

### Power Modules - Thyristor/Thyristor

#### FEATURES

- High surge capability
- Qualified for industrial level
- Thick copper baseplate
- Easy mounting on heatsink

#### TYPICAL APPLICATIONS

- Power supplies
- Machine tools control
- High power drives
- Welders
- Medium traction

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
I <sub>T(AV)</sub>		250	A
	T <sub>Case</sub>	85	°C
I <sub>T(RMS)</sub>		555	A
	T <sub>Case</sub>	85	°C
I <sub>TSM</sub>	50 Hz	8170	A
	60 Hz	8900	A
I <sup>2</sup> t	50 Hz	302	kA <sup>2</sup> s
	60 Hz	329	kA <sup>2</sup> s
V <sub>DRM</sub> /V <sub>RRM</sub>		200 to 1600	V
t <sub>q</sub>	Typical	125	µs
T <sub>J</sub>		-40 to 125	°C

#### ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS				
SERIES	VOLTAGE CODE	V <sub>DRM</sub> /V <sub>RRM</sub> , MAX. RE- PETITIVE PEAK AND OFF-STATE VOLTAGE (V)	V <sub>RSM</sub> , MAX. NON- REPETITIVE PEAK VOLTAGE (V)	I <sub>DRM</sub> /I <sub>RRM</sub> , MAX. at T <sub>J</sub> = T <sub>J(Max.)</sub> (mA)
TT250/...	02	200	300	50
TT250/...	04	400	500	
TT250/...	06	600	700	
TT250/...	08	800	900	
TT250/...	10	1000	1100	
TT250/...	12	1200	1300	
TT250/...	14	1330	1500	
TT250/...	16	1520	1700	

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MAXIMUM ALLOWABLE RATINGS					
SYMBOL	DESCRIPTION	TEST CONDITIONS		VALUE	UNITS
$I_{T(AV)}$	Maximum average on-state current at heatsink temperature	180° conduction, half sine wave		250	A
				85	°C
$I_{T(RMS)}$	Maximum RMS on-state current	DC at 25°C heatsink temperature		555	A
$I_{TSM}$	Maximum peak, one-cycle non-repetitive surge current	t = 10 ms	100% $V_{RRM}$ reapplied	Sinusoidal half wave, initial $T_j = T_j$ max.	kA
		t = 8.3 ms			
		t = 10 ms	No voltage reapplied		
		t = 8.3 ms			
$I^2t$	Maximum $I^2t$	t = 10 ms	100% $V_{RRM}$ reapplied		kA <sup>2</sup> s
		t = 8.3 ms			
		t = 10 ms	No voltage reapplied		
		t = 8.3 ms			
$I^2t^{1/2}$	Maximum $I^2t^{1/2}$	t = 0.1 to 10 ms, no voltage reapplied		3610	kA <sup>2</sup> s <sup>1/2</sup>
$V_{T(TO)}$	Low level threshold voltage	(16.7% $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$ ), $T_j = T_j$ max.		0.89	V
$r_T$	Low level on-state slope resistance			0.61	mΩ
$V_{TM}$	Maximum on-state voltage	$I_{pk} = 785A$ , 50Hz half sine pulse, $T_j = T_j$ max.		1.37	V
$I_H$	Maximum holding current	$T_j = 25^\circ C$ , anode supply 12V resistive load		500	mA
$I_L$	Typical latching current			200	

SWITCHING					
SYMBOL	DESCRIPTION	TEST CONDITIONS		VALUE	UNITS
dI/dt	Maximum non-repetitive rate of rise of turned-on current	Gate drive 20 V, 20 Ω, $t_r \leq 1 \mu s$ , $T_j = T_j$ max., anode voltage $\leq 80\%$ $V_{DRM}$		500	A/ $\mu s$
$t_d$	Typical delay time	Gate current 1 A, $dI_g/dt = 1 A/\mu s$ , $V_d = 0.67\%$ $V_{DRM}$ , $T_j = 25^\circ C$		0.7	$\mu s$
$t_q$	Typical turn-off time			125	

BLOCKING					
SYMBOL	DESCRIPTION	TEST CONDITIONS		VALUE	UNITS
dV/dt	Maximum critical rate of rise of off-state voltage	$T_j = T_j$ max. Linear to 80% rated $V_{DRM}$		1000	V/ $\mu s$
$I_{RRM}, I_{DRM}$	Maximum peak reverse and off-state leakage current	$T_j = T_j$ max., rated $V_{DRM}/V_{RRM}$ applied		50	mA

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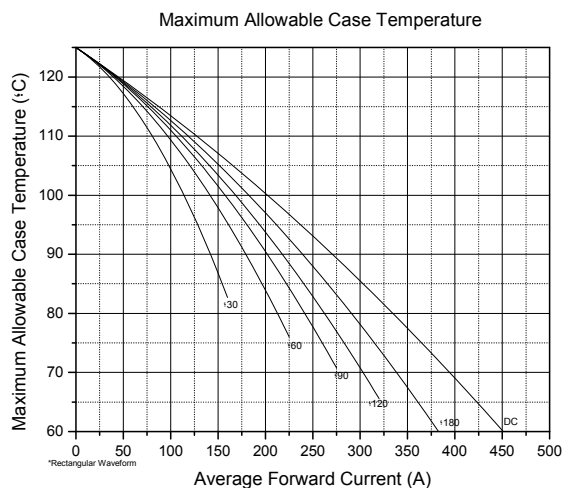
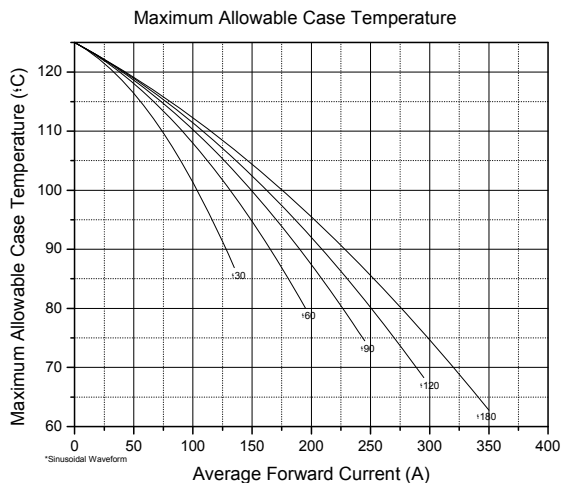
TRIGGERING						
SYMBOL	DESCRIPTION	TEST CONDITIONS	VALUE		UNITS	
			TYP.	MAX.		
$P_{GM}$	Maximum peak gate power	$T_J = T_J \text{ max.}, t_p \leq 5\text{ms}$	10		W	
$P_{G(AV)}$	Maximum average gate power	$T_J = T_J \text{ max.}, f = 50\text{Hz}, d\% = 50$	3			
$I_{GM}$	Maximum peak gate current	$T_J = T_J \text{ max.}, t_p \leq 5\text{ms}$	1		A	
$-V_{GM}$	Maximum negative gate voltage	$T_J = T_J \text{ max.}, t_p \leq 5\text{ms}$	2		V	
$I_{GT}$	DC gate current to trigger	$T_J = -40^\circ\text{C}$	Maximum required gate trigger/current/voltage are the lowest values which will trigger all units, 12V anode to cathode applied	-	300	mA
		$T_J = 25^\circ\text{C}$		80	150	
$V_{GT}$	DC gate voltage to trigger	$T_J = -40^\circ\text{C}$		-	4	V
		$T_J = 25^\circ\text{C}$		-	2	
$V_{GD}$	DC gate voltage not to trigger	$T_J = T_J \text{ max.}$	0.30		V	

THERMAL AND MECHANICAL SPECIFICATIONS					
SYMBOL	DESCRIPTION	TEST CONDITIONS	VALUE	UNITS	
$T_J$	Maximum operating junction temperature	-	-40 to 125	°C	
$T_{Stg}$	Maximum storage temperature	-	-40 to 150		
$R_{thJ-hs}$	Maximum thermal resistance, junction to heatsink	DC	0.070	°C/W	
		180° sine wave	0.071		
		120° rectangular wave	0.075		
$R_{thC-hs}$	Maximum thermal resistance, case to heat-sink	Mtg. Surface smooth, flat, greased	0.020		
-	Mounting force, ± 10%	To terminal (To heatsink)	3(5)	N.m	
-	Approximate weight	-	500	g	
-	Case style	Modified	TO-240AA	JEDEC	

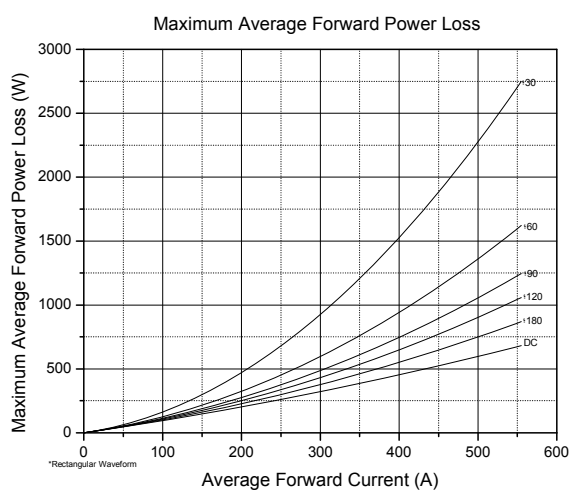
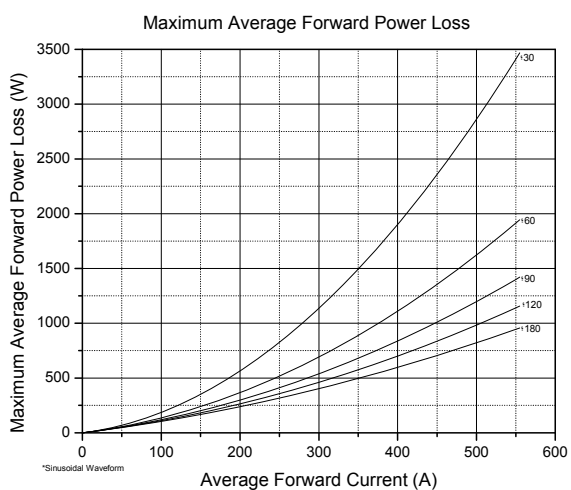
CURRENT FORM FACTOR								
FORM FACTOR	CONDUCTION ANGLE	15°	30°	45°	60°	90°	120°	180°
		Sine wave		31.956	15.832	10.452	7.721	4.933
Rectangular wave		24.000	12.000	8.000	6.000	4.000	3.000	2.000

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#### CURRENT RATINGS CHARACTERISTICS

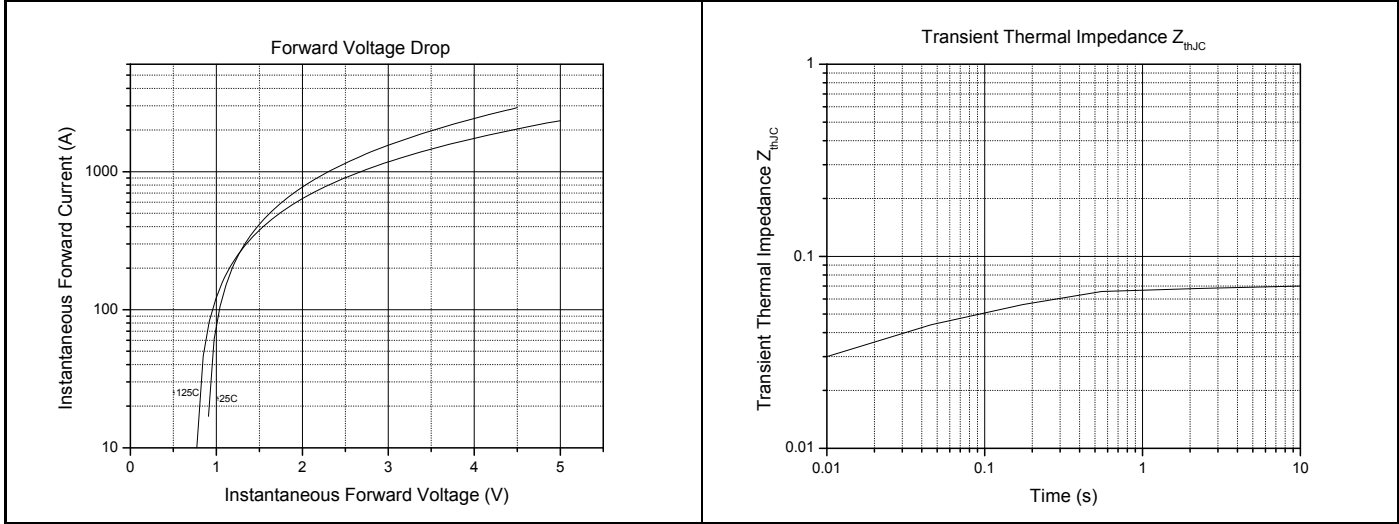


#### ON-STATE POWER LOSS CHARACTERISTICS

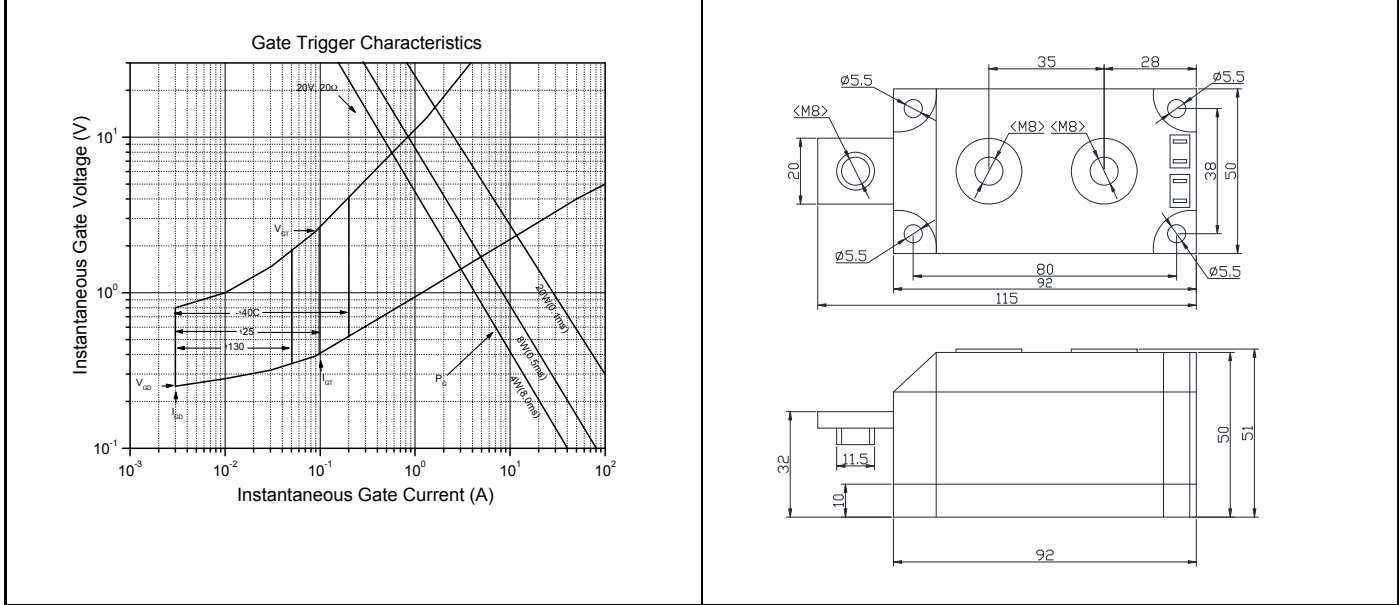


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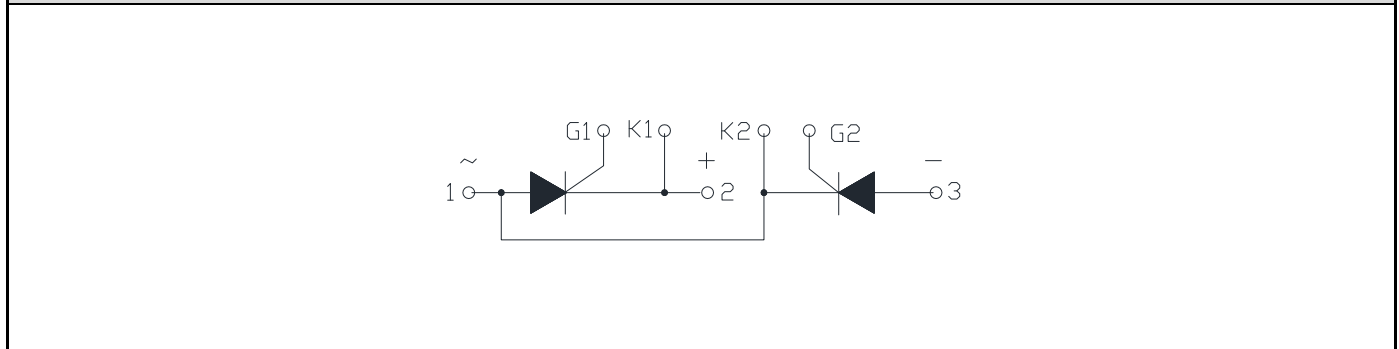
#### FORWARD VOLTAGE DROP / THERMAL IMPEDANCE CHARACTERISTICS



#### GATE TRIGGER / OUTLINE CHARACTERISTICS



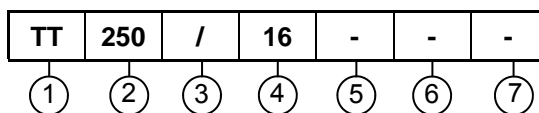
#### CIRCUIT CONFIGURATION



### Power Modules - Thyristor/Thyristor

#### ORDERING INFORMATION

Device code



- |   |  |
|---|--|
| 1 | <ul style="list-style-type: none"> <li>- N = Phase Control Thyristors</li> <li>- F = Fast Thyristors (inverter grade)</li> <li>- D = Normal Recovery Diodes</li> <li>- DF = Fast Recovery Diodes</li> <li>- DD = Module (diode-diode)</li> <li>- DT = Module (diode-thyristor)</li> <li>- TD = Module (thyristor-diode)</li> <li>- TT = Module (thyristor-thyristor)</li> <li>- P = Press-fit diode</li> </ul> |
| 2 | <ul style="list-style-type: none"> <li>- Average Current Code</li> </ul>   |
| 3 | <ul style="list-style-type: none"> <li>- Essential Part Number</li> </ul>  |
| 4 | <ul style="list-style-type: none"> <li>- Voltage Code x 100 = <math>V_{RRM}</math></li> </ul>  |
| 5 | <ul style="list-style-type: none"> <li>- Turn-off time (fast thyristors only)</li> <li>- Reverse Recovery Time (fast diodes only)</li> </ul>   |
| 6 | <ul style="list-style-type: none"> <li>- M = Metric Thread</li> <li>- I = Inch Thread</li> </ul>   |
| 7 | <ul style="list-style-type: none"> <li>- None = Anode to stud (stud diodes only)</li> <li>- R = Cathode to stud (stud diodes only)</li> </ul>  |

#### Disclaimer

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