

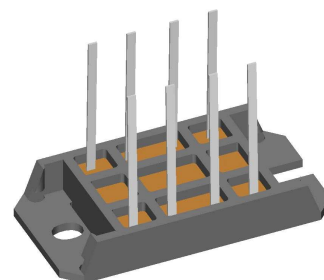
Thyristor Module

3~ Rectifier	
V_{RRM}	= 1200 V
I_{DAV}	= 45 A
I_{FSM}	= 320 A

3~ Rectifier Bridge, half-controlled (high-side)

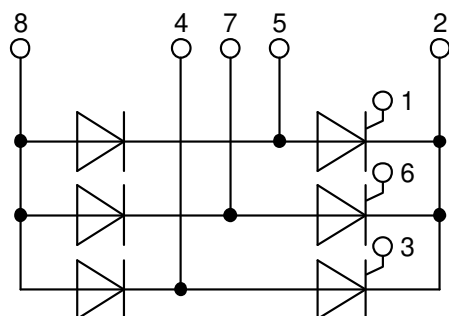
Part number

VVZ40-12io1



Backside: isolated

 E72873



Features / Advantages:

- Package with DCB ceramic base plate
- Improved temperature and power cycling
- Planar passivated chips
- Very low forward voltage drop
- Very low leakage current

Applications:

- Line rectifying 50/60 Hz
- Drives
- SMPS
- UPS

Package: V1-B-Pack

- Isolation Voltage: 3600 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 10 mm
- Base plate: DCB ceramic
- Reduced weight
- Advanced power cycling

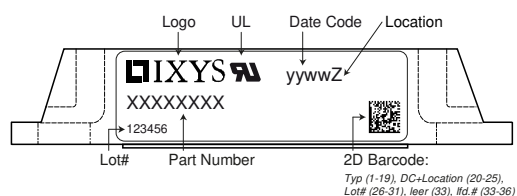
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Rectifier				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1300	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}\text{C}$				1200	V
$I_{R/D}$	reverse current, drain current	$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			300	μA
		$V_{R/D} = 1200\text{ V}$	$T_{VJ} = 125^{\circ}\text{C}$			5	mA
V_T	forward voltage drop	$I_T = 15\text{ A}$	$T_{VJ} = 25^{\circ}\text{C}$			1.12	V
		$I_T = 45\text{ A}$				1.47	V
		$I_T = 15\text{ A}$	$T_{VJ} = 125^{\circ}\text{C}$			1.07	V
		$I_T = 45\text{ A}$				1.52	V
I_{DAV}	bridge output current	$T_C = 100^{\circ}\text{C}$ rectangular $d = 1/3$	$T_{VJ} = 125^{\circ}\text{C}$			45	A
V_{T0}	threshold voltage	} for power loss calculation only				0.85	V
r_T	slope resistance					15	m Ω
R_{thJC}	thermal resistance junction to case					1	K/W
R_{thCH}	thermal resistance case to heatsink				0.6		K/W
P_{tot}	total power dissipation	$T_C = 25^{\circ}\text{C}$				100	W
I_{TSM}	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			320	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			345	A
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$			270	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			295	A
I^2t	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}\text{C}$			510	A ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			495	A ² s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}\text{C}$			365	A ² s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$			360	A ² s
C_J	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}\text{C}$		16		pF
P_{GM}	max. gate power dissipation	$t_p = 30\text{ }\mu\text{s}$	$T_C = 125^{\circ}\text{C}$			10	W
		$t_p = 300\text{ }\mu\text{s}$				1	W
P_{GAV}	average gate power dissipation					0.5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 125^{\circ}\text{C}; f = 50\text{ Hz}$ repetitive, $I_T = 45\text{ A}$				150	A/ μs
		$t_p = 200\text{ }\mu\text{s}; di_G/dt = 0.3\text{ A}/\mu\text{s};$ $I_G = 0.3\text{ A}; V = 2/3 V_{DRM}$ non-repet., $I_T = 15\text{ A}$				500	A/ μs
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = 2/3 V_{DRM}$ $R_{GK} = \infty$; method 1 (linear voltage rise)	$T_{VJ} = 125^{\circ}\text{C}$			1000	V/ μs
V_{GT}	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			1	V
			$T_{VJ} = -40^{\circ}\text{C}$			1.2	V
I_{GT}	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}\text{C}$			65	mA
			$T_{VJ} = -40^{\circ}\text{C}$			80	mA
V_{GD}	gate non-trigger voltage	$V_D = 2/3 V_{DRM}$	$T_{VJ} = 125^{\circ}\text{C}$			0.2	V
I_{GD}	gate non-trigger current					5	mA
I_L	latching current	$t_p = 30\text{ }\mu\text{s}$	$T_{VJ} = 25^{\circ}\text{C}$			150	mA
		$I_G = 0.3\text{ A}; di_G/dt = 0.3\text{ A}/\mu\text{s}$					
I_H	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}\text{C}$			100	mA
t_{gd}	gate controlled delay time	$V_D = 1/2 V_{DRM}$	$T_{VJ} = 25^{\circ}\text{C}$			2	μs
		$I_G = 0.3\text{ A}; di_G/dt = 0.3\text{ A}/\mu\text{s}$					
t_q	turn-off time	$V_R = 100\text{ V}; I_T = 15\text{ A}; V = 2/3 V_{DRM}$ $di/dt = 10\text{ A}/\mu\text{s}$ $dv/dt = 20\text{ V}/\mu\text{s}$ $t_p = 300\text{ }\mu\text{s}$	$T_{VJ} = 100^{\circ}\text{C}$		150		μs

Package V1-B-Pack				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
I_{RMS}	RMS current	per terminal				100	A
T_{VJ}	virtual junction temperature			-40		125	°C
T_{op}	operation temperature			-40		100	°C
T_{stg}	storage temperature			-40		125	°C
Weight					30		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; $I_{ISOL} \leq 1$ mA	3600			V
		t = 1 minute		3000			V



Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VVZ40-12io1	VVZ40-12io1	Box	5	466352

Equivalent Circuits for Simulation

* on die level

$T_{VJ} = 125^{\circ}\text{C}$



Thyristor

$V_{0\max}$	threshold voltage	0.85	V
$R_{0\max}$	slope resistance *	12.5	mΩ

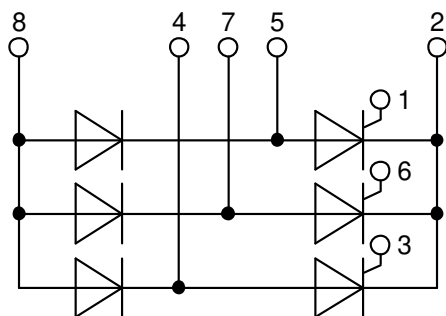
Technical drawing of a cooling plate, showing two views: a side view (top) and a top view (bottom).

Side View (Top):

- Overall height: 31
- Height of the base: 10
- Thickness of the plate: 2
- Cooling area dimensions: 35 x 26
- Label: Kühlfläche cooling area
- Dimension: ca. 0.25

Top View (Bottom):

- Overall width: 63
- Overall height: 31.6
- Width of the cooling area: 38.6
- Width of the base: 27.2
- Width of the side flange: 5.3
- Width of the base flange: 1.6
- Width of the cooling channels: 14
- Width of the base flange: 5
- Width of the cooling channels: 5
- Width of the base flange: 0.5
- Number of cooling channels: 8 (labeled 1 to 8)



Thyristor

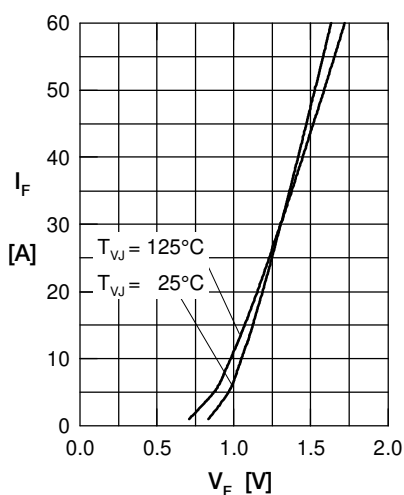


Fig. 1 Forward current vs. voltage drop per thyristor

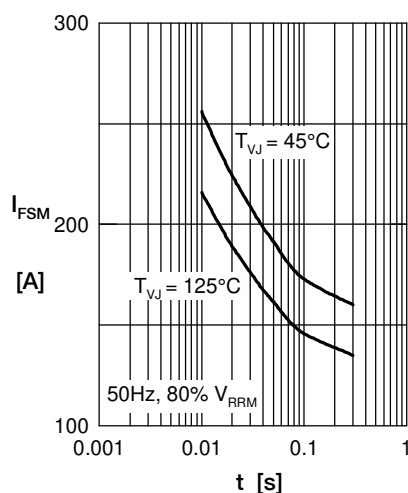


Fig. 2 Surge overload current vs. time per thyristor

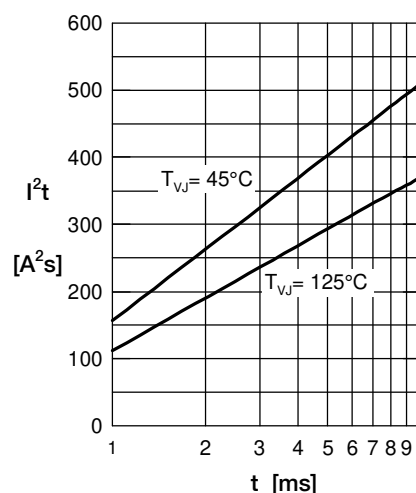


Fig. 3 I^2t vs. time per thyristor

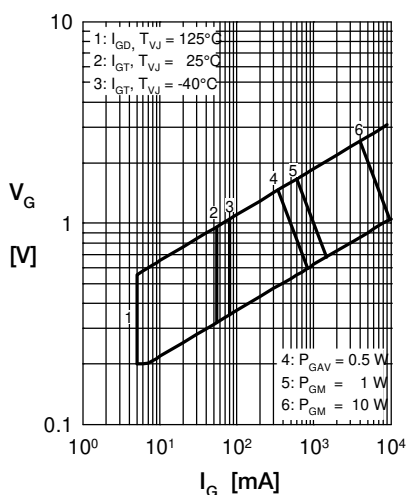


Fig. 4 Gate trigger characteristics

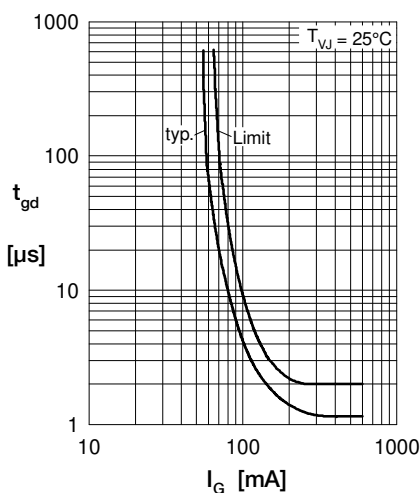


Fig. 5 Gate trigger delay time

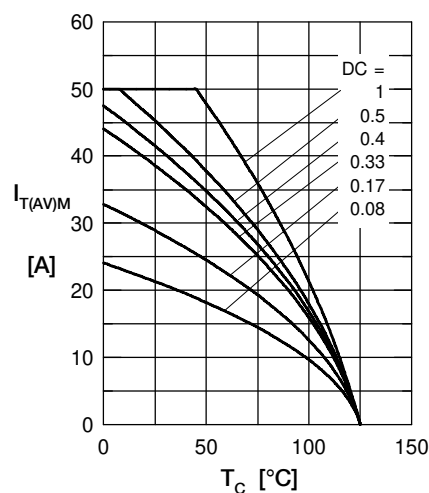


Fig. 5 Max. forward current vs. case temperature per thyristor

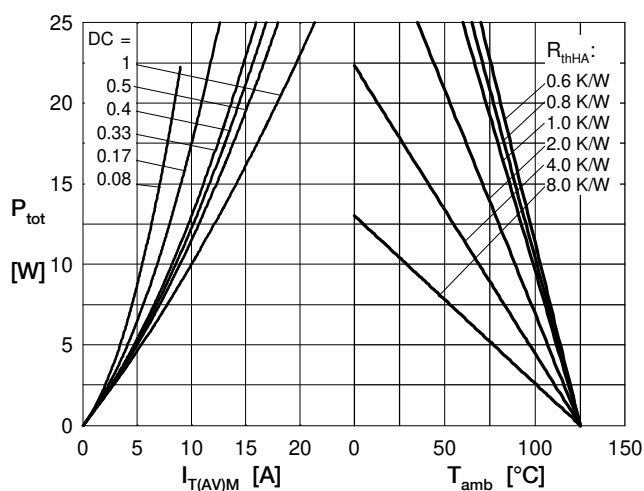


Fig. 4 Power dissipation vs. forward current and ambient temperature per thyristor

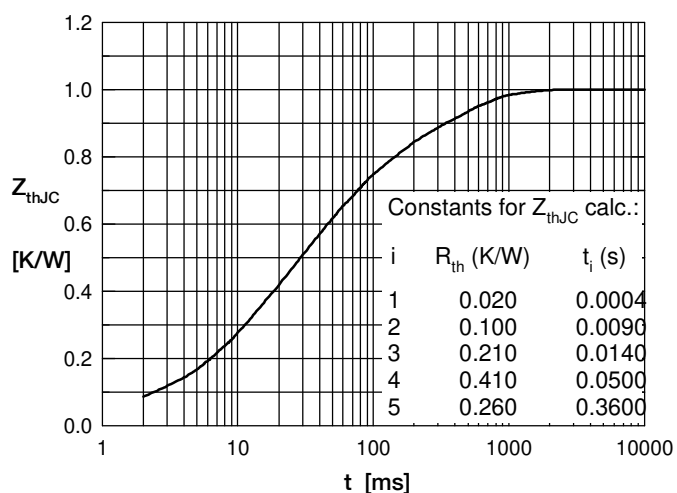


Fig. 6 Transient thermal impedance junction to case vs. time per thyristor