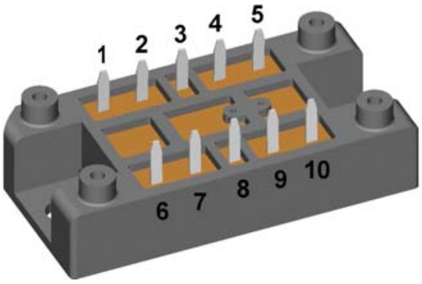
Thyristor Module

V_{RRM} = 2x 1600 V
I_{TAV} = 110 A
V_T = 1.21 V

Phase leg

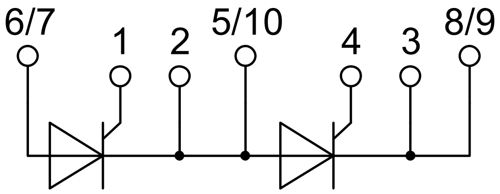
Part number

MCMA110P1600VA



Backside: isolated

E72873



Features / Advantages:

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al2O3-ceramic

Applications:

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

Package: V1-A-Pack

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 17 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

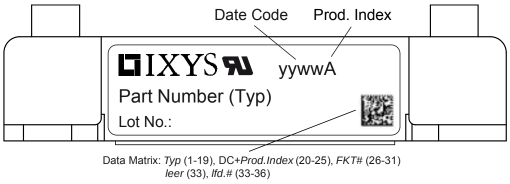
Thyristor

Symbol	Definition	Conditions		Ratings min.	typ.	max.	Unit
$V_{RSM/DSM}$	*max. non-repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1700	V
$V_{RRM/DRM}$	*max. repetitive reverse/forward blocking voltage*		T_{VJ} = 25°C			1600	V
$I_{R/D}$	*reverse current, drain current*	$V_{R/D}$ = 1600 V	T_{VJ} = 25°C			100	µA
		$V_{R/D}$ = 1600 V	T_{VJ} = 140°C			10	mA
V_T	*forward voltage drop*	I_T = 110 A	T_{VJ} = 25°C			1.24	V
		I_T = 220 A				1.52	V
		I_T = 110 A	T_{VJ} = 125°C			1.21	V
		I_T = 220 A				1.57	V
I_{TAV}	*average forward current*	T_C = 85°C	T_{VJ} = 140°C			110	A
$I_{T(RMS)}$	*RMS forward current*	180° sine				170	A
V_{T0}	*threshold voltage*	*for power loss calculation only*	T_{VJ} = 140°C			0.85	V
r_T	*slope resistance*					3.3	mΩ
R_{thJC}	*thermal resistance junction to case*					0.3	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.20		K/W
P_{tot}	*total power dissipation*		T_C = 25°C			380	W
I_{TSM}	*max. forward surge current*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			1.90	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			2.05	kA
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			1.62	kA
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			1.75	kA
I^2t	*value for fusing*	t = 10 ms; (50 Hz), sine	T_{VJ} = 45°C			18.1	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			17.5	kA²s
		t = 10 ms; (50 Hz), sine	T_{VJ} = 140°C			13.0	kA²s
		t = 8,3 ms; (60 Hz), sine	V_R = 0 V			12.7	kA²s
C_J	*junction capacitance*	V_R = 400 V f = 1 MHz	T_{VJ} = 25°C		95		pF
P_{GM}	*max. gate power dissipation*	t_P = 30 µs	T_C = 140°C			10	W
		t_P = 300 µs				5	W
P_{GAV}	*average gate power dissipation*					0.5	W
$(di/dt)_{cr}$	*critical rate of rise of current*	T_{VJ} = 140°C; f = 50 Hz	repetitive, I_T = 330 A			150	A/µs
		t_P = 200 µs; di_G/dt = 0.45 A/µs;					
		I_G = 0.45 A; V_D = ⅔ V_{DRM}	non-repet., I_T = 110 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			1.5	V
			T_{VJ} = -40°C			1.6	V
I_{GT}	*gate trigger current*	V_D = 6 V	T_{VJ} = 25°C			150	mA
			T_{VJ} = -40°C			200	mA
V_{GD}	*gate non-trigger voltage*	V_D = ⅔ V_{DRM}	T_{VJ} = 140°C			0.2	V
I_{GD}	*gate non-trigger current*					10	mA
I_L	*latching current*	t_p = 10 µs	T_{VJ} = 25°C			200	mA
		I_G = 0.45 A; di_G/dt = 0.45 A/µs					
I_H	*holding current*	V_D = 6 V R_{GK} = ∞	T_{VJ} = 25°C			200	mA
t_{gd}	*gate controlled delay time*	V_D = ½ V_{DRM}	T_{VJ} = 25°C			2	µs
		I_G = 0.45 A; di_G/dt = 0.45 A/µs					
t_q	*turn-off time*	V_R = 100 V; I_T = 110 A; V_D = ⅔ V_{DRM}	T_{VJ} = 140°C		185		µs
		di/dt = 10 A/µs; dv/dt = 20 V/µs; t_p = 200 µs					

Data according to IEC 60747and per semiconductor unless otherwise specified

Package V1-A-Pack

Symbol	Definition	Conditions		Ratings min.	typ.	max.	Unit
I_{RMS}	*RMS current*	per terminal				100	A
T_{VJ}	*virtual junction temperature*			-40		140	°C
T_{op}	*operation temperature*			-40		125	°C
T_{stg}	*storage temperature*			-40		125	°C
Weight					37		g
M_D	*mounting torque*			2		2.5	Nm
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*		*terminal to terminal*	6.0			mm
$d_{Spb/Apb}$			*terminal to backside*	12.0			mm
V_{ISOL}	*isolation voltage*	t = 1 second	50/60 Hz, RMS; I_{ISOL} ≤ 1 mA	3600			V
		t = 1 minute		3000			V



Data Matrix: *Typ* (1-19), DC+*Prod.Index* (20-25), *FKT#* (26-31) *leer* (33), *lfd.#* (33-36)

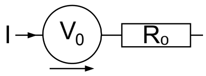
Part number

M = Module
C = Thyristor (SCR)
M = Thyristor
A = (up to 1800V)
110 = Current Rating [A]
P = Phase leg
1600 = Reverse Voltage [V]
VA = V1-A-Pack

Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MCMA110P1600VA	MCMA110P1600VA	Box	10	513348

Equivalent Circuits for Simulation

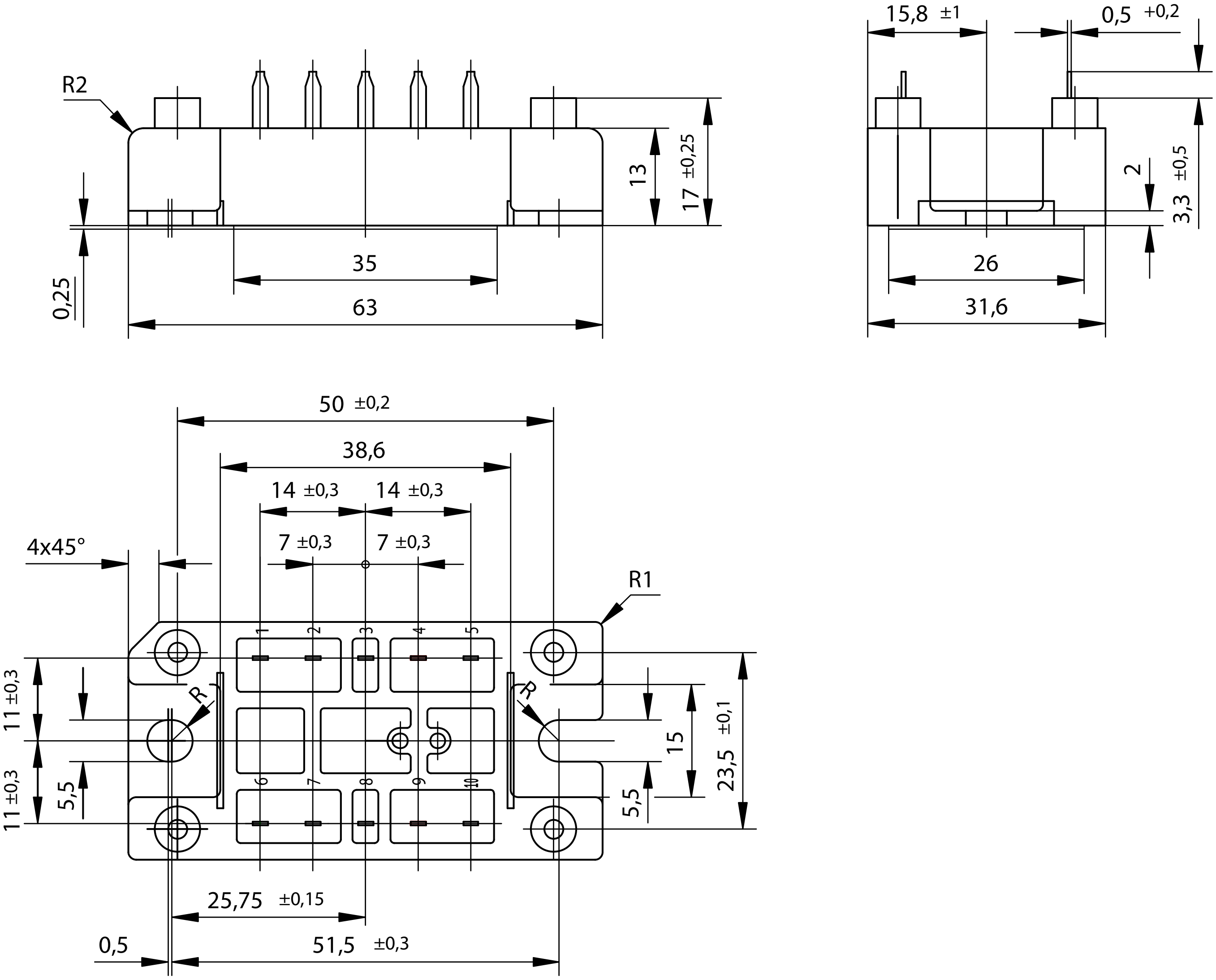
** on die level* T_{VJ} = 140 °C

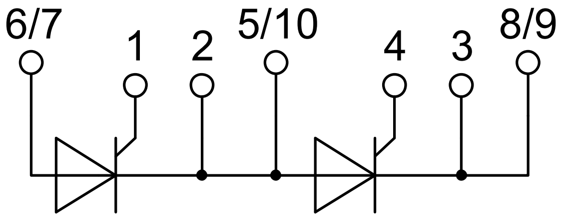


Thyristor

$V_{0\,max}$	*threshold voltage*	0.85	V
$R_{0\,max}$	*slope resistance **	2.1	mΩ

Outlines V1-A-Pack





Thyristor

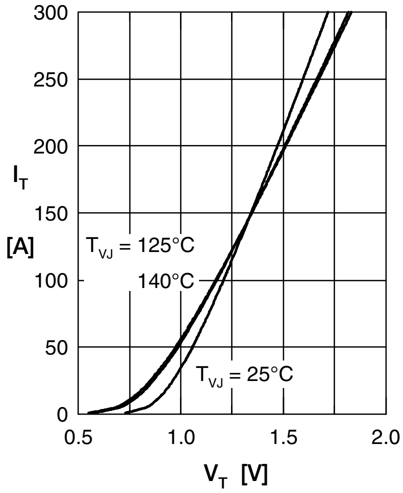


Fig. 1 Forward characteristics

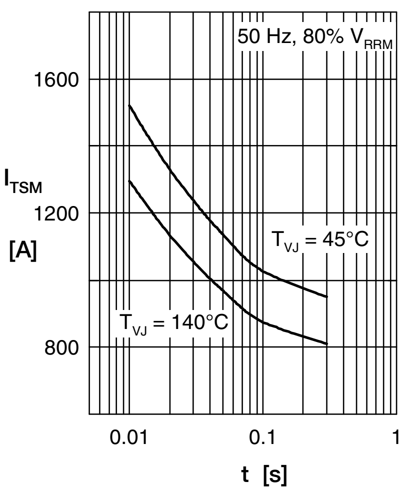


Fig. 2 Surge overload current
I_{TSM}: crest value, t: duration

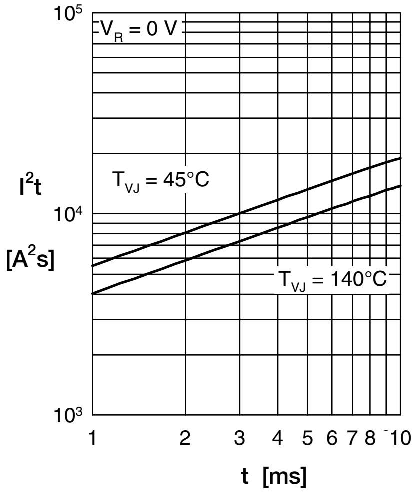


Fig. 3 I^2t versus time (1-10 s)

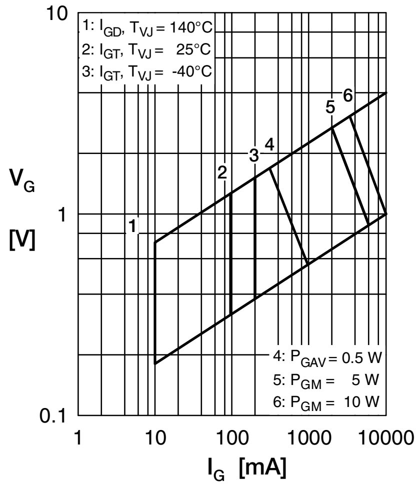


Fig. 4 Gate voltage & gate current

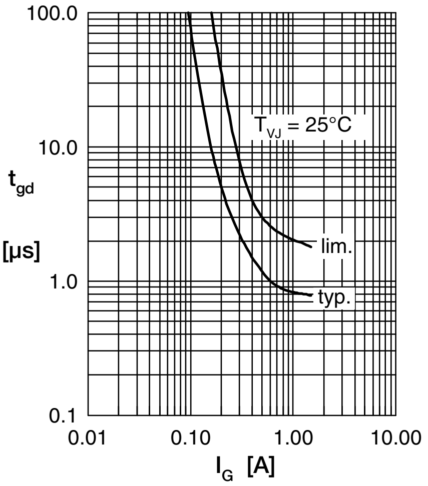


Fig. 5 Gate controlled delay time t_{gd}

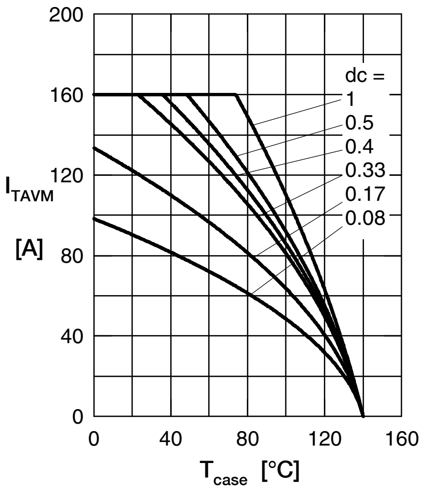


Fig. 6 Max. forward current at case temperature

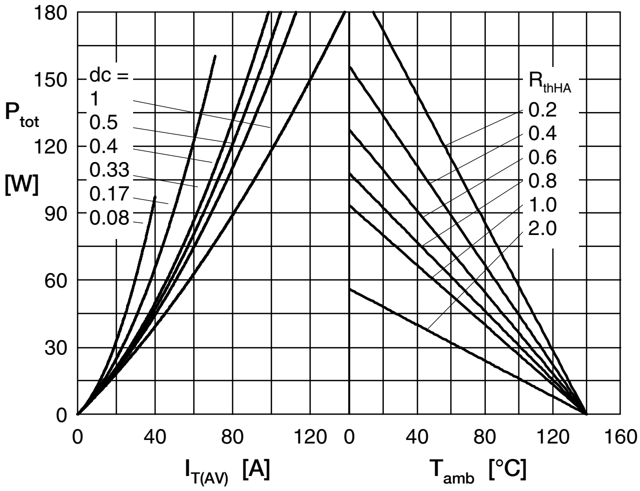
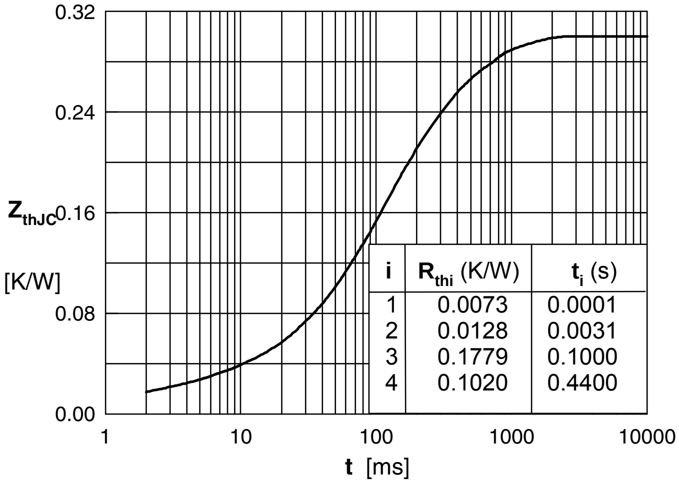


Fig. 7a Power dissipation versus direct output current
Fig. 7b and ambient temperature



i	R_{thi} (K/W)	t_i (s)
1	0.0073	0.0001
2	0.0128	0.0031
3	0.1779	0.1000
4	0.1020	0.4400

Fig. 8 Transient thermal impedance junction to case