Thyristor Module

V_{RRM} = 2x 1200 V
I_{TAV} = 250 A
V_T = 1,08 V

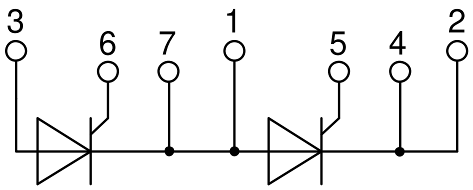
Phase leg

Part number

MCC255-12io1

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

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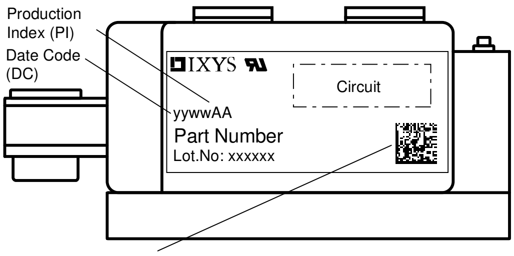
Thyristor

Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1300	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1200	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 1200 V	T_{VJ} = 25°C			1	mA
		$V_{R/D}$ = 1200 V	T_{VJ} = 140°C			40	mA
V_T	*forward voltage drop*	I_T = 300 A	T_{VJ} = 25°C			1,14	V
		I_T = 600 A				1,36	V
		I_T = 300 A	T_{VJ} = 125°C			1,08	V
		I_T = 600 A				1,33	V
I_{TAV}	*average forward current*	T_C = 85°C	T_{VJ} = 140°C			250	A
$I_{T(RMS)}$	*RMS forward current*	180° sine				450	A
V_{T0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 140°C			0,80	V
r_T	*slope resistance*					0,68	mΩ
R_{thJC}	*thermal resistance junction to case*					0,14	K/W
R_{thCH}	*thermal resistance case to heatsink*				0,04		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			820	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			9,20	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			9,94	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			7,82	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			8,45	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			423,2	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			410,6	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			305,8	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			296,7	kA²s
C_J	*junction capacitance*	V_R = 400V f = 1 MHz	T_{VJ} = 25°C		438		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 140°C			120	W
		t_P = 500 µs				60	W
P_{GAV}	*average gate power dissipation*					20	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 140°C; f = 50 Hz	repetitive, I_T = 860 A			100	A/µs
		t_P = 200 µs; di_G/dt = 1 A/µs;					
		I_G = 1 A; V_D = ⅔ V_{DRM}	non-repet., I_T = 250 A			500	A/µs
$(dv/dt)_{cr}$	*critical rate of rise of voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 140°C			1000	V/µs
		R_{GK} = ∞; method 1 (linear voltage rise)					
V_{GT}	*gate trigger voltage*	V_D = 6 V	T_{VJ} = 25°C			2	V
			T_{VJ} = -40°C			3	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			150	mA
			T_{VJ} = -40°C			220	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 140°C			0,25	V
I_{GD}	*gate non-trigger current*					10	mA
I_L	*latching current*	t_p = 30 µs	T_{VJ} = 25°C			200	mA
		I_G = 0,45A; di_G/dt = 0,45 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			150	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 1 A; di_G/dt = 1 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 300A; V_D = ⅔ V_{DRM}	T_{VJ} =125 °C		200		µs
		di/dt = 10 A/µs; dv/dt = 50 V/µs; t_p = 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; 50/60 Hz, RMS; I_{ISOL} ≤ 1 mA	4800			V
		t = 1 minute	4000			V

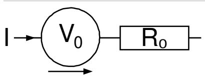


Data Matrix: *part no.* (1-19), DC + *PI* (20-25), *lot.no.#* (26-31), *blank* (32), *serial no.#* (33-36)

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCC255-12io1	MCC255-12io1	Box	3	509922

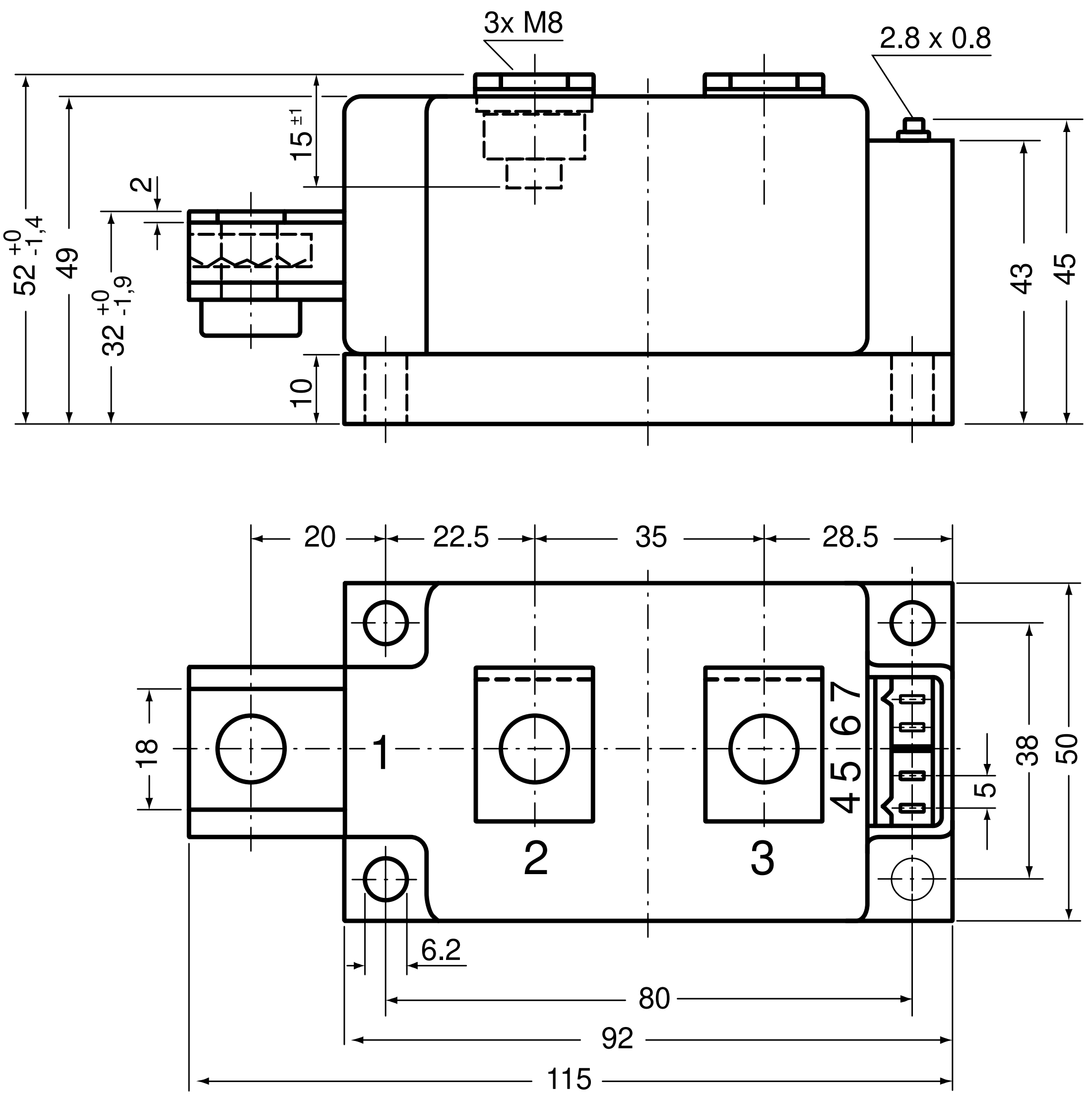
Equivalent Circuits for Simulation

* *on die level* $T_{VJ} = 140°C$

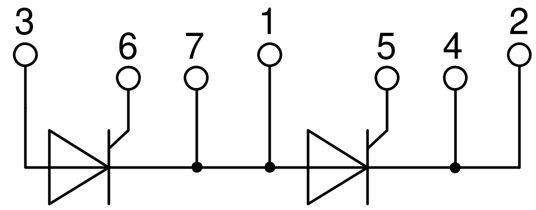


		Thyristor	
$V_{0\,max}$	*threshold voltage*	0,8	V
$R_{0\,max}$	*slope resistance **	0,5	mΩ

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
Type ZY 180R (R = Right for pin pair 6/7) } UL 758, style 3751



Thyristor

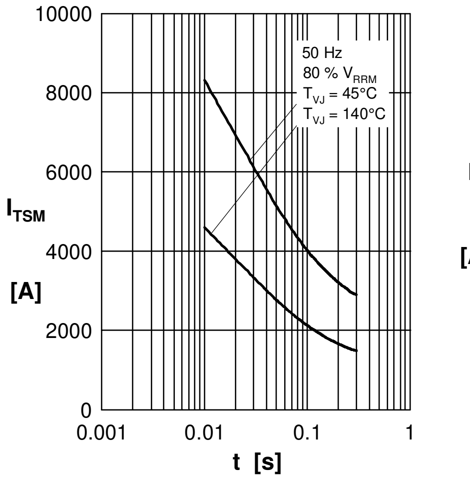


Fig. 1 Surge overload current
$I_{T(F)SM}$: Crest value, t: duration

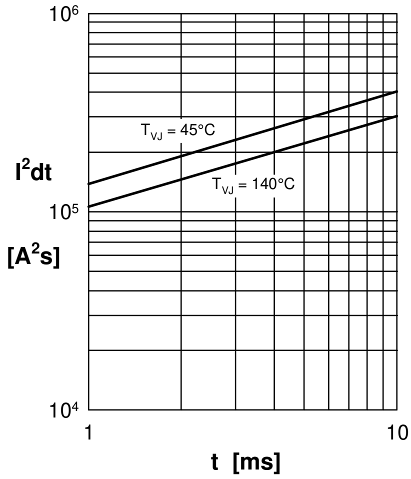


Fig. 2 I^2dt versus time

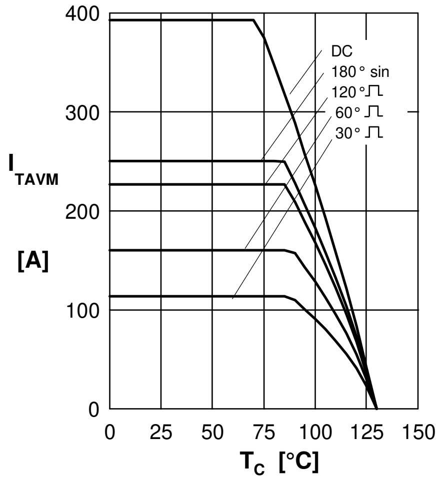


Fig. 3 Max. forward current
at case temperature

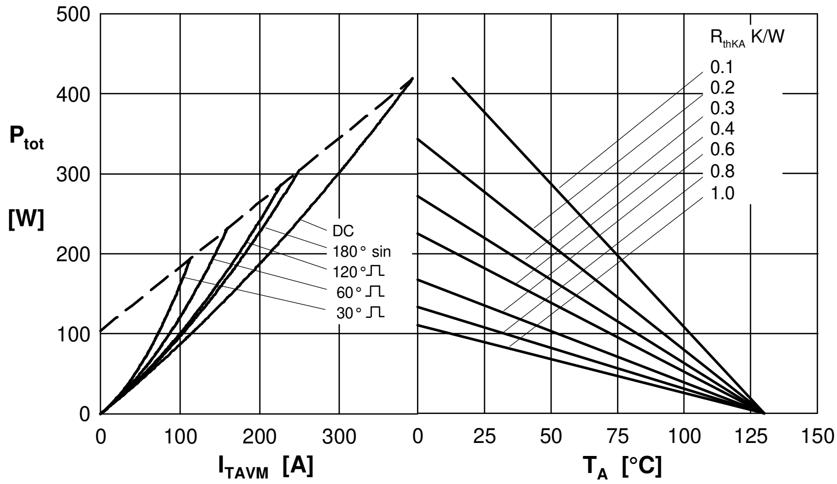


Fig. 4 Power dissipation versus on-state current and
ambient temperature (per thyristor or diode)

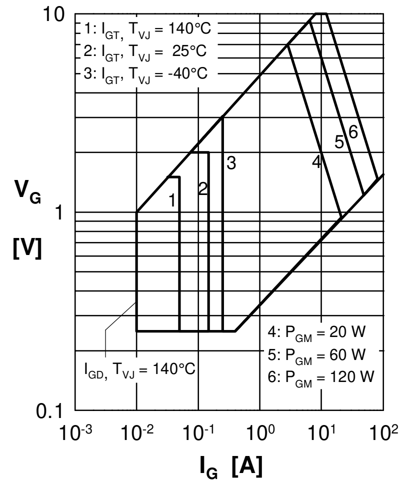


Fig. 5 Surge overload current
$I_{T(F)SM}$: Crest value, t: duration

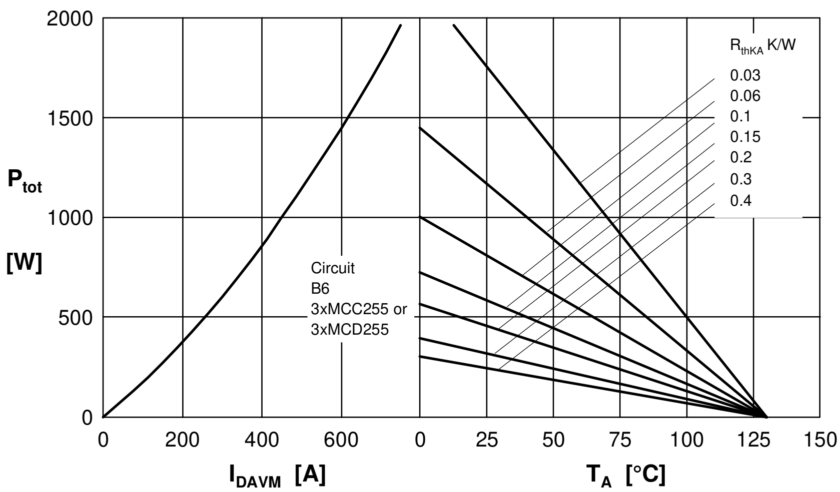


Fig. 6 Three phase rectifier bridge: Power dissipation
vs. direct output current and ambient temperature

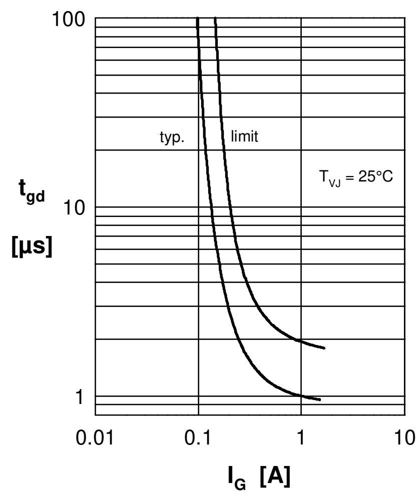


Fig. 7 Gate trigger delay time

Thyristor

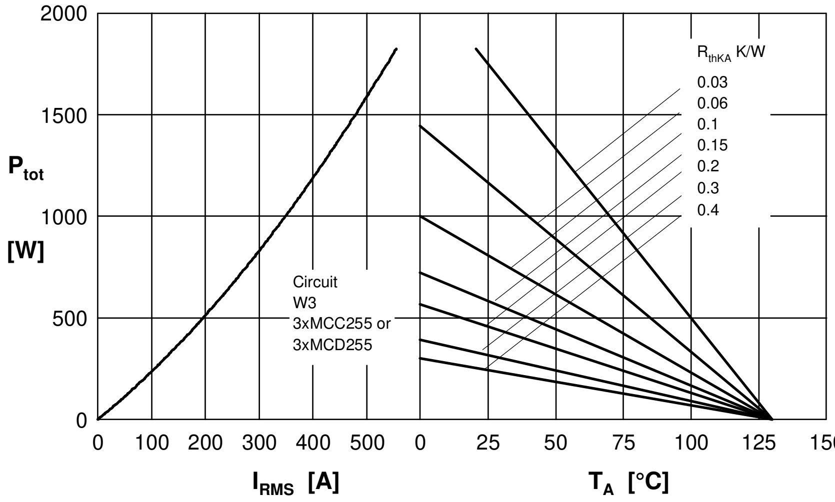


Fig. 8 Three phase AC-controller: Power dissipation versus R_{MS} output current and ambient temperature

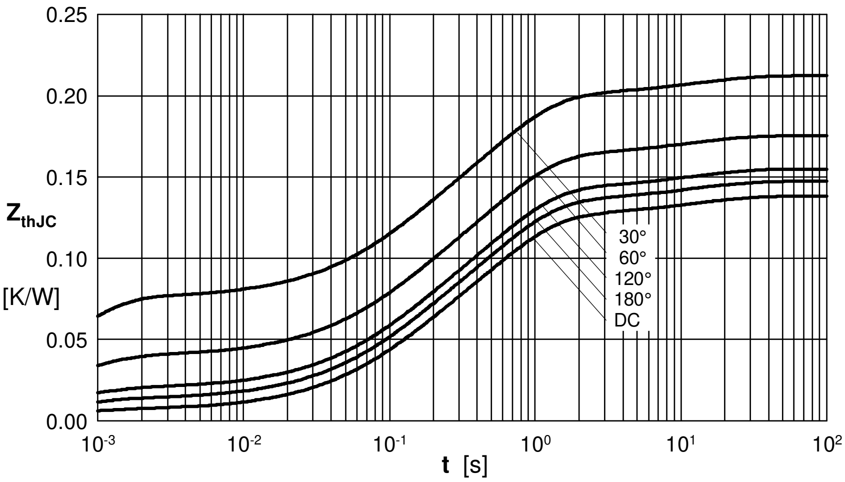


Fig. 9 Transient thermal impedance junction to case (per thyristor/diode)

R_{thJC} for various conduct. angles d:

d	R_{thJC} [K/W]
DC	0.139
180°	0.148
120°	0.156
60°	0.176
30°	0.214

Constants for Z_{thJC} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.0066	0.00054
2	0.0358	0.098
3	0.0831	0.54
4	0.0129	12

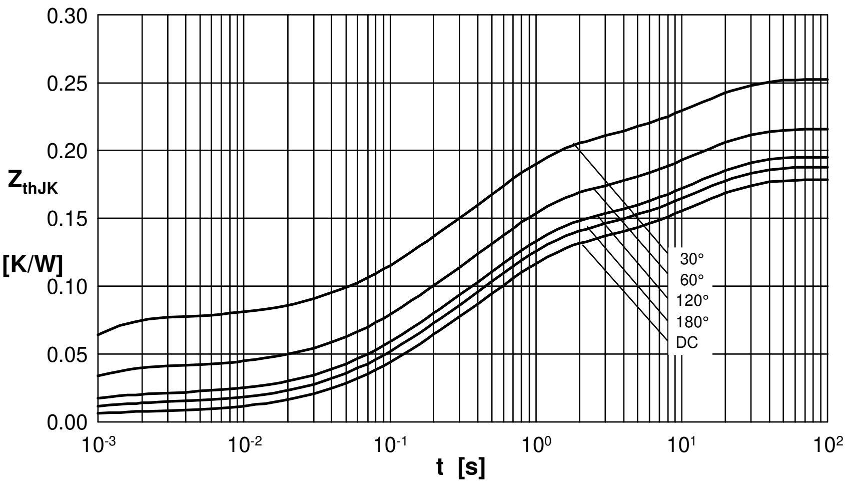


Fig. 10 Transient thermal impedance junction to heatsink (per thyristor/diode)

R_{thJK} for various conduct. angles d:

d	R_{thJK} [K/W]
DC	0.179
180°	0.188
120°	0.196
60°	0.216
30°	0.254

Constants for Z_{thJK} calculation:

i	R_{thi} [K/W]	t_i [s]
1	0.0066	0.00054
2	0.0358	0.098
3	0.0831	0.54
4	0.0129	12
5	0.04	12