



Thyristor \ Diode Module

$V_{RRM} = 2 \times 1800 \text{ V}$

$I_{TAV} = 320 \text{ A}$

$V_T = 1,06 \text{ V}$

Phase leg

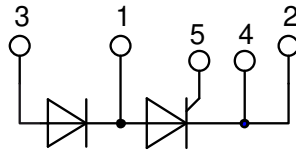
Part number

MCD312-18io1



Backside: isolated

E72873



Features / Advantages:

- International standard package
- Direct copper bonded Al₂O₃-ceramic with copper base plate
- Planar passivated chip
- Keyed gate/cathode twin pins

Applications:

- Motor control, softstarter
- Power converter
- Heat and temperature control for industrial furnaces and chemical processes
- Lighting control
- Solid state switches

Package: Y1

- Isolation Voltage: 4800 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Base plate: Copper internally DCB isolated
- Advanced power cycling

Disclaimer Notice

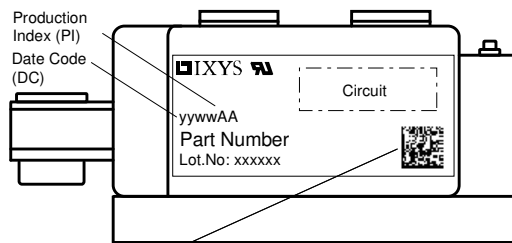
Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.



Rectifier			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1900	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1800	V
I_{RD}	reverse current, drain current	$V_{R/D} = 1800 V$	$T_{VJ} = 25^{\circ}C$		1	mA
		$V_{R/D} = 1800 V$	$T_{VJ} = 140^{\circ}C$		40	mA
V_T	forward voltage drop	$I_T = 300 A$	$T_{VJ} = 25^{\circ}C$		1,12	V
		$I_T = 600 A$			1,32	V
		$I_T = 300 A$	$T_{VJ} = 125^{\circ}C$		1,06	V
		$I_T = 600 A$			1,29	V
I_{TAV}	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 140^{\circ}C$		320	A
$I_{T(RMS)}$	RMS forward current	180° sine			520	A
V_{T0}	threshold voltage	} for power loss calculation only	$T_{VJ} = 140^{\circ}C$		0,80	V
r_T	slope resistance				0,68	mΩ
R_{thJC}	thermal resistance junction to case				0,12	K/W
R_{thCH}	thermal resistance case to heatsink			0,04		K/W
P_{tot}	total power dissipation		$T_C = 25^{\circ}C$		960	W
I_{TSM}	max. forward surge current	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		9,60	kA
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		10,4	kA
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		8,16	kA
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		8,82	kA
I^2t	value for fusing	$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		460,8	kA ² s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		447,4	kA ² s
		$t = 10 \text{ ms}; (50 \text{ Hz}), \text{ sine}$	$T_{VJ} = 140^{\circ}C$		332,9	kA ² s
		$t = 8,3 \text{ ms}; (60 \text{ Hz}), \text{ sine}$	$V_R = 0 V$		323,3	kA ² s
C_J	junction capacitance	$V_R = 400V \quad f = 1 \text{ MHz}$	$T_{VJ} = 25^{\circ}C$		438	pF
P_{GM}	max. gate power dissipation	$t_p = 30 \mu s$	$T_C = 140^{\circ}C$		120	W
		$t_p = 500 \mu s$			60	W
P_{GAV}	average gate power dissipation				20	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 140^{\circ}C; f = 50 \text{ Hz}$ repetitive, $I_T = 960 A$			100	A/μs
		$t_p = 200 \mu s; di_G/dt = 1 A/\mu s;$ $I_G = 1 A; V_D = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 320 A$			500	A/μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V_D = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$T_{VJ} = 140^{\circ}C$		1000	V/μs
V_{GT}	gate trigger voltage	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		2	V
			$T_{VJ} = -40^{\circ}C$		3	V
I_{GT}	gate trigger current	$V_D = 6 V$	$T_{VJ} = 25^{\circ}C$		150	mA
			$T_{VJ} = -40^{\circ}C$		220	mA
V_{GD}	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 140^{\circ}C$		0,25	V
I_{GD}	gate non-trigger current				10	mA
I_L	latching current	$t_p = 30 \mu s$	$T_{VJ} = 25^{\circ}C$		200	mA
		$I_G = 0,45 A; di_G/dt = 0,45 A/\mu s$				
I_H	holding current	$V_D = 6 V \quad R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		150	mA
t_{gd}	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	μs
		$I_G = 1 A; di_G/dt = 1 A/\mu s$				
t_q	turn-off time	$V_R = 100 V; I_T = 300 A; V_D = \frac{2}{3} V_{DRM}$ $di/dt = 10 A/\mu s; dv/dt = 50 V/\mu s; t_p = 200 \mu s$	$T_{VJ} = 125^{\circ}C$		200	μs



Package Y1		Ratings				
Symbol	Definition	Conditions	min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal			600	A
T_{VJ}	virtual junction temperature		-40		140	°C
T_{op}	operation temperature		-40		125	°C
T_{stg}	storage temperature		-40		125	°C
Weight				680		g
M_D	mounting torque		4,5		7	Nm
M_T	terminal torque		11		13	Nm
$d_{Spp/App}$	creepage distance on surface striking distance through air	terminal to terminal	16,0			mm
$d_{Spb/Apb}$		terminal to backside	16,0			mm
V_{ISOL}	isolation voltage	t = 1 second	4800			V
		t = 1 minute	4000			V



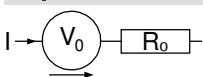
Data Matrix: part no. (1-19), DC + PI (20-25), lot.no.# (26-31), blank (32), serial no.# (33-36)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCD312-18io1	MCD312-18io1	Box	3	461865

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 140^{\circ}C$

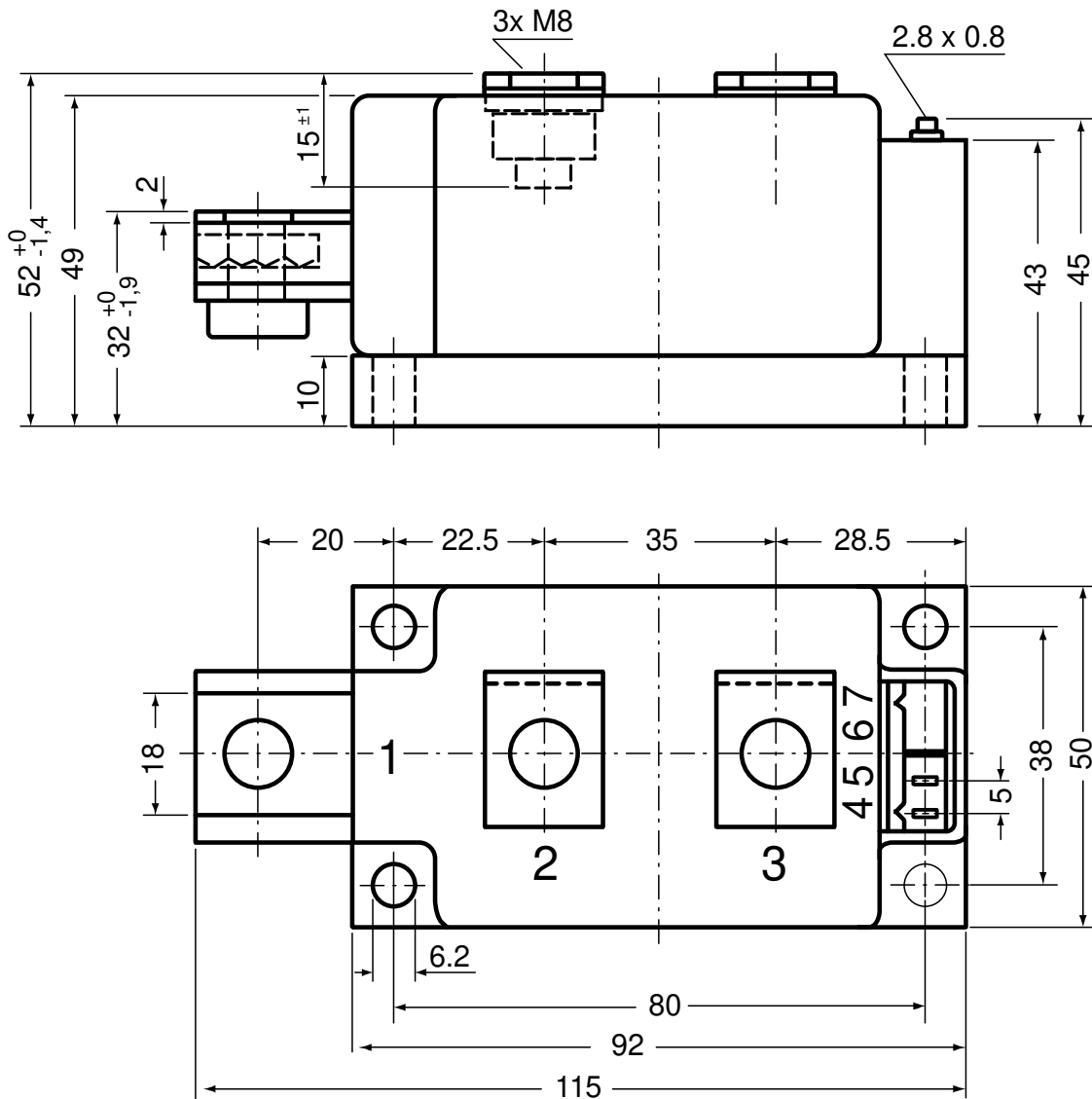


Thyristor

$V_{0\ max}$	threshold voltage	0,8	V
$R_{0\ max}$	slope resistance *	0,5	mΩ

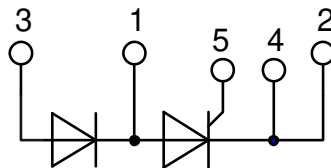


Outlines Y1



Optional accessories for modules

Keyed gate/cathode twin plugs with wire length = 350 mm, gate = white, cathode = red
Type ZY 180L (L = Left for pin pair 4/5) UL 758, style 3751



Thyristor

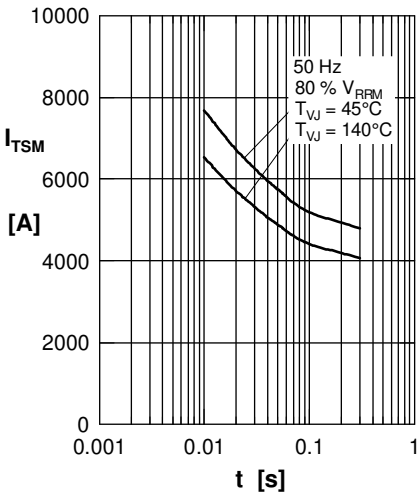


Fig. 1 Surge overload current
 I_{TSM} : Crest value, t : duration

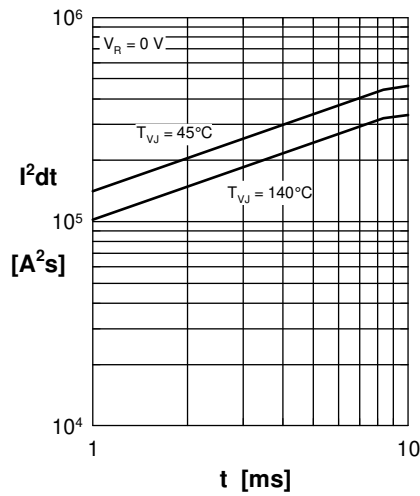


Fig. 2 I^2dt versus time

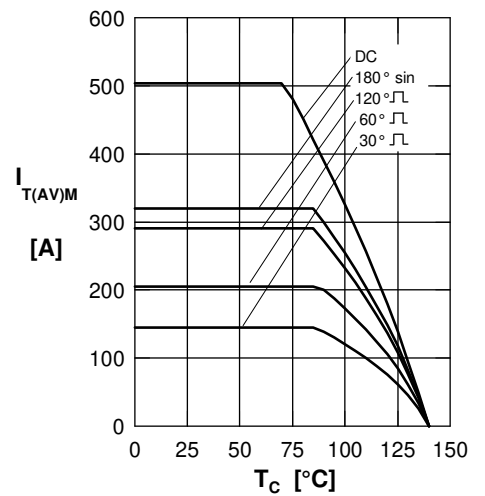


Fig. 3 Max. forward current at case temperature

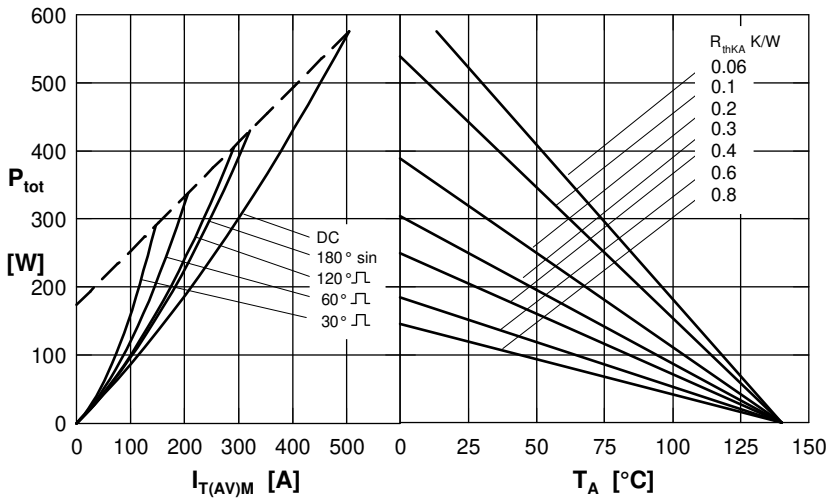


Fig. 4 Power dissipation versus on-state current and ambient temperature (per thyristor)

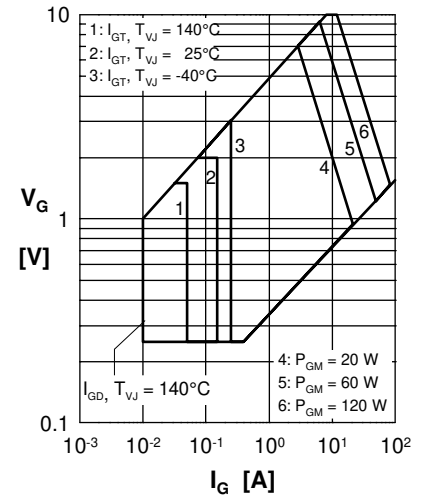


Fig. 5 Gate voltage & gate current

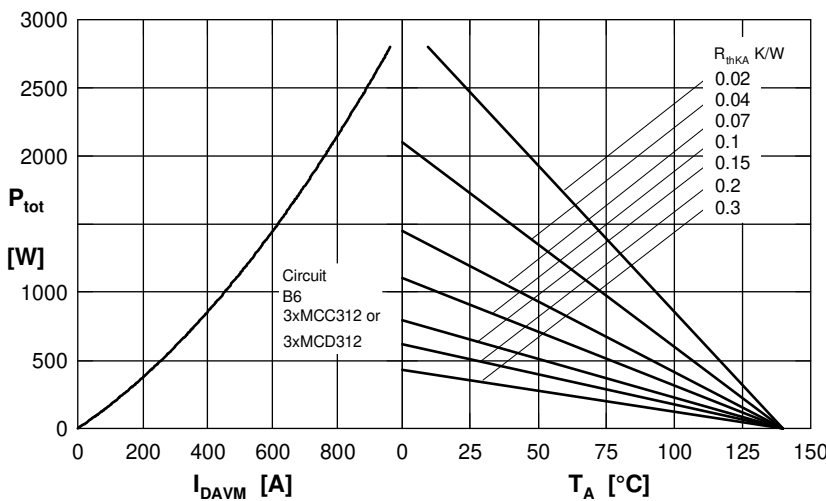


Fig. 6 Three phase rectifier bridge: Power dissipation versus direct output current and ambient temperature

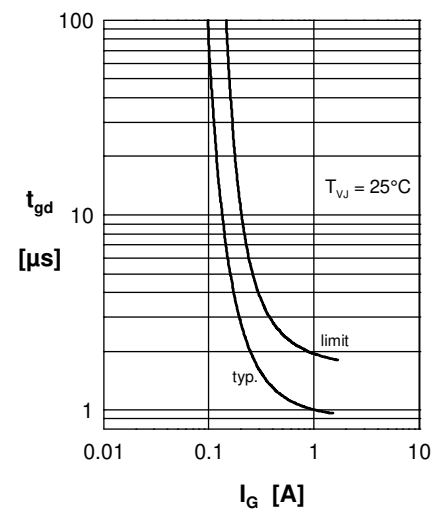


Fig. 7 Gate controlled delay time t_{gd}



Rectifier

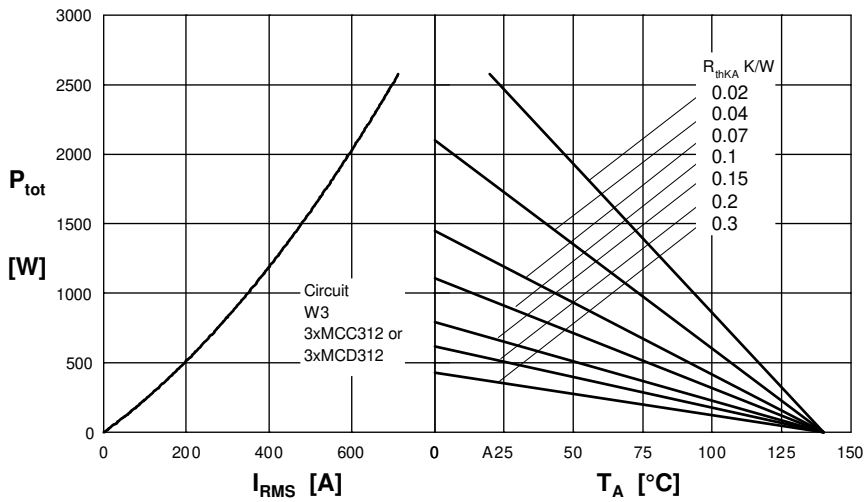


Fig. 8 Three phase AC-controller: Power dissipation versus R_{MS} output current and ambient temperature

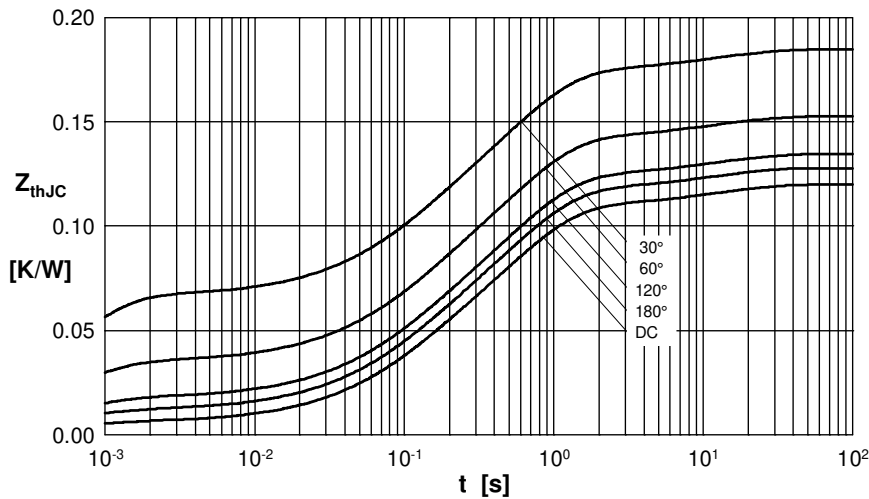


Fig. 9 Transient thermal impedance junction to case (per thyristor)

R_{thJC} for various conduct. angles d:

d	R_{thJC} [K/W]
DC	0.120
180°	0.128
120°	0.135
60°	0.153
30°	0.185

Constants for Z_{thJC} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.0058	0.00054
2	0.0310	0.098
3	0.0720	0.54
4	0.0112	12

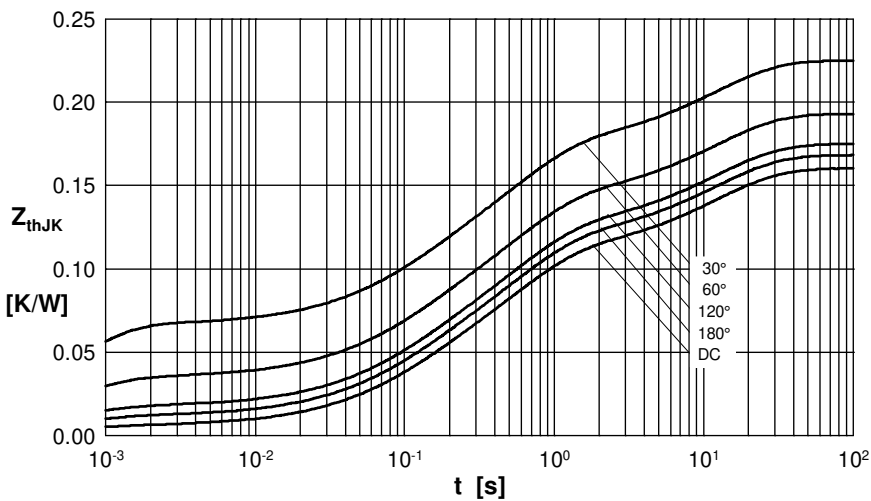


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor)

R_{thJK} for various conduct. angles d:

d	R_{thJK} [K/W]
DC	0.160
180°	0.168
120°	0.175
60°	0.193
30°	0.225

Constants for Z_{thJK} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.0058	0.00054
2	0.0310	0.098
3	0.0720	0.54
4	0.0114	12
5	0.0400	12