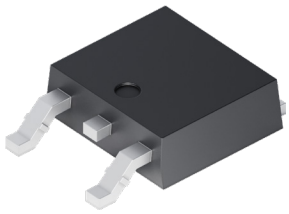
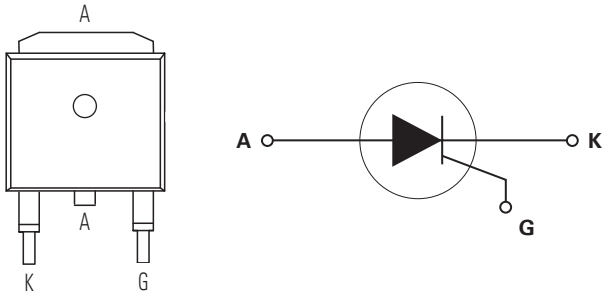
MCR12DCM & MCR12DCN

400 V–800 V Surface Mount SCRs



Pinout Diagram TO-252 (DPAK)



K: Cathode; **A**: Anode; **G**: Gate

Description

The MCR12DCM and MCR12DCN thyristors are designed primarily for half-wave ac control applications, such as motor controls, heating controls, and power supplies; or wherever half-wave, silicon gate-controlled devices are needed.

Features

- ESD Ratings: Human Body Model – 3B > 8000 V, Machine Model – C > 400 V
- UL Recognized compound meeting flammability rating V-0
- Small size
- Low-level triggering and holding characteristics
- Passivated die surface for reliability and uniformity
- Pb-free packages are available

Product Summary

Characteristic	Value	Unit
$I_{T(RMS)}$	12	A
V_{DRM}/V_{RRM}	600 or 800	V
I_{GT}	20	mA

Revised: TK.06/06/2025

Maximum Ratings (T_{vj} = 25 °C, unless otherwise specified)

Symbol	Characteristics	Conditions		Value	Units
V_{DRM}/ V_{RRM}	Repetitive Peak Off-state Voltage[1]	T_{vj} = – 40 to +125 °C, Sine Wave, 50 to 60 Hz, Gate open	MCR12DCM	600	V
			MCR12DCN	800	
$I_{T(RMS)}$	RMS On-state Current	180° Conduction Angles; T_c = 90 °C		12	A
$I_{T(AV)}$	Average On-state Current	180° Conduction Angles; T_c = 90 °C		7.8	A
I_{TSM}	Non-repetitive Surge On-state Current	½ cycle, sine wave 60 Hz, T_{vj} = 125 °C		100	A
I^2t	I^2t Value	t_p = 8.3 ms		41	A^2s
P_{GM}	Forward Peak Gate Power	$P_W \leq$ 10 µs, T_c = 90 °C		5	W
$P_{G(AV)}$	Average Gate Power Dissipation	t_p = 8.3 ms, T_c = 90 °C		0.5	W
I_{GM}	Peak Gate Current	$P_W \leq$ 1 µs, T_c = 90 °C		2	A
T_{stg}	Storage Temperature Range	–		–40 to 150	°C
T_{vj}	Virtual Junction Temperature Range	–		–40 to 125	°C

Note 1: V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the devices are exceeded.

Electrical Characteristics – OFF (T_{vj} = 25 °C, unless otherwise specified)

Symbol	Characteristics	Conditions		Min.	Typ.	Max.	Units
I_{DRM}/I_{RRM}	Peak Repetitive Forward or Reverse Blocking Current[2]	V_{AK} = Rated V_{DRM} or V_{RRM}, Gate open	T_{vj} = 25 °C	–	–	0.01	mA
			T_{vj} = 125 °C	–	–	5.0	

Electrical Characteristics – ON (T_{vj} = 25 °C, unless otherwise specified; Electricals apply in both directions)

Symbol	Characteristics	Conditions		Min.	Typ.	Max.	Units
V_{TM}	Peak Sinusoidal On–State Voltage[2]	I_{TM} = 20 A		–	1.3	1.9	V
I_{GT}	Gate Trigger Current	V_D= 12 V_{dc}; R_L = 100 Ω	T_{vj} = 25 °C	2	7	20	mA
			T_{vj} = –40 °C	–	–	40	
V_{GT}	Gate Trigger Voltage	V_D = 12 V; R_L = 100 Ω	T_{vj} = 25 °C	0.5	0.65	1	V
			T_{vj} = –40 °C	–	–	2.0	
V_{GD}	Gate Non-trigger Voltage	V_D = 12 V; R_L = 100 Ω	T_{vj} = 125 °C	0.2	–	–	V
I_H	Holding Current	V_D = 12 V, Initiating Current = 200 mA, Gate openD	T_{vj} = 25 °C	4.0	22	40	mA
			T_{vj} = –40 °C	–	–	80	
I_L	Latching Current	V_D = 12 V, I_G = 20 mA,	T_{vj} = 25 °C	4.0	22	40	mA
		V_D = 12 V, I_G = 40 mA,	T_{vj} = –40 °C	–	–	80	

Thermal Characteristics

Symbol	Characteristics	Value	Units
$R_{th(j-c)}$	Thermal Resistance, Junction to Case	2.2	K/W
$R_{th(j-a)}$	Thermal Resistance, Junction to Ambient	88	
$R_{th(j-a)}$	Thermal Resistance, Junction to Ambient[2]	80	
T_{sld}	Maximum Lead Temperature for Soldering Purposes[3]	260	°C

Note 2: These ratings are applicable when surface mounted on the minimum pad sizes recommended.

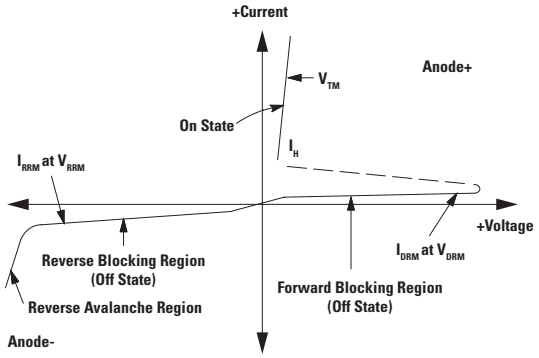
Dynamic Characteristics

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
$dv/dt_{(cr)}$	Critical Rate of Rise of Off–State Voltage	V_D = Rated V_{DRM}, Exponential Waveform, Gate open, T_{vj} = 125 °C	50	200	–	V/µs

Note 3: 1/8" from case for 10 seconds
Note 4: Pulse Test: Pulse Width ≤ 2.0 msec, Duty Cycle ≤ 2%

Voltage Current Characteristics of SCR

Symbol	Characteristics
V_{DRM}	Peak Repetitive Forward Off State Voltage
I_{DRM}	Peak Forward Blocking Current
V_{RRM}	Peak Repetitive Reverse Off State Voltage
I_{RRM}	Peak Reverse Blocking Current
V_{TM}	Maximum On-state Voltage
I_H	Holding Current



Characteristic Curves

Fig. 1. Average RMS Current Derating

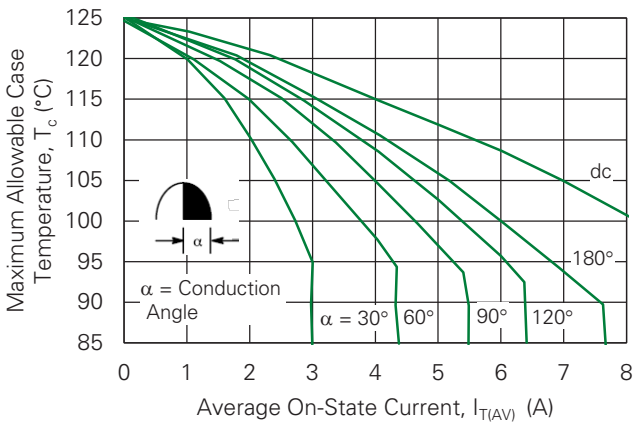


Fig. 2. On-state Power Dissipation

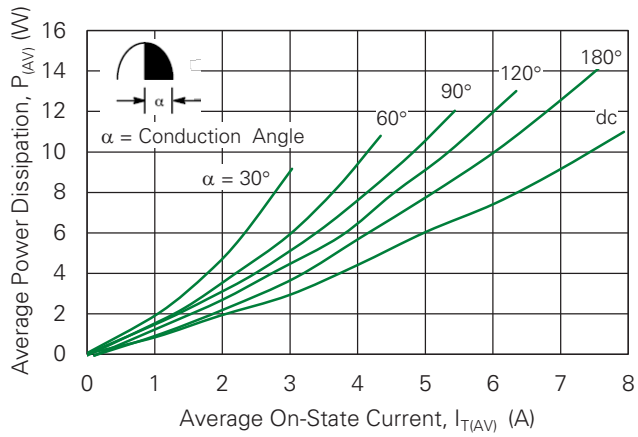


Fig. 3. Typical On-state Current vs. On-state Voltage

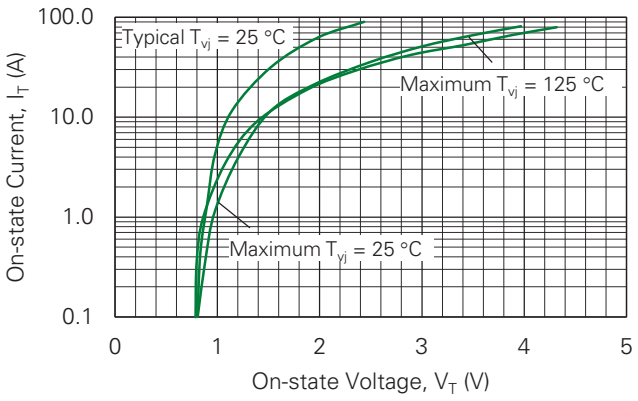


Fig. 4. Transient Thermal Response

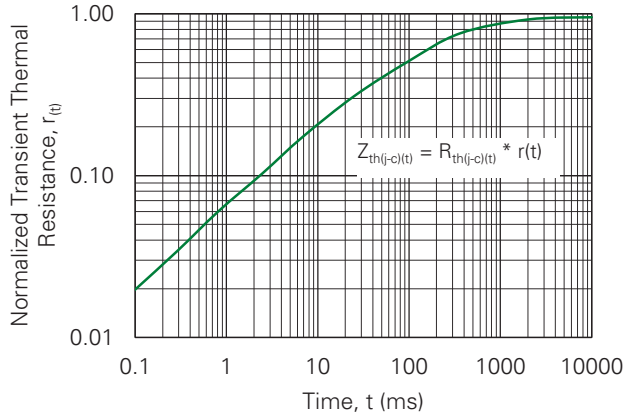


Fig. 5. Typical Gate Trigger Current vs. Junction Temperature

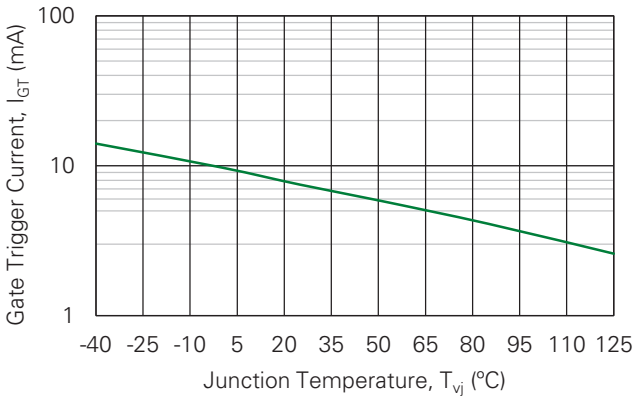


Fig. 6. Typical Gate Trigger Voltage vs. Junction Temperature

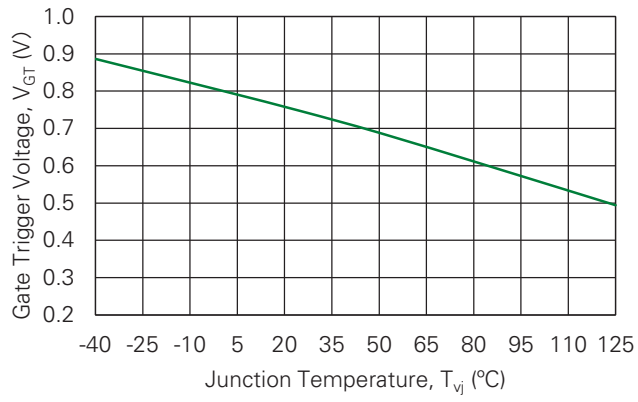


Fig. 7. Typical Holding Current vs. Junction Temperature

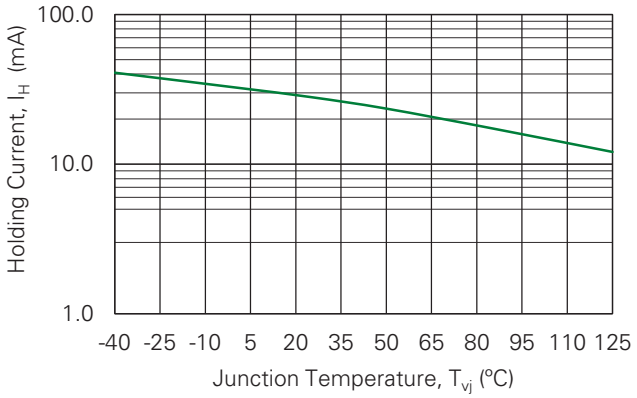
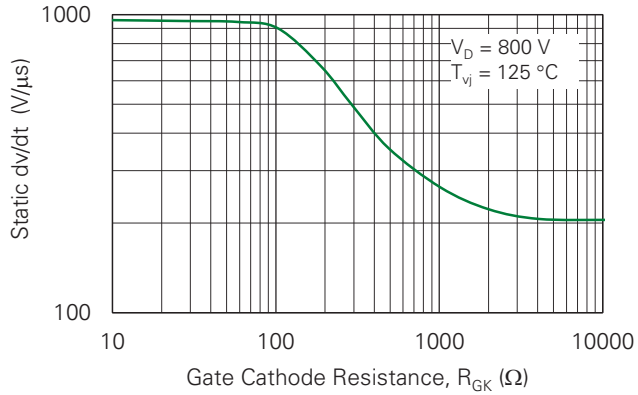
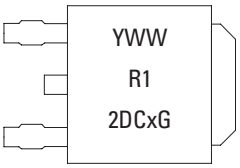


Fig. 8. Exponential Static dv/dt vs. Gate-Cathode Resistance



Part Marking

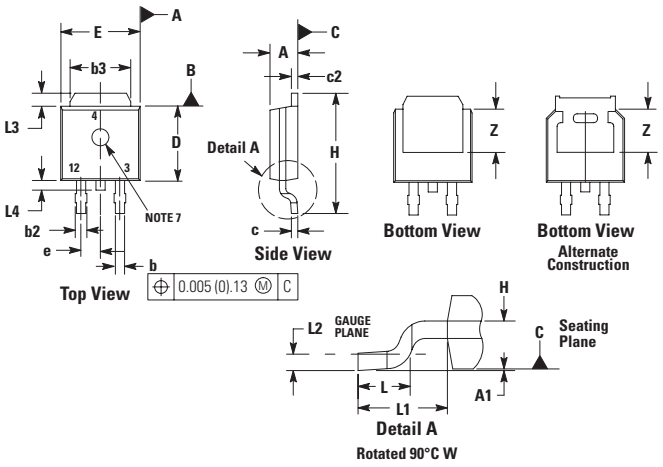


Y = Year
WW = Work Week
R12DC = Device Code
x = M or N
G = Pb-free Package

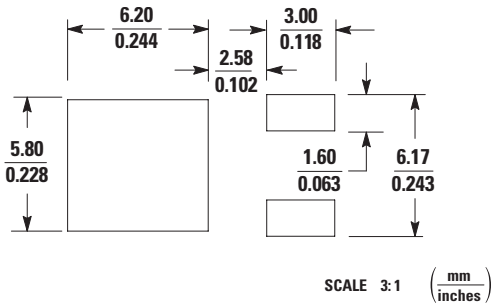
Packing Options

Part Number	Package Type	Packing Mode	Base Quantity
MCR12DCMT4G	DPAK (Pb-free)	Tape and Reel	2500
MCR12DCNT4G	DPAK (Pb-free)	Tape and Reel	2500

Package Dimensions TO-252 (DPAK)



Soldering Footprint



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max
A	2.20	2.40	0.087	0.094
A1	0.00	0.12	0.000	0.005
b	0.55	0.75	0.022	0.030
b2	0.65	0.85	0.026	0.033
b3	5.30	5.50	0.209	0.217
C	0.49	0.59	0.019	0.023
c2	0.49	0.59	0.019	0.023
D	5.40	5.70	0.213	0.224
E	6.40	6.60	0.252	0.260
e	2.30		0.091	
H	9.50	10.30	0.374	0.406
L	1.47	1.78	0.058	0.070
L1	2.90		0.114	
L2	0.49	0.59	0.019	0.023
L3	1.35	1.65	0.053	0.065
L4	0.70	1.00	0.028	0.039
Z	3.90	–	0.154	–

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