^\circ C$
Peak forward gate current	I_{FGM}	2.0			A	$f \geq 50Hz$, duty $\leq 10\%$
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	$f \geq 50Hz$
Peak gate power loss	P_{GM}	5.0			W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	T_j	-40 to +125			$^\circ C$	
Storage temperature	T_{stg}	-40 to +125			$^\circ C$	

■ Electrical Characteristics

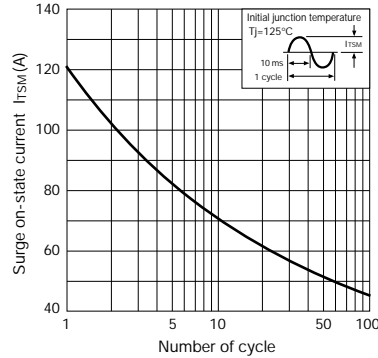
Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	$T_j = 125^\circ C$, $V_D = V_{DRM}(V_{RRM})$, $R_{GK} = 1k\Omega$
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	$T_c = 25^\circ C$, $I_{TM} = 15A$
Gate trigger voltage	V_{GT}			1.5	V	$V_D = 6V$, $R_L = 10\Omega$, $T_c = 25^\circ C$
Gate trigger current	I_{GT}		5.0	15	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$
Holding current	I_H		4.0		mA	$R_{GK} = 1k\Omega$, $T_j = 25^\circ C$
Critical rate-of-rise of off-state voltage	dv/dt		50		$V/\mu S$	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$, $C_{GK} = 0.033\mu F$
Turn-off time	t_q		30		μS	$T_c = 25^\circ C$
Thermal resistance	R_{th}			2.7	$^\circ C/W$	Junction to case

TF821M, TF841M, TF861M

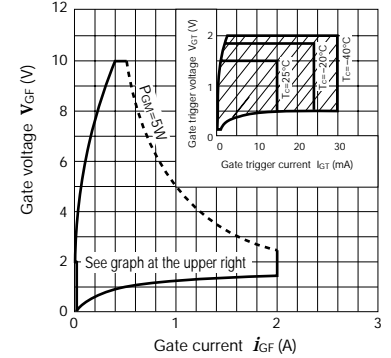
$V_T - I_T$ Characteristics (max)



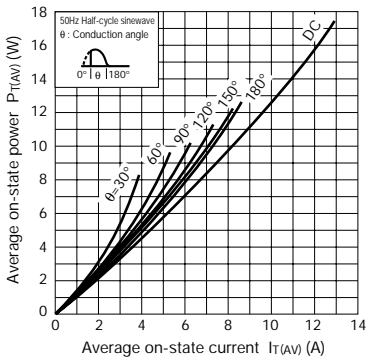
ITSM Ratings



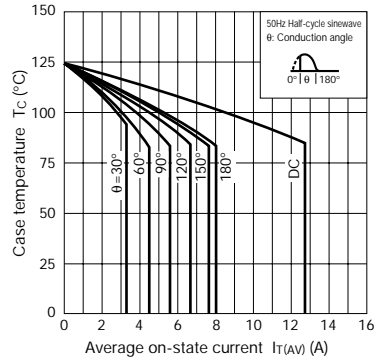
Gate Characteristics



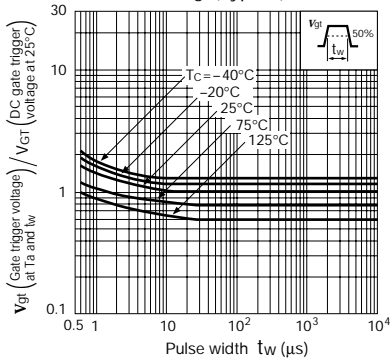
$I_T(AV) - P_T(AV)$ Characteristics



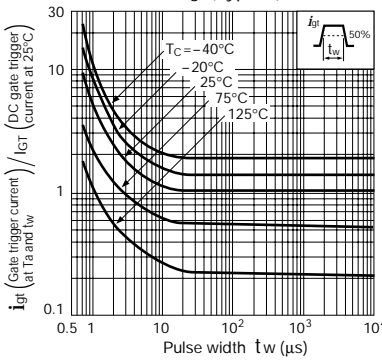
$I_T(AV) - T_C$ Ratings



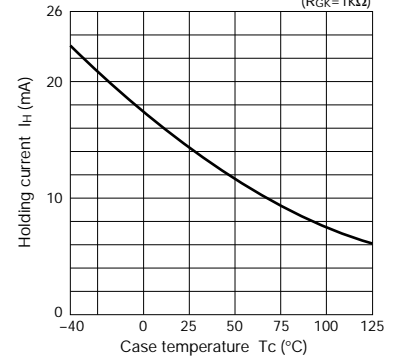
Pulse trigger temperature Characteristics V_{GT} (Typical)



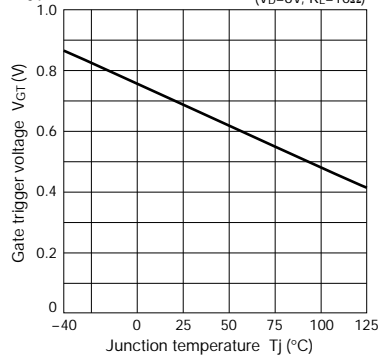
Pulse trigger temperature Characteristics I_{GT} (Typical)



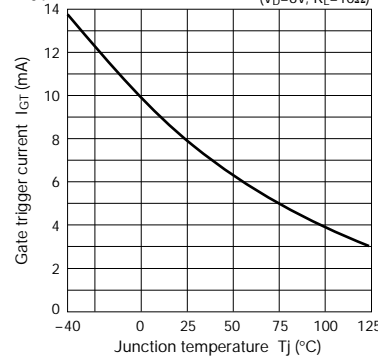
I_H temperature Characteristics (Typical)



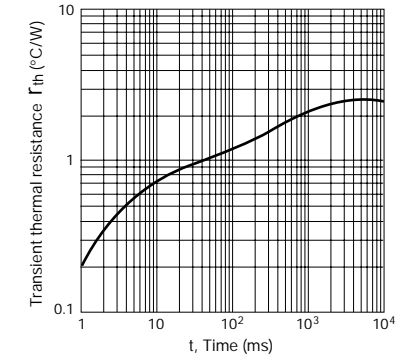
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)

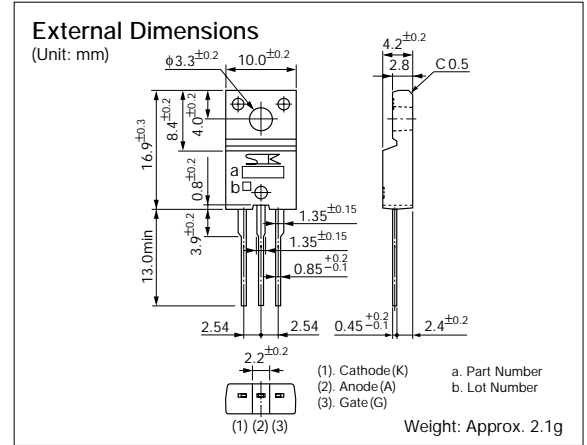


TO-220F 8A Thyristor

TF821S, TF841S, TF861S

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=200, 400, 600V$
- Average on-state current: $I_{T(AV)}=8A$
- Gate trigger current: $I_{GT}=15mA$ max
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- UL approved type available



■ Absolute Maximum Ratings

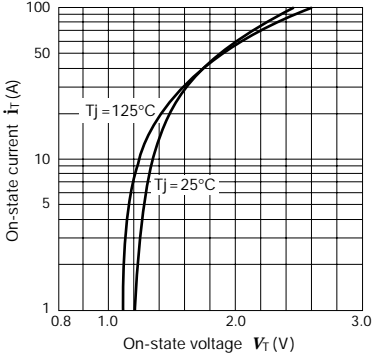
Parameter	Symbol	Ratings			Unit	Conditions
		TF821S	TF841S	TF861S		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	$T_j = -40$ to $+125^\circ C$, $R_{GK} = 1k\Omega$
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	8.0			A	50Hz Half-cycle sinewave, Continuous current, $T_c = 87^\circ C$
RMS on-state current	$I_{T(RMS)}$	12.6			A	
Surge on-state current	I_{TSM}	120			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, $T_j = 125^\circ C$
Peak forward gate current	I_{FGM}	2.0			A	$f \geq 50Hz$, duty $\leq 10\%$
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	$f \geq 50Hz$
Peak gate power loss	P_{GM}	5.0			W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	T_j	-40 to $+125$			$^\circ C$	
Storage temperature	T_{stg}	-40 to $+125$			$^\circ C$	
Isolation voltage	V_{ISO}	1500			V	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■ Electrical Characteristics

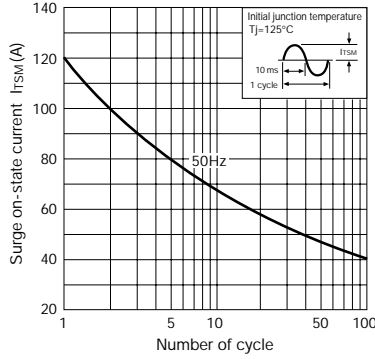
Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	$T_j = 125^\circ C$, $V_D = V_{DRM}(V_{RRM})$, $R_{GK} = 1k\Omega$
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	$T_c = 25^\circ C$, $I_{TM} = 15A$
Gate trigger voltage	V_{GT}			1.5	V	$V_D = 6V$, $R_L = 10\Omega$, $T_c = 25^\circ C$
Gate trigger current	I_{GT}		5.0	15	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$
Holding current	I_H		4.0		mA	$R_{GK} = 1k\Omega$, $T_j = 25^\circ C$
Critical rate-of-rise of off-state voltage	dv/dt		50		$V/\mu S$	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$, $C_{GK} = 0.033\mu F$
Turn-off time	t_q		30		μS	$T_c = 25^\circ C$
Thermal resistance	R_{th}			3.6	$^\circ C/W$	Junction to case

TF821S, TF841S, TF861S

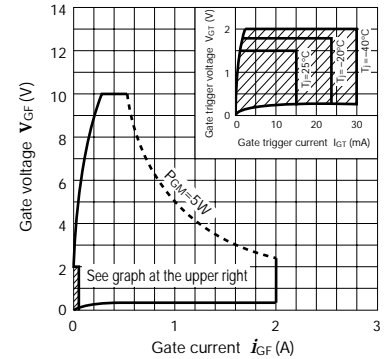
$V_T - I_T$ Characteristics (max)



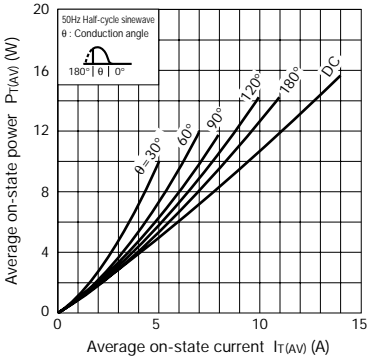
ITSM Ratings



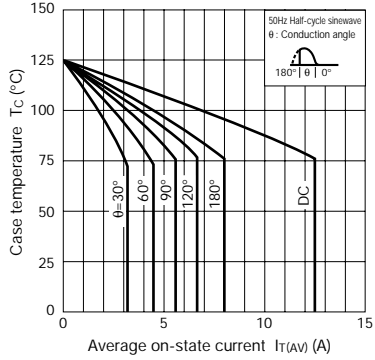
Gate Characteristics



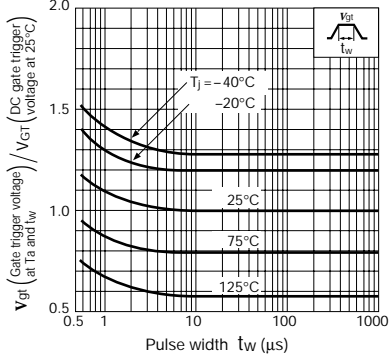
$I_T(AV) - P_T(AV)$ Characteristics



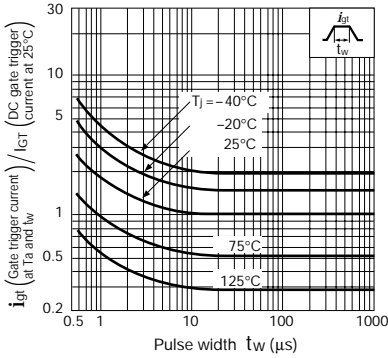
$I_T(AV) - T_C$ Ratings



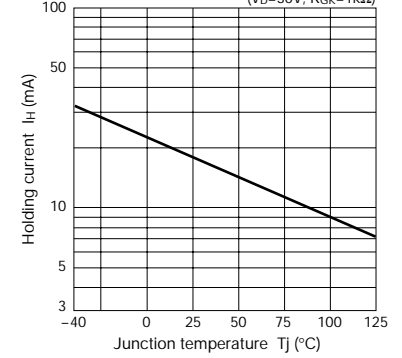
Pulse trigger temperature Characteristics V_{GT} (Typical)



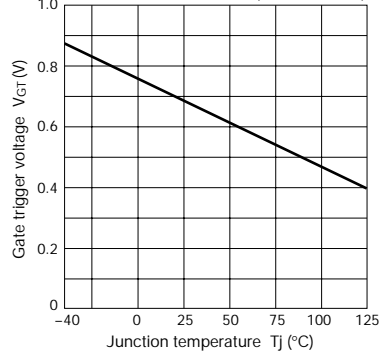
Pulse trigger temperature Characteristics I_{GT} (Typical)



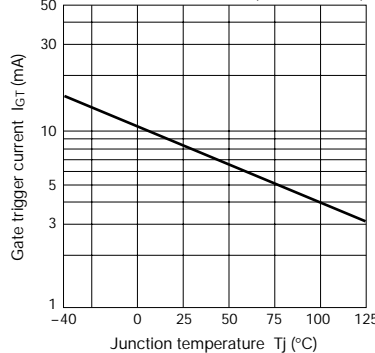
I_H temperature Characteristics (Typical)



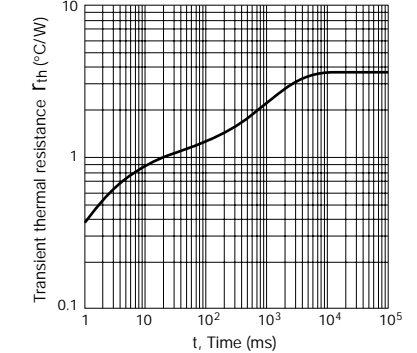
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)

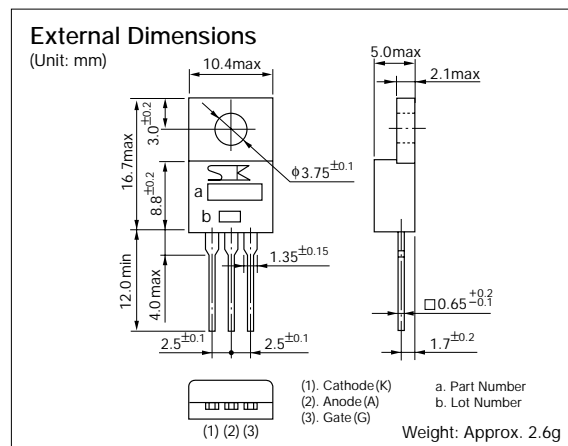


TO-220 3A High sensitive Thyristor

TF321M-A, TF341M-A, TF361M-A

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=200, 400, 600V$
- Average on-state current: $I_{T(AV)}=3A$
- High sensitive Gate trigger Current: $I_{GT}=0.1mA$ max



■ Absolute Maximum Ratings

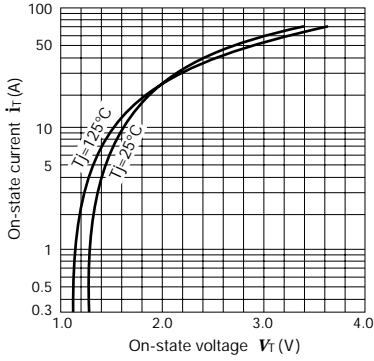
Parameter	Symbol	Ratings			Unit	Conditions
		TF321M-A	TF341M-A	TF361M-A		
Repetitive peak off-state voltage	V_{DRM}	200	400	600	V	$T_j = -40$ to $+125^\circ C$, $R_{GK} = 1k\Omega$
Repetitive peak reverse voltage	V_{RRM}	200	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	300	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	300	500	700	V	
Average on-state current	$I_{T(AV)}$	3.0			A	50Hz Half-cycle sinewave, Continuous current, $T_c=87^\circ C$
RMS on-state current	$I_{T(RMS)}$	4.7			A	
Surge on-state current	I_{TSM}	60			A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, $T_j=125^\circ C$
Peak forward gate current	I_{FGM}	2.0			A	$f \geq 50Hz$, duty $\leq 10\%$
Peak forward gate voltage	V_{FGM}	10			V	
Peak reverse gate voltage	V_{RGM}	5.0			V	$f \geq 50Hz$
Peak gate power loss	P_{GM}	5.0			W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5			W	
Junction temperature	T_j	-40 to +110			$^\circ C$	
Storage temperature	T_{stg}	-40 to +125			$^\circ C$	

■ Electrical Characteristics

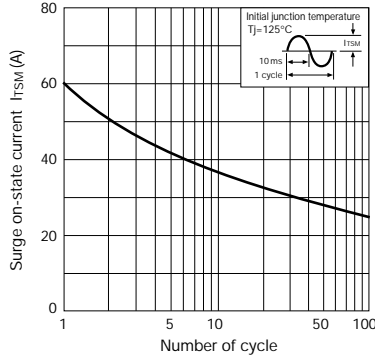
Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			1.0	mA	$T_j=125^\circ C$, $V_D=V_{DRM}(V_{RRM})$, $R_{GK}=1k\Omega$
Reverse current	I_{RRM}			1.0	mA	
On-state voltage	V_{TM}			1.4	V	$T_c=25^\circ C$, $I_{TM}=5A$
Gate trigger voltage	V_{GT}			1	V	$V_D=6V$, $R_L=10\Omega$, $T_c=25^\circ C$
Gate trigger current	I_{GT}			0.1	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D=1/2 \times V_{DRM}$, $T_j=125^\circ C$, $R_{GK}=1k\Omega$
Holding current	I_H		1.0		mA	$R_{GK}=1k\Omega$, $T_j=25^\circ C$
Critical rate-of-rise of off-state voltage	dv/dt		20		$V/\mu S$	$V_D=1/2 \times V_{DRM}$, $T_j=125^\circ C$, $R_{GK}=1k\Omega$, $C_{GK}=0.033\mu F$
Turn-off time	t_q		30		μS	$T_c=25^\circ C$
Thermal resistance	R_{th}			3.0	$^\circ C/W$	Junction to case

TF321M-A, TF341M-A, TF361M-A

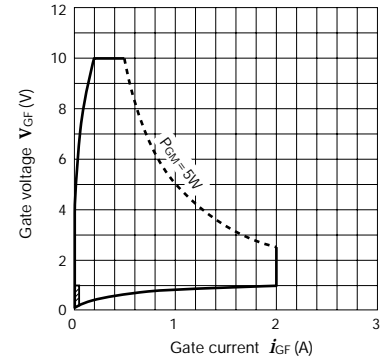
$V_T - I_T$ Characteristics (max)



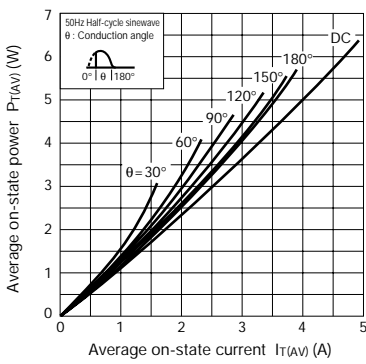
I_{TSM} Ratings



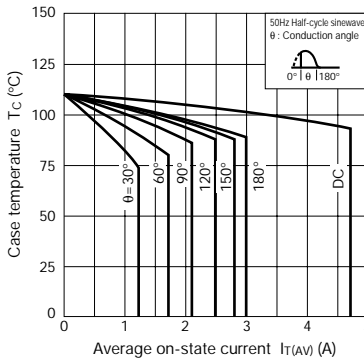
Gate Characteristics



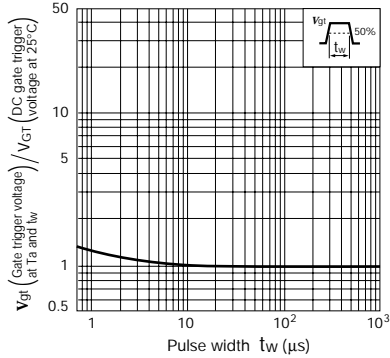
$I_T(AV) - P_T(AV)$ Characteristics



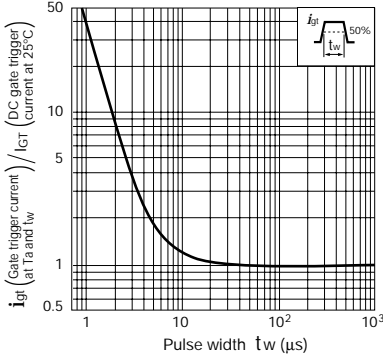
$I_T(AV) - T_c$ Ratings



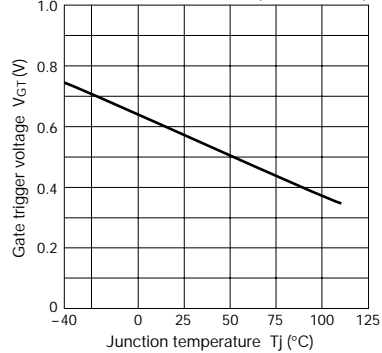
Pulse trigger temperature Characteristics V_{GT} (Typical)



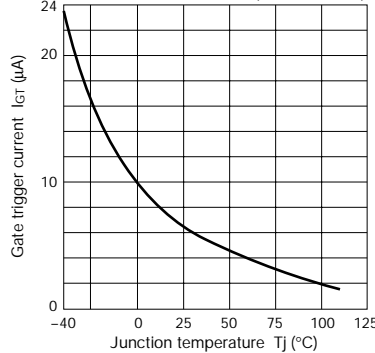
Pulse trigger temperature Characteristics I_{GT} (Typical)



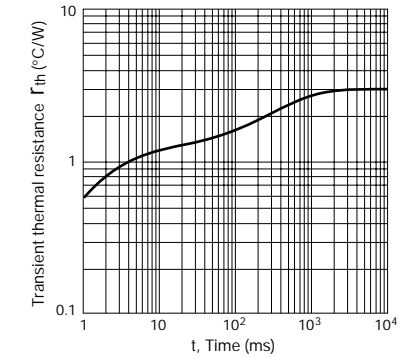
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)

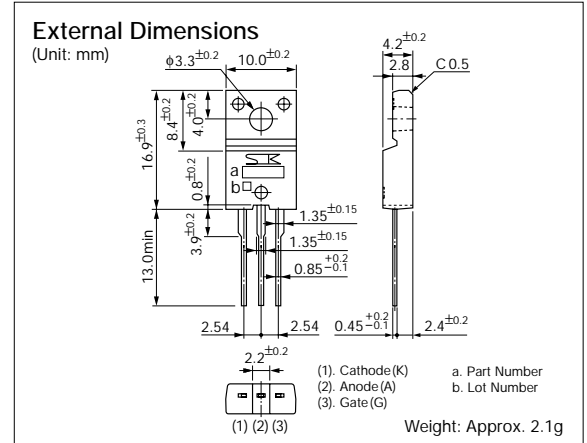


TO-220F 5A High sensitive Thyristor

TF541S-A, TF561S-A

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- Average on-state current: $I_{T(AV)}=5A$
- High sensitive Gate trigger current: $I_{GT}=0.2mA$ max
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)



■ Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TF541S-A	TF561S-A		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	$T_j = -40$ to $+125^\circ C$, $R_{GK} = 470\Omega$
Repetitive peak reverse voltage	V_{RRM}	400	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	500	700	V	
Non-repetitive peak reverse voltage	V_{RSM}	500	700	V	
Average on-state current	$I_{T(AV)}$	5.0		A	50Hz Half-cycle sinewave, Continuous current, $T_c = 88^\circ C$
RMS on-state current	$I_{T(RMS)}$	7.8		A	
Surge on-state current	I_{TSM}	80		A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, $T_j = 125^\circ C$
Peak forward gate current	I_{FGM}	2.0		A	$f \geq 50Hz$, duty $\leq 10\%$
Peak forward gate voltage	V_{FGM}	10		V	
Peak reverse gate voltage	V_{RGM}	5.0		V	$f \geq 50Hz$
Peak gate power loss	P_{GM}	5.0		W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		$^\circ C$	
Storage temperature	T_{stg}	-40 to +125		$^\circ C$	
Isolation voltage	V_{ISO}	1500		V	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■ Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	$T_j = 125^\circ C$, $V_D = V_{DRM}(V_{RRM})$, $R_{GK} = 1k\Omega$
Reverse current	I_{RRM}			2.0	mA	
On-state voltage	V_{TM}			1.4	V	$T_c = 25^\circ C$, $I_{TM} = 10A$
Gate trigger voltage	V_{GT}			1.5	V	$V_D = 6V$, $R_L = 10\Omega$, $T_c = 25^\circ C$
Gate trigger current	I_{GT}		0.03	0.2	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$
Holding current	I_H		4.0		mA	$R_{GK} = 1k\Omega$, $T_j = 25^\circ C$
Critical rate-of-rise of off-state voltage	dv/dt		20		$V/\mu S$	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$, $C_{GK} = 0.033\mu F$
Turn-off time	t_q		30		μS	$T_c = 25^\circ C$
Thermal resistance	R_{th}			4.0	$^\circ C/W$	Junction to case

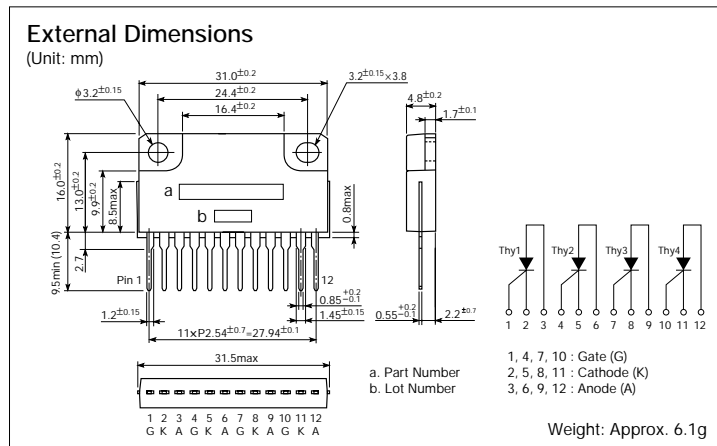
TF541S-A,TF561S-A

5A 600V 4 circuits Thyristor array

SLA0201

■ Features

- 5A 4 Thyristors combined one package
- Repetitive peak off-state voltage: $V_{DRM}=600V$
- Average on-state current: $I_{T(AV)}=5A$
- Gate trigger current: $I_{GT}=10mA$ max



■ Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	600	V	$T_j = -40$ to $+125^\circ C$, $R_{GK} = 1k\Omega$
Repetitive peak reverse voltage	V_{RRM}	600	V	
Non-repetitive peak off-state voltage	V_{DSM}	650	V	
Non-repetitive peak reverse voltage	V_{RSM}	650	V	
Average on-state current	$I_{T(AV)}$	5.0	A	50Hz Half-cycle sinewave, Conduction angle 180° , Continuous current
RMS on-state current	$I_{T(RMS)}$	7.8	A	
Surge on-state current	I_{TSM}	80	A	50Hz Half-cycle sinewave, Single shot, Non-repetitive, $T_j = 125^\circ C$
Peak forward gate current	I_{FGM}	2.0	A	$f \geq 50Hz$, duty $\leq 10\%$
Peak forward gate voltage	V_{FGM}	10	V	
Peak reverse gate voltage	V_{RGM}	5.0	V	$f \geq 50Hz$
Peak gate power loss	P_{GM}	5.0	W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5	W	
Junction temperature	T_j	-40 to $+125$	$^\circ C$	
Storage temperature	T_{stg}	-40 to $+125$	$^\circ C$	

■ Electrical Characteristics

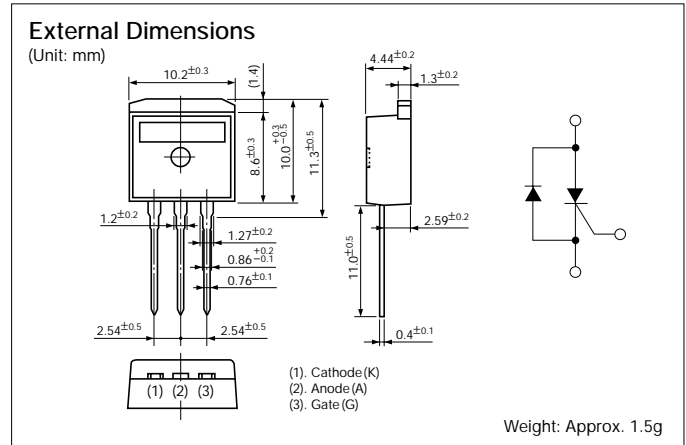
Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			2.0	mA	$T_j = 125^\circ C$, $V_D = 600V$, $R_{GK} = 1k\Omega$
				100		μA
Reverse current	I_{RRM}			2.0	mA	$T_j = 125^\circ C$, $V_D = 600V$, $R_{GK} = 1k\Omega$
				100		μA
On-state voltage	V_{TM}			1.4	V	$T_C = 25^\circ C$, $I_{TM} = 10A$
Gate trigger voltage	V_{GT}		0.7	1.5	V	$V_D = 6V$, $R_L = 10\Omega$, $T_C = 25^\circ C$
Gate trigger current	I_{GT}		5.0	10	mA	
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$
Holding current	I_H		4.0		mA	$R_{GK} = 1k\Omega$, $T_j = 25^\circ C$
Critical rate-of-rise of off-state voltage	dv/dt		50		$V/\mu S$	$V_D = 1/2 \times V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$, $C_{GK} = 0.033\mu F$
Total power dissipation	P_T			4	W	Without Heatsink, $T_j = 25^\circ C$, All elements operation
				32		With infinite Heatsink, $T_j = 25^\circ C$, All elements operation

TO-220S Thyristor with built-in reverse diode for HID lamp ignition

TFC561D

Features

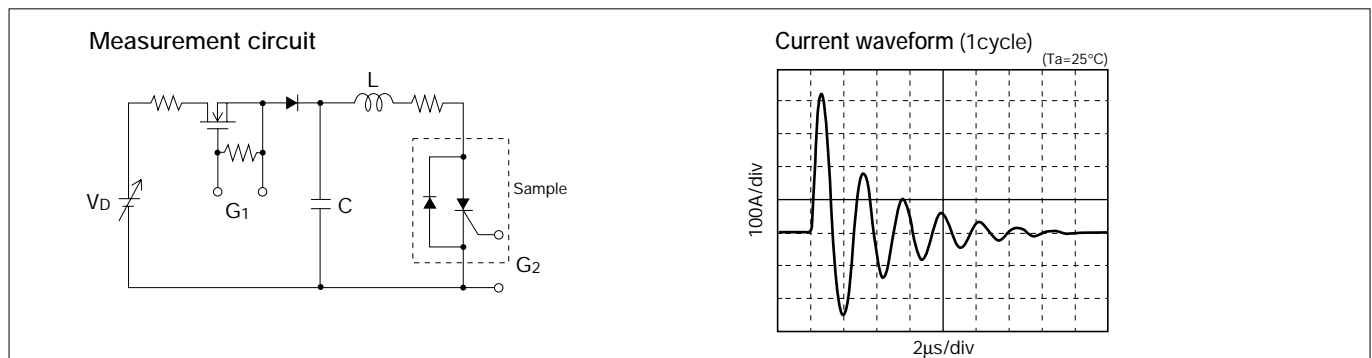
- Repetitive peak off-state voltage: $V_{DRM}=600V$
- Repetitive peak surge on-state current: $I_{TRM}=430A$
- Critical rate-of-rise of on-state current: $di/dt=1200A/\mu s$
- Gate trigger current: $I_{GT}=20mA$ max
- With built-in reverse diode



Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	600	V	$T_J = -40$ to $+125^\circ C$, $R_{GK}=1k\Omega$
Repetitive surge peak on-state current	I_{TRM}	430	A	$V_D \leq 430V$, 100kcycle, $W_p=1.3\mu s$, $T_a=125^\circ C$ *
Critical rate-of-rise of on-state current	di/dt	1200	A/ μs	*
Peak forward gate current	I_{FGM}	2.0	A	$f \geq 50Hz$, duty $\leq 10\%$
Peak gate power loss	P_{GM}	5.0	W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5	W	
Peak reverse gate voltage	V_{RGM}	5	V	$f \geq 50Hz$
Diode repetitive peak surge forward current	I_{FRM}	240	A	$V_D \leq 430V$, 100kcycle, $W_p=1.3\mu s$, $T_a=125^\circ C$ *
Junction temperature	T_J	-40 to +125	$^\circ C$	
Storage temperature	T_{stg}	-40 to +125	$^\circ C$	

* The surge current for $T=10ms$ /cycle shall be applied 50 cycles successively, and an interval time shall follow to cool down the junction temperature of the device to $125^\circ C$. This process shall be repeated up to 100K cycles.



Electrical Characteristics

($T_J=25^\circ C$)

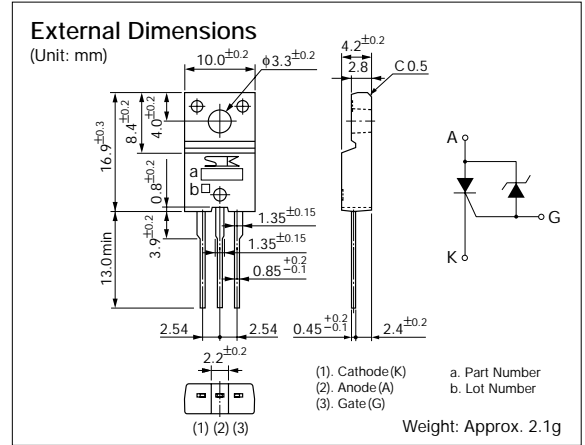
Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
On-state voltage	V_{TM}			1.4	V	$I_T=10A$
Gate trigger voltage	V_{GT}			1.5	V	$V_D=6V$, $R_L=10\Omega$
Gate trigger current	I_{GT}			20	mA	$V_D=6V$, $R_L=10\Omega$
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D=480V$, $T_J=125^\circ C$
Holding current	I_H	2	10.0		mA	$R_{G-K}=1k\Omega$, $T_J=25^\circ C$
Off-state current (1)	$I_{DRM}(1)$			100	μA	$V_D=V_{DRM}$, $R_{G-K}=1k\Omega$, $T_J=25^\circ C$
Off-state current (2)	$I_{DRM}(2)$			1	mA	$V_D=V_{DRM}$, $R_{G-K}=1k\Omega$, $T_J=125^\circ C$
Thermal resistance	R_{th}			4.0	$^\circ C/W$	Junction to case
Diode forward voltage	V_F			1.4	V	$I_F=10A$

TO-220F 3A Thyristor with built-in Avalanche diode

TFD312S series

Features

- With built-in Avalanche diode
- Average on-state current: $I_{T(AV)}=3A$
- Gate trigger current: $I_{GT}=10mA$ max
- Isolation voltage: $V_{ISO}=1500V(50Hz$ AC, RMS, 1min.)



Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	*	V	$T_j = -10$ to $+125^\circ C$, $R_{GK} = 1k\Omega$
Average on-state current	$I_{T(AV)}$	3.0	A	50Hz Half-cycle sine wave, 180° , Continuous current, $T_c = 92^\circ C$
RMS on-state current	$I_T(RMS)$	4.7	A	
Surge on-state current	I_{TSM}	60	A	50Hz Half-cycle sine wave, Peak value, Non-repetitive, $T_j = 125^\circ C$
Squared rated current and time product	i^2t	18	$A^2 \cdot sec$	$2ms \leq t \leq 10ms$
Peak forward gate voltage	V_{FGM}	1.5	V	$f \geq 50Hz$, duty $\leq 10\%$
Peak reverse gate voltage	V_{RGM}	5.0	V	$f \geq 50Hz$
Peak gate power loss	P_{GM}	5.0	W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5	W	
Junction temperature	T_j	-10 to $+125$	$^\circ C$	
Storage temperature	T_{stg}	-40 to $+125$	$^\circ C$	
Isolation voltage	V_{ISO}	1500	V	50Hz Sine wave, RMS, Terminal to case, 1min.

* V_{DRM}

Rank	-C	-F	-G	-J	-K	-L	-M	-N	-O
Ratings	20	35	45	80	100	120	145	170	190

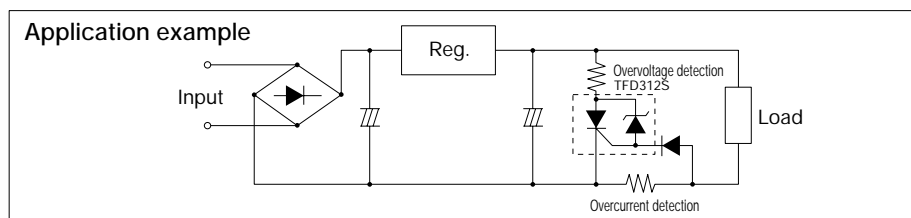
Electrical Characteristics

($T_j = 25^\circ C$, unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions
		min	typ	max		
Off-state current	I_{DRM}			1.0	mA	$T_j = 125^\circ C$, $V_D = V_{DRM}$, $R_{GK} = 1k\Omega$
				100	μA	$T_j = 25^\circ C$, $V_D = V_{DRM}$, $R_{GK} = 1k\Omega$
Breakover voltage	V_{BO}		*		V	
Breakover current	I_{BO}	0.2		15	mA	
On-state voltage	V_{TM}			1.4	V	$I_{TM} = 5A$
Gate trigger voltage	V_{GT}			1.0	V	
Gate trigger current	I_{GT}	0.2		10	mA	$V_D = 6V$, $R_L = 10\Omega$
Gate non-trigger voltage	V_{GT}	0.1			V	$V_D = V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$
Holding current	I_H			15	mA	$R_{GK} = 1k\Omega$, $T_j = 125^\circ C$
Critical rate-of-rise of off-state voltage	dv/dt		40		$V/\mu S$	$V_D = V_{DRM}$, $T_j = 125^\circ C$, $R_{GK} = 1k\Omega$, $C_{GK} = 0.033\mu F$
Thermal resistance	R_{th}			5.0	$^\circ C/W$	Junction to case

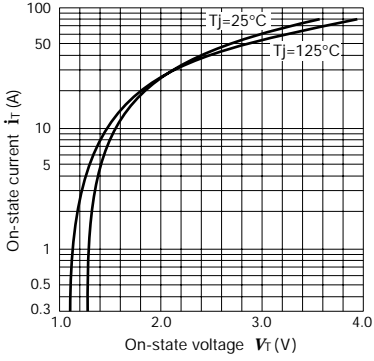
* V_{BO}

Rank	min	-C	-F	-G	-J	-K	-L	-M	-N	-O
		Ratings	27	50	60	90	115	140	163	185
	typ	30	55	65	100	125	150	175	200	225
	max	33	60	70	110	135	160	187	215	240

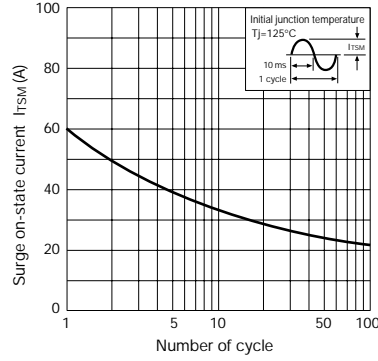


TFD312S series

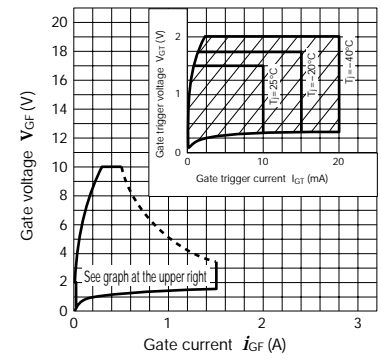
$V_T - I_T$ Characteristics (max)



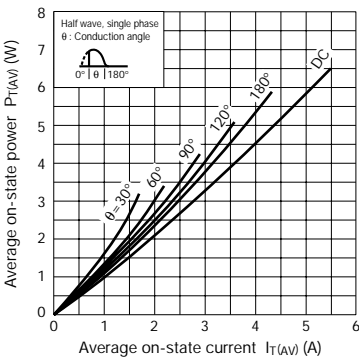
I_{TSM} Ratings



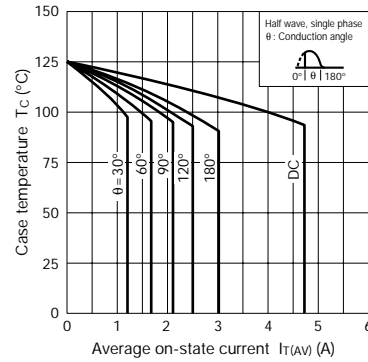
Gate Characteristics



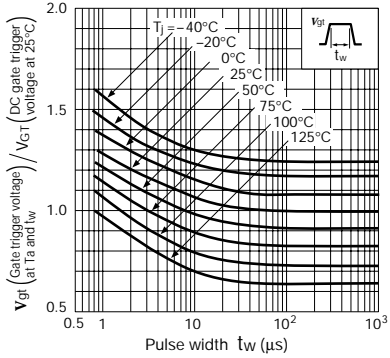
$I_T(AV) - P_T(AV)$ Characteristics



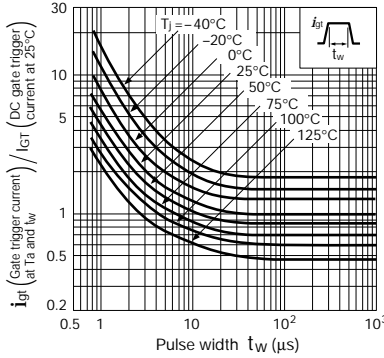
$I_T(AV) - T_C$ Ratings



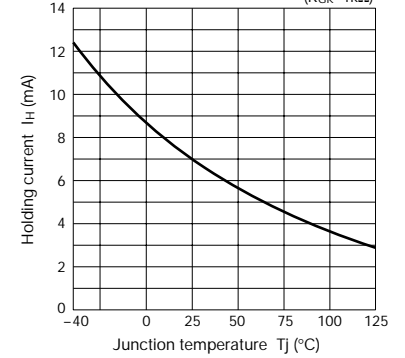
Pulse trigger temperature Characteristics V_{GT} (Typical)



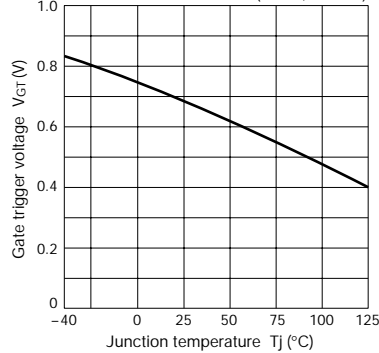
Pulse trigger temperature Characteristics i_{GT} (Typical)



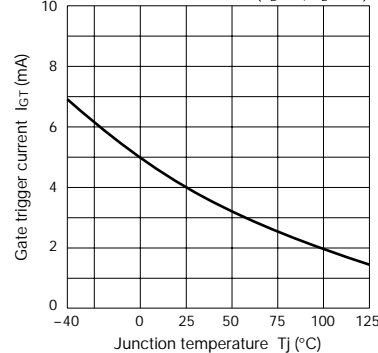
I_H temperature Characteristics (Typical)



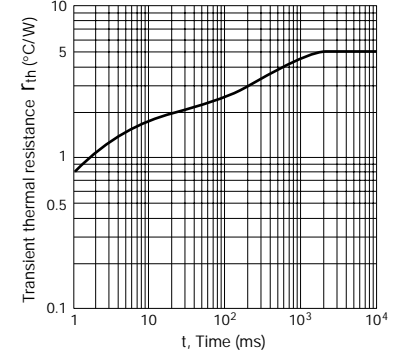
V_{GT} temperature Characteristics (Typical)



I_{GT} temperature Characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)

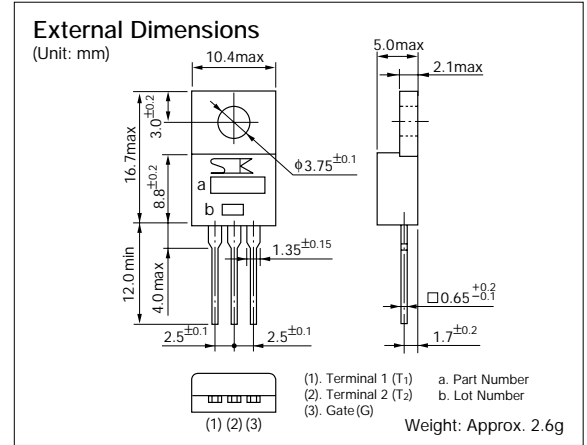


TO-220 3A Triac

TM341M-L, TM361M-L

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=3A$
- Gate trigger Current: $I_{GT}=20mA \text{ max (MODE I, II, III)}$



■ Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM341M-L	TM361M-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	3.0		A	Conduction angle 360°, $T_C=115^\circ C$
Surge on-state current	I_{TSM}	30		A	50Hz full-cycle sine wave, Peak value, Non-repetitive, $T_J=125^\circ C$
Peak gate voltage	V_{GM}	6		V	
Peak gate current	I_{GM}	0.5		A	
Peak gate power loss	P_{GM}	3		W	
Average gate power loss	$P_{G(AV)}$	0.3		W	
Junction temperature	T_J	-40 to +125		$^\circ C$	
Storage temperature	T_{stg}	-40 to +125		$^\circ C$	

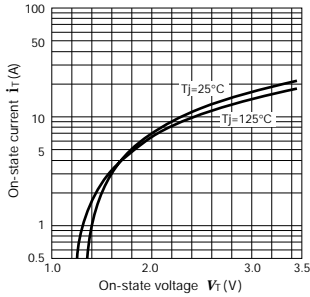
■ Electrical Characteristics

($T_J=25^\circ C$, unless otherwise specified)

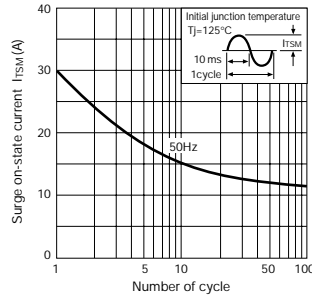
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.3	2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_J=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_J=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=5A$	
Gate trigger voltage	V_{GT}	I	0.7	2.0	V	$V_D=6V, R_L=10\Omega, T_C=25^\circ C$	T_2^+, G^+
		II	0.7	2.0			T_2^+, G^-
		III	0.8	2.0			T_2^-, G^-
		IV	0.8				T_2^-, G^+
Gate trigger current	I_{GT}	I	8	20	mA	$V_D=6V, R_L=10\Omega, T_C=25^\circ C$	T_2^+, G^+
		II	10	20			T_2^+, G^-
		III	12	20			T_2^-, G^-
		IV	15				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_J=125^\circ C$	
Holding current	I_H		10		mA	$V_D=6V$	
Thermal resistance	R_{th}			3.0	$^\circ C/W$	Junction to case	

TM341M-L, TM361M-L

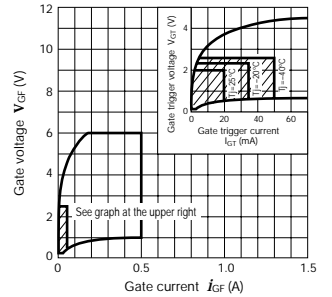
$V_T - I_T$ Characteristics (max)



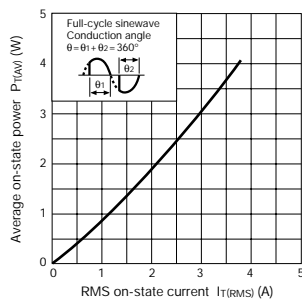
ITSM Ratings



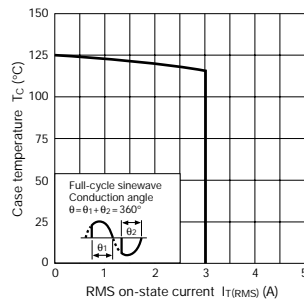
Gate Characteristics



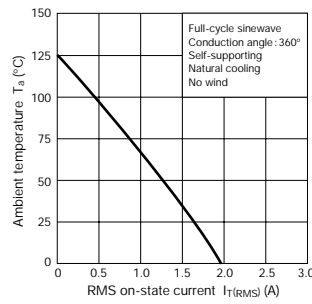
$I_T(RMS) - P_{T(AV)}$ Characteristics



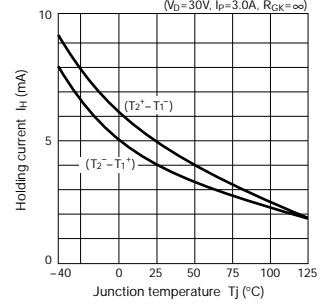
$I_T(RMS) - T_c$ Ratings



$I_T(RMS) - T_a$ Ratings

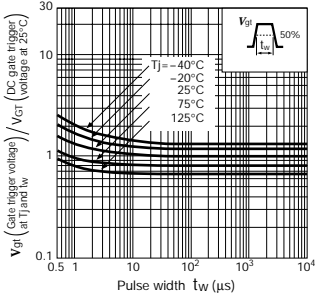


I_H temperature Characteristics (Typical)

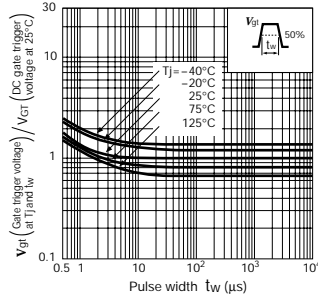


Pulse trigger temperature Characteristics V_{gt} (Typical)

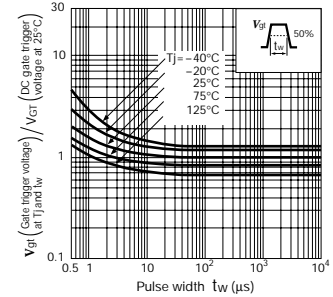
(MODE - I)



(MODE - II)

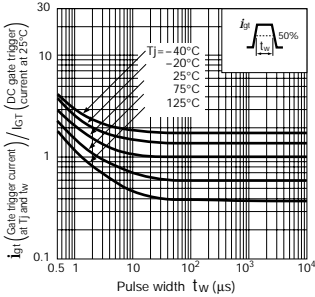


(MODE - III)

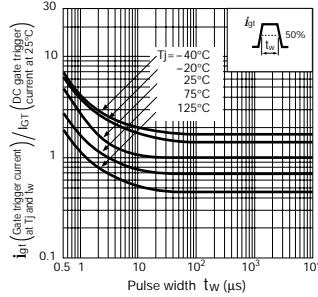


Pulse trigger temperature Characteristics I_{gt} (Typical)

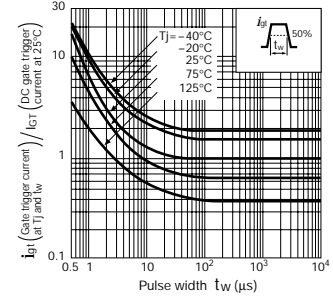
(MODE - I)



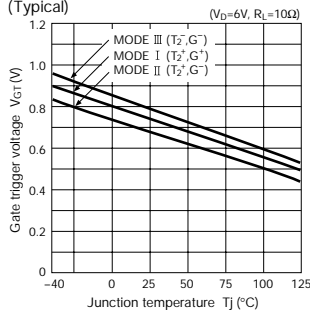
(MODE - II)



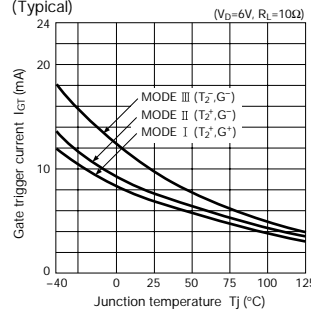
(MODE - III)



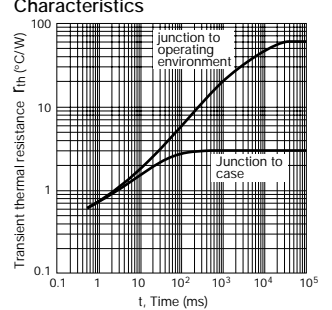
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics

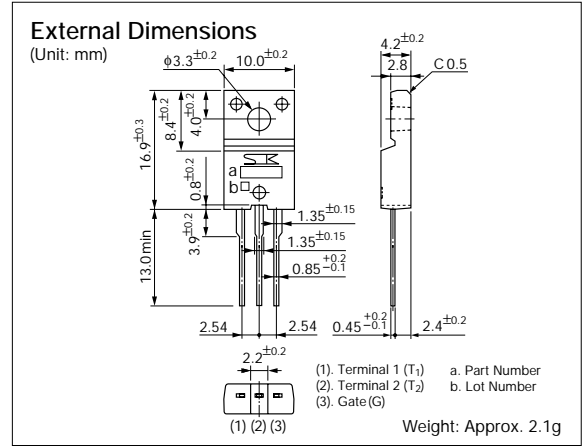


TO-220F 3A Triac

TM341S-L, TM361S-L

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- Rms on-state current: $I_{T(RMS)}=3A$
- Gate trigger current: $I_{GT}=20mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- UL approved type available



■ Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM341S-L	TM361S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	3.0		A	Conduction angle 360°, $T_C=109^\circ C$
Surge on-state current	I_{TSM}	30		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_J=125^\circ C$
Peak gate voltage	V_{GM}	6		V	
Peak gate current	I_{GM}	0.5		A	
Peak gate power loss	P_{GM}	3		W	
Average gate power loss	$P_{G(AV)}$	0.3		W	
Junction temperature	T_J	-40 to +125		$^\circ C$	
Storage temperature	T_{stg}	-40 to +125		$^\circ C$	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

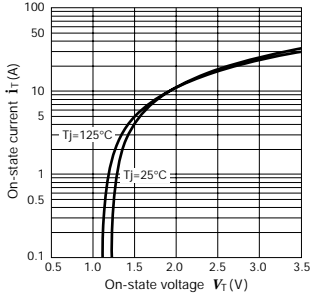
■ Electrical Characteristics

($T_J=25^\circ C$, unless otherwise specified)

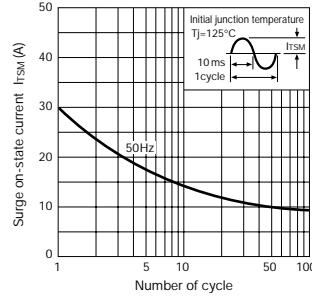
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.3	2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_J=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_J=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=5A$	
Gate trigger voltage	V_{GT}	I	0.7	2.0	V	$V_D=6V, R_L=10\Omega, T_C=25^\circ C$	T_2^+, G^+
		II	0.7	2.0			T_2^+, G^-
		III	0.8	2.0			T_2^-, G^-
		IV	0.8				T_2^-, G^+
Gate trigger current	I_{GT}	I	8	20	mA	$V_D=6V, R_L=10\Omega, T_C=25^\circ C$	T_2^+, G^+
		II	10	20			T_2^+, G^-
		III	12	20			T_2^-, G^-
		IV	15				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_J=125^\circ C$	
Holding current	I_H		10		mA	$V_D=6V$	
Thermal resistance	R_{th}			5.0	$^\circ C/W$	Junction to case	

TM341S-L, TM361S-L

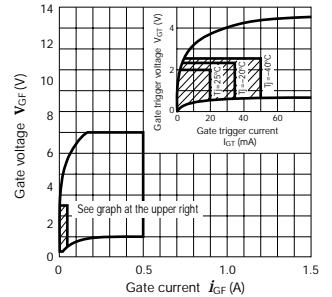
$V_T - I_T$ Characteristics (max)



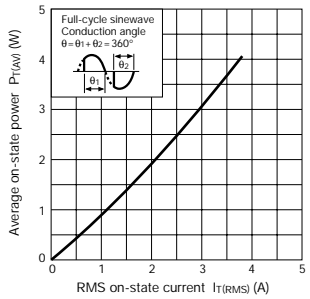
I_{TSM} Ratings



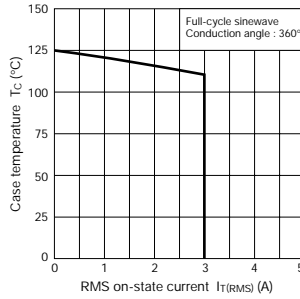
Gate Characteristics



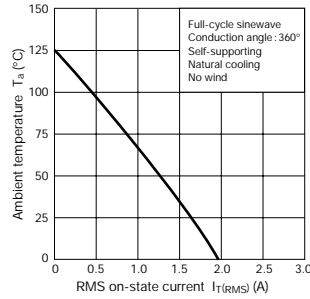
$I_T(RMS) - P_T(AV)$ Characteristics



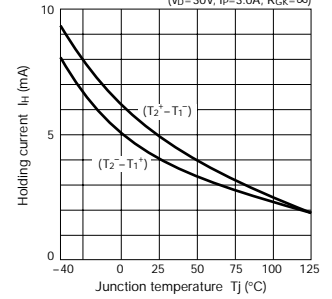
$I_T(RMS) - T_c$ Ratings



$I_T(RMS) - T_a$ Ratings

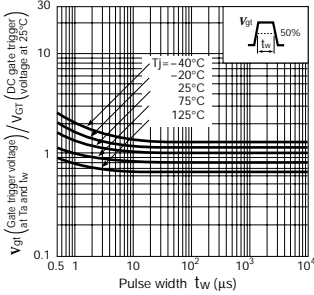


I_H temperature Characteristics (Typical)

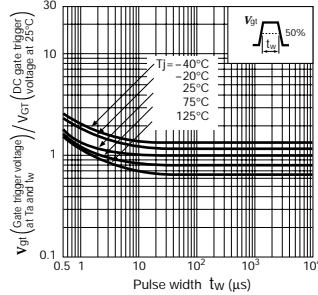


Pulse trigger temperature Characteristics V_{gt} (Typical)

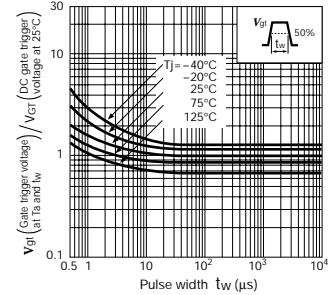
(MODE - I)



(MODE - II)

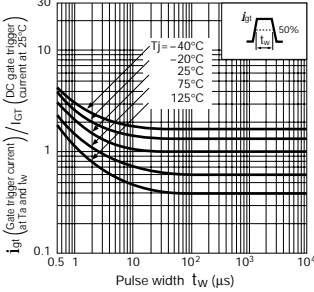


(MODE - III)

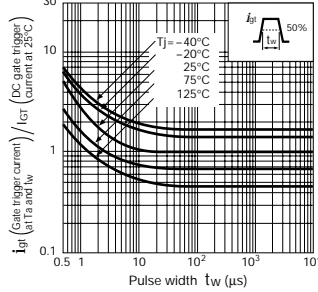


Pulse trigger temperature Characteristics I_{gt} (Typical)

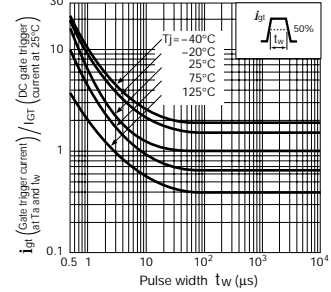
(MODE - I)



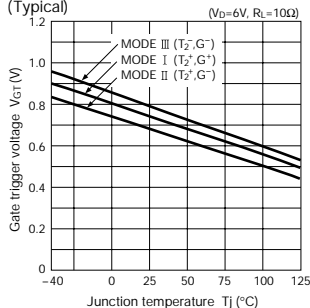
(MODE - II)



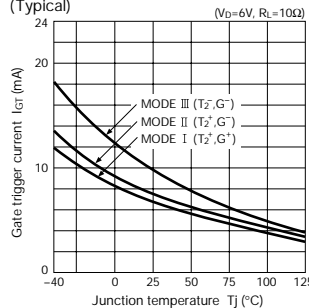
(MODE - III)



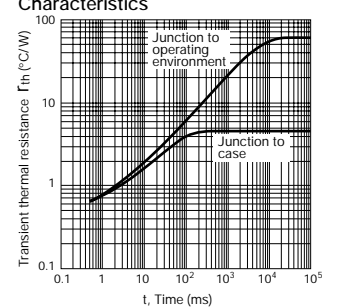
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)

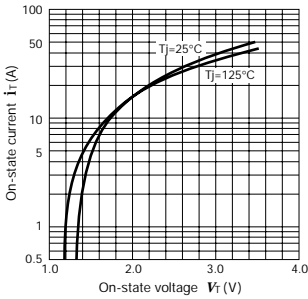


Transient thermal resistance Characteristics

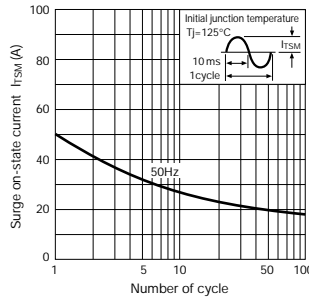


TM541M-L, TM561M-L

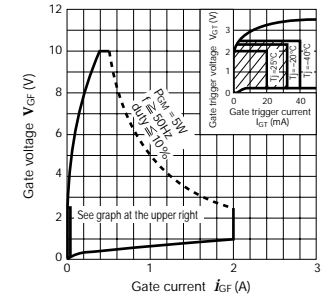
$V_T - I_T$ Characteristics (max)



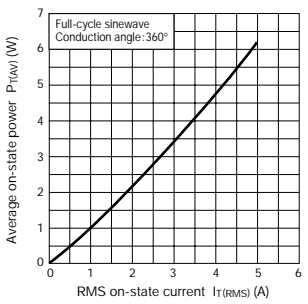
I_{TSM} Ratings



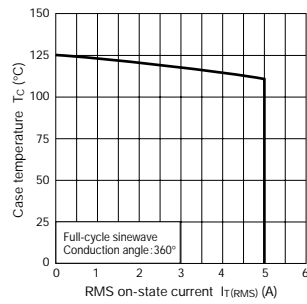
Gate Characteristics



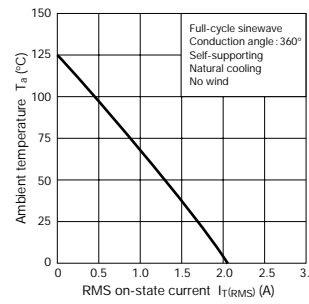
$I_T(RMS) - P_T(AV)$ Characteristics



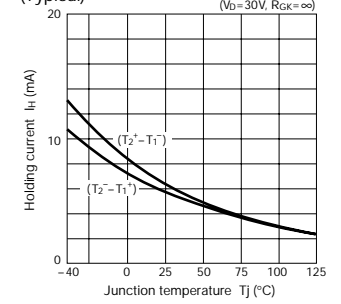
$I_T(RMS) - T_c$ Ratings



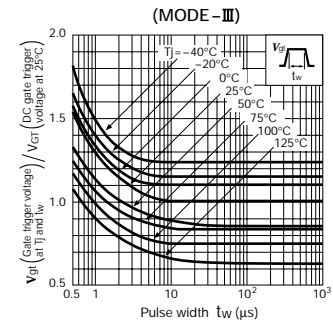
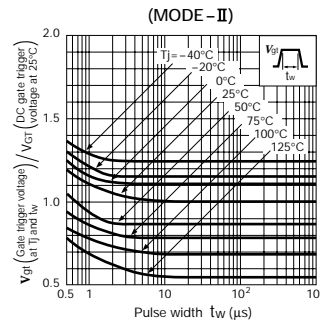
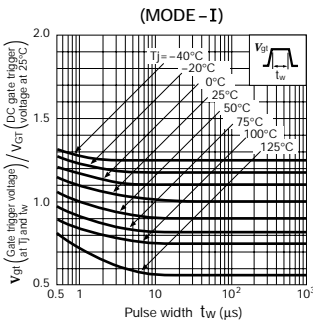
$I_T(RMS) - T_a$ Ratings



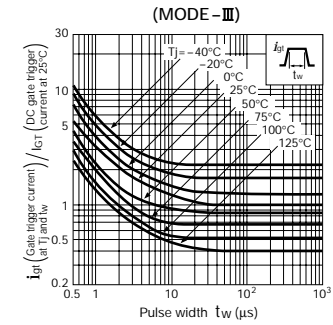
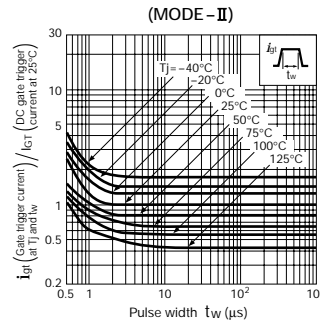
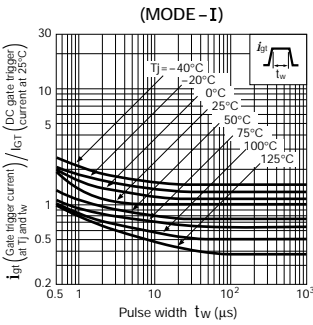
I_H temperature Characteristics (Typical)



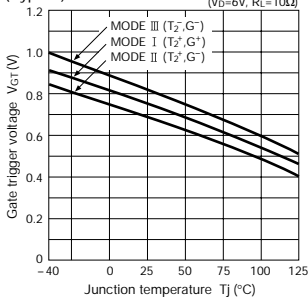
Pulse trigger temperature Characteristics V_{gt} (Typical)



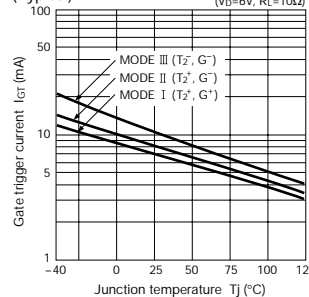
Pulse trigger temperature Characteristics i_{gt} (Typical)



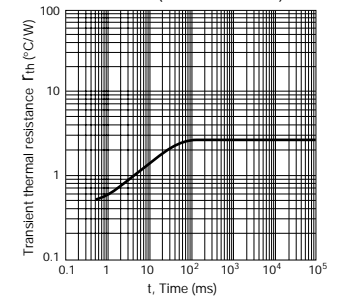
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics (Junction to case)

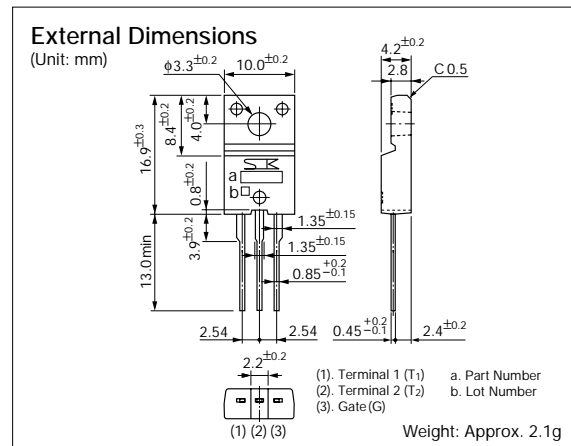


TO-220F 5A Triac

TM541S-L, TM561S-L

Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=5A$
- Gate trigger current: $I_{GT}=20mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- UL approved type available



Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM541S-L	TM561S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	5.0		A	Conduction angle 360°, $T_c=104^\circ C$
Surge on-state current	I_{TSM}	50		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		$^\circ C$	
Storage temperature	T_{stg}	-40 to +125		$^\circ C$	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

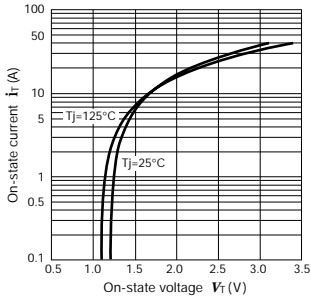
Electrical Characteristics

($T_j=25^\circ C$, unless otherwise specified)

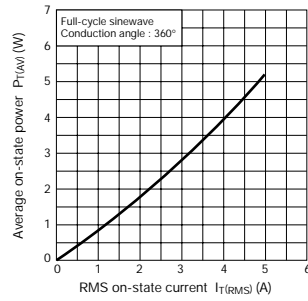
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.3	2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=7A$	
Gate trigger voltage	V_{GT}	I	0.7	2.0	V	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	0.7	2.0			T_2^+, G^-
		III	0.8	2.0			T_2^-, G^-
		IV	0.8	2.0			T_2^-, G^+
Gate trigger current	I_{GT}	I	7	20	mA	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	8	20			T_2^+, G^-
		III	10	20			T_2^-, G^-
		IV	15	20			T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_j=125^\circ C$	
Holding current	I_H		5		mA	$V_D=6V$	
Thermal resistance	R_{th}			4.0	$^\circ C/W$	Junction to case	

TM541S-L, TM561S-L

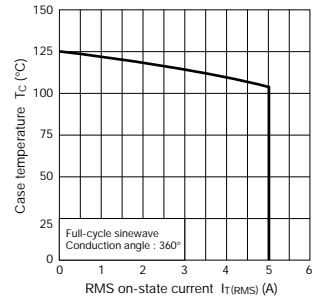
$V_T - I_T$ Characteristics (max)



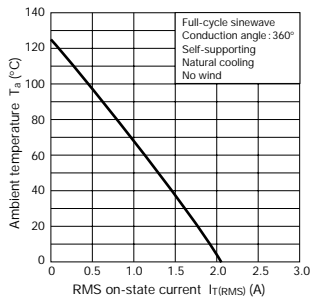
$I_T(\text{RMS}) - P_T(\text{AV})$ Characteristics



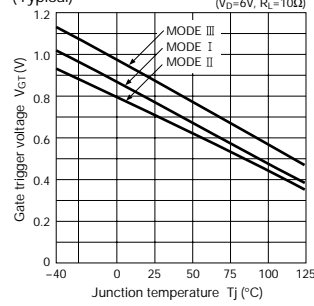
$I_T(\text{RMS}) - T_c$ Ratings



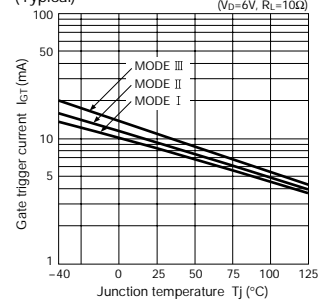
$I_T(\text{RMS}) - T_a$ Ratings



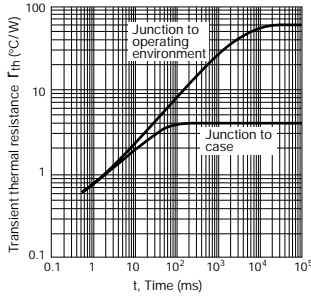
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics

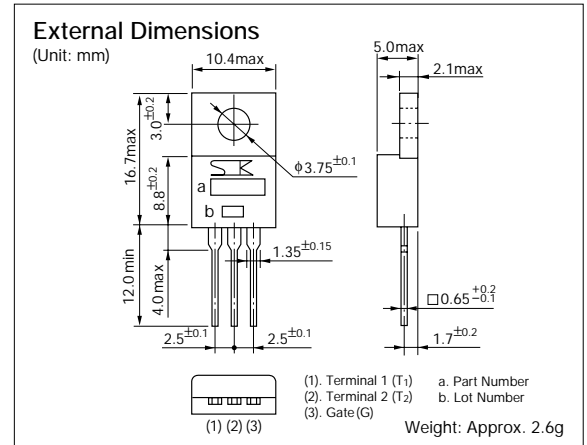


TO-220 8A Triac

TM841M-L, TM861M-L

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=8A$
- Gate trigger Current: $I_{GT}=30mA \text{ max (MODE I, II, III)}$



■ Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM841M-L	TM861M-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	8.0		A	Conduction angle 360°, $T_c=108^\circ C$
Surge on-state current	I_{TSM}	80		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		$^\circ C$	
Storage temperature	T_{stg}	-40 to +125		$^\circ C$	

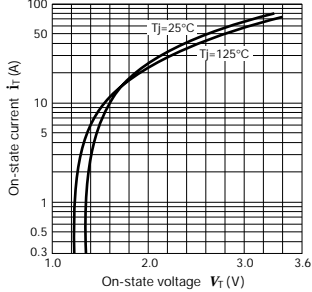
■ Electrical Characteristics

($T_j=25^\circ C$, unless otherwise specified)

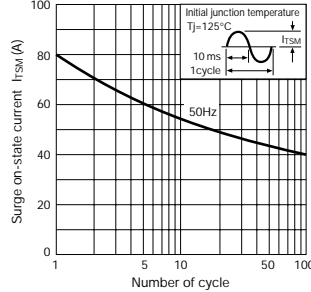
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.3	2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=10A$	
Gate trigger voltage	V_{GT}	I	0.8	2.0	V	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	0.7	2.0			T_2^+, G^-
		III	0.8	2.0			T_2^-, G^-
		IV	0.9				T_2^-, G^+
Gate trigger current	I_{GT}	I	8	30	mA	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	10	30			T_2^+, G^-
		III	12	30			T_2^-, G^-
		IV	30				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_j=125^\circ C$	
Holding current	I_H		12		mA	$V_D=6V$	
Thermal resistance	R_{th}			1.8	$^\circ C/W$	Junction to case	

TM841M-L, TM861M-L

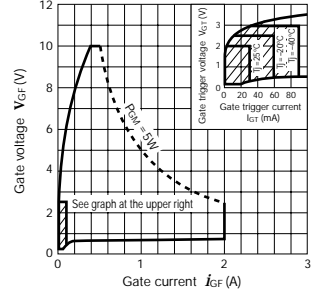
$V_T - I_T$ Characteristics (max)



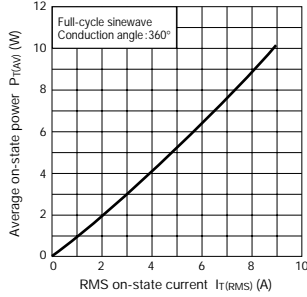
I_{TSM} Ratings



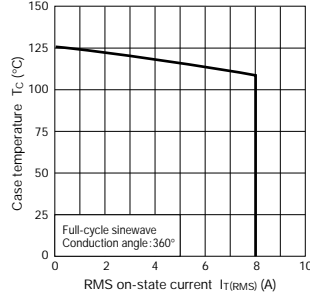
Gate Characteristics



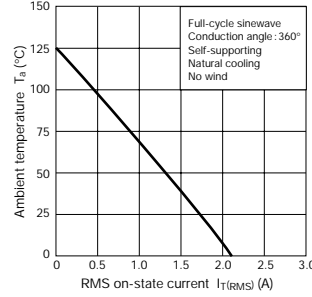
$I_T(RMS) - P_T(AV)$ Characteristics



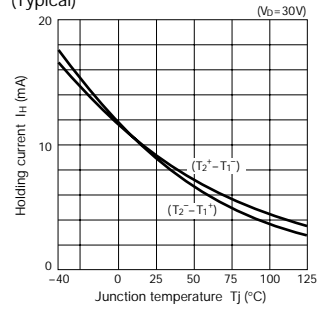
$I_T(RMS) - T_c$ Ratings



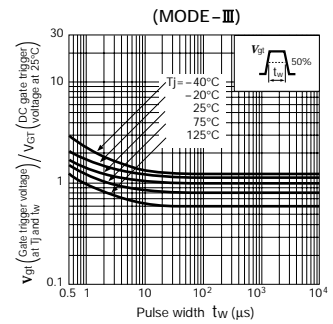
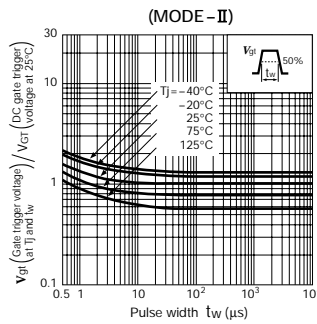
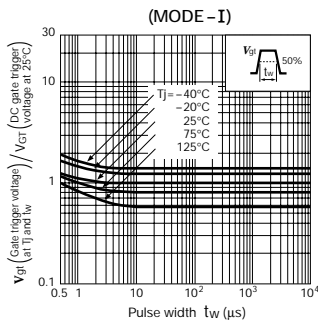
$I_T(RMS) - T_a$ Ratings



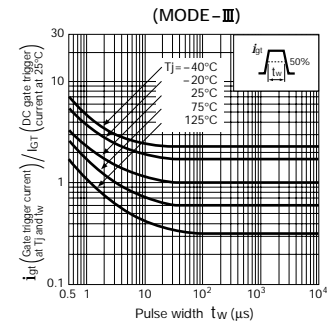
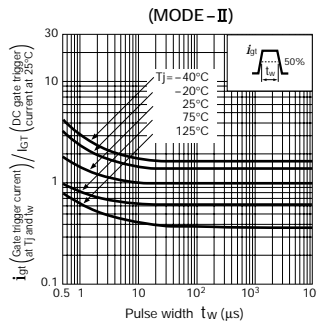
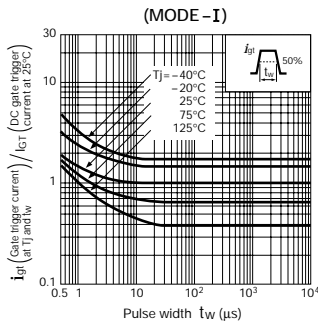
I_H temperature Characteristics (Typical)



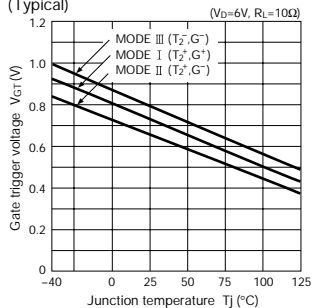
Pulse trigger temperature Characteristics V_{GT} (Typical)



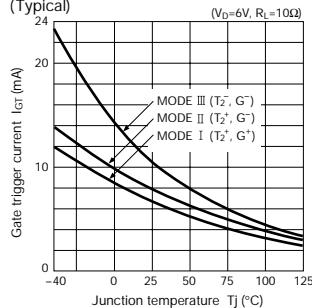
Pulse trigger temperature Characteristics I_{GT} (Typical)



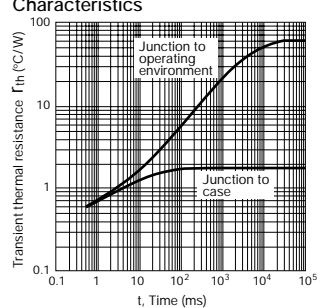
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics

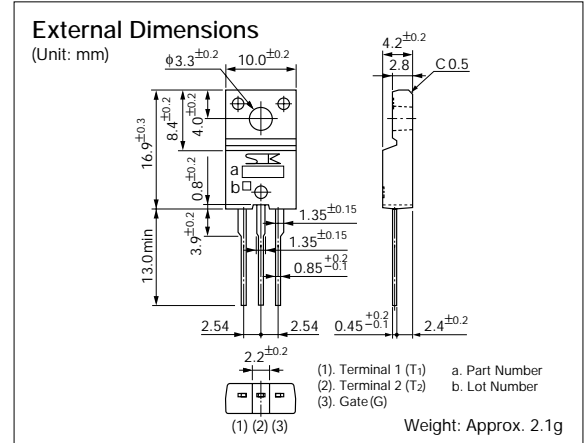


TO-220F 8A Triac

TM841S-L, TM861S-L

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=8A$
- Gate trigger current: $I_{GT}=30mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- UL approved type available



■ Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM841S-L	TM861S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	8.0		A	Conduction angle 360°, $T_c=90^\circ C$
Surge on-state current	I_{TSM}	80		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		°C	
Storage temperature	T_{stg}	-40 to +125		°C	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

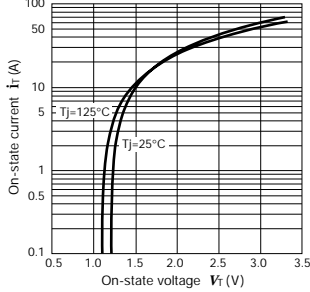
■ Electrical Characteristics

($T_j=25^\circ C$, unless otherwise specified)

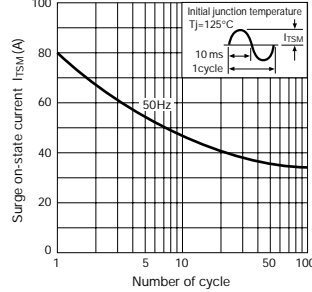
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.3	2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=10A$	
Gate trigger voltage	V_{GT}	I	0.8	2.0	V	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	0.7	2.0			T_2^+, G^-
		III	0.8	2.0			T_2^-, G^-
		IV	0.9				T_2^-, G^+
Gate trigger current	I_{GT}	I	8	30	mA	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	10	30			T_2^+, G^-
		III	12	30			T_2^-, G^-
		IV	30				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_j=125^\circ C$	
Holding current	I_H		12		mA	$V_D=6V$	
Thermal resistance	R_{th}			3.6	°C/W	Junction to case	

TM841S-L, TM861S-L

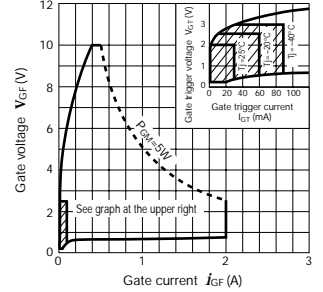
$V_T - I_T$ Characteristics (max)



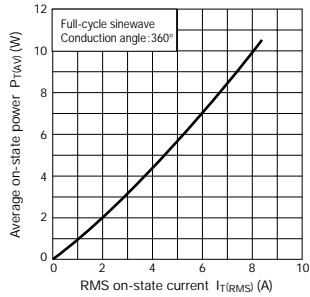
I_{TSM} Ratings



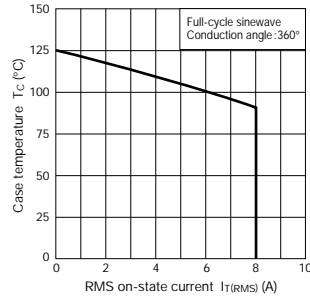
Gate Characteristics



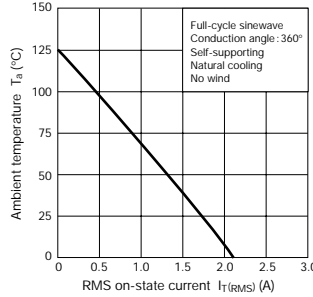
$I_T(RMS) - P_T(AV)$ Characteristics



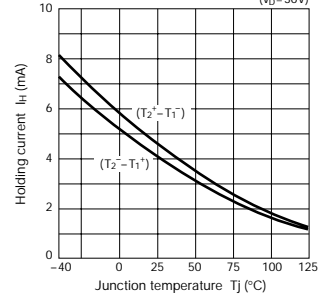
$I_T(RMS) - T_c$ Ratings



$I_T(RMS) - T_a$ Ratings

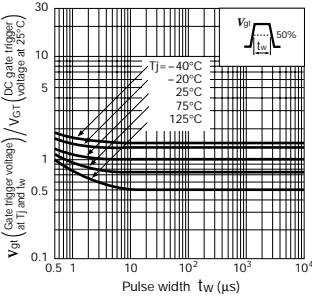


I_H temperature Characteristics (Typical)

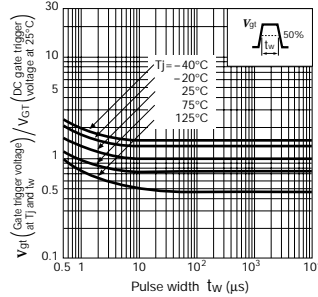


Pulse trigger temperature Characteristics V_{gt} (Typical)

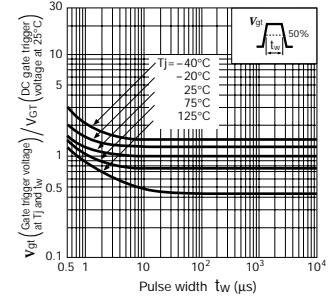
(MODE - I)



(MODE - II)

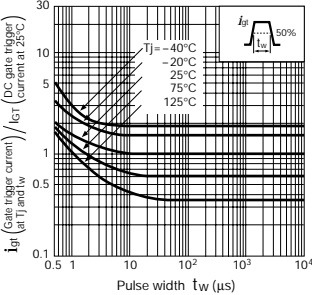


(MODE - III)

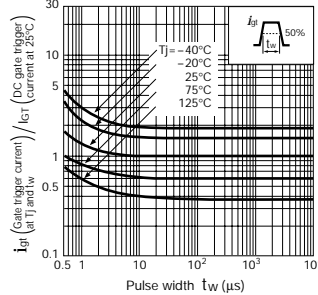


Pulse trigger temperature Characteristics I_{gt} (Typical)

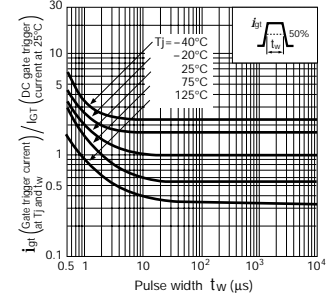
(MODE - I)



(MODE - II)

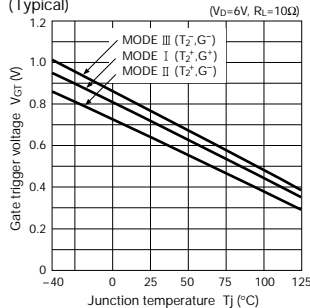


(MODE - III)



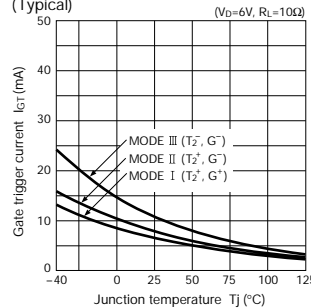
V_{GT} temperature characteristics (Typical)

($V_D=6V, R_L=10\Omega$)

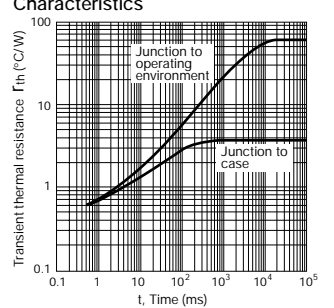


I_{GT} temperature characteristics (Typical)

($V_D=6V, R_L=10\Omega$)



Transient thermal resistance Characteristics

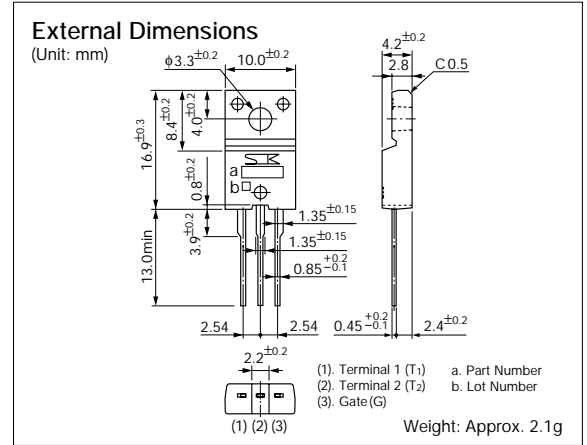


TO-220F 10A Triac

TM1041S-L, TM1061S-L

Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=10A$
- Gate trigger current: $I_{GT}=30mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- UL approved type available



Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM1041S-L	TM1061S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	10.0		A	Conduction angle 360°, $T_c=90^\circ C$
Surge on-state current	I_{TSM}	100		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		°C	
Storage temperature	T_{stg}	-40 to +125		°C	
Isolation voltage	V_{ISO}	1500		V _{rms}	50Hz Sine wave, RMS, Terminal to Case, 1 min.

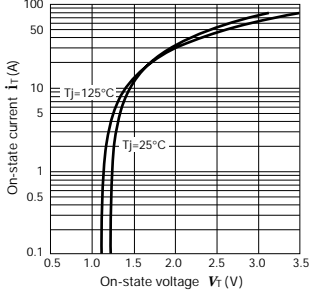
Electrical Characteristics

($T_j=25^\circ C$, unless otherwise specified)

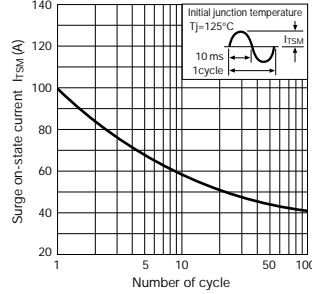
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.3	2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=14A$	
Gate trigger voltage	V_{GT}	I	0.8	2.0	V	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	0.7	2.0			T_2^+, G^-
		III	0.8	2.0			T_2^-, G^-
		IV	0.9				T_2^-, G^+
Gate trigger current	I_{GT}	I	10	30	mA	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	13	30			T_2^+, G^-
		III	15	30			T_2^-, G^-
		IV	30				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_j=125^\circ C$	
Holding current	I_H		15		mA	$V_D=6V$	
Thermal resistance	R_{th}			3.3	°C/W	Junction to case	

TM1041S-L, TM1061S-L

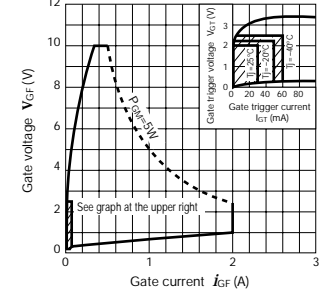
$V_T - I_T$ Characteristics (max)



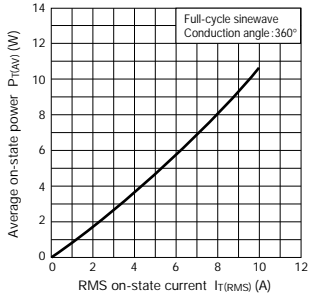
I_{TSM} Ratings



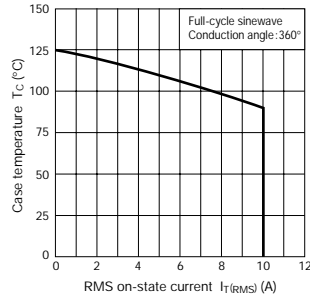
Gate Characteristics



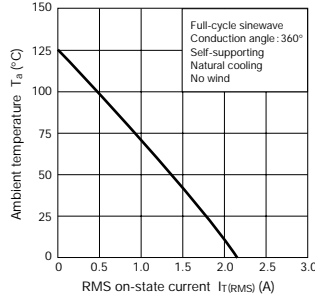
$I_T(RMS) - P_T(AV)$ Characteristics



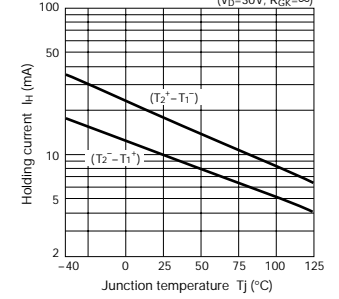
$I_T(RMS) - T_c$ Ratings



$I_T(RMS) - T_a$ Ratings

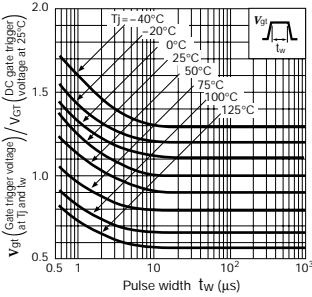


I_H temperature Characteristics (Typical)

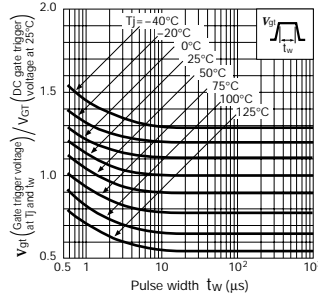


Pulse trigger temperature Characteristics V_{gt} (Typical)

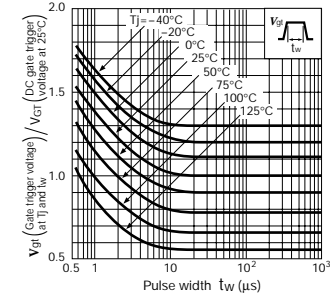
(MODE - I)



(MODE - II)

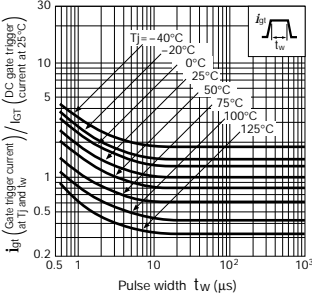


(MODE - III)

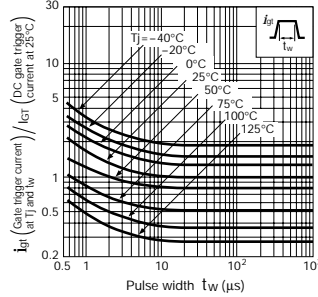


Pulse trigger temperature Characteristics I_{gt} (Typical)

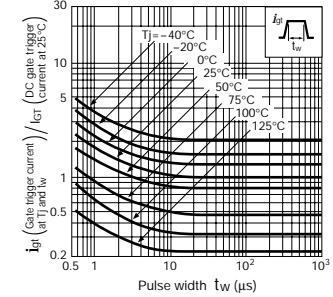
(MODE - I)



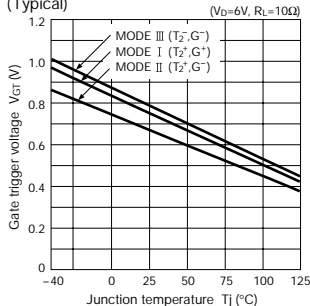
(MODE - II)



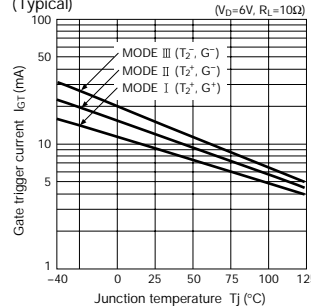
(MODE - III)



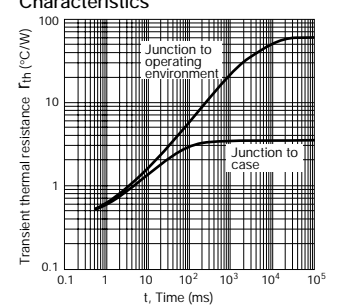
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics

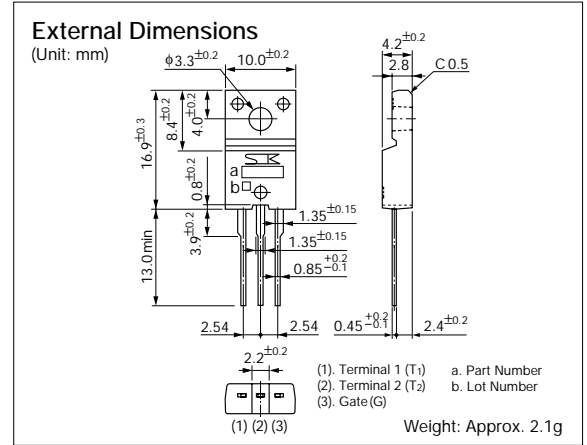


TO-220F 12A Triac

TM1241S-L, TM1261S-L

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=12A$
- Gate trigger current: $I_{GT}=30mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- UL approved type available



■ Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM1241S-L	TM1261S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	12.0		A	Conduction angle 360°, $T_c=85^\circ C$
Surge on-state current	I_{TSM}	120		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		$^\circ C$	
Storage temperature	T_{stg}	-40 to +125		$^\circ C$	
Isolation voltage	V_{ISO}	1500		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

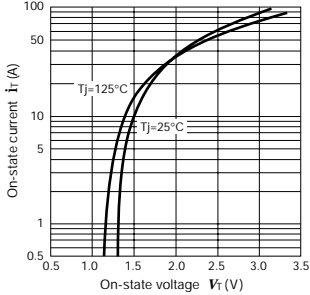
■ Electrical Characteristics

($T_j=25^\circ C$, unless otherwise specified)

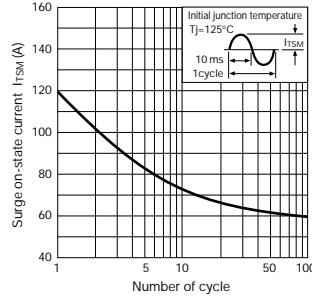
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.3	2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=16A$	
Gate trigger voltage	V_{GT}	I	0.8	2.0	V	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	0.7	2.0			T_2^+, G^-
		III	0.8	2.0			T_2^-, G^-
		IV	1.0				T_2^-, G^+
Gate trigger current	I_{GT}	I	12	30	mA	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	16	30			T_2^+, G^-
		III	25	30			T_2^-, G^-
		IV	70				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_j=125^\circ C$	
Holding current	I_H		20		mA	$V_D=6V$	
Thermal resistance	R_{th}			3.0	$^\circ C/W$	Junction to case	

TM1241S-L, TM1261S-L

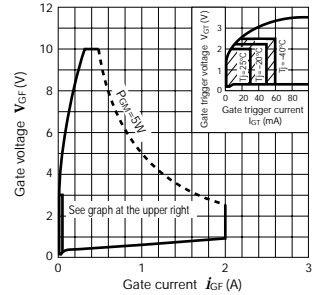
$V_T - I_T$ Characteristics (max)



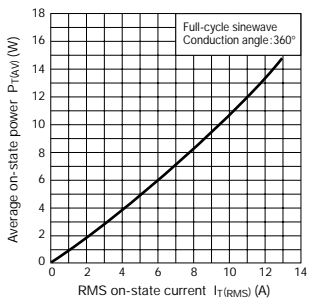
I_{TSM} Ratings



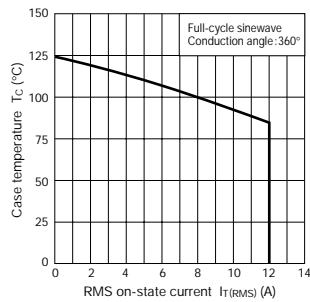
Gate Characteristics



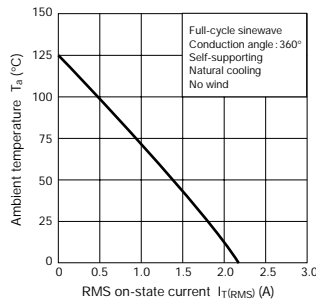
$I_T(RMS) - P_T(AV)$ Characteristics



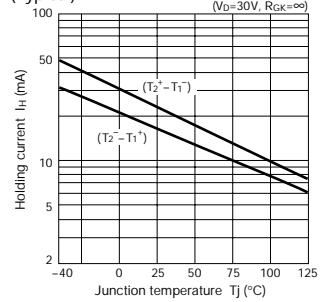
$I_T(RMS) - T_C$ Ratings



$I_T(RMS) - T_a$ Ratings

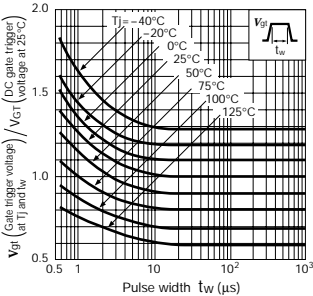


I_H temperature Characteristics (Typical)

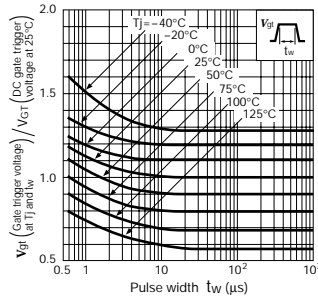


Pulse trigger temperature Characteristics V_{GT} (Typical)

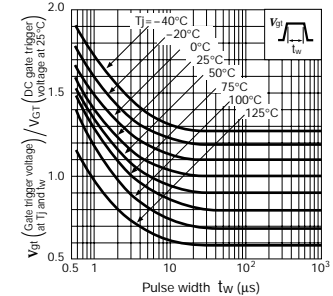
(MODE - I)



(MODE - II)

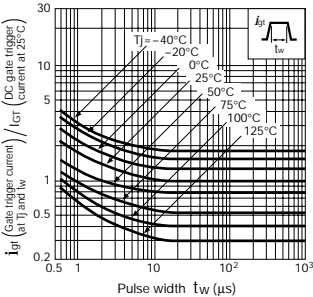


(MODE - III)

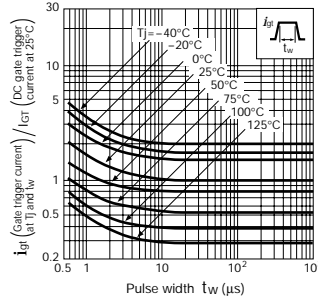


Pulse trigger temperature Characteristics I_{GT} (Typical)

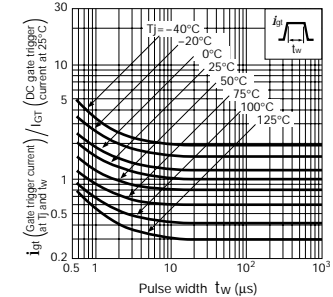
(MODE - I)



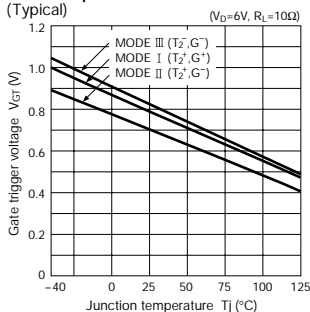
(MODE - II)



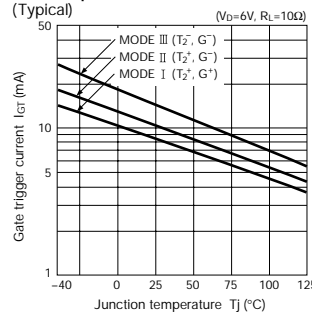
(MODE - III)



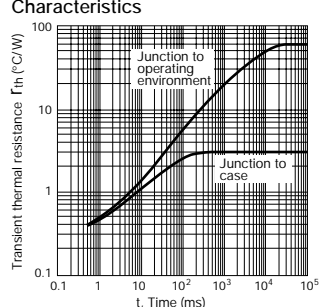
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics

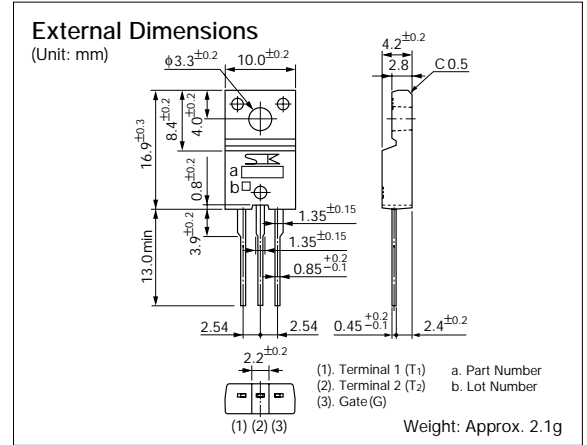


TO-220F 16A Triac

TM1641S-L, TM1661S-L

Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=16A$
- Gate trigger current: $I_{GT}=30mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- UL approved type available



Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM1641S-L	TM1661S-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	16		A	Conduction angle 360°, $T_c=74^\circ C$
Surge on-state current	I_{TSM}	150		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		°C	
Storage temperature	T_{stg}	-40 to +125		°C	
Isolation voltage	V_{ISO}	1500		V _{rms}	50Hz Sine wave, RMS, Terminal to Case, 1 min.

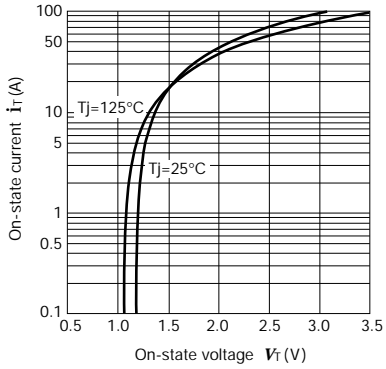
Electrical Characteristics

($T_j=25^\circ C$, unless otherwise specified)

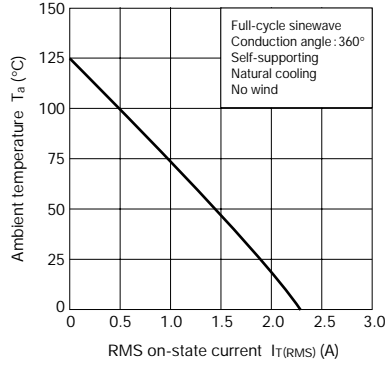
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.3	2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=20A$	
Gate trigger voltage	V_{GT}	I	0.8	2.0	V	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	0.7	2.0			T_2^+, G^-
		III	0.8	2.0			T_2^-, G^-
		IV	1.0				T_2^-, G^+
Gate trigger current	I_{GT}	I	12	30	mA	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	16	30			T_2^+, G^-
		III	25	30			T_2^-, G^-
		IV	70				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_j=125^\circ C$	
Holding current	I_H		25		mA	$V_D=6V$	
Thermal resistance	R_{th}			3.0	°C/W	Junction to case	

TM1641S-L, TM1661S-L

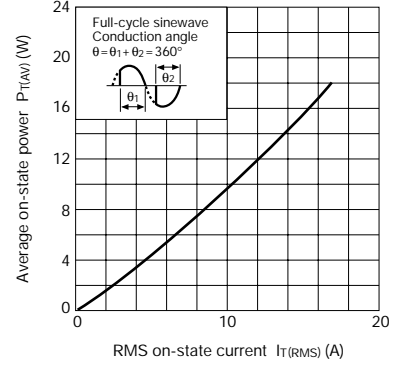
$V_T - I_T$ Characteristics (max)



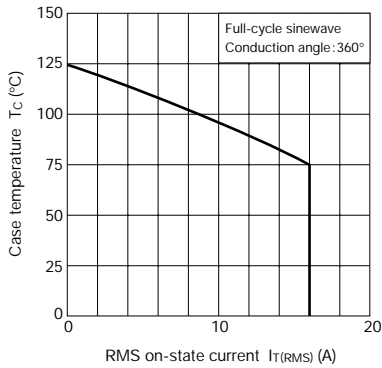
$I_T(\text{RMS}) - T_a$ Ratings



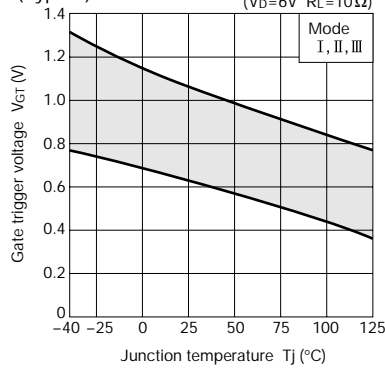
$I_T(\text{RMS}) - P_{T(\text{AV})}$ Characteristics



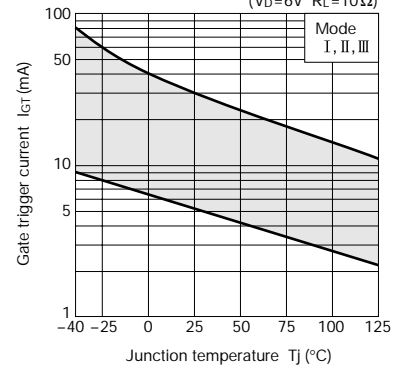
$I_T(\text{RMS}) - T_c$ Ratings



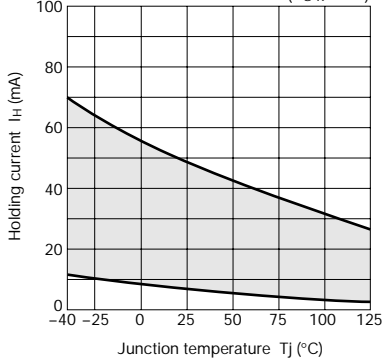
V_{GT} temperature characteristics (Typical)



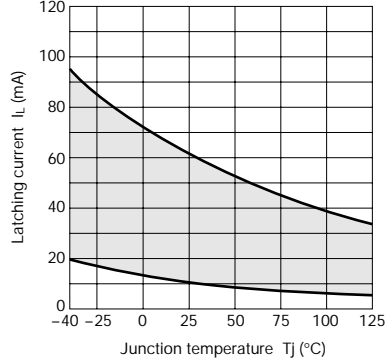
I_{GT} temperature characteristics



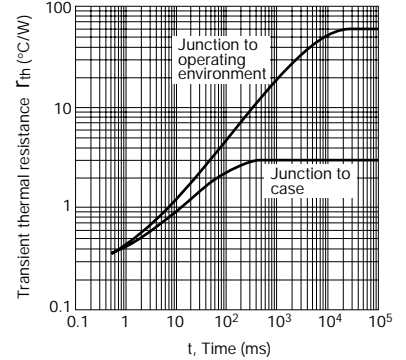
I_H temperature Characteristics (Typical)



I_L temperature Characteristics (Typical)



Transient thermal resistance Characteristics

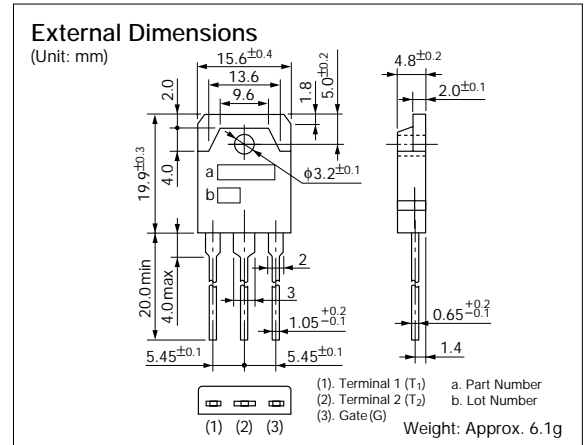


TO-3P 16A Triac

TM1641P-L(L), TM1661P-L(L)

Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=16A$
- Gate trigger current: $I_{GT}=30mA$ max (MODE I, II, III)



Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM1641P-L(L)	TM1661P-L(L)		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	16		A	Conduction angle 360°, $T_c=103^{\circ}C$
Surge on-state current	I_{TSM}	160		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^{\circ}C$
Peak gate voltage	V_{GM}	10		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		$^{\circ}C$	
Storage temperature	T_{stg}	-40 to +125		$^{\circ}C$	

Electrical Characteristics

($T_j=25^{\circ}C$, unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}			2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^{\circ}C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^{\circ}C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=20A$	
Gate trigger voltage	V_{GT}	I	0.8	1.5	V	$V_D=6V, R_L=10\Omega, T_c=25^{\circ}C$	T_2^+, G^+
		II	0.7	1.5			T_2^+, G^-
		III	0.8	1.5			T_2^-, G^-
		IV	1.0				T_2^-, G^+
Gate trigger current	I_{GT}	I	12	30	mA	$V_D=6V, R_L=10\Omega, T_c=25^{\circ}C$	T_2^+, G^+
		II	16	30			T_2^+, G^-
		III	25	30			T_2^-, G^-
		IV	70				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_j=125^{\circ}C$	
Holding current	I_H		25		mA	$V_D=6V$	
Thermal resistance	R_{th}			1.2	$^{\circ}C/W$	Junction to case	

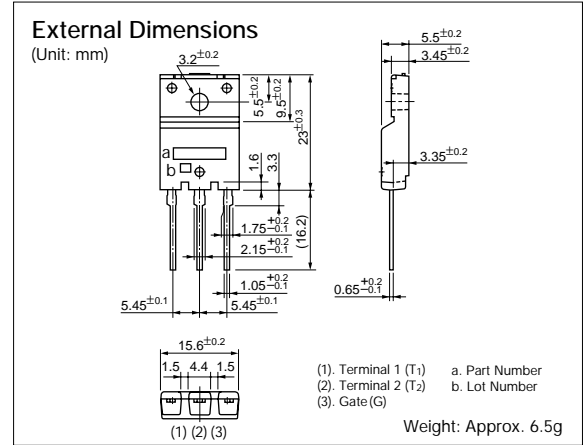
TM1641P-L(L), TM1661P-L(L)

TO-3PF 16A Triac

TM1641B-L, TM1661B-L

Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=16A$
- Gate trigger current: $I_{GT}=30mA$ max (MODE I, II, III)
- Rate-of-rise of off-state commutation voltage: $(dv/dt)_C=10V/\mu s$ min.
- Isolation voltage: $V_{ISO}=2000V(AC, 1min.)$
- UL approved type available



Absolute Maximum Ratings

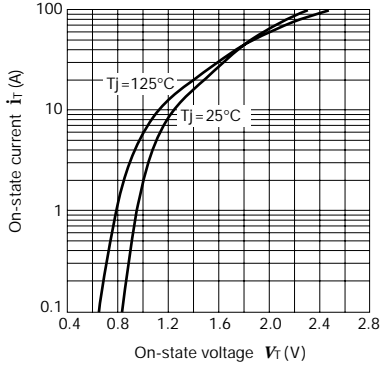
Parameter	Symbol	Ratings		Unit	Conditions
		TM1641B-L	TM1661B-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	16		A	Conduction angle 360°, $T_C=92.5^\circ C$
Surge on-state current	I_{TSM}	160		A	50Hz full-cycle sine wave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	10		V	$f \geq 50Hz$, duty $\leq 10\%$
Peak gate current	I_{GM}	2		A	$f \geq 50Hz$, duty $\leq 10\%$
Peak gate power loss	P_{GM}	5		W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		$^\circ C$	
Storage temperature	T_{stg}	-40 to +125		$^\circ C$	
Isolation voltage	V_{ISO}	2000		Vrms	50Hz Sine wave, RMS, Terminal to Case, 1 min.

Electrical Characteristics

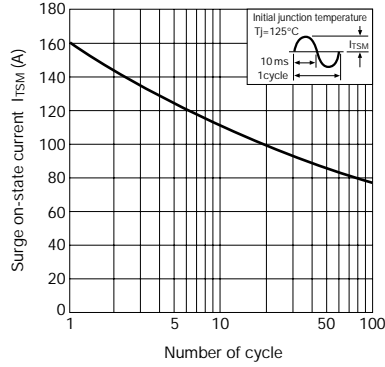
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.1	2.0	mA	$V_D=V_{DRM}$, $R_{GK}=\infty$, $T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}$, $R_{GK}=\infty$, $T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	$I_{TM}=20A$, $T_C=25^\circ C$	
Gate trigger voltage	V_{GT}	I	0.8	1.5	V	$V_D=6V$, $R_L=10\Omega$, $T_C=25^\circ C$	T_2^+ , G^+
		II	0.7	1.5			T_2^+ , G^-
		III	0.8	1.5			T_2^-, G^-
		IV	1.0				T_2^-, G^+
Gate trigger current	I_{GT}	I	12	30	mA	$V_D=6V$, $R_L=10\Omega$, $T_C=25^\circ C$	T_2^+ , G^+
		II	16	30			T_2^+ , G^-
		III	25	30			T_2^-, G^-
		IV	70				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}$, $T_j=125^\circ C$	
Holding current	I_H		25		mA	$T_j=25^\circ C$	
Rate-of-rise of off-state commutation voltage	$(dv/dt)_C$	10			V/ μs	$V_D=400V$, $T_j=125^\circ C$	
Thermal resistance	R_{th}			1.8	$^\circ C/W$	Junction to case	

TM1641B-L, TM1661B-L

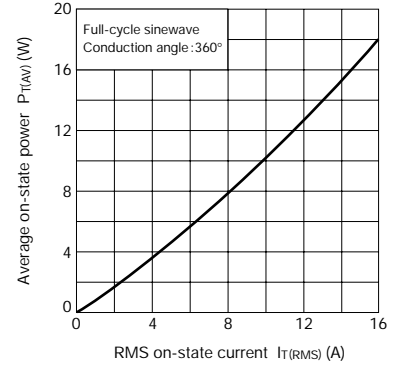
$V_T - I_T$ Characteristics (max)



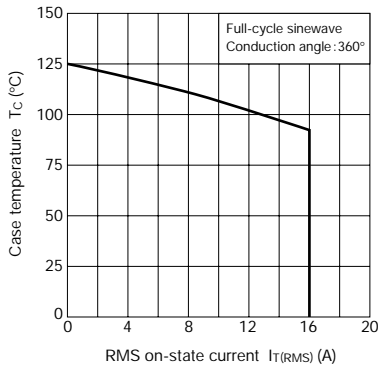
I_{TSM} Ratings



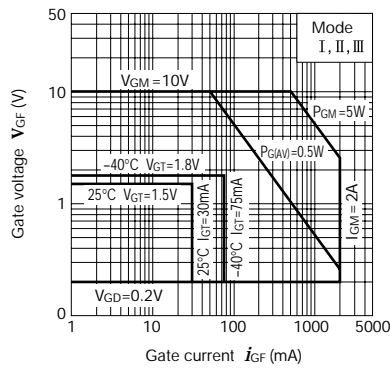
$I_T(RMS) - P_{T(AV)}$ Characteristics



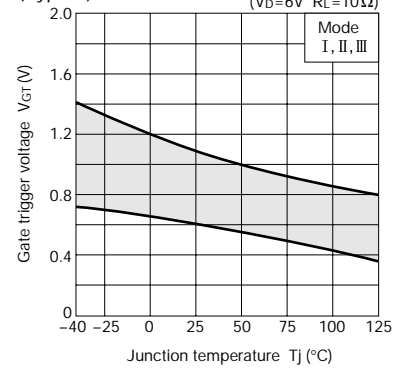
$I_T(RMS) - T_C$ Ratings



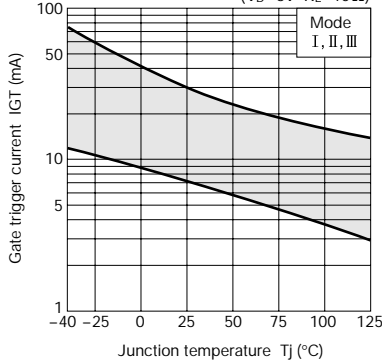
Gate Characteristics



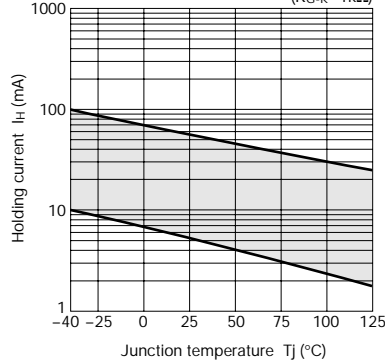
V_{GT} temperature characteristics (Typical)



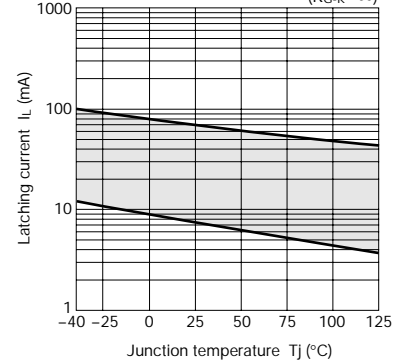
I_{GT} temperature characteristics (Typical)



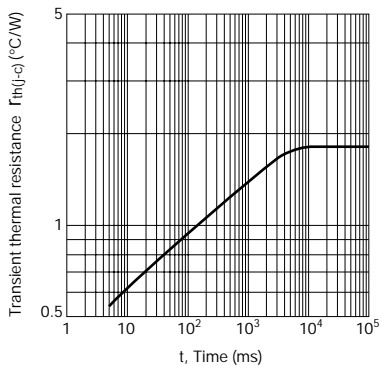
I_H temperature characteristics (Typical)



I_L temperature characteristics (Typical)



$t_{th(j-c)} - t$ Characteristics

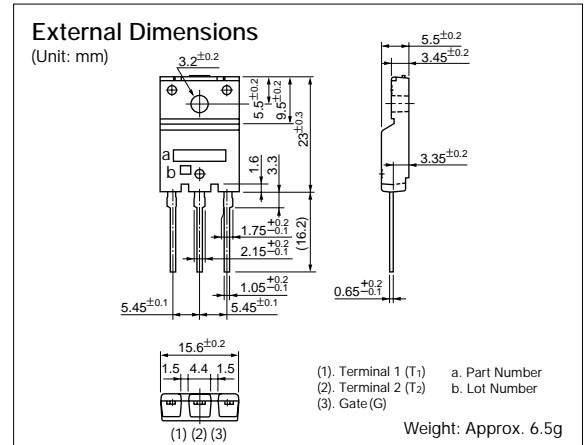


TO-3PF 25A Triac

TM2541B-L, TM2561B-L

Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=25A$
- Gate trigger current: $I_{GT}=30mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=2000V(AC, 1min.)$
- UL approved type available



Absolute Maximum Ratings

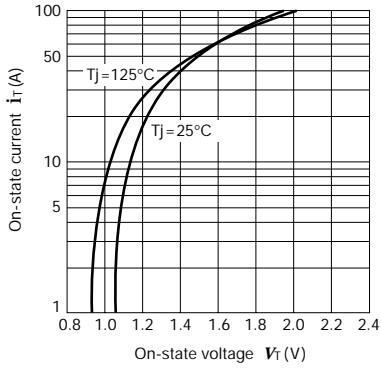
Parameter	Symbol	Ratings		Unit	Conditions
		TM2541B-L	TM2561B-L		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	$R_{GK}=\infty, T_j=-40^{\circ}C$ to $+125^{\circ}C$
RMS on-state current	$I_{T(RMS)}$	25		A	Conduction angle $360^{\circ}, T_c=84^{\circ}C$
Surge on-state current	I_{TSM}	240		A	50Hz full-cycle sine wave, Peak value, Non-repetitive, $T_j=125^{\circ}C$
Peak gate voltage	V_{GM}	10		V	$f \geq 50Hz, duty \leq 10\%$
Peak gate current	I_{GM}	2		A	$f \geq 50Hz, duty \leq 10\%$
Peak gate power loss	P_{GM}	5		W	$f \geq 50Hz, duty \leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		$^{\circ}C$	
Storage temperature	T_{stg}	-40 to +125		$^{\circ}C$	
Isolation voltage	V_{ISO}	2000		V _{rms}	50Hz Sine wave, RMS, Terminal to Case, 1 min.

Electrical Characteristics

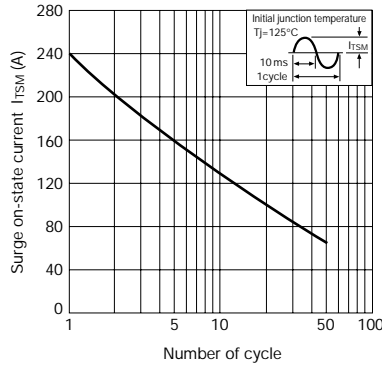
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.3	2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^{\circ}C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^{\circ}C$	
On-state voltage	V_{TM}			1.3	V	$I_{TM}=20A, T_c=25^{\circ}C$	
Gate trigger voltage	V_{GT}	I	0.8	2.0	V	$V_D=6V, R_L=10\Omega, T_c=25^{\circ}C$	T_2^+, G^+
		II	0.8	2.0			T_2^+, G^-
		III	0.8	2.0			T_2^-, G^-
		IV	1.0				T_2^-, G^+
Gate trigger current	I_{GT}	I	17	30	mA	$V_D=6V, R_L=10\Omega, T_c=25^{\circ}C$	T_2^+, G^+
		II	19	30			T_2^+, G^-
		III	22	30			T_2^-, G^-
		IV	50				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.2			V	$V_D=1/2 \times V_{DRM}, T_j=125^{\circ}C$	
Holding current	I_H		40		mA	$T_j=25^{\circ}C$	
Rate-of-rise of off-state commutation voltage	$(dv/dt)_C$	10			V/ μs	$V_D=400V, T_j=125^{\circ}C$	
Thermal resistance	R_{th}			1.5	$^{\circ}C/W$	Junction to case	

TM2541B-L, TM2561B-L

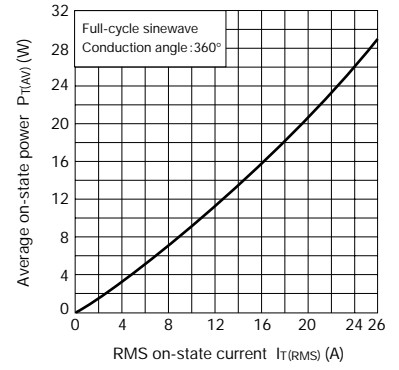
$V_T - I_T$ Characteristics (max)



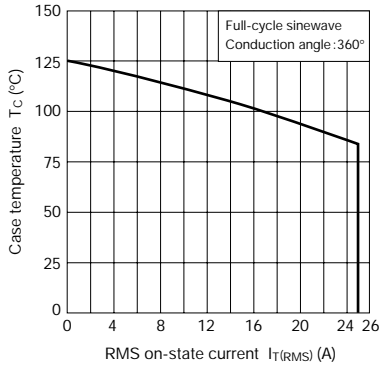
I_{TSM} Ratings



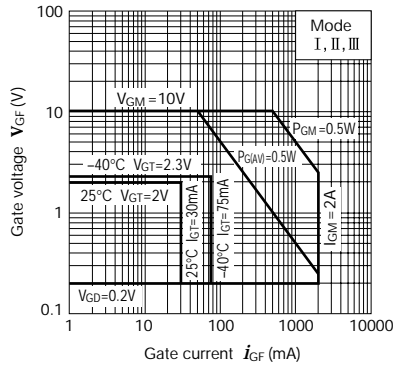
$I_{T(RMS)} - P_{T(AV)}$ Characteristics



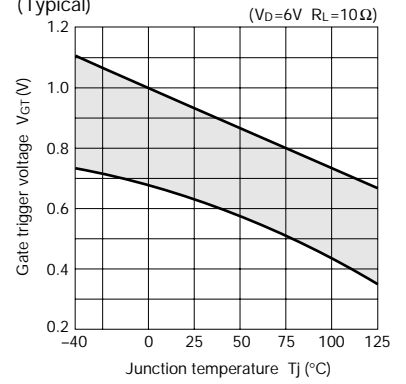
$I_{T(RMS)} - T_C$ Ratings



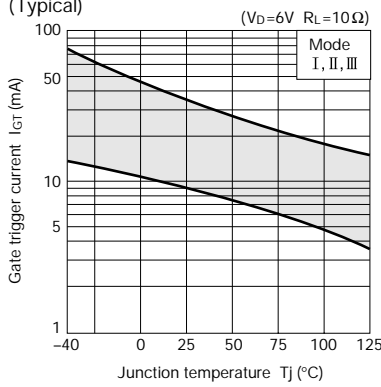
Gate Characteristics



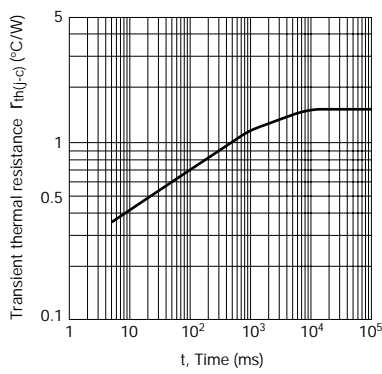
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



$r_{th(j-c)} - t$ Characteristics

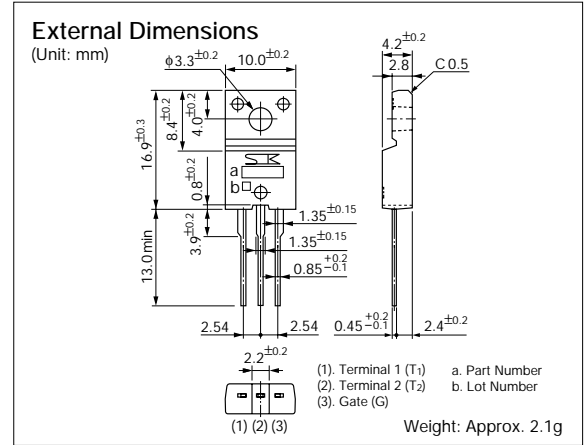


TO-220F 5A Triac

TM541S-R, TM561S-R

Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=5A$
- Gate trigger current: $I_{GT}=12mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- For resistive load
- UL approved type available



Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM541S-R	TM561S-R		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	5.0		A	Conduction angle 360°, $T_c=104^\circ C$
Surge on-state current	I_{TSM}	50		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	—		V	
Peak gate current	I_{GM}	1		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		°C	
Storage temperature	T_{stg}	-40 to +125		°C	
Isolation voltage	V_{ISO}	1500		V _{rms}	50Hz Sine wave, RMS, Terminal to Case, 1 min.

Electrical Characteristics

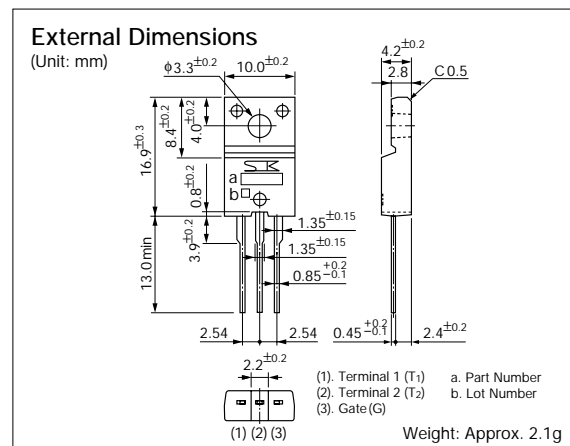
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}			2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=7A$	
Gate trigger voltage	V_{GT}	I	1.3	1.8	V	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	0.7	1.2			T_2^+, G^-
		III	0.8	1.2			T_2^-, G^-
		IV	3.1				T_2^-, G^+
Gate trigger current	I_{GT}	I	8	12	mA	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	8.5	12			T_2^+, G^-
		III	9	12			T_2^-, G^-
		IV	70				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D=1/2 \times V_{DRM}, T_j=125^\circ C$	
Holding current	I_H		14		mA	$V_D=6V$	
Thermal resistance	R_{th}			4.0	°C/W	Junction to case	

TO-220F 10A Triac

TM1041S-R, TM1061S-R

■ Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=10A$
- Gate trigger current: $I_{GT}=7mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- For resistive load
- UL approved type available



■ Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM1041S-R	TM1061S-R		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	10		A	Conduction angle 360°, $T_c=90^\circ C$
Surge on-state current	I_{TSM}	80		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	—		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		°C	
Storage temperature	T_{stg}	-40 to +125		°C	
Isolation voltage	V_{ISO}	1500		V _{rms}	50Hz Sine wave, RMS, Terminal to Case, 1 min.

■ Electrical Characteristics

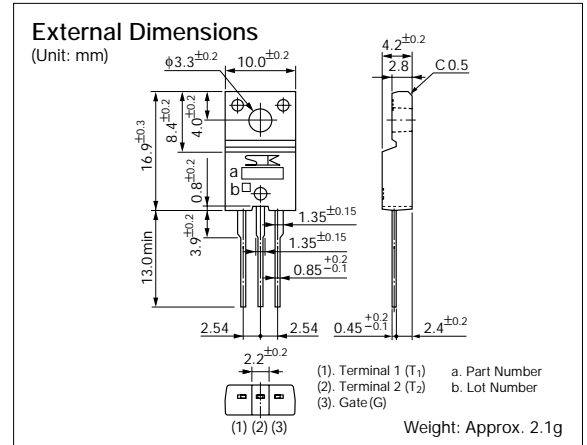
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}			2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=14A$	
Gate trigger voltage	V_{GT}	I	1.2	2.0	V	$V_D=20V, R_L=40\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	0.6	1.2			T_2^+, G^-
		III	0.7	1.2			T_2^-, G^-
		IV	2.4				T_2^-, G^+
Gate trigger current	I_{GT}	I	4.5	7.0	mA	$V_D=20V, R_L=40\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	3.6	7.0			T_2^+, G^-
		III	3.8	7.0			T_2^-, G^-
		IV	25				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D=1/2 \times V_{DRM}, T_j=125^\circ C$	
Holding current	I_H		6		mA	$V_D=6V$	
Thermal resistance	R_{th}			3.3	°C/W	Junction to case	

TO-220F 12A Triac

TM1241S-R, TM1261S-R

Features

- Repetitive peak off-state voltage: $V_{DRM}=400, 600V$
- RMS on-state current: $I_{T(RMS)}=12A$
- Gate trigger current: $I_{GT}=8mA$ max (MODE I, II, III)
- Isolation voltage: $V_{ISO}=1500V$ (50Hz Sine wave, RMS)
- For resistive load
- UL approved type available



Absolute Maximum Ratings

Parameter	Symbol	Ratings		Unit	Conditions
		TM1241S-R	TM1261S-R		
Repetitive peak off-state voltage	V_{DRM}	400	600	V	
RMS on-state current	$I_{T(RMS)}$	12		A	Conduction angle 360°, $T_c=84^\circ C$
Surge on-state current	I_{TSM}	110		A	50Hz full-cycle sinewave, Peak value, Non-repetitive, $T_j=125^\circ C$
Peak gate voltage	V_{GM}	—		V	
Peak gate current	I_{GM}	2		A	
Peak gate power loss	P_{GM}	5		W	
Average gate power loss	$P_{G(AV)}$	0.5		W	
Junction temperature	T_j	-40 to +125		°C	
Storage temperature	T_{stg}	-40 to +125		°C	
Isolation voltage	V_{ISO}	1500		V _{rms}	50Hz Sine wave, RMS, Terminal to Case, 1 min.

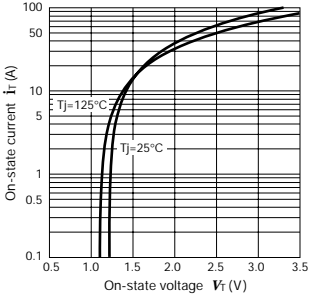
Electrical Characteristics

($T_j=25^\circ C$, unless otherwise specified)

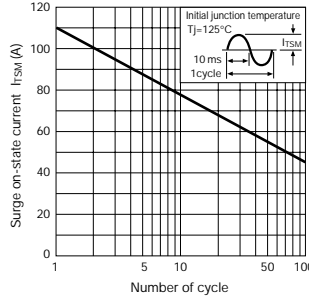
Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}			2.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_j=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_j=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=16A$	
Gate trigger voltage	V_{GT}	I	1.1	1.8	V	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	0.6	1.2			T_2^+, G^-
		III	0.7	1.2			T_2^-, G^-
		IV	2.1				T_2^-, G^+
Gate trigger current	I_{GT}	I	5	8	mA	$V_D=6V, R_L=10\Omega, T_c=25^\circ C$	T_2^+, G^+
		II	4.5	8			T_2^+, G^-
		III	5	8			T_2^-, G^-
		IV	25				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D=1/2 \times V_{DRM}, T_j=125^\circ C$	
Holding current	I_H		6		mA	$V_D=6V$	
Thermal resistance	R_{th}			3.0	°C/W	Junction to case	

TM1241S-R, TM1261S-R

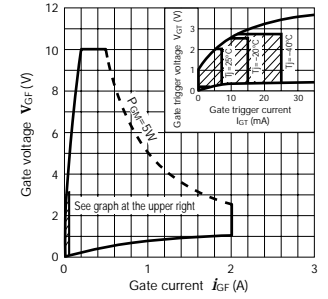
$V_T - I_T$ Characteristics (max)



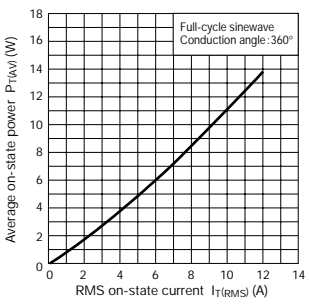
I_{TSM} Ratings



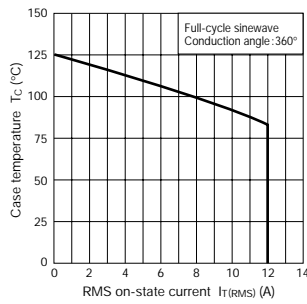
Gate Characteristics



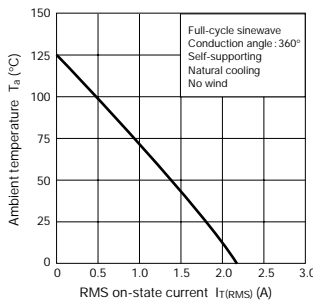
$I_T(RMS) - P_T(AV)$ Characteristics



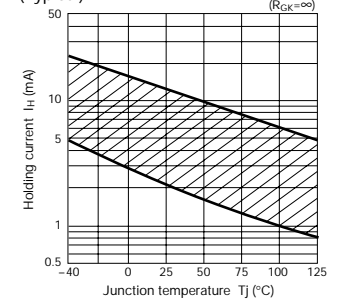
$I_T(RMS) - T_c$ Ratings



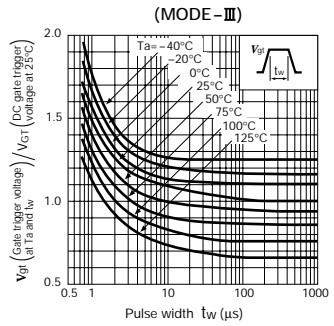
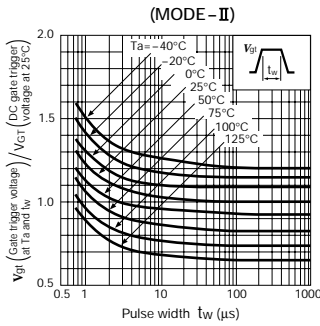
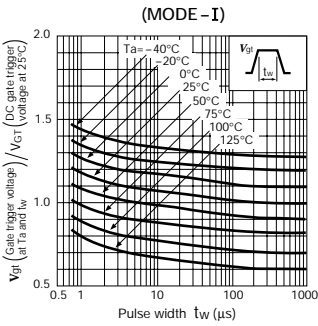
$I_T(RMS) - T_a$ Ratings



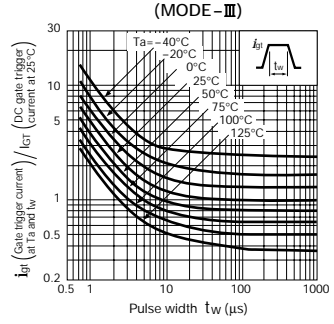
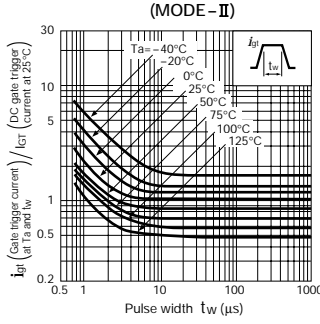
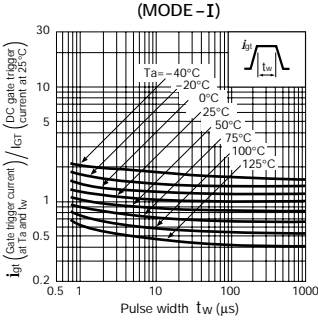
I_H temperature Characteristics (Typical)



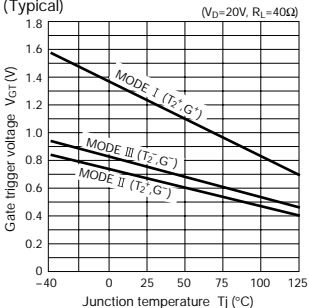
Pulse trigger temperature Characteristics V_{Gf} (Typical)



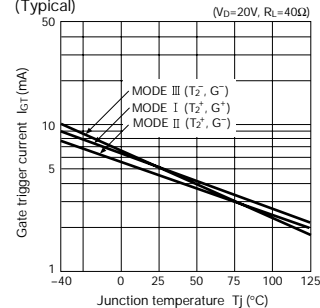
Pulse trigger temperature Characteristics I_{Gf} (Typical)



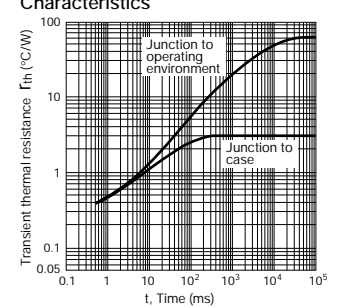
V_{GT} temperature characteristics (Typical)



I_{GT} temperature characteristics (Typical)



Transient thermal resistance Characteristics

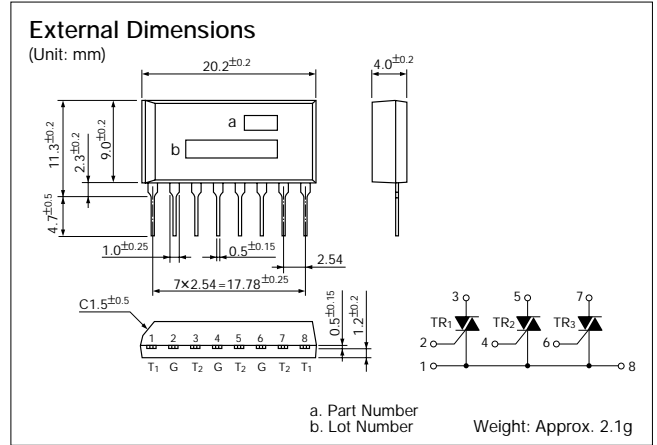


1.2A 3 circuits Triac Array

STA203A

Features

- 1.2A 3 Triacs combined one package
- Repetitive peak off-state voltage: $V_{DRM}=400V$
- RMS on-state current: $I_{T(RMS)}=1.2A$
- Gate trigger current: $I_{GT}=3mA$ max (MODE I, II, III)



Absolute Maximum Ratings

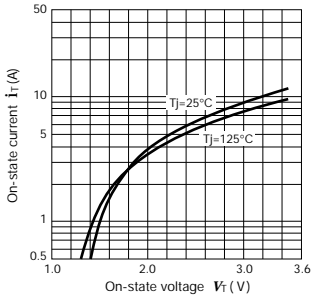
Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	400	V	
RMS on-state current	$I_{T(RMS)}$	1.2	A	Conduction angle 360°, $T_C=97^\circ C$
Surge on-state current	I_{TSM}	10	A	50Hz full-cycle sine wave, Peak value, Non-repetitive, $T_J=125^\circ C$
Peak gate voltage	V_{GM}	6	V	
Peak gate current	I_{GM}	0.5	A	
Peak gate power loss	P_{GM}	1	W	
Average gate power loss	$P_{G(AV)}$	0.1	W	
Junction temperature	T_J	-40 to +125	$^\circ C$	
Storage temperature	T_{stg}	-40 to +125	$^\circ C$	

Electrical Characteristics

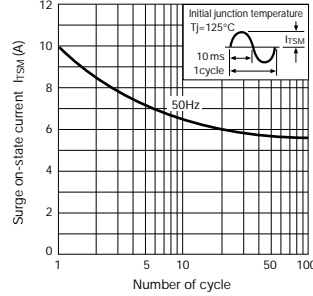
($T_J=25^\circ C$, unless otherwise specified)

Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.1	1.0	mA	$V_D=V_{DRM}, R_{GK}=\infty, T_J=125^\circ C$	
				0.1		$V_D=V_{DRM}, R_{GK}=\infty, T_J=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	Pulse test, $I_{TM}=1.6A$	
Gate trigger voltage	V_{GT}	I	2.0	3.5	V	$V_D=6V, R_L=10\Omega, T_C=25^\circ C$	T_2^+, G^+
		II	0.7	1.2			T_2^+, G^-
		III	0.8	1.2			T_2^-, G^-
		IV	2.0				T_2^-, G^+
Gate trigger current	I_{GT}	I	2.0	3.0	mA	$V_D=6V, R_L=10\Omega, T_C=25^\circ C$	T_2^+, G^+
		II	1.8	3.0			T_2^+, G^-
		III	2.3	3.0			T_2^-, G^-
		IV	13.0				T_2^-, G^+
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D=1/2 \times V_{DRM}, T_J=125^\circ C$	
Holding current	I_H			5.0	mA	$V_D=6V$	
Thermal resistance	R_{th}			20.0	$^\circ C/W$	Junction to case	

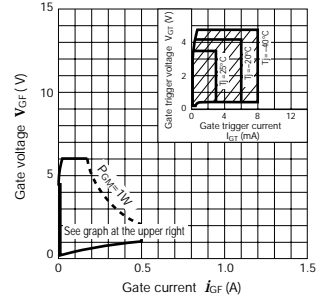
$V_T - I_T$ Characteristics (max)



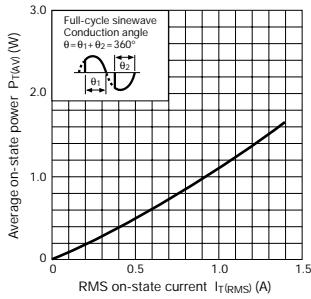
I_{TSM} Ratings



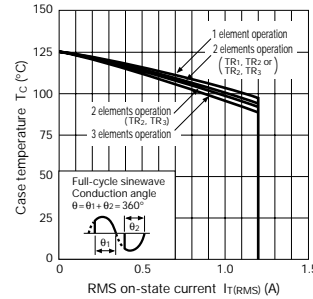
Gate Characteristics



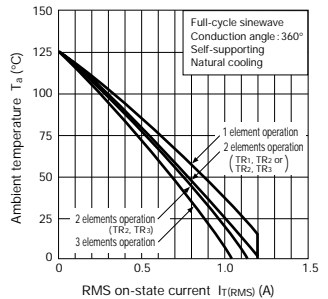
$I_T(RMS) - P_T(AV)$ Characteristics



$I_T(RMS) - T_c$ Ratings

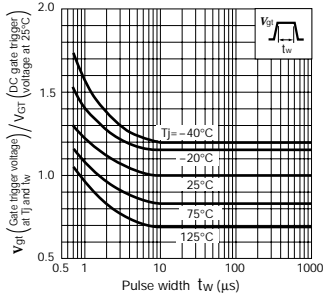


$I_T(RMS) - T_a$ Ratings

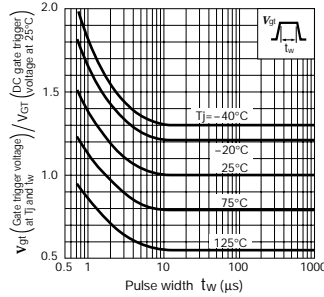


Pulse trigger temperature Characteristics V_{gt} (Typical)

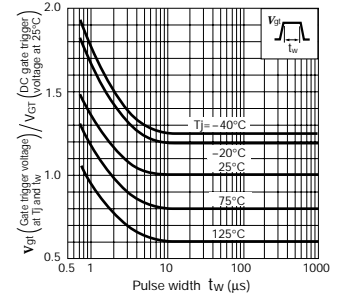
(MODE-I)



(MODE-II)

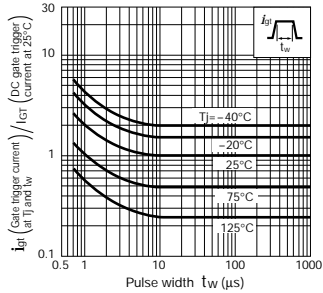


(MODE-III)

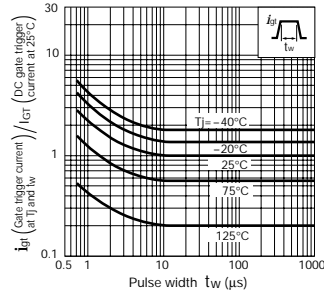


Pulse trigger temperature Characteristics I_{gt} (Typical)

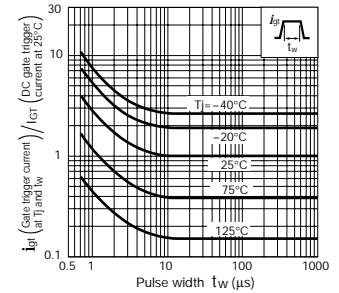
(MODE-I)



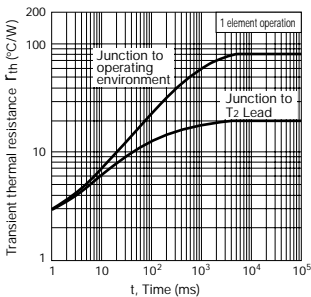
(MODE-II)



(MODE-III)



Transient thermal resistance Characteristics

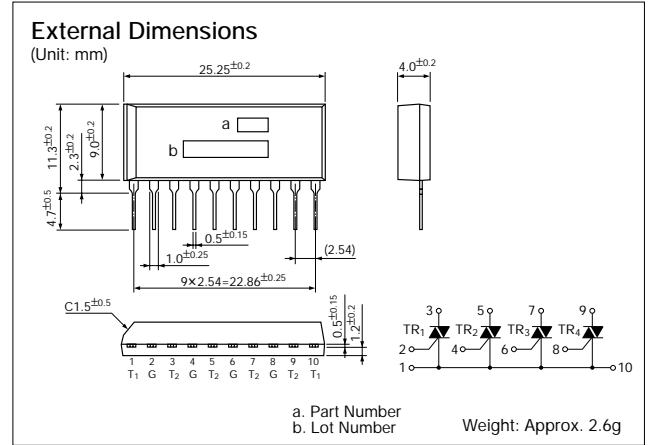


1A 4 circuits Triac Array

STA221A

■ Features

- 1A 4 Triacs combined one package
- Repetitive peak off-state voltage: $V_{DRM}=400V$
- RMS on-state current: $I_{T(RMS)}=1A$
- Gate trigger current: $I_{GT}=3mA$ max (MODE I, II, III)



■ Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit	Conditions
Repetitive peak off-state voltage	V_{DRM}	400	V	-40°C to +125°C
RMS on-state current	$I_{T(RMS)}$	1.0	A	Conduction angle 360°, $T_C=97^\circ C$
Surge on-state current	I_{TSM}	10	A	50Hz full-cycle sine wave, Peak value, Non-repetitive, $T_J=125^\circ C$
Peak forward gate voltage	V_{GM}	6	V	$f \geq 50Hz$, duty $\leq 10\%$
Peak forward gate current	I_{GM}	0.5	A	$f \geq 50Hz$, duty $\leq 10\%$
Peak gate power loss	P_{GM}	1.0	W	$f \geq 50Hz$, duty $\leq 10\%$
Average gate power loss	$P_{G(AV)}$	0.1	W	
Junction temperature	T_J	-40 to +125	°C	
Storage temperature	T_{stg}	-40 to +125	°C	

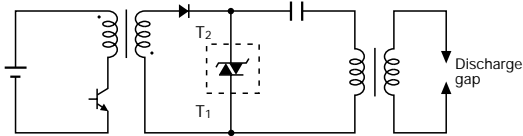
■ Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions	
		min	typ	max			
Off-state current	I_{DRM}		0.1	1.0	mA	$V_D=V_{DRM}$, $R_{GK}=\infty$, $T_J=125^\circ C$	
				0.1		$V_D=V_{DRM}$, $R_{GK}=\infty$, $T_J=25^\circ C$	
On-state voltage	V_{TM}			1.6	V	$I_{TM}=1.6A$, $T_C=25^\circ C$	
Gate trigger voltage	V_{GT}	I		1.7	V	$V_D=6V$, $R_L=10\Omega$, $T_C=25^\circ C$	T_2^+ , G^+
		II		0.7			T_2^+ , G^-
		III		0.8			T_2^- , G^-
		IV		2.0			T_2^- , G^+
Gate trigger current	I_{GT}	I		2.0	mA	$V_D=6V$, $R_L=10\Omega$, $T_C=25^\circ C$	T_2^+ , G^+
		II		1.8			T_2^+ , G^-
		III		2.3			T_2^- , G^-
		IV		13.0			T_2^- , G^+
Gate non-trigger voltage	V_{GD}	0.1			V	$V_D=1/2 \times V_{DRM}$, $T_J=125^\circ C$	
Thermal resistance	θ_H			20	°C/W	Junction to Lead, 1 element operation	
	R_{th}			80		junction to operating environment, 1 element operation	

PNPN Switch

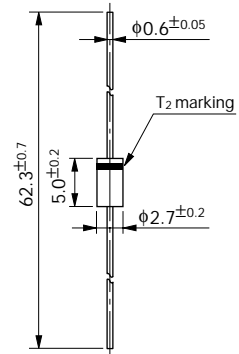
ET013, ET015, ET020

Example of application circuit (ignition)



External Dimensions

(Unit: mm)



Weight: Approx. 2.6g

■ Absolute Maximum Ratings

Parameter	Symbol	Ratings			Unit	Conditions
		ET013	ET015	ET020		
Repetitive peak off-state voltage	V_{DRM}	90	115	170	V	
RMS on-state current	$I_{T(RMS)}$	0.6			A	DC, $T_j \leq 112^\circ\text{C}$
Surge on-state current	I_{TSM}	80			A	$T_a = 25^\circ\text{C}$, $W_p = 10\mu\text{s}$, Full-cycle sinewave, 1cycle, Peak value, $f = 50\text{Hz}$
Rate-of-rise of on-state current	di_T/dt	30			A/ $\mu\text{sec.}$	
Junction temperature	T_j	-40 to +125			$^\circ\text{C}$	
Storage temperature	T_{stg}	-40 to +125			$^\circ\text{C}$	

■ Electrical Characteristics

Parameter	Symbol	Ratings			Unit	Conditions
		ET013	ET015	ET020		
Breakeover voltage	V_{BO}	120 to 138	142 to 157	190 to 210	V	
Breakeover current	I_{BO}	150max	100max		μA	
On-state voltage	V_T	± 2.5			V	$I_T = \pm 10\text{A}$

ET013, ET015, ET020

List of Discontinued Parts

■ Discontinued Parts

Product series	Part Number	Replacement Parts
Thyristors	TGH340M	—
	TF325P	—
	TF320M	TF321M
	TF320M-A	TF321M-A
	TF620M	TF861M
	TF640M	TF841M
	TFD312M	TFD312S series
	TFH341S	—
	TFH361S	—
Triacs	TM1041M-L	TM1041S-L
	TM1061M-L	TM1061S-L
	TM1241M-L	TM1241S-L
	TM1261M-L	TM1261S-L
	TM1641M-L	TM1641S-L
	TM1661M-L	TM1661S-L
	TM1262B-R	—
PNPN Switch	ET014	—

MEMO

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