

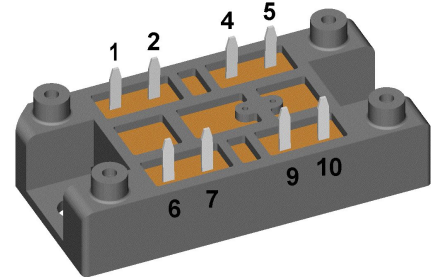
# Thyristor Module

$V_{RRM} = 1400\text{ V}$   
 $I_{TAV} = 27\text{ A}$   
 $V_T = 1,28\text{ V}$

AC Controlling  
2~ full-controlled

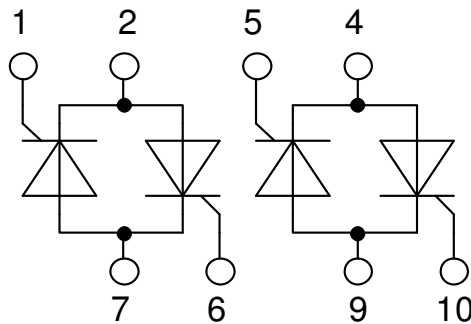
Part number

**VW2x60-14io1**



Backside: isolated

E72873



**Features / Advantages:**

- Thyristor for line frequency
- Planar passivated chip
- Long-term stability
- Direct Copper Bonded Al<sub>2</sub>O<sub>3</sub>-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

**Terms Conditions of usage:**

The data contained in this product data sheet is exclusively intended for technically trained staff. The user will have to evaluate the suitability of the product for the intended application and the completeness of the product data with respect to his application. The specifications of our components may not be considered as an assurance of component characteristics. The information in the valid application- and assembly notes must be considered. Should you require product information in excess of the data given in this product data sheet or which concerns the specific application of your product, please contact the sales office, which is responsible for you.

Due to technical requirements our product may contain dangerous substances. For information on the types in question please contact the sales office, which is responsible for you.

Should you intend to use the product in aviation, in health or live endangering or life support applications, please notify. For any such application we urgently recommend

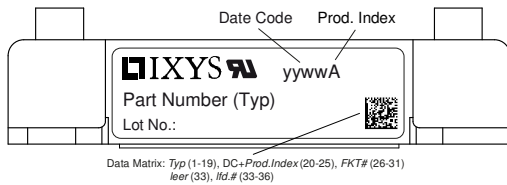
- to perform joint risk and quality assessments;

- the conclusion of quality agreements;

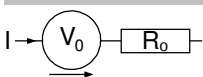
- to establish joint measures of an ongoing product survey, and that we may make delivery dependent on the realization of any such measures.

Rectifier			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$V_{RSM/DSM}$	max. non-repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1500	V
$V_{RRM/DRM}$	max. repetitive reverse/forward blocking voltage	$T_{VJ} = 25^{\circ}C$			1400	V
$I_{RD}$	reverse current, drain current	$V_{R/D} = 1400\text{ V}$	$T_{VJ} = 25^{\circ}C$		100	$\mu A$
		$V_{R/D} = 1400\text{ V}$	$T_{VJ} = 125^{\circ}C$		5	mA
$V_T$	forward voltage drop	$I_T = 40\text{ A}$	$T_{VJ} = 25^{\circ}C$		1,25	V
		$I_T = 80\text{ A}$			1,65	V
		$I_T = 40\text{ A}$	$T_{VJ} = 125^{\circ}C$		1,28	V
		$I_T = 80\text{ A}$			1,75	V
$I_{TAV}$	average forward current	$T_C = 85^{\circ}C$	$T_{VJ} = 125^{\circ}C$		27	A
$I_{RMS}$	RMS forward current per phase	180° sine			60	A
$V_{T0}$	threshold voltage	} for power loss calculation only	$T_{VJ} = 125^{\circ}C$		0,85	V
$r_T$	slope resistance				11	m $\Omega$
$R_{thJC}$	thermal resistance junction to case				0,92	K/W
$R_{thCH}$	thermal resistance case to heatsink			0,30		K/W
$P_{tot}$	total power dissipation		$T_C = 25^{\circ}C$		110	W
$I_{TSM}$	max. forward surge current	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		520	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		560	A
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}C$		440	A
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		475	A
$I^2t$	value for fusing	$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 45^{\circ}C$		1,35	kA <sup>2</sup> s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		1,31	kA <sup>2</sup> s
		$t = 10\text{ ms}; (50\text{ Hz}), \text{ sine}$	$T_{VJ} = 125^{\circ}C$		970	A <sup>2</sup> s
		$t = 8,3\text{ ms}; (60\text{ Hz}), \text{ sine}$	$V_R = 0\text{ V}$		940	A <sup>2</sup> s
$C_J$	junction capacitance	$V_R = 400\text{ V}$ $f = 1\text{ MHz}$	$T_{VJ} = 25^{\circ}C$		64	pF
$P_{GM}$	max. gate power dissipation	$t_p = 30\text{ }\mu s$	$T_C = 125^{\circ}C$		10	W
		$t_p = 300\text{ }\mu s$			5	W
$P_{GAV}$	average gate power dissipation				0,5	W
$(di/dt)_{cr}$	critical rate of rise of current	$T_{VJ} = 125^{\circ}C; f = 50\text{ Hz}$ repetitive, $I_T = 45\text{ A}$			100	A/ $\mu s$
		$t_p = 200\text{ }\mu s; di_G/dt = 0,45\text{ A}/\mu s;$ $I_G = 0,45\text{ A}; V = \frac{2}{3} V_{DRM}$ non-repet., $I_T = 27\text{ A}$			500	A/ $\mu s$
$(dv/dt)_{cr}$	critical rate of rise of voltage	$V = \frac{2}{3} V_{DRM}$ $R_{GK} = \infty; \text{ method 1 (linear voltage rise)}$	$T_{VJ} = 125^{\circ}C$		1000	V/ $\mu s$
$V_{GT}$	gate trigger voltage	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		1,5	V
			$T_{VJ} = -40^{\circ}C$		1,6	V
$I_{GT}$	gate trigger current	$V_D = 6\text{ V}$	$T_{VJ} = 25^{\circ}C$		100	mA
			$T_{VJ} = -40^{\circ}C$		200	mA
$V_{GD}$	gate non-trigger voltage	$V_D = \frac{2}{3} V_{DRM}$	$T_{VJ} = 125^{\circ}C$		0,2	V
$I_{GD}$	gate non-trigger current				5	mA
$I_L$	latching current	$t_p = 10\text{ }\mu s$	$T_{VJ} = 25^{\circ}C$		450	mA
		$I_G = 0,45\text{ A}; di_G/dt = 0,45\text{ A}/\mu s$				
$I_H$	holding current	$V_D = 6\text{ V}$ $R_{GK} = \infty$	$T_{VJ} = 25^{\circ}C$		200	mA
$t_{gd}$	gate controlled delay time	$V_D = \frac{1}{2} V_{DRM}$	$T_{VJ} = 25^{\circ}C$		2	$\mu s$
		$I_G = 0,45\text{ A}; di_G/dt = 0,45\text{ A}/\mu s$				
$t_q$	turn-off time	$V_R = 100\text{ V}; I_T = 20\text{ A}; V = \frac{2}{3} V_{DRM}$ $di/dt = 10\text{ A}/\mu s$ $dv/dt = 15\text{ V}/\mu s$ $t_p = 200\text{ }\mu s$	$T_{VJ} = 100^{\circ}C$		150	$\mu s$

Package V1-A-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
<b>Weight</b>				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	3600			V
		t = 1 minute	3000			V

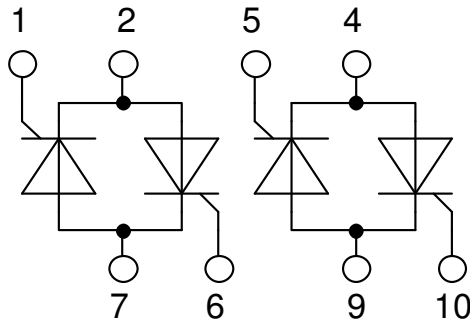
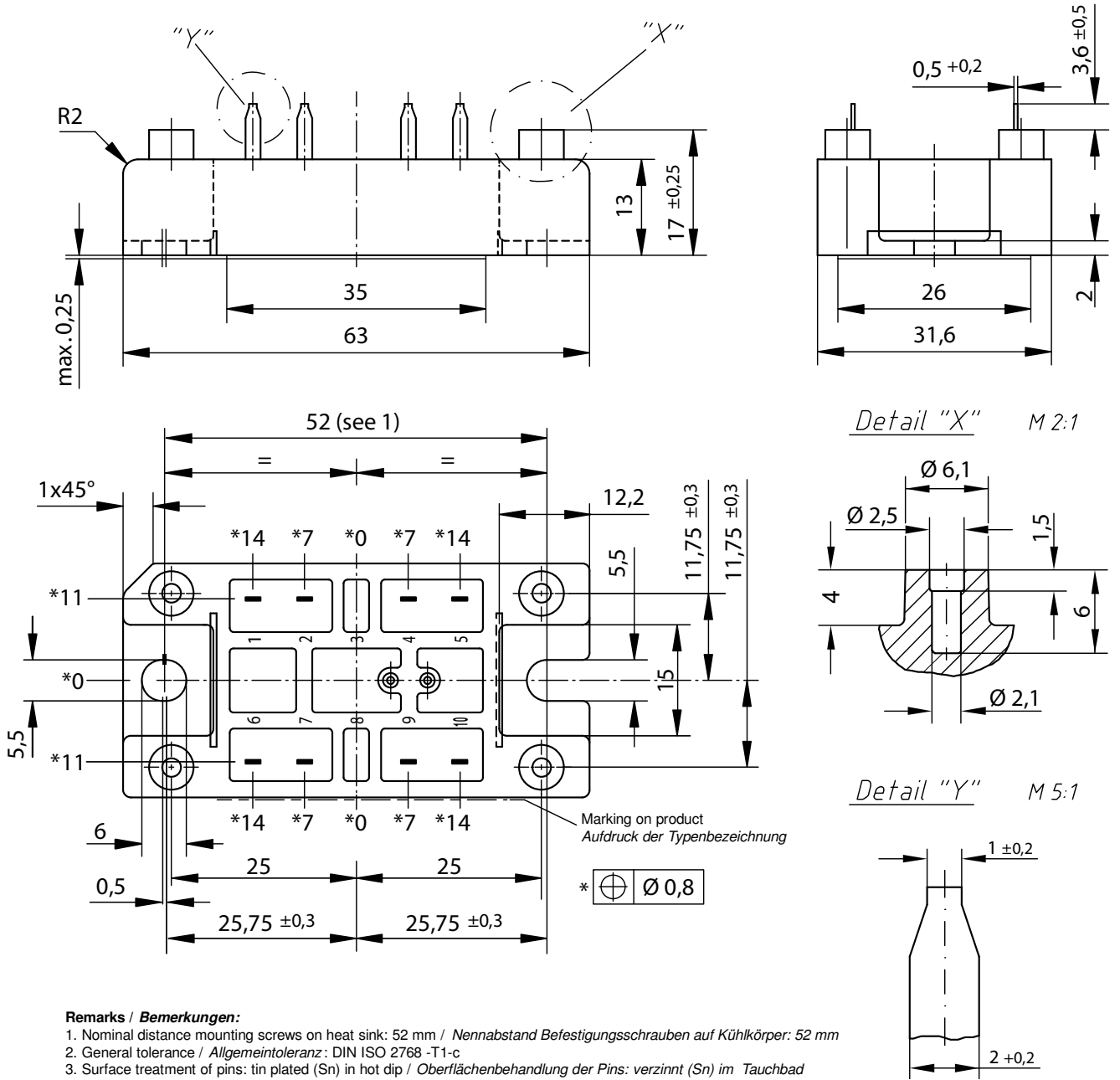


Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	VW2x60-14io1	VW2x60-14io1	Blister	24	468339

**Equivalent Circuits for Simulation**
*\* on die level*
 $T_{VJ} = 125\text{ °C}$ 

**Thyristor**

$V_{0\ max}$	threshold voltage	0,85	V
$R_{0\ max}$	slope resistance *	8,5	mΩ

## Outlines V1-A-Pack



## Thyristor

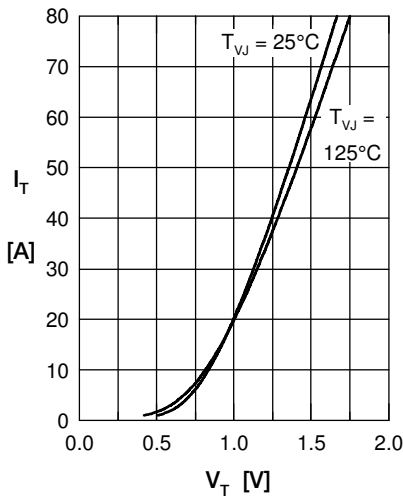


Fig. 1 Forward characteristics

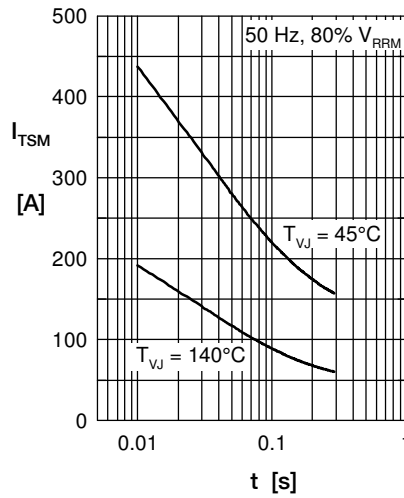


Fig. 2 Surge overload current  $I_{TSM}$ : crest value,  $t$ : duration

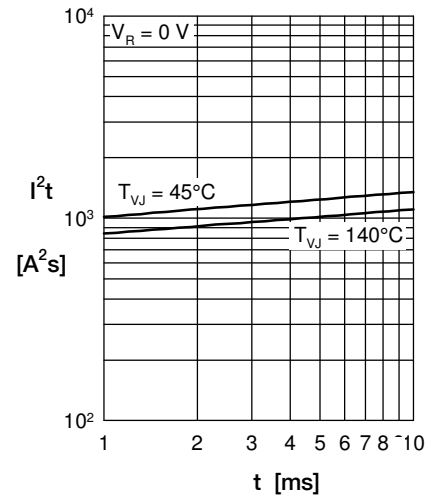


Fig. 3  $I^2t$  versus time (1-10 s)

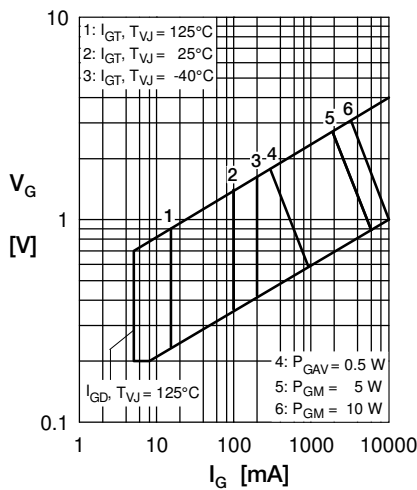


Fig. 4 Gate voltage & gate current

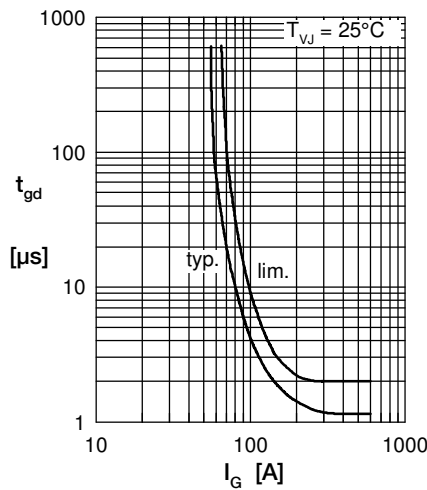


Fig. 5 Gate controlled delay time  $t_{gd}$

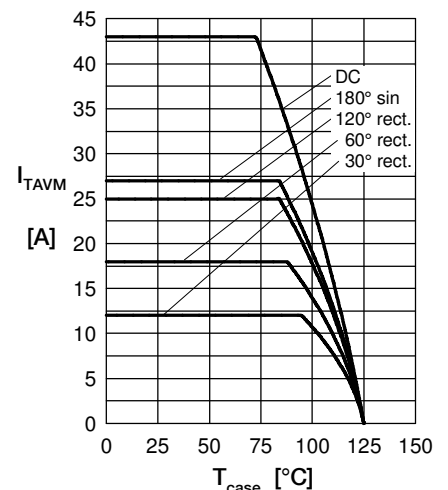


Fig. 6 Max. forward current at case temperature

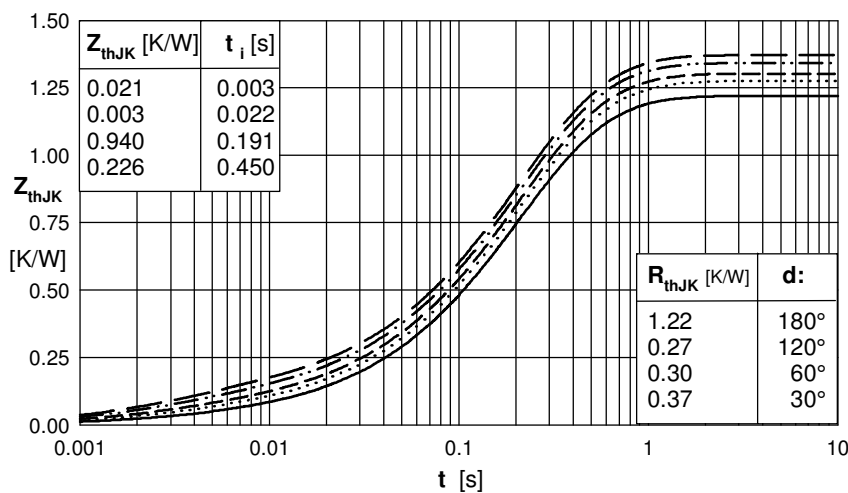


Fig. 7 Transient thermal impedance junction to heatsink (per thyristor)

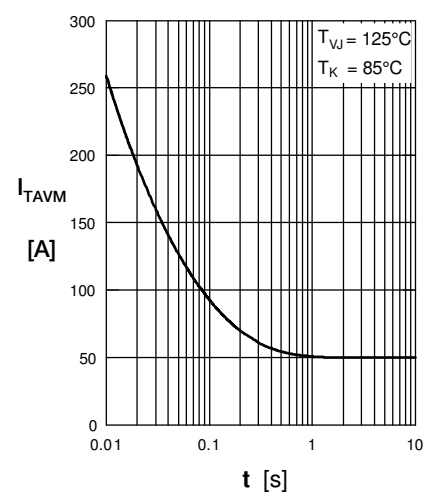


Fig. 8 Rated RMS current vs. time (360° conduction)

**Rectifier**

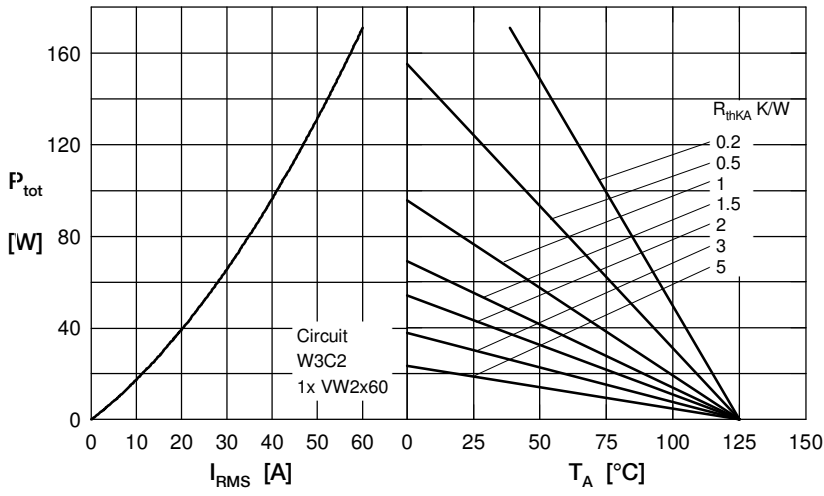


Fig. 9 Load current capability for two phase AC controller

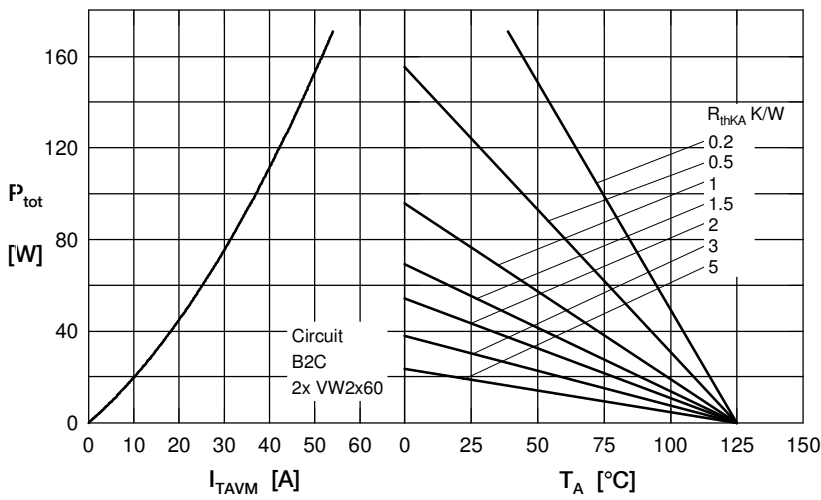


Fig. 10 Power dissipation vs. direct output current and ambient temperature cyclo converter, four quadrant operation