

Inverter Grade Thyristors

FEATURES

- Amplified gate structure
- Qualified for industrial level
- International standard case TO-200AD
- Metal case with ceramic insulator

TYPICAL APPLICATIONS

- Induction heating
- Choppers
- Inverters

MAJOR RATINGS AND CHARACTERISTICS			
PARAMETER	TEST CONDITIONS	VALUES	UNITS
$I_{T(AV)}$		1000	A
	T_{Case}	70	°C
$I_{T(RMS)}$		1580	A
	T_{Case}	70	°C
I_{TSM}	50 Hz	22100	A
	60 Hz	24000	A
I^2t	50 Hz	1514	kA ² s
	60 Hz	1650	kA ² s
V_{DRM}/V_{RRM}		200 to 2000	V
t_q	Maximum	60	µs
T_J		-40 to 125	°C

ELECTRICAL SPECIFICATIONS

VOLTAGE RATINGS				
SERIES	VOLTAGE CODE	V_{DRM}/V_{RRM} , MAX. RE- PETITIVE PEAK AND OFF-STATE VOLTAGE (V)	V_{RSM} , MAX. NON- REPETITIVE PEAK VOLTAGE (V)	I_{DRM}/I_{RRM} , MAX. at T_J = $T_{J(Max.)}$ (mA)
F1000/...	02	200	300	135
F1000/...	04	400	500	
F1000/...	06	600	700	
F1000/...	08	800	900	
F1000/...	10	1000	1100	
F1000/...	12	1200	1300	
F1000/...	14	1330	1500	
F1000/...	16	1520	1700	
F1000/...	18	1710	1900	
F1000/...	20	1900	2100	

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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, double side cooled		1000	A
				70	°C
$I_{T(RMS)}$	Maximum RMS on-state current	DC at 25°C heatsink temperature, double side cooled		1580	A
I_{TSM}	Maximum peak, one-cycle non-repetitive surge current	t = 10 ms	100% V_{RRM} reapplied	Sinusoidal half wave, initial $T_J = T_J \text{ max.}$	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	1328	kA^2s
		t = 8.3 ms			
		t = 10 ms	No voltage reapplied	1514	
		t = 8.3 ms			
$I^2t^{1/2}$	Maximum $I^2t^{1/2}$	t = 0.1 to 10 ms, no voltage reapplied		25500	$\text{kA}^2\text{s}^{1/2}$
$V_{T(TO)}$	Low level threshold voltage	(16.7% $\times \pi \times I_{T(AV)} < I < \pi \times I_{T(AV)}$), $T_J = T_J \text{ max.}$		1.43	V
r_T	Low level on-state slope resistance			0.36	mΩ
V_{TM}	Maximum on-state voltage	$I_{pk} = 3142\text{A}$, 50Hz half sine pulse, $T_J = T_J \text{ max.}$		2.36	V
I_H	Maximum holding current	$T_J = 25^\circ\text{C}$, anode supply 12V resistive load		500	mA
I_L	Typical latching current			270	

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, $t_r \leq 1 \mu\text{s}$, $T_J = T_J \text{ max.}$, anode voltage $\leq 80\% V_{DRM}$		800	A/μs
t_d	Typical delay time	Gate current 1 A, $dI_g/dt = 1 \text{ A}/\mu\text{s}$, $V_d = 0.67\% V_{DRM}$, $T_J = 25^\circ\text{C}$		1.5	μs
t_q	Typical turn-off time	$T_J = 125^\circ\text{C}$, $I_{TM} = 500\text{A}$, $dI/dt = 25\text{A}/\mu\text{s}$, $V_R = 50\text{V}$, $dV/dt = 200\text{V}/\mu\text{s}$ lin. To 80% rated V_{DRM} . Gate: 0V, 100Ω		25	

BLOCKING					
SYMBOL	DESCRIPTION	TEST CONDITIONS		VALUE	UNITS
dV/dt	Maximum critical rate of rise of off-state voltage	$T_J = T_J \text{ max.}$ Linear to 80% rated V_{DRM}		700	V/μs
I_{RRM}, I_{DRM}	Maximum peak reverse and off-state leakage current	$T_J = T_J \text{ max.}$, rated V_{DRM}/V_{RRM} applied		135	mA

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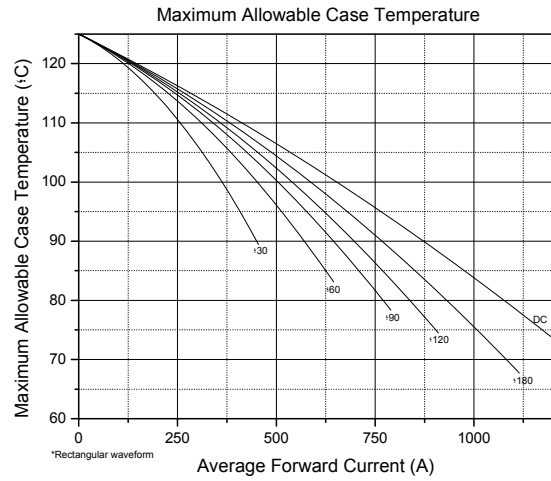
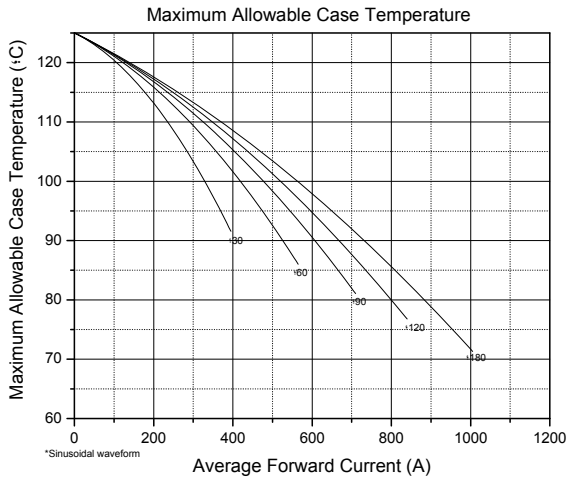
TRIGGERING						
SYMBOL	DESCRIPTION	TEST CONDITIONS		VALUE		UNITS
				TYP.	MAX.	
P_{GM}	Maximum peak gate power	$T_J = T_J \text{ max.}, t_p \leq 5\text{ms}$		16		W
$P_{G(AV)}$	Maximum average gate power	$T_J = T_J \text{ max.}, f = 50\text{Hz}, d\% = 50$		3		
I_{GM}	Maximum peak gate current	$T_J = T_J \text{ max.}, t_p \leq 5\text{ms}$		2		A
$-V_{GM}$	Maximum negative gate voltage	$T_J = T_J \text{ max.}, t_p \leq 5\text{ms}$		3		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
		$T_J = 25^\circ\text{C}$		-	150	
V_{GT}	DC gate voltage to trigger	$T_J = -40^\circ\text{C}$		-	3.3	V
		$T_J = 25^\circ\text{C}$			2.5	
V_{GD}	DC gate voltage not to trigger	$T_J = T_J \text{ max.}$	Maximum gate current/voltage not to trigger is the maximum value which will not trigger any unit with rated V_{DRM} anode to cathode applied	0.3		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, double side cooled	0.023	°C/W	
		180° sine wave, double side cooled	0.026		
		120° rectangular wave, double side cooled	0.027		
R_{thC-hs}	Maximum thermal resistance, case to heat-sink	Mtg. Surface smooth, flat, greased, double side cooled	0.01		
-	Mounting force, $\pm 10\%$	-	2500	kgf	
-	Approximate weight	-	425	g	
-	Case style	-	TO-200AD	JEDEC	

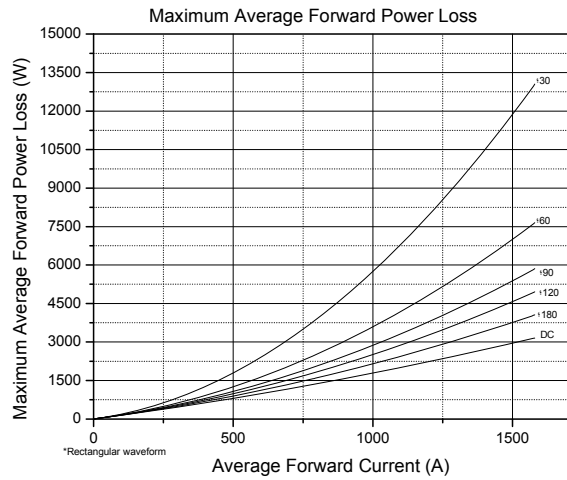
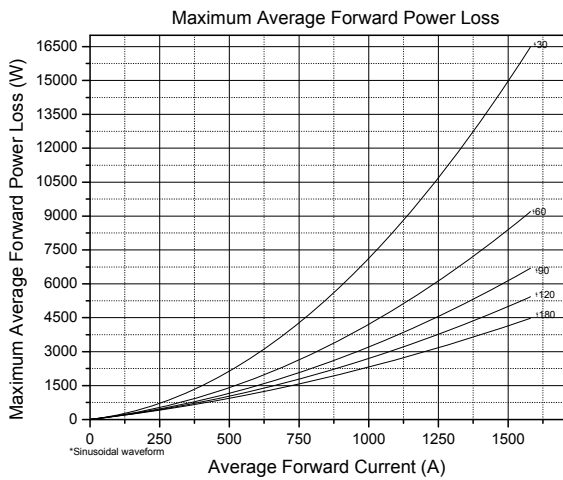
CURRENT FORM FACTOR								
FORM FACTOR	CONDUCTION ANGLE	15°	30°	45°	60°	90°	120°	180°
		Sine wave		31.956	15.832	10.452	7.721	4.933
Rectangular wave		24.000	12.000	8.000	6.000	4.000	3.000	2.000

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CURRENT RATINGS CHARACTERISTICS

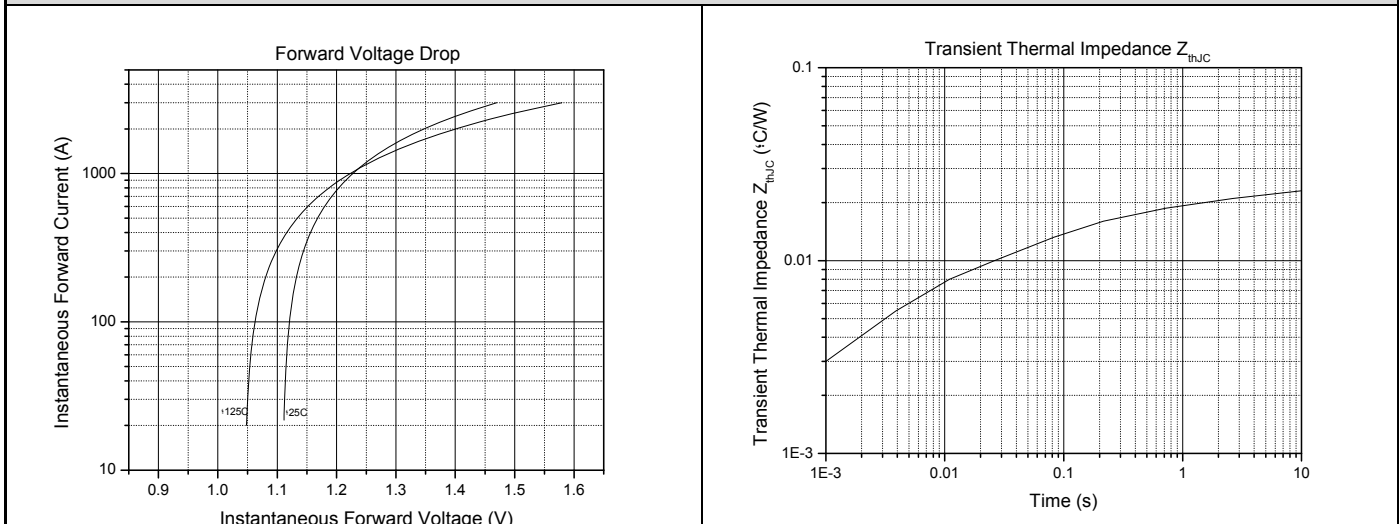


ON-STATE POWER LOSS CHARACTERISTICS

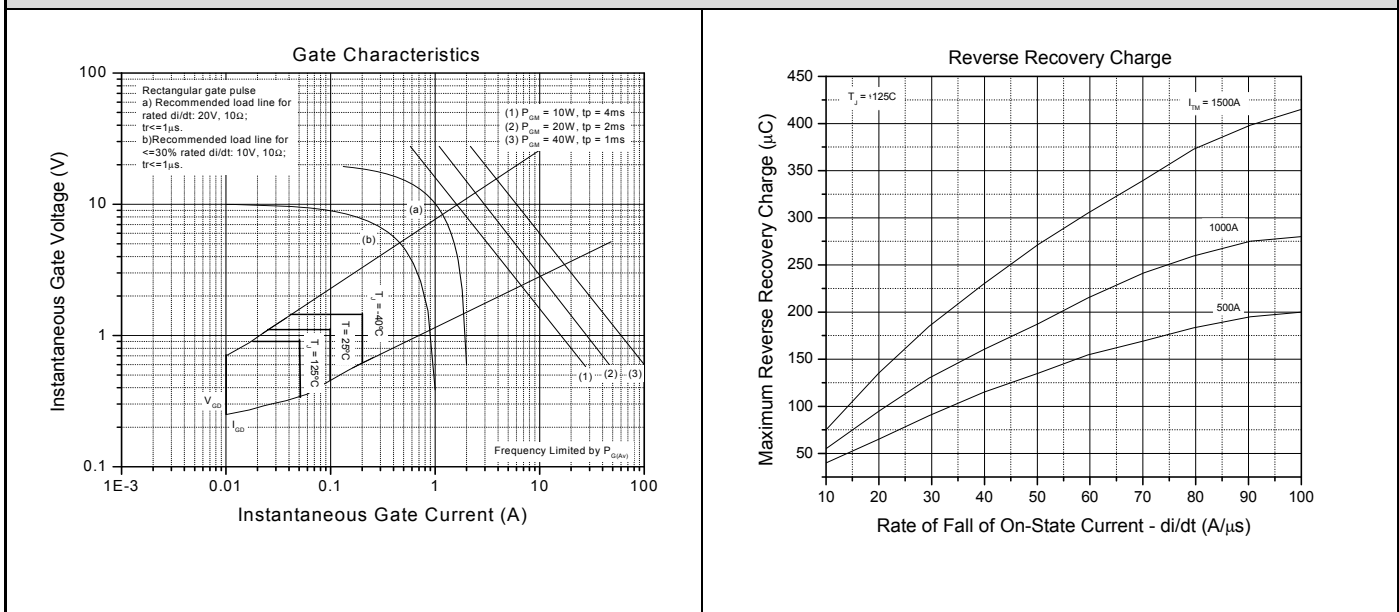


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FORWARD VOLTAGE DROP / THERMAL IMPEDANCE CHARACTERISTICS

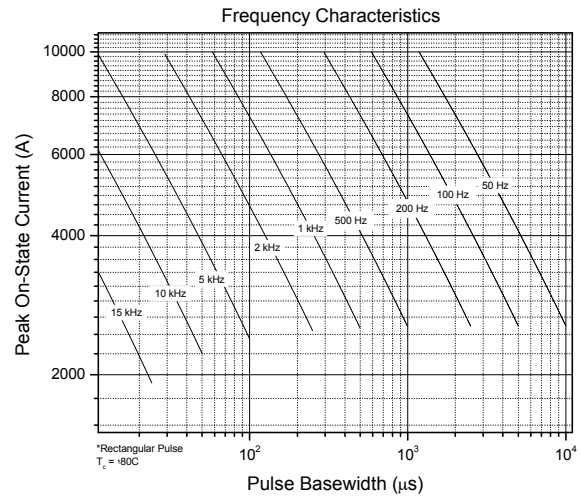
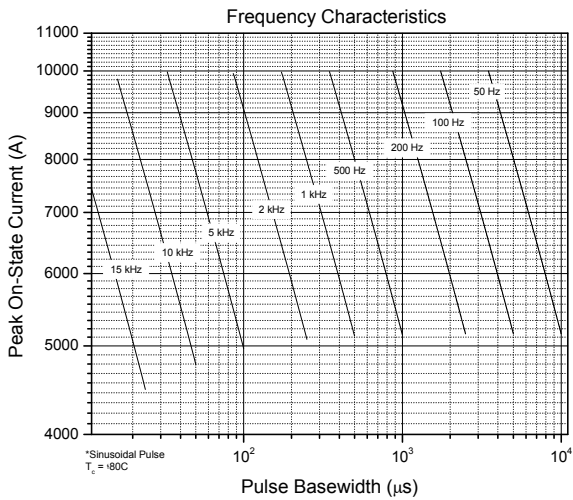
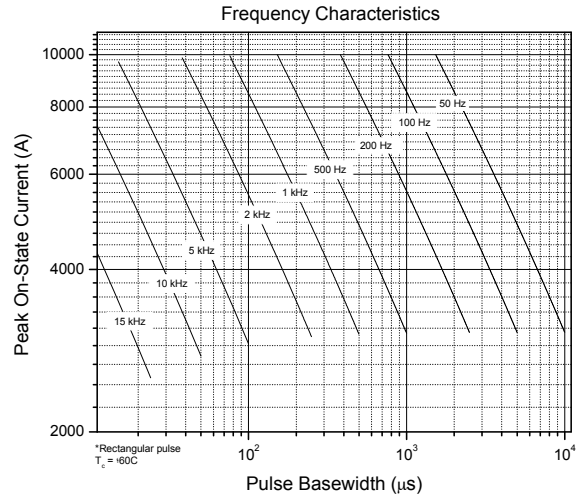
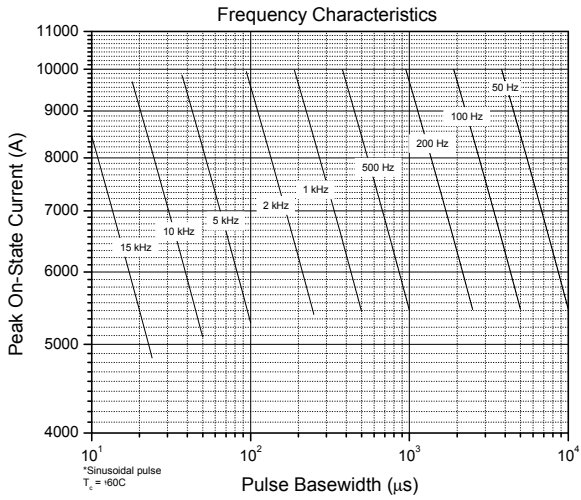


GATE TRIGGER / REVERSE RECOVERY CHARGE CHARACTERISTICS



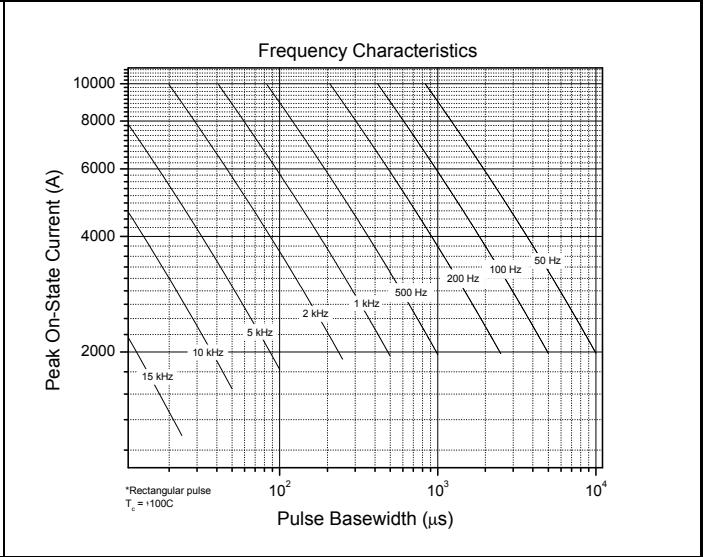
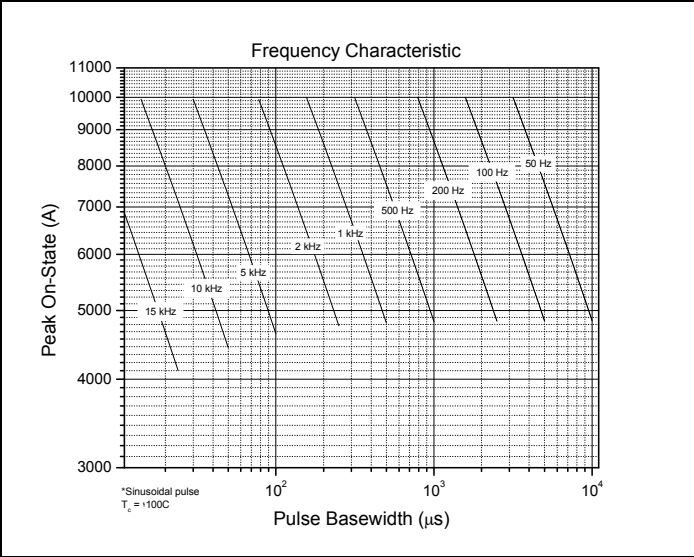
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FREQUENCY CHARACTERISTICS

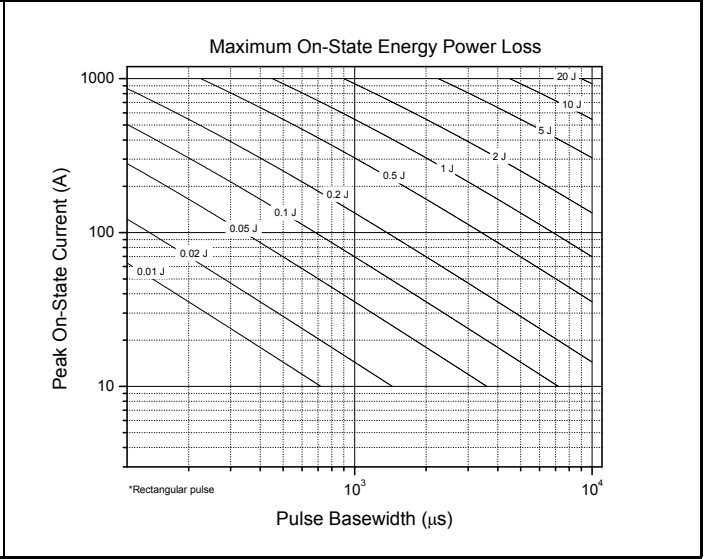
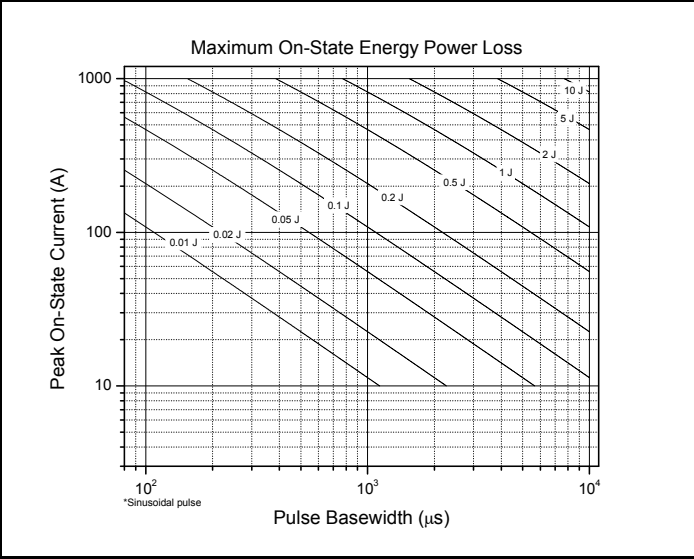


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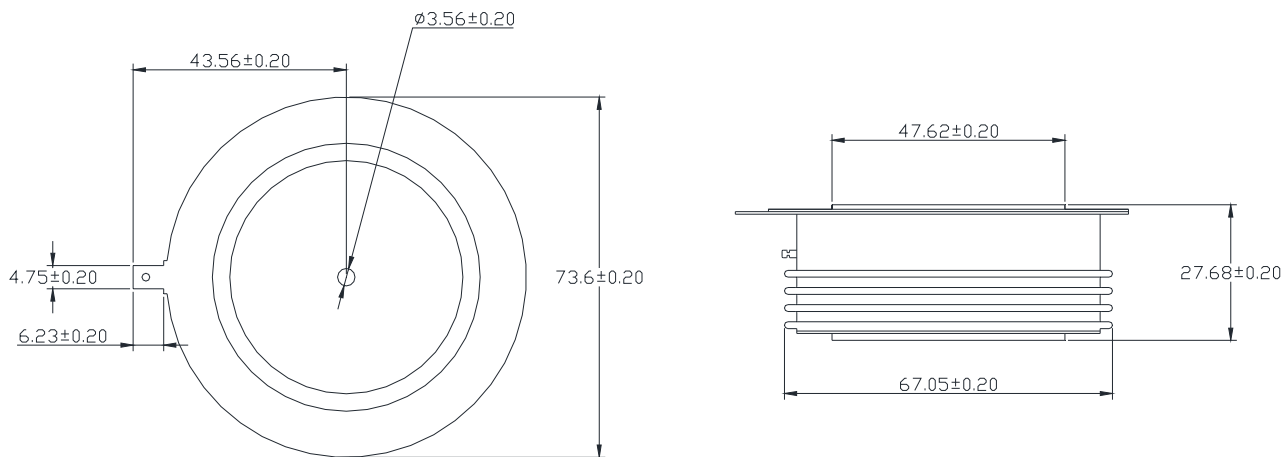


ENERGY POWER-LOSS CHARACTERISTICS



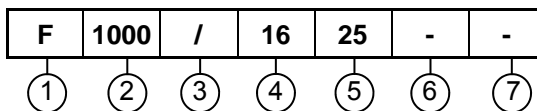
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OUTLINE CHARACTERISTICS



ORDERING INFORMATION

Device code



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

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Disclaimer

All product specifications and data are subject to change without notice.

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