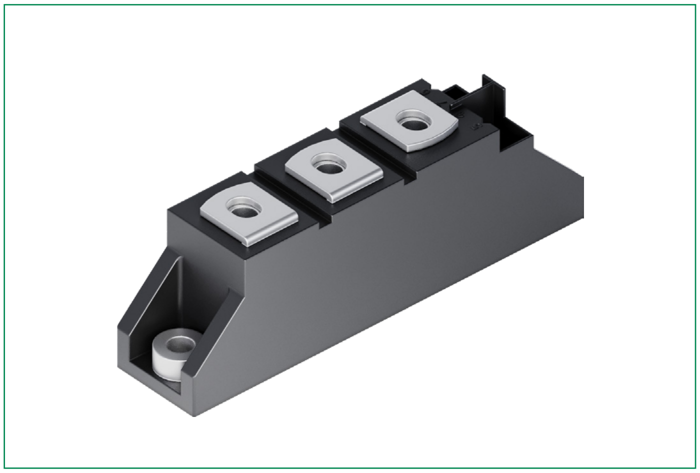
MCMA140PD1800TB

Thyristor-Diode Module

RoHS



Features

- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al_2O_3-ceramic

Applications

- Line rectifying 50/60 Hz
- Soft start AC motor control
- Lighting and temperature control
- DC motor control
- Power converter
- AC power control

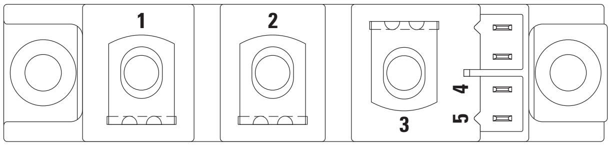
Package

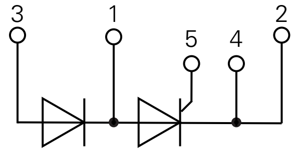
- RoHS compliant
- Industry standard outline
- Soldering pins for PCB mounting
- Base plate: DCB ceramic
- Isolation voltage: 4800 V~
- Reduced weight
- Advanced power cycling
- UL recognized (file number E72873)

Product Summary

Characteristic	Value	Unit
V_{RRM}	2 x 1800	V
$I_{T(AV)}$	140	A
V_T	1.28	V

Pinout Diagram (TO-240AA)





1: AC (~); **2:** DC+; **3:** DC- ;**4:** Kelvin contact DC+ ; **5:** Gate

Maximum Ratings

Symbol	Characteristics	Conditions		Value	Units
$I_{T(RMS)}$	RMS On-state Current	180° Sine, T_c = 85 °C, T_{vj} = 140 °C		220	A
$I_{T(AV)}$	Average Forward Current	180° Sine, T_c = 85 °C, T_{vj} = 140 °C		140	A
$I_{R/D}$	Reverse Current/ Drain Current	T_{vj} = 25 °C	$V_{R/D}$ = 1800 V	100	μA
		T_{vj} = 140 °C	$V_{R/D}$ = 1800 V	10	mA
I_{TSM}	Maximum Forward Surge Current	T_{vj} = 45 °C	t = 10 ms, (50 Hz), sine V_R = 0 V	2.40	kA
			t = 8.3 ms; (60 Hz), sine V_R = 0 V	2.59	
		T_{vj}= 140 ° C	t = 10 ms, (50 Hz), sine V_R = 0 V	2.04	
			t = 8.3 ms; (60 Hz), sine V_R = 0 V	2.21	
I^2t	I^2t Value	T_{vj} = 45 °C	t = 10 ms; (50 Hz), sine V_R = 0 V	28.8	kA^2s
			t = 8.3 ms; (60 Hz), sine V_R = 0 V	27.9	
		T_{vj} = 140 °C	t = 10 ms; (50 Hz), sine V_R = 0 V	20.8	
			t = 8.3 ms; (60 Hz), sine V_R = 0 V	20.2	
V_{RSM}/ V_{DSM}	Maximum Non-repetitive Reverse/Forward Blocking Voltage	T_{vj} = 25 °C		1900	V
V_{RRM}/ V_{DRM}	Maximum Repetitive Reverse/Forward Blocking Voltage	T_{vj} = 25 °C		1800	V
di/dt_{cr}	Critical Rate of Rise of On-state Current	t_p= 200 μs; di_G/dt = 0.45 A/μs; T_{vj} = 140 °C, f= 50 Hz, I_G = 0.45 A;V = 2/3 V_{DRM}	Repetitive, I_T = 450 A	150	A/μs
			Non-repetitive, I_T = 150 A	500	
dv/dt_{cr}	Critical Rate of Rise of Off-state Voltage	T_{vj} = 140 °C , R_{GK} = ∞, V = 2/3 $V_{DRM,}$ method 1 (linear voltage rise)		1000	V/μs
P_{GM}	Maximum Gate Power Dissipation	T_c = 140 °C	t_p = 30 μs	10	W
			t_p = 300 μs	5	
$P_{G(AV)}$	Average Gate Power Dissipation	T_c = 140 °C		0.5	W
P_{tot}	Total Power Dissipation	T_c = 25 °C		520	W
T_{stg}	Storage Temperature Range	–		–40 to 125	°C
T_{op}	Operating Temperature Range	–		–40 to 125	°C
T_{vj}	Virtual Junction Temperature Range	–		–40 to 140	°C

Thermal Characteristics

Symbol	Characteristics	Value			Units
		Min.	Typ.	Max.	
$R_{th(j-c)}$	Thermal Resistance Junction to Case	–	–	0.22	K/W
$R_{th(c-h)}$	Thermal Resistance Case to Heatsink	–	0.2	–	K/W

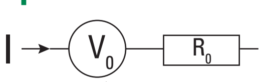
Electrical Characteristics

Symbol	Characteristics	Conditions		Value Min.	Value Typ.	Value Max.	Units
I_{GT}	Gate Trigger Current	T_{vj} = 25 °C	V_D = 6 V	–	–	150	mA
		T_{vj} = –40 °C		–	–	200	
V_{GT}	Gate Trigger Voltage	T_{vj} = 25 °C	V_D = 6 V	–	–	1.5	V
		T_{vj} = –40 °C		–	–	1.6	
I_{GD}	Gate Non-trigger Current	V = 2/3 V_{DRM}, T_{vj} = 140 °C		–	–	10	mA
V_{GD}	Gate Non-trigger Voltage			–	–	0.2	V
V_T	Forward Voltage Drop	T_{vj} = 25 °C	I_T = 150 A	–	–	1.29	V
			I_T = 300 A	–	–	1.63	
		T_{vj} = 125 °C	I_T = 150 A	–	–	1.28	
			I_T = 300 A	–	–	1.70	
V_{TO}	Threshold Voltage	T_{vj} = 140 °C		–	–	0.85	V
r_T	Slope Resistance			–	–	2.8	mΩ
I_L	Latching Current	t_p = 10 µs; I_G = 0.45 A; di_G/dt = 0.45 A/µs, T_{vj} = 25 °C		–	–	200	mA
I_H	Holding Current	V_D = 6 V; R_{GK} = ∞; T_{vj} = 25 °C		–	–	200	mA
C_j	Junction Capacitance	V_R = 400 V, f = 1 MHz, T_{vj} = 25 °C		–	119	–	pF
t_{gd}	Gate Controlled Turn-on Delay Time	V_D = 1/2 V_{DRM}; I_G = 0.45 A ; di_G/dt = 0.45 A/µs, T_{vj} = 25 °C		–	–	2	µs
t_q	Turn-off Time	V_R = 100 V, I_T = 150 A, V_D = 2/3 V_{DRM}, di/dt = 10 A/µs; dv/dt = 20 V/µs, t_p = 200 µs, T_{vj} = 125 °C		–	185	–	µs

Package

Symbol	Characteristics	Conditions		Value Min.	Value Typ.	Value Max.	Units
I_{RMS}	RMS Current	–		–	–	200	A
M_D	Mounting Torque	–		2.5	–	4	Nm
M_T	Terminal Torque			2.5	–	4	Nm
G	Weight	–		–	81	–	g
$d_{Spp/App}$	Creepage Distance on Surface/ Striking Distance through Air	terminal to terminal	13.0	9.7	–	–	mm
$d_{Spb/Apb}$		terminal to backside	16.0	16.0	–	–	mm
V_{isol}	Isolation Voltage	t = 1 second	50/60 Hz, RMS, I_{isol} ≤ 1mA	4800	–	–	V
		t = 1 minute		4000	–	–	V

Equivalent Circuits for Simulation (T_{vj} = 140 °C)



Symbol	Characteristics	Value	Units
$V_{0\ max}$	Threshold Voltage	0.85	V
$R_{0\ max}$	Slope Resistance[1]	1.6	mΩ

Note 1: On die level

Characteristic Curves

Figure 1. Forward Characteristics

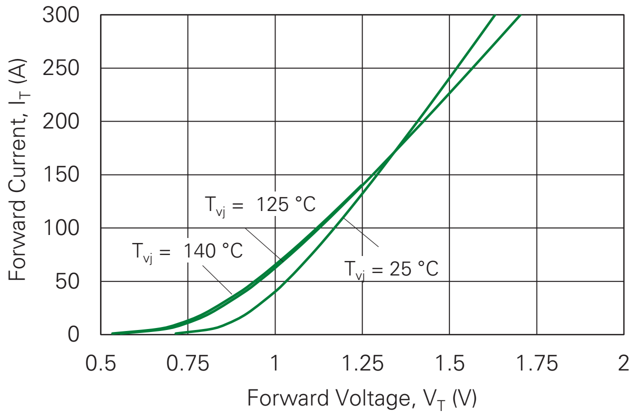


Figure 2. Surge Overload Current
I_TSM: Crest Value, t: duration

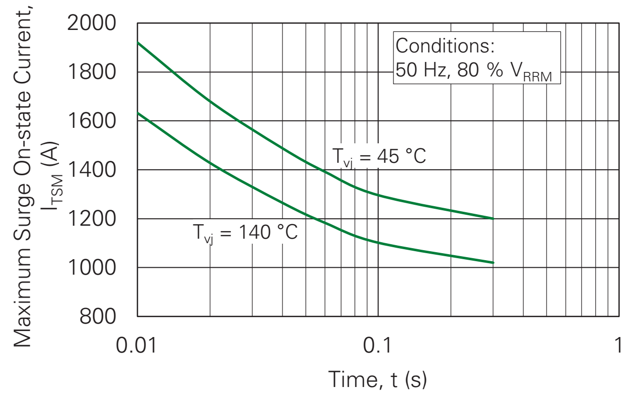


Figure 3. I²t vs. Time (1-10 s)

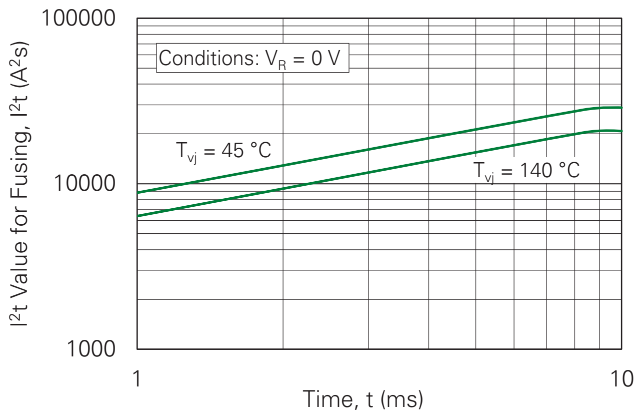


Figure 4. Gate Voltage and Gate Current

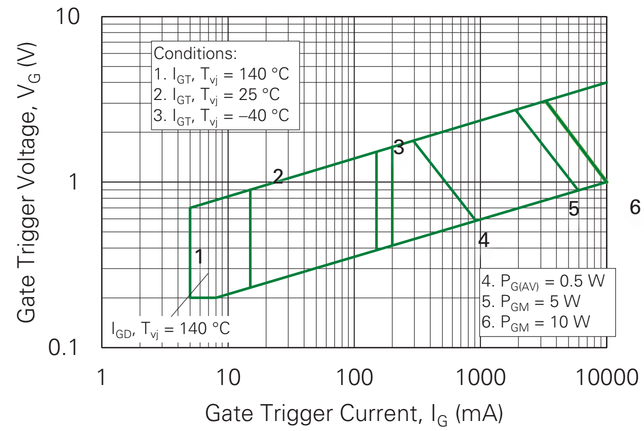


Figure 5. Gate Controlled Delay Time

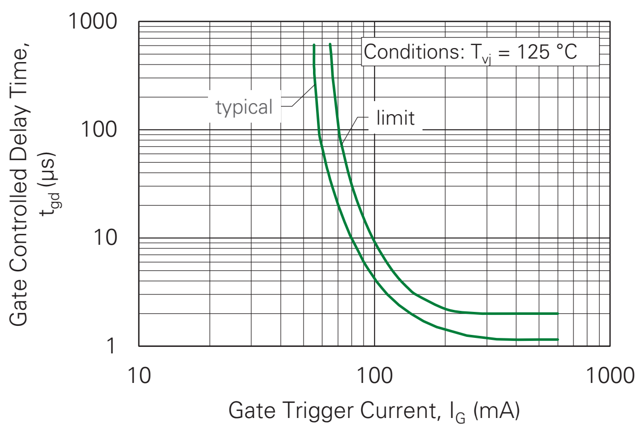


Figure 6. Max. Forward Current at Case Temperature

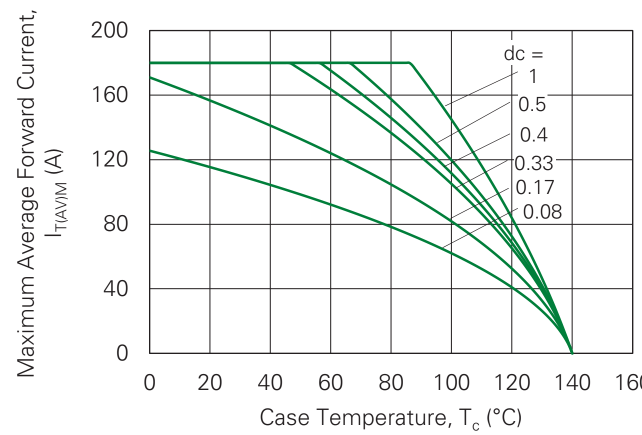


Figure 7a. Power Dissipation vs. Output Current

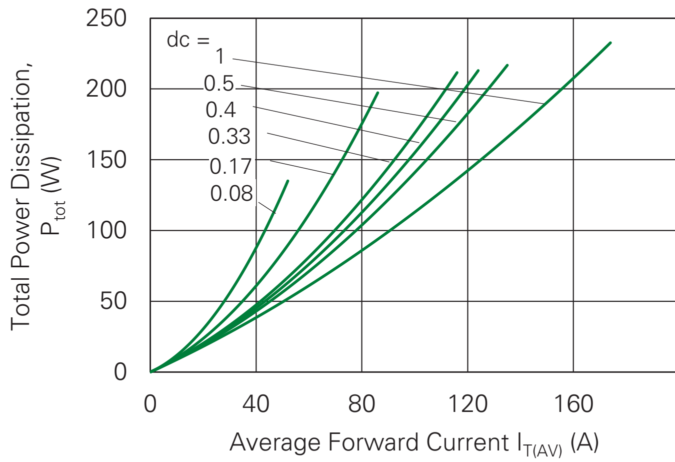


Figure 7b. Power Output vs. Ambient Temperature

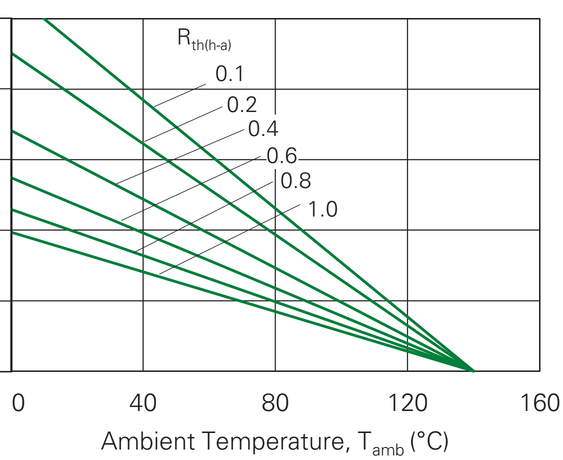
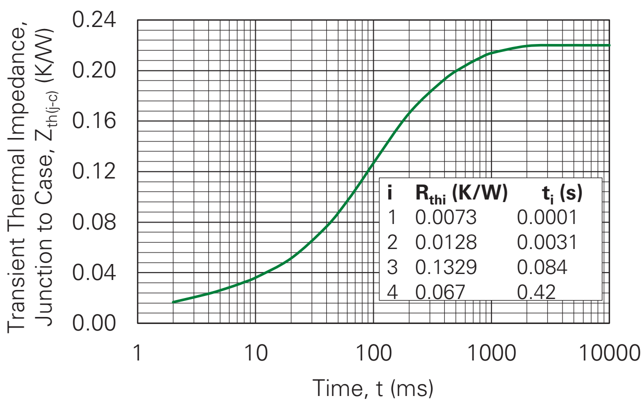
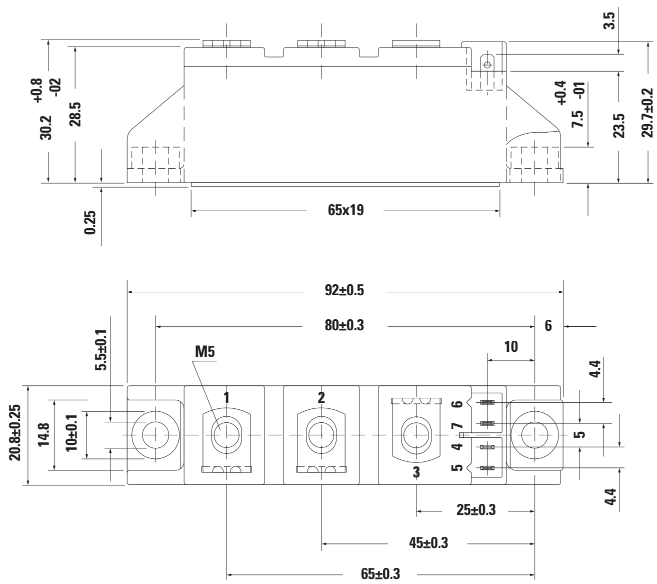


Figure 8. Transient Thermal Impedance, Junction to Case



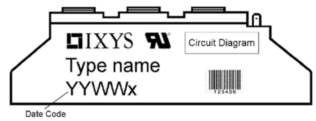
Package Dimensions (TO-240AA)



Packing Options

Part Number	Marking	Packing Mode	Quantity
MCMA140PD1800TB	MCMA140PD1800TB	Box	36

Part Numbering and Marking



M = Module
C = Thyristor (SCR)
M = Thyristor
A = Voltage Class (up to 1800 V)
140 = Current Rating (A)
PD = Phase Leg
1800 = Reverse Voltage (V)
TB = Package (TO-240AA-1B)