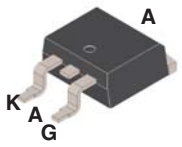
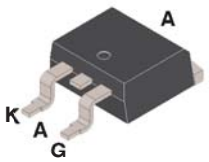
12A - SCR

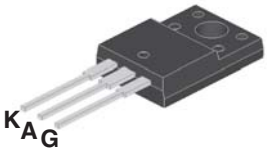
TO-252AA (DPAK)
(FS12xxxD)



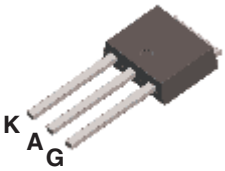
TO-263AB (D2PAK)
(FS12xxxG)



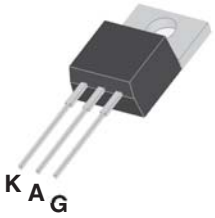
TO220-F
(FS12xxxW)

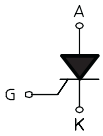


TO-251AA (IPAK)
(FS12xxxI)



TO-220-AB
(FS12xxxH)





On-State Current	Gate Trigger Current
12 Amp	200 µA to 25mA

Off-State Voltage
400 V ÷ 800 V

FEATURES

- Glass/passivated die junctions
- Low current SCR
- Low thermal resistance
- High surge current capability
- Low forward voltage drop
- Solder dip 260ºC, 10s
- Component in accordance to RoHS 2011/65/EU and WEEE 2002/96/EC
- Meets MSL level 3, per J-STD-020, LF maximum peak of 260º C

RoHS COMPLIANT

MECHANICAL DATA

- **Case:** (DPAK) / (D2PAK) / (IPAK) / (TO220-F) / (TO-220-AB). Epoxy meets UL 94V-0 flammability rating.
- **Polarity:** As marked on the body.
- **Terminals:** Matte tin plated leads, solderable per MIL-STD-750 Method 2026, J-STD-002 and JESD22-B102. Consumer grade, meets JESD 201 class 1A whisker test.

TYPICAL APPLICATIONS

Thanks to highly sensitive triggering levels, the FS12xxxx SCR series is suitable for all applications where available gate current is limited, such as ground fault circuit interruptors, pilot circuits in solid state relays, stand-by mode power supplies, smoke and alarm detectors.

Maximun Ratings and Electrical Characteristics at 25°C

SYMBOL	PARAMETER	CONDITIONS	Value	Unit
$I_{T(RMS)}$	On-state Current	180 ° Conduction Angle, T_C = 105 °C	12	A
$I_{T(AV)}$	Average On-state Current	180 ° Conduction Angle, T_C = 105 °C	8	A
I_{TSM}	Non-repetitive On-State Current	Half Cycle, 60 Hz	145	A
I_{TSM}	Non-repetitive On-State Current	Halfl Cycle, 50 Hz	140	A
I^2t	Fusing Current	tp = 10 ms, Half Cycle	98	A^2s
I_{GM}	Peak Gate Current	20 µs max.	4	A
P_{GM}	Peak Gate Dissipation	20 µs max.	10	W
$P_{G(AV)}$	Gate Dissipation	20ms max.	1	W
T_j	Operating Temperature		(-40 to +125)	°C
T_{stg}	Storage Temperature		(-40 to +150)	°C
T_{sld}	Soldering Temperature	10s max.	260	°C
V_{RGM}	Max. Peak Reverse Gate Voltage		5	V

SYMBOL	PARAMETER	VOLTAGE			Unit
		D	M	N	
V_{DRM} V_{RRM}	Repetitive Peak Off State Voltage	400	600	800	V

Electrical Characteristics at Tamb = 25 °C

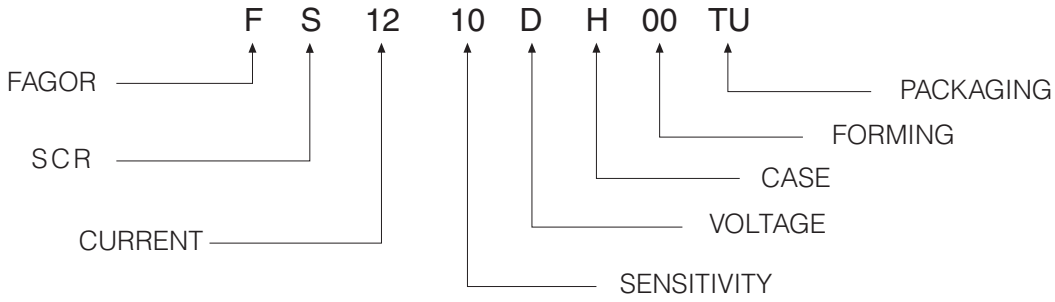
SYMBOL	PARAMETER	CONDITIONS			SG	STANDARD			Unit
					02	08	09	10	
I_{GT}	Gate Trigger Current	V_D = 12 V_{DC}	R_L = 140Ω	MAX	200	-	-	-	µA
			R_L = 33Ω	MIN	-	0.5	2	2	mA
				MAX	-	5	15	25	mA
V_{GT}	Gate Trigger Voltage	V_D = 12 V_{DC}	R_L = 140Ω	MAX	0.8	-			V
			R_L = 33Ω		-	1.3			
V_{GD}	Gate Non Trigger Voltage	V_D = V_{DRM}, T_j = 125°C, R_L = 3.3kΩ,	R_{GK} = 220Ω Gate open	MIN	0.1	-			V
					-	0.2			
V_{RGM}	Reverse Gate Voltage	I_{RG} = 10µA,		MIN	8	-			V
I_H	Holding Current	I_T = 500 mA,	R_{GK} = 1kΩ Gate open	MAX	5	-	-	-	mA
					-	15	30	40	
I_L	Latching Current	I_G = 1.2 I_{GT}	R_{GK} = 1kΩ Gate open	MAX	6	-	-	-	mA
					-	30	60	60	
dV / dt	Critical Rate of Voltage Rise	V_D = 0.67 V_{DRM}, T_j = 125 °C	R_{GK} = 220Ω Gate open	MIN	5	-	-	-	V/µs
					-	40	200	400	
dI / dt	Critical Rate of Current Rise	I_G = 2 x I_{GT}, tr ≤ 100 ns, f = 60 Hz, T_j = 125 °C		MIN	50				A/µs
V_{TM}	On-state Voltage	at I_T = 24 Amp, tp = 380 µs, T_j = 25 °C		MAX	1.6				V
$V_{t(o)}$	Threshold Voltage	T_j = 125 °C		MAX	0.85				V
r_d	Dynamic resistance	T_j = 125 °C		MAX	30				mΩ
I_{DRM} / I_{RRM}	Off-State Leakage Current	V_{DRM} = V_{RRM}, R_{GK} = 220Ω	T_j = 125 °C	MAX	1	2			mA
			T_j = 25 °C	MAX	5	5			µA

Thermal resistance

SYMBOL	PARAMETER	CONDITIONS		Value	Unit
$R_{th(j-c)}$	Thermal Resistance Junction-Case for DC			1.3	°C/W
$R_{th(j-a)}$	Thermal Resistance Junction-Amb for DC	S = 0.5cm²	DPAK	70	°C/W
		S = 1cm²	D2PAK	45	
			IPAK	60	
			TO-220-F	60	
			TO-220-AB	60	

S = Copper surface under tab

Part Number Information



Ordering information

PREFERRED P/N	PACKAGE CODE	DELIVERY MODE	BASE QUANTITY	UNIT WEIGHT (g)
FS1209DD 00TR	TR	13" diameter tape and reel	2,500	0.30

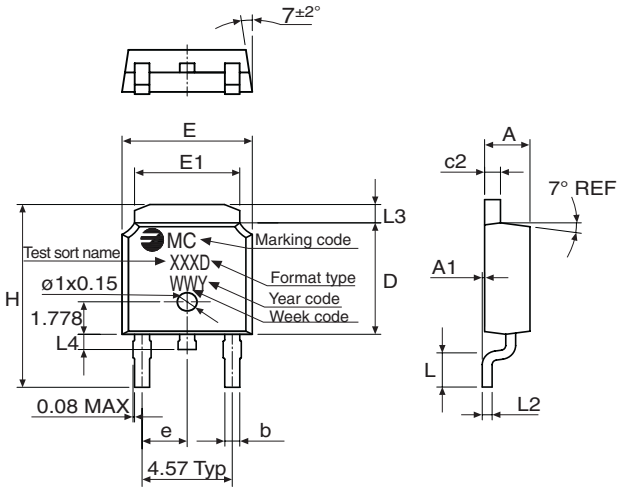
PREFERRED P/N	PACKAGE CODE	DELIVERY MODE	BASE QUANTITY	UNIT WEIGHT (g)
FS1209DG 00TR	TR	13" diameter tape and reel	800	1.50

PREFERRED P/N	PACKAGE CODE	DELIVERY MODE	BASE QUANTITY	UNIT WEIGHT (g)
FS1209DW 00TU	TU	TUBE	1,000	2.00

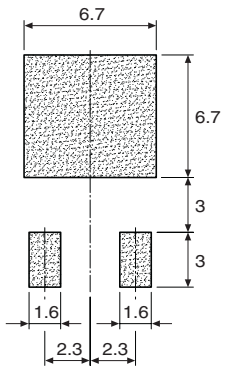
PREFERRED P/N	PACKAGE CODE	DELIVERY MODE	BASE QUANTITY	UNIT WEIGHT (g)
FS1209DI 00TU	TU	TUBE	4,000	0.40

PREFERRED P/N	PACKAGE CODE	DELIVERY MODE	BASE QUANTITY	UNIT WEIGHT (g)
FS1209DH 00TU	TU	TUBE	1000	2.30

Package Outline Dimensions: (mm) TO-252AA (DPAK)

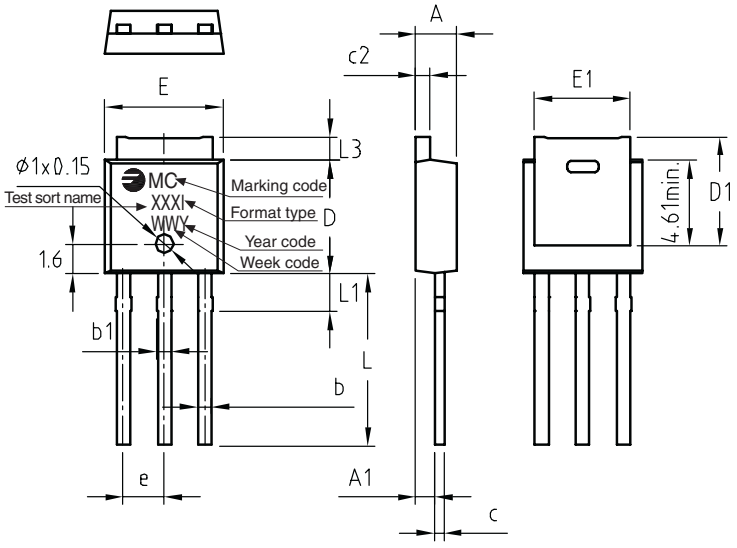


Mounting Pad Layout



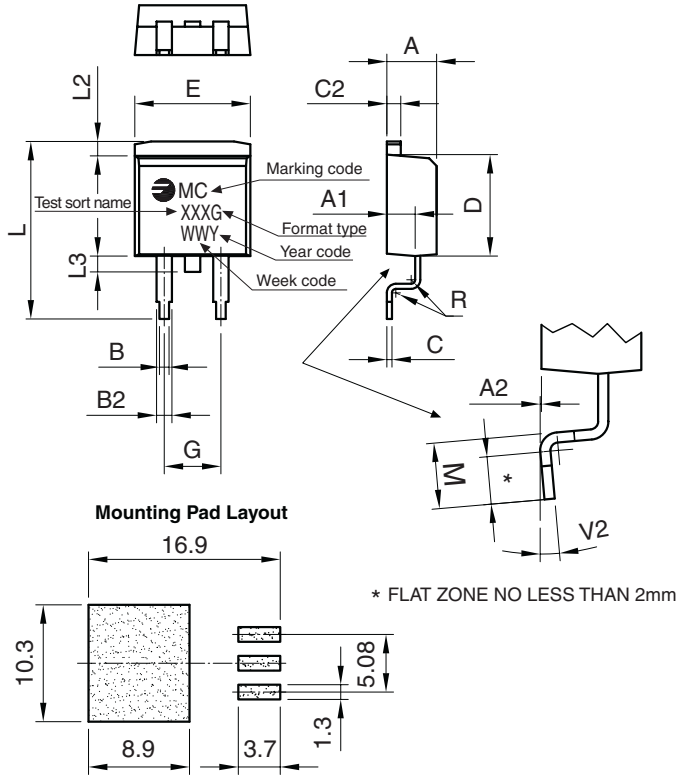
REF.	DIMENSIONS Milimeters		
	Min.	Nominal	Max.
A	2.18	2.3	2.39
A1	0	0.127	0.127
b	0.64	0.75	0.89
c2	0.46	0.51	0.56
D	5.97	6.1	6.22
E	6.47	6.6	6.73
E1	5.20	5.34	5.46
e		2.28BSC	
H	9.77	10.03	10.28
L	1.31	1.44	1.57
L2	0.46	0.51	0.56
L3	0.89	1.02	1.14
L4	0.51	0.76	1.02

Package Outline Dimensions: (mm) TO-251AA (IPAK)



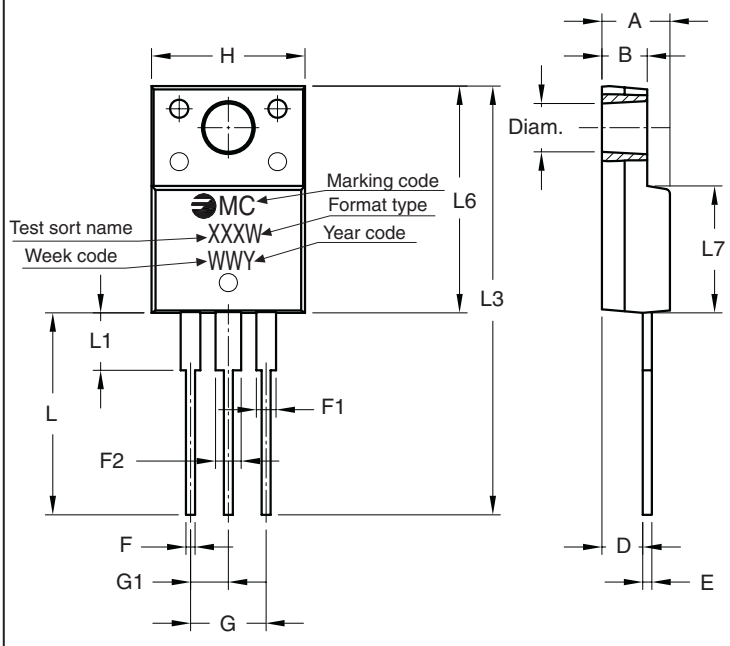
REF.	DIMENSIONS Milimeters		
	Min.	Nominal	Max.
A	2.19	2.30 ± 0.11	2.41
A1	0.89	1.08 ± 0.19	1.27
b	0.50	0.70 ± 0.20	0.90
b1	0.70	0.92 ± 0.22	1.14
c	0.43	0.51 ± 0.08	0.59
c2	0.43	0.62 ± 0.19	0.81
D	5.40	5.81 ± 0.41	6.22
D1	5.70	5.90 ± 0.20	6.10
E	6.35	6.54 ± 0.19	6.73
E1	5.20	5.33 ± 0.13	5.46
e	2.25	2.30 ± 0.05	2.35
L	7.50	8.58 ± 1.08	9.66
L1	1.90	2.10 ± 0.20	2.28
L3	0.89	1.27 ± 0.38	1.65

Package Outline Dimensions: (mm) TO-263AB (D2PAK)



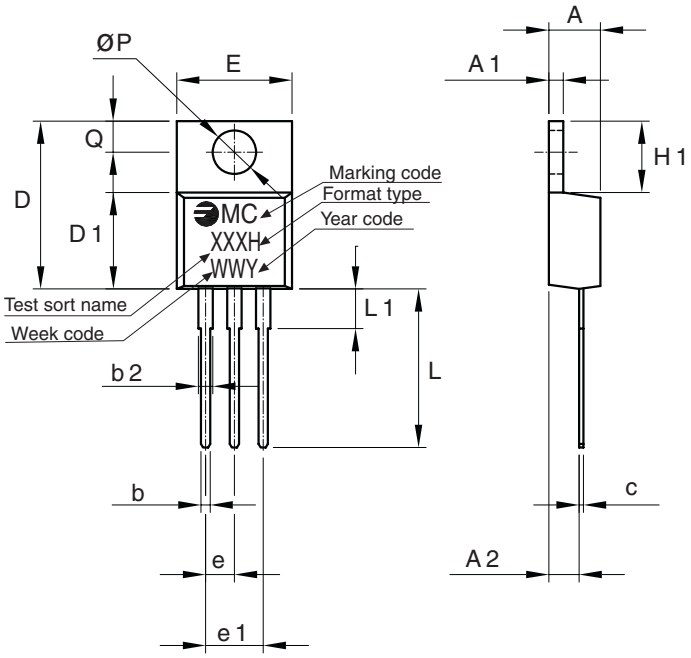
REF.	DIMENSIONS		
	Milimeters		
	Min.	Nominal	Max.
A	4.40	4.45	4.60
A1	2.49	2.50	2.69
A2	0.03	0.10	0.23
B	0.70	0.90	0.93
B2	1.14	1.03	1.70
C	0.45	0.45	0.60
C2	1.23	1.23	1.36
D	8.95	9.00	9.35
E	10.00	10.25	10.40
G	4.88	5.15	5.28
L	15.00	15.40	15.85
L2	1.27	1.27	1.40
L3	1.40	1.55	1.75
M	2.40	3.00	3.20
R		0.40 typ	
V2	0º		8º

Package Outline Dimensions: (mm) TO-220F



REF.	DIMENSIONS		
	Milimeters		
	Min.	Nominal	Max.
A	3.55	4.50	4.90
B	2.34	3.00	3.70
D	2.03	2.70	2.96
E	0.35	0.60	0.70
F	0.25	0.60	1.01
F1	0.70	1.30	1.78
F2	0.70	1.70	1.78
G	4.88	5.00	5.28
G1	2.34	2.50	2.74
H	9.65	10.15	10.67
L	12.70	13.35	14.73
L1	2.93	3.75	6.35
L3	26.90	28.35	31.20
L6	14.22	15.00	16.50
L7	8.30	8.40	9.59
Diam.	3.00	3.20	3.28

Package Outline Dimensions: (mm) TO-220AB



REF.	DIMENSIONS Milimeters	
	Min.	Max.
A	4.47	4.67
A1	1.17	1.37
A2	2.52	2.82
b	0.71	0.91
b2	1.17	1.37
c	0.31	0.53
D	14.65	15.35
D1	8.50	8.90
E	10.01	10.36
e	2.51	2.57
e1	4.98	5.18
H1	6.15	6.45
L	13.40	13.96
L1	3.56	3.96
P	3.735	3.935
Q	2.59	2.89

Fig. 1: Maximum average power dissipation versus average on-state current.

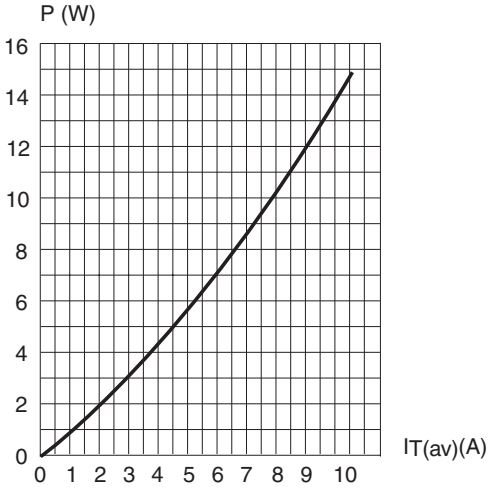


Fig. 2: Average and D.C. on-state current versus case temperature.

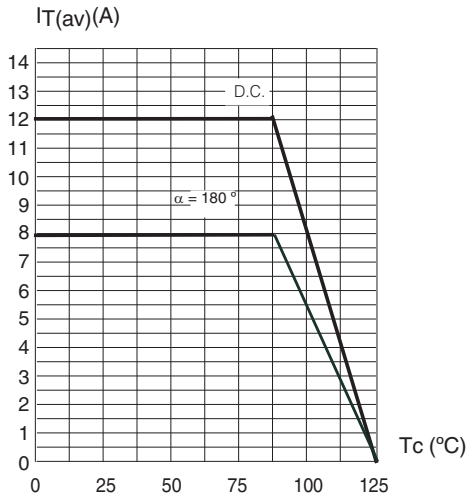


Fig. 3: Relative variation of thermal impedance junction to case versus pulse duration.

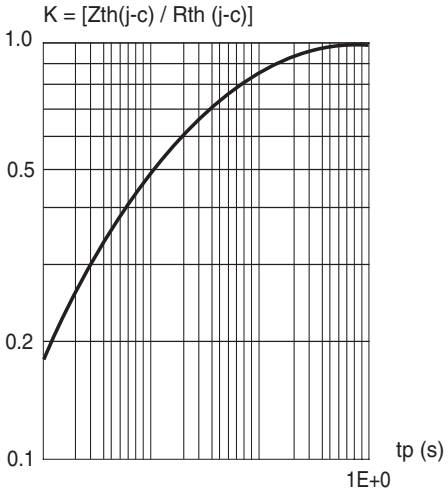


Fig. 4: Relative variation of gate trigger current, holding and latching current versus junction temperature for Sensitive Gate SCR (02).

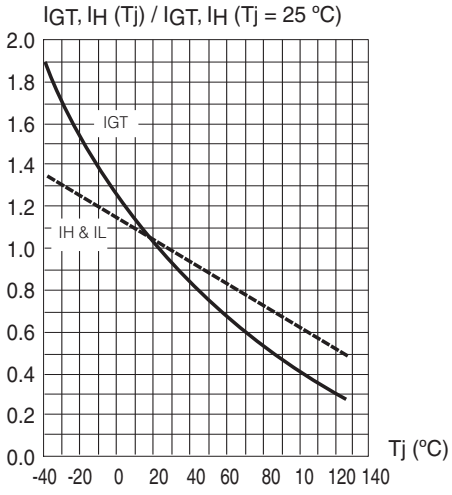


Fig. 5: Relative variation of gate trigger current, holding and latching current versus junction temperature for Standard Gate SCRs (08,09,10).

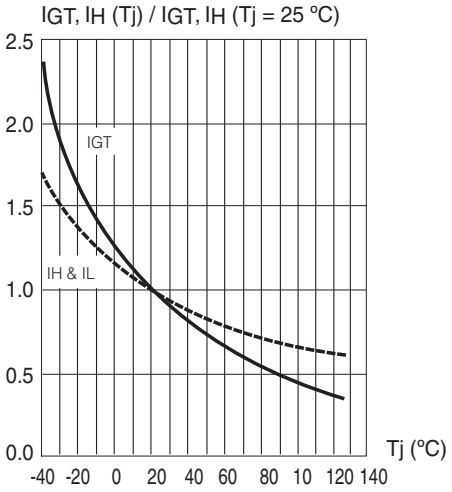


Fig. 6: Non repetitive surge peak on-state current versus number of cycles.

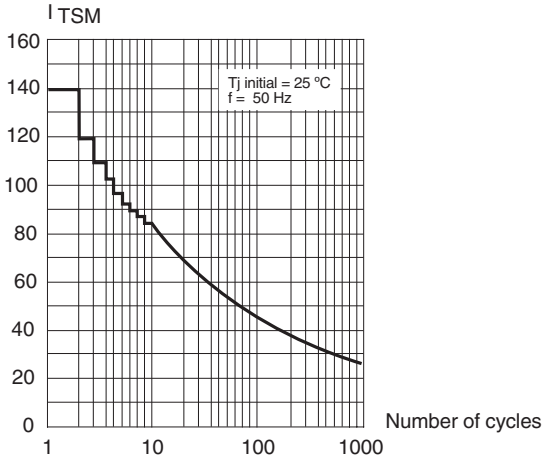


Fig. 7: Non repetitive surge peak on-state current for a sinusoidal pulse with width: tp < 10 ms, and corresponding value of I^2t.

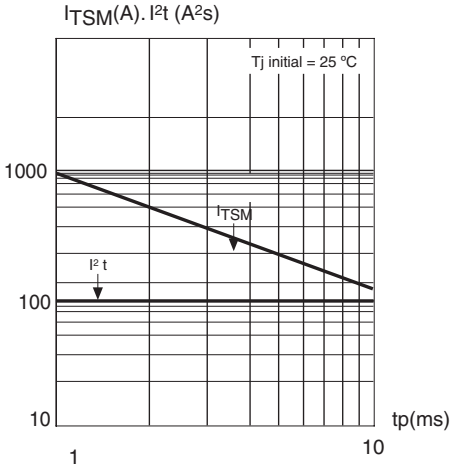
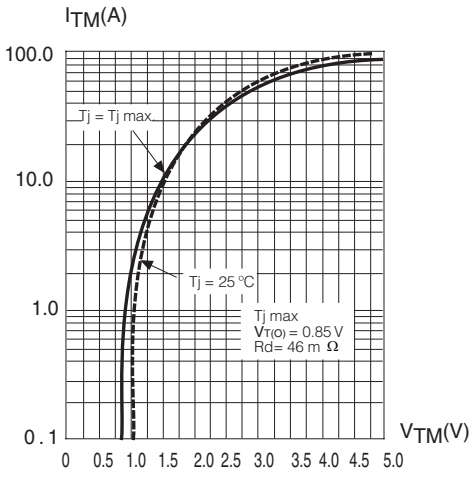


Fig. 8: On-state characteristics (maximum values).



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