

# XPT IGBT Module

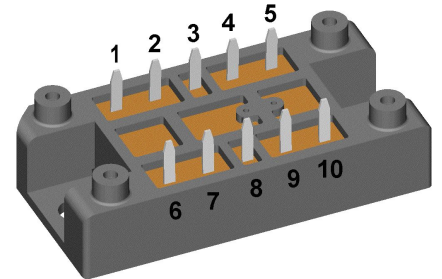
preliminary

$$V_{CES} = 1200 \text{ V}$$

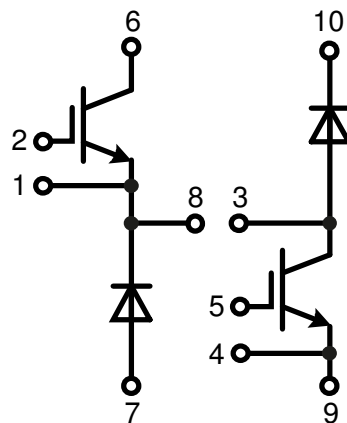
$$I_{C25} = 85 \text{ A}$$

$$V_{CE(sat)} = 1,8 \text{ V}$$

H~ Bridge, Buck / Boost - Combination

**Part number**
**MIXA60HU1200VA**


Backside: isolated


**Features / Advantages:**

- Easy paralleling due to the positive temperature coefficient of the on-state voltage
- Rugged XPT design (Xtreme light Punch Through) results in:
  - short circuit rated for 10  $\mu$ sec.
  - very low gate charge
  - low EMI
  - square RBSOA @ 3x  $I_c$
- Thin wafer technology combined with the XPT design results in a competitive low  $V_{CE(sat)}$
- SONIC™ diode
  - fast and soft reverse recovery
  - low operating forward voltage

**Applications:**

- Switched-mode power supplies
- Switched reluctance motor drive

**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;

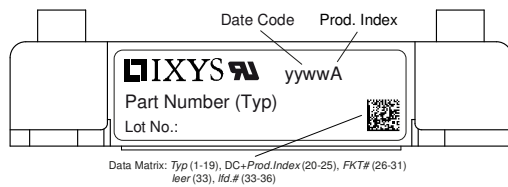
- the conclusion of quality agreements;

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

IGBT				Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit	
$V_{CES}$	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$			1200	V	
$V_{GES}$	max. DC gate voltage				$\pm 20$	V	
$V_{GEM}$	max. transient gate emitter voltage				$\pm 30$	V	
$I_{C25}$	collector current	$T_C = 25^{\circ}\text{C}$			85	A	
$I_{C80}$		$T_C = 80^{\circ}\text{C}$			60	A	
$P_{tot}$	total power dissipation	$T_C = 25^{\circ}\text{C}$			290	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 55\text{A}; V_{GE} = 15\text{V}$			1,8	V	
					2,1	V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 2\text{mA}; V_{GE} = V_{CE}$	5,4	5,9	6,5	V	
$I_{CES}$	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{V}$			0,5	mA	
					0,2	mA	
$I_{GES}$	gate emitter leakage current	$V_{GE} = \pm 20\text{V}$			500	nA	
$Q_{G(on)}$	total gate charge	$V_{CE} = 600\text{V}; V_{GE} = 15\text{V}; I_C = 55\text{A}$		165		nC	
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{V}; I_C = 55\text{A}$ $V_{GE} = \pm 15\text{V}; R_G = 15\Omega$		70		ns	
$t_r$	current rise time		$T_{VJ} = 125^{\circ}\text{C}$	40		ns	
$t_{d(off)}$	turn-off delay time		250		ns		
$t_f$	current fall time		100		ns		
$E_{on}$	turn-on energy per pulse		4,5		mJ		
$E_{off}$	turn-off energy per pulse		5,5		mJ		
<b>RBSOA</b>	reverse bias safe operating area	$V_{GE} = \pm 15\text{V}; R_G = 15\Omega$					
$I_{CM}$		$V_{CEma} = 1200\text{V}$			150	A	
<b>SCSOA</b>	short circuit safe operating area	$V_{CEma} = 1200\text{V}$					
$t_{SC}$	short circuit duration	$V_{CE} = 900\text{V}; V_{GE} = \pm 15\text{V}$			10	$\mu\text{s}$	
$I_{SC}$	short circuit current	$R_G = 15\Omega$ ; non-repetitive		200		A	
$R_{thJC}$	thermal resistance junction to case				0,5	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0,30		K/W	
<b>Diode</b>							
$V_{RRM}$	max. repetitive reverse voltage	$T_{VJ} = 25^{\circ}\text{C}$			1200	V	
$I_{F25}$	forward current	$T_C = 25^{\circ}\text{C}$			88	A	
$I_{F80}$		$T_C = 80^{\circ}\text{C}$			59	A	
$V_F$	forward voltage	$I_F = 60\text{A}$			2,20	V	
					1,95	V	
$I_R$	reverse current	$V_R = V_{RRM}$			0,3	mA	
					1,2	mA	
$Q_{rr}$	reverse recovery charge	$V_R = 600\text{V}$ $-di_F/dt = 1200\text{A}/\mu\text{s}$ $I_F = 60\text{A}; V_{GE} = 0\text{V}$		8		$\mu\text{C}$	
$I_{RM}$	max. reverse recovery current		$T_{VJ} = 125^{\circ}\text{C}$	60		A	
$t_{rr}$	reverse recovery time		350		ns		
$E_{rec}$	reverse recovery energy		2,5		mJ		
$R_{thJC}$	thermal resistance junction to case				0,6	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0,20		K/W	

preliminary

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		150	°C
$T_{op}$	operation temperature		-40		125	°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



### Part description

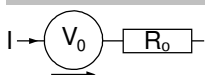
- M = Module
- I = IGBT
- X = XPT IGBT
- A = Gen 1 / std
- 60 = Current Rating [A]
- HU = H- Bridge, Buck / Boost - Combination
- 1200 = Reverse Voltage [V]
- VA = V1-A-Pack

Ordering	Ordering Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MIXA60HU1200VA	MIXA60HU1200VA	Blister	24	511602

### Equivalent Circuits for Simulation

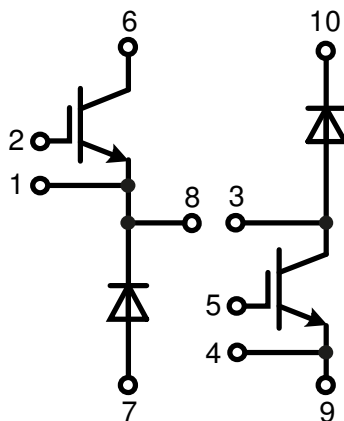
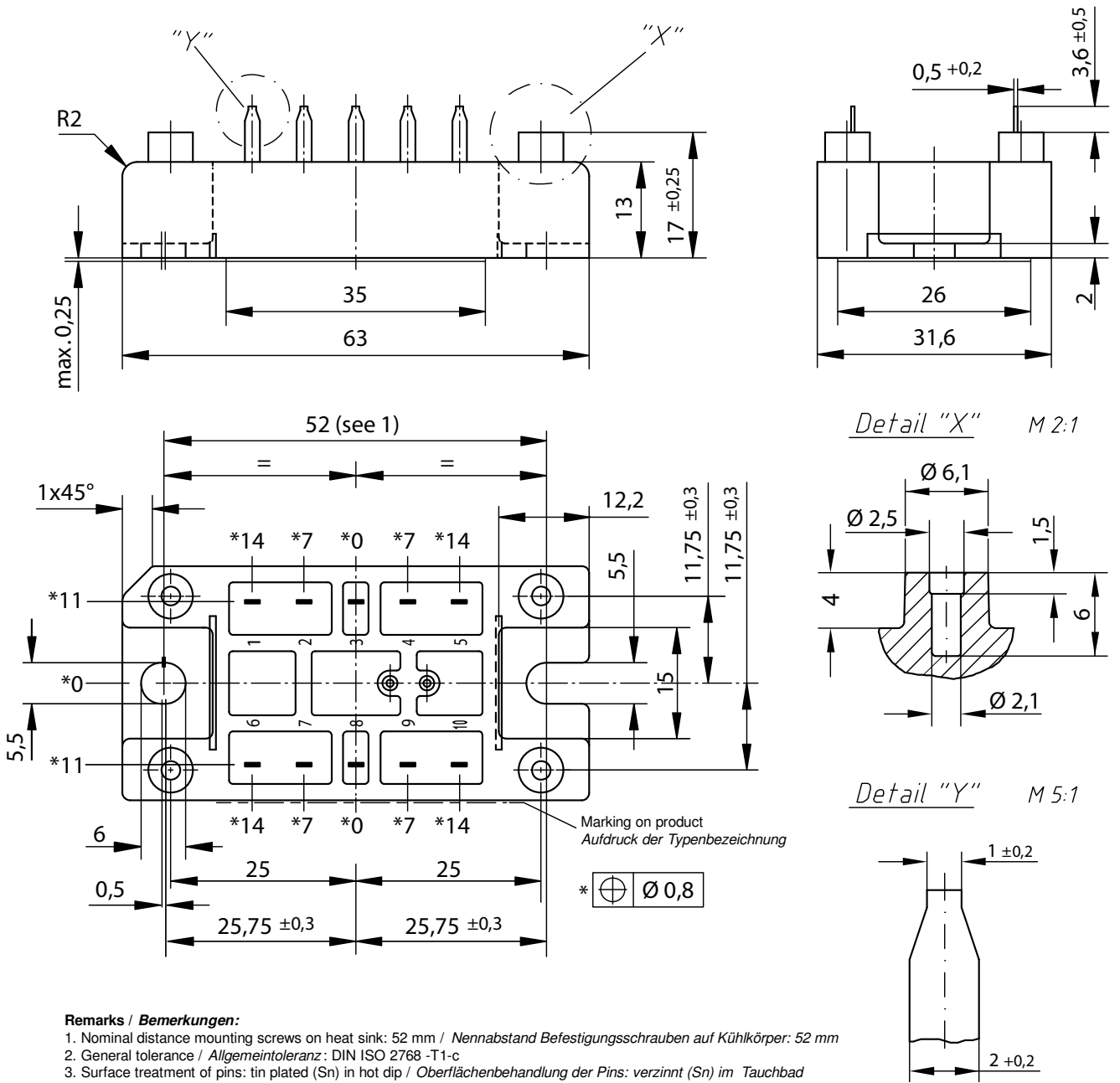
\* on die level

$T_{VJ} = 150\text{ °C}$



	IGBT	Diode	
$V_{0\ max}$	1,1	1,22	V
$R_{0\ max}$	25,1	13	mΩ

## Outlines V1-A-Pack



## IGBT

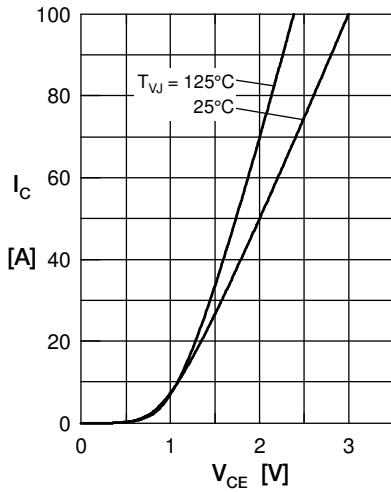


Fig. 1 Typ. output characteristics

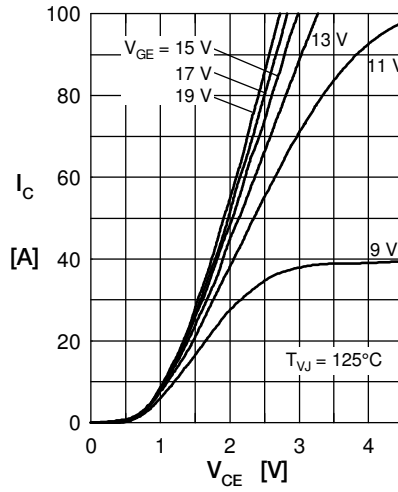


Fig. 2 Typ. output characteristics

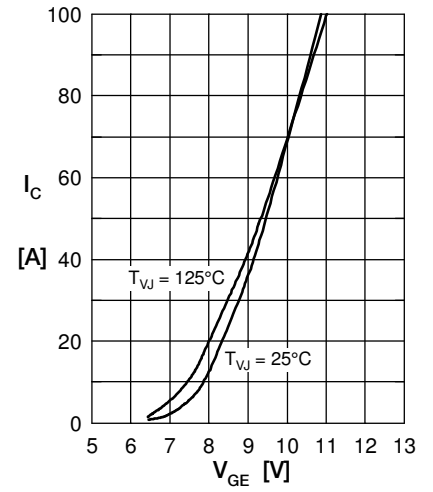


Fig. 3 Typ. transfer characteristics

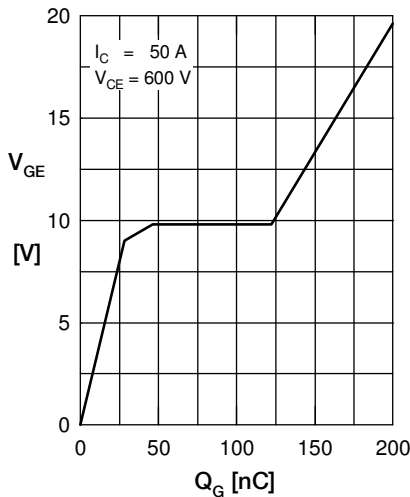


Fig. 4 Dynamic parameters  $Q_r, I_{RM}$  versus  $T_{VJ}$

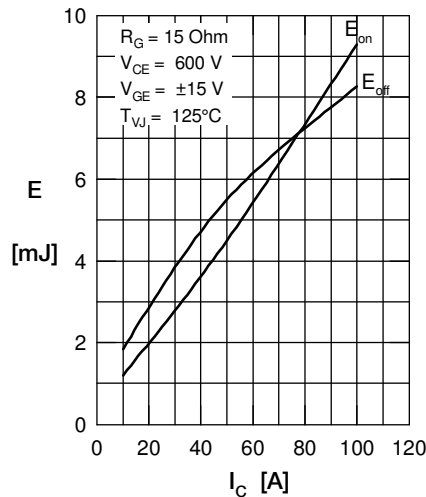


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $-di_F/dt$

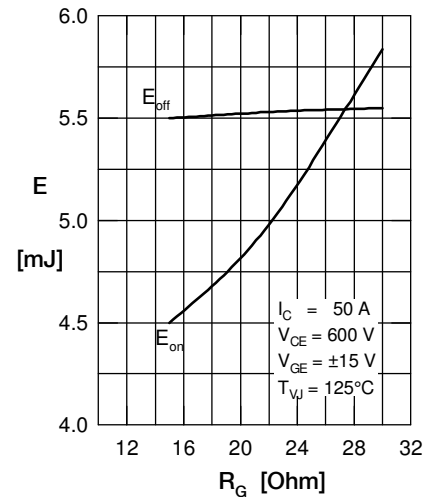


Fig. 6 Typ. peak forward voltage  $V_{FR}$  and  $t_{tr}$  versus  $di_F/dt$

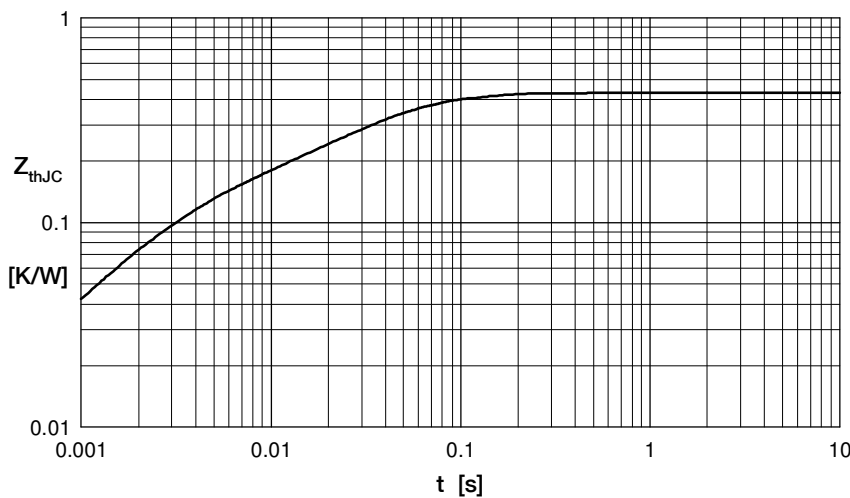


Fig. 7 Transient thermal impedance junction to case

## Diode

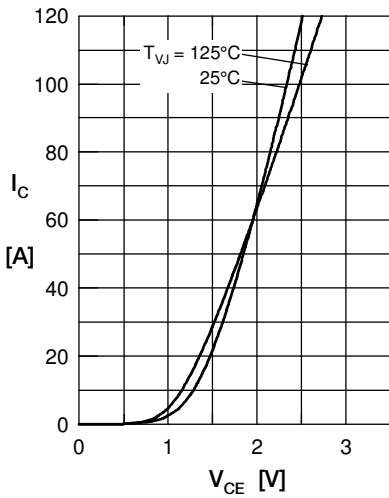


Fig. 1 Typ. Forward current versus  $V_F$

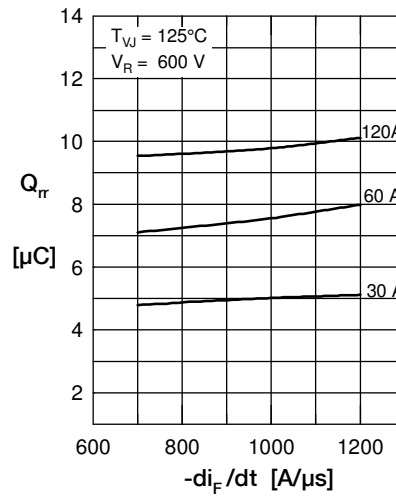


Fig. 2 Typ. reverse recovery charge  $Q_{rr}$  versus  $di/dt$

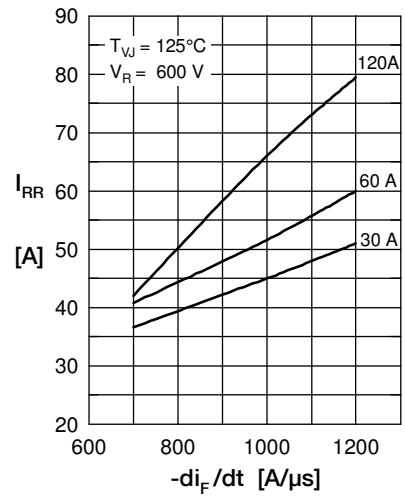


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $di/dt$

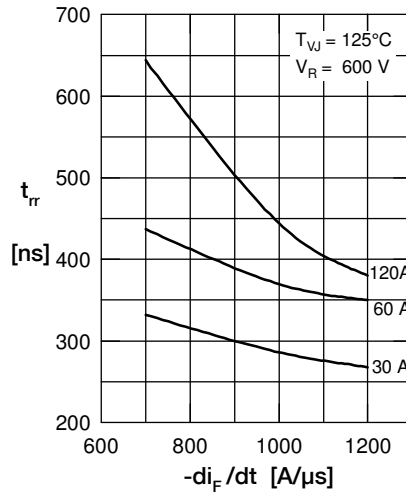


Fig. 4 Dynamic parameters  $Q_{rr}$ ,  $I_{RM}$  versus  $T_{VJ}$

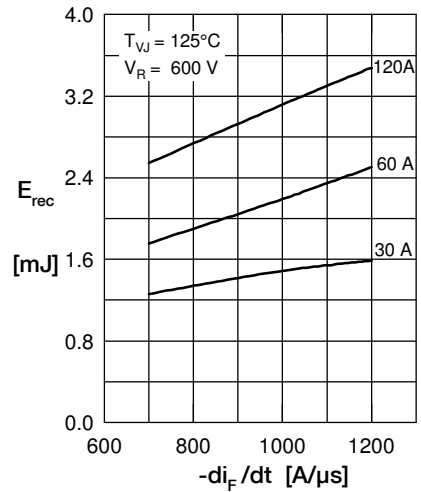


Fig. 6 Typ. recovery energy  $E_{rec}$  versus  $-di/dt$

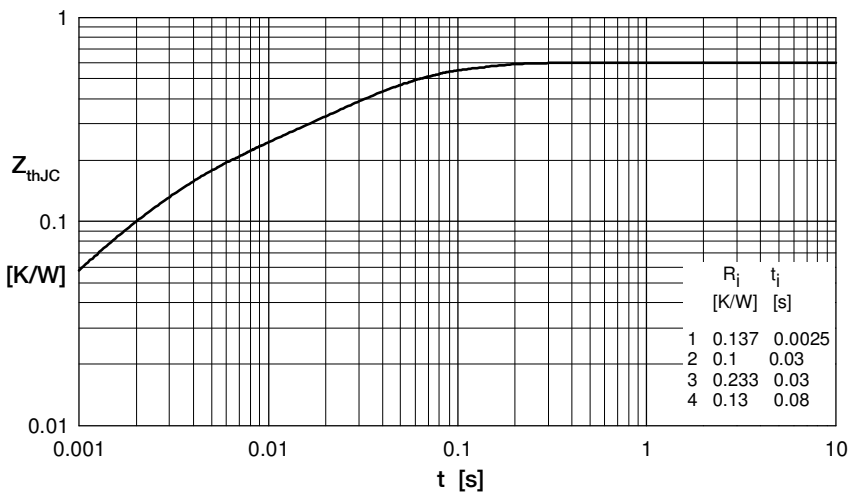


Fig. 7 Transient thermal impedance junction to case