preliminary

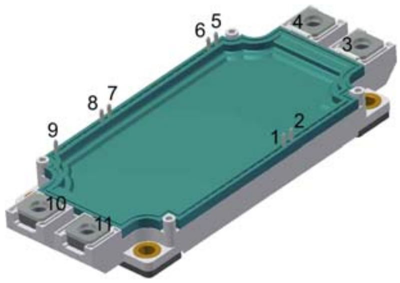
XPT IGBT Module

V_{CES} = 2x 1200 V
I_{C25} = 360 A
$V_{CE(sat)}$ = 1.8 V

Phase leg + free wheeling Diodes + NTC

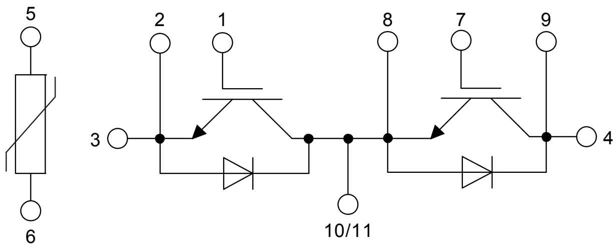
Part number

MIXA225PF1200TSF



Backside: isolated

E72873



Features / Advantages:

- High level of integration - only one power semiconductor module required for the whole drive
- Rugged XPT design (Xtreme light Punch Through) results in:
  - short circuit rated for 10 µsec.
  - very low gate charge
  - low EMI
  - square RBSOA @ 3x Ic
- Thin wafer technology combined with the XPT design results in a competitive low VCE(sat)
- Temperature sense included
- SONIC™ diode
  - fast and soft reverse recovery
  - low operating forward voltage

Applications:

- AC motor drives
- Pumps, Fans
- Air-conditioning system
- Inverter and power supplies
- UPS

Package: SimBus F

- Isolation Voltage: 3000 V~
- Industry standard outline
- RoHS compliant
- Soldering pins for PCB mounting
- Height: 17 mm
- Base plate: Copper internally DCB isolated
- Advanced power cycling

preliminary

IGBT

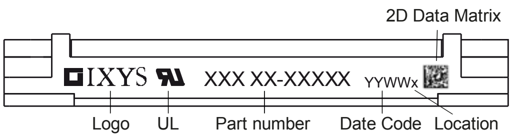
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{CES}	*collector emitter voltage*		T_{VJ} = 25°C			1200	V
V_{GES}	*max. DC gate voltage*					±20	V
V_{GEM}	*max. transient gate emitter voltage*					±30	V
I_{C25}	*collector current*		T_C = 25°C			360	A
I_{C80}			T_C = 80°C			250	A
P_{tot}	*total power dissipation*		T_C = 25°C			1100	W
$V_{CE(sat)}$	*collector emitter saturation voltage*	I_C = 225A; V_{GE} = 15 V	T_{VJ} = 25°C		1.8	2.1	V
			T_{VJ} = 125°C		2.1		V
$V_{GE(th)}$	*gate emitter threshold voltage*	I_C = 9mA; V_{GE} = V_{CE}	T_{VJ} = 25°C	5.4	5.9	6.5	V
I_{CES}	*collector emitter leakage current*	V_{CE} = V_{CES}; V_{GE} = 0 V	T_{VJ} = 25°C			0.3	mA
			T_{VJ} = 125°C		0.3		mA
I_{GES}	*gate emitter leakage current*	V_{GE} = ±20 V				1.5	μA
$Q_{G(on)}$	*total gate charge*	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 225 A			690		nC
$t_{d(on)}$	*turn-on delay time*	inductive load V_{CE} = 600 V; I_C = 225 A V_{GE} = ±15 V; R_G = 3.3 Ω	T_{VJ} = 125°C		60		ns
t_r	*current rise time*				70		ns
$t_{d(off)}$	*turn-off delay time*				280		ns
t_f	*current fall time*				310		ns
E_{on}	*turn-on energy per pulse*				20		mJ
E_{off}	*turn-off energy per pulse*				27		mJ
RBSOA	*reverse bias safe operating area*	V_{GE} = ±15 V; R_G = 3.3 Ω	T_{VJ} = 125°C				
I_{CM}		V_{CEmax} = 1200 V				500	A
SCSOA	*short circuit safe operating area*	V_{CEmax} = 1200 V					
t_{SC}	*short circuit duration*	V_{CE} = 900 V; V_{GE} = ±15 V	T_{VJ} = 125°C			10	μs
I_{SC}	*short circuit current*	R_G = 3.3 Ω; non-repetitive			900		A
R_{thJC}	*thermal resistance junction to case*					0.115	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.05		K/W

Diode

Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{RRM}	*max. repetitive reverse voltage*		T_{VJ} = 25°C			1200	V
I_{F25}	*forward current*		T_C = 25°C			265	A
I_{F80}			T_C = 80°C			185	A
V_F	*forward voltage*	I_F = 225A	T_{VJ} = 25°C			2.10	V
			T_{VJ} = 125°C		1.70		V
I_R	*reverse current*	V_R = V_{RRM}	T_{VJ} = 25°C			*	mA
	* not applicable, see Ices value above		T_{VJ} = 125°C		*		mA
Q_{rr}	*reverse recovery charge*	V_R = 600 V $-di_F/dt$ = 3300 A/μs I_F = 225A; V_{GE} = 0 V	T_{VJ} = 125°C		32		μC
I_{RM}	*max. reverse recovery current*				250		A
t_{rr}	*reverse recovery time*				340		ns
E_{rec}	*reverse recovery energy*				11.7		mJ
R_{thJC}	*thermal resistance junction to case*					0.145	K/W
R_{thCH}	*thermal resistance case to heatsink*				0.05		K/W

preliminary

Package SimBus F			Ratings			
Symbol	**Definition**	**Conditions**	**min.**	**typ.**	**max.**	**Unit**
I_{RMS}	*RMS current*	per terminal				A
T_{stg}	*storage temperature*		-40		125	°C
T_{VJ}	*virtual junction temperature*		-40		150	°C
Weight				350		g
M_D	*mounting torque*		3		6	Nm
M_T	*terminal torque*		3		6	Nm
$d_{Spp/App}$	*creepage distance on surface | striking distance through air*	*terminal to terminal*	12.7			mm
$d_{Spb/Apb}$		*terminal to backside*	10.0			mm
V_{ISOL}	*isolation voltage*	t = 1 second; 50/60 Hz, RMS; $I_{ISOL} \leq 1$ mA	3000			V
		t = 1 minute	2500			V
$R_{pin\text{-}chip}$	*resistance pin to chip*	$V = V_{CEsat} + 2 \cdot R \cdot I_C$ resp. $V = V_F + 2 \cdot R \cdot I_F$		0.65		mΩ



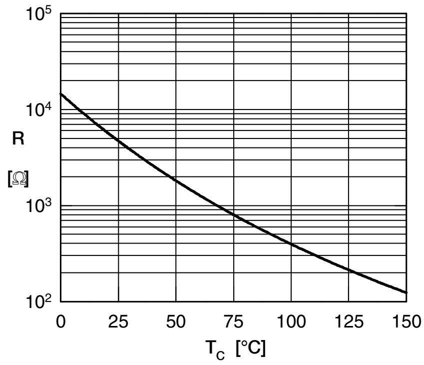
Part number

M = Module
I = IGBT
X = XPT IGBT
A = Gen 1 / std
225 = Current Rating [A]
PF = Phase leg + free wheeling Diodes
1200 = Reverse Voltage [V]
T = Thermistor \ Temperature sensor
SF = SimBus F

Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	MIXA225PF1200TSF	MIXA225PF1200TSF	Box	3	512257

Temperature Sensor NTC

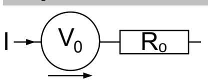
Symbol	Definition	Conditions	min.	typ.	max.	Unit
R_{25}	*resistance*	T_{VJ} = 25°	4.75	5	5.25	kΩ
$B_{25/50}$	*temperature coefficient*			3375		K



Typ. NTC resistance vs. temperature

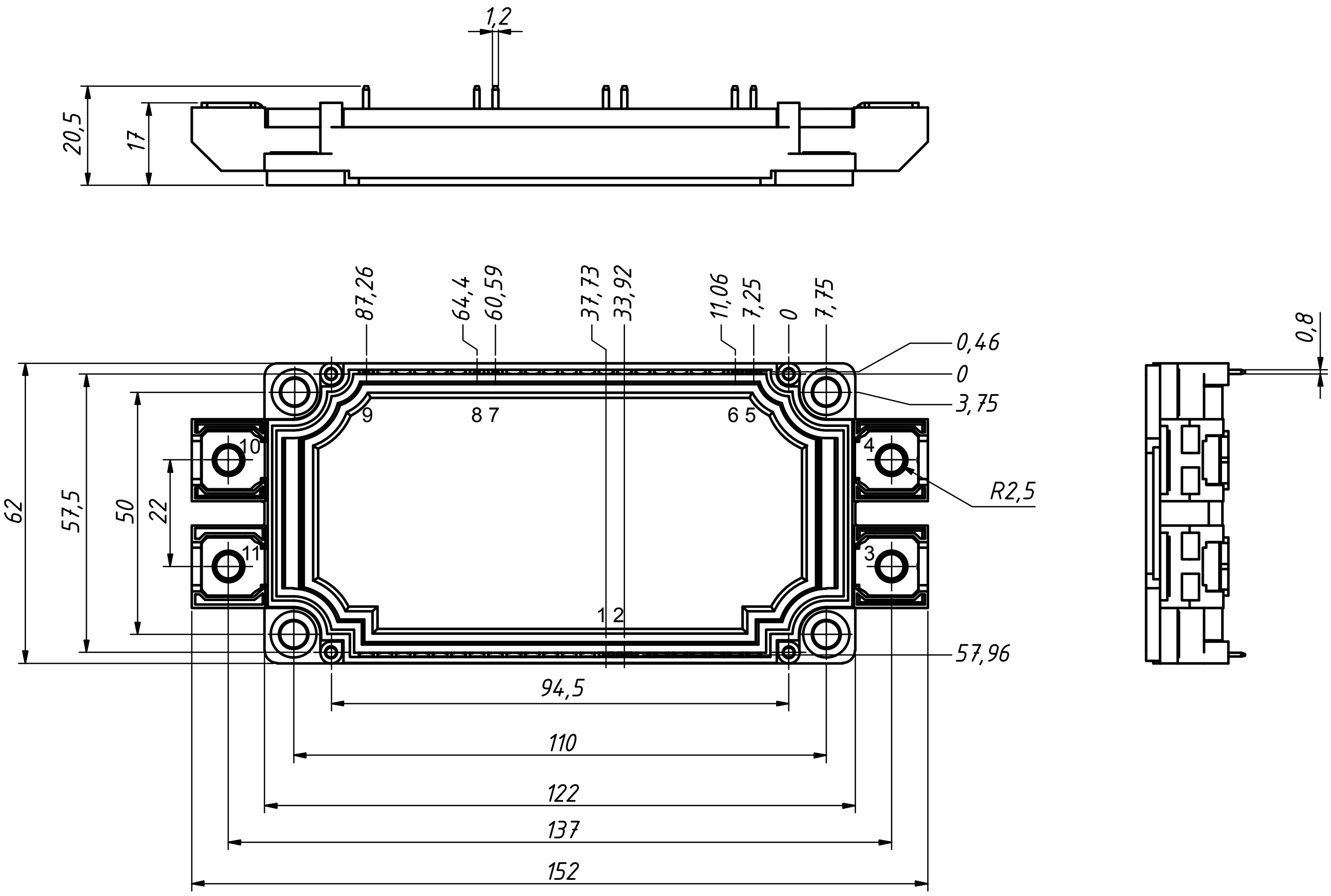
Equivalent Circuits for Simulation

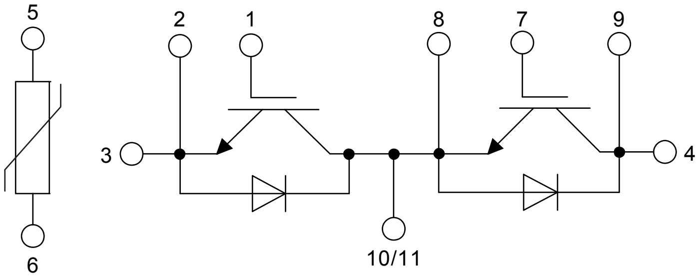
** on die level* $T_{VJ} = 150\,°C$



		IGBT	Diode	
$V_{0\,max}$	*threshold voltage*	1.1	1.19	V
$R_{0\,max}$	*slope resistance **	6	8.9	mΩ

Outlines SimBus F





IGBT

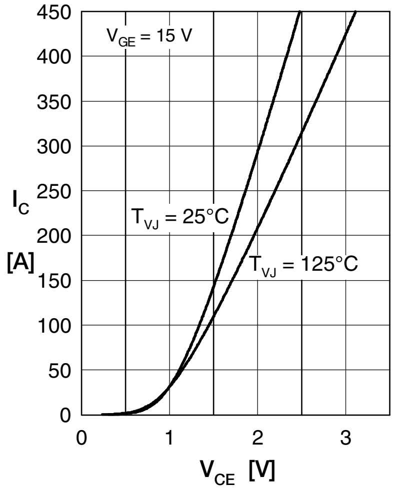


Fig. 1 Typ. output characteristics

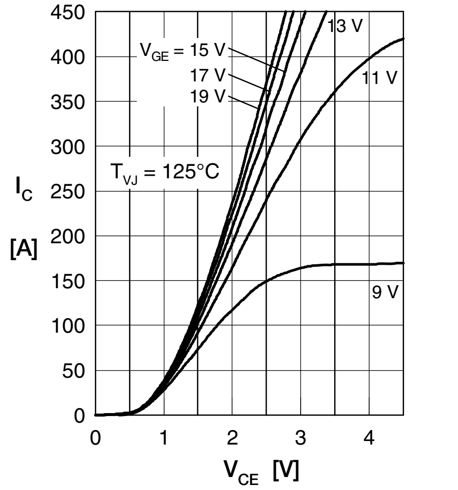


Fig. 2 Typ. output characteristics

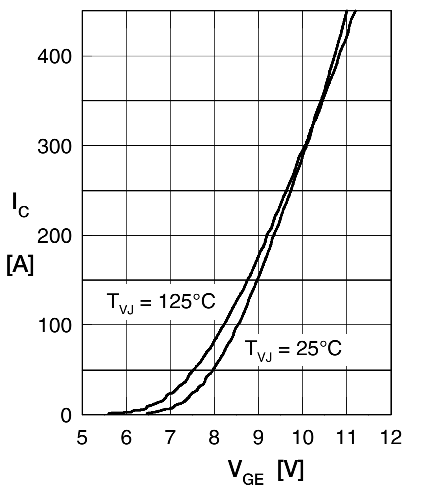


Fig. 3 Typ. transfer characteristics

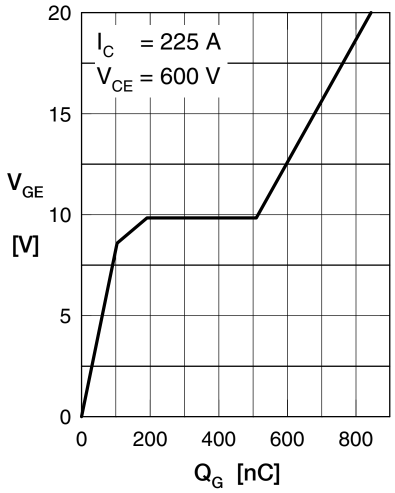


Fig. 4 Typ. turn-on gate charge

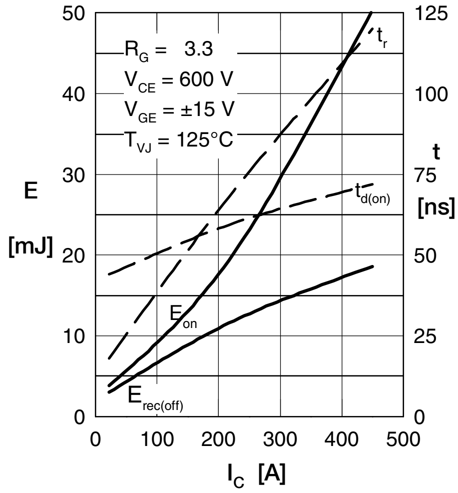


Fig. 5 Typ. switching energy versus collector current

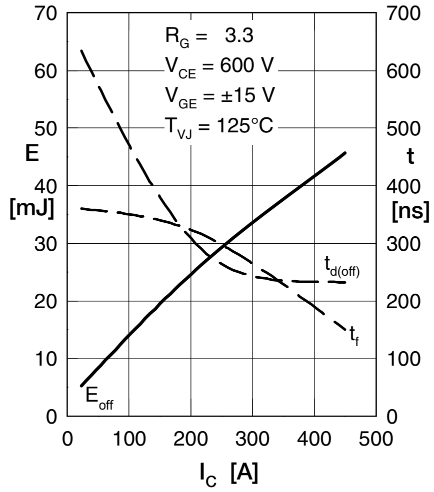


Fig. 6 Typ. switching energy versus collector current

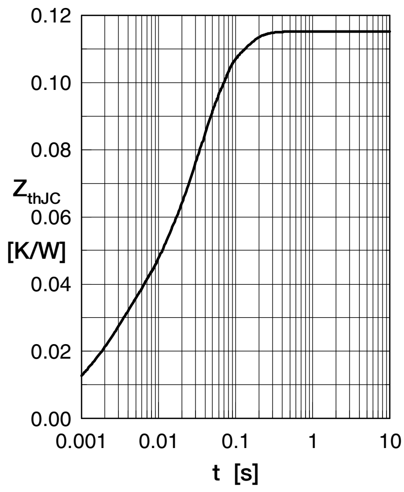


Fig. 7 Typical transient thermal impedance junction to case

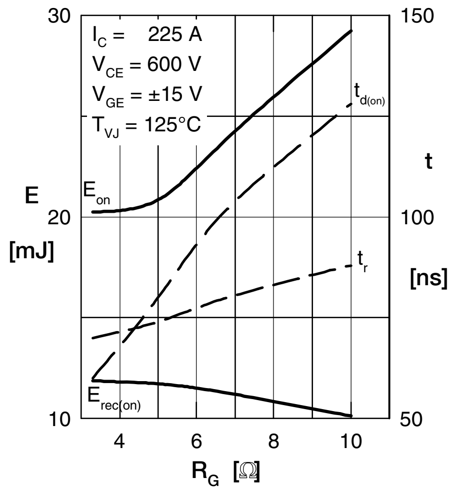


Fig. 8 Typ. switching energy versus gate resistance

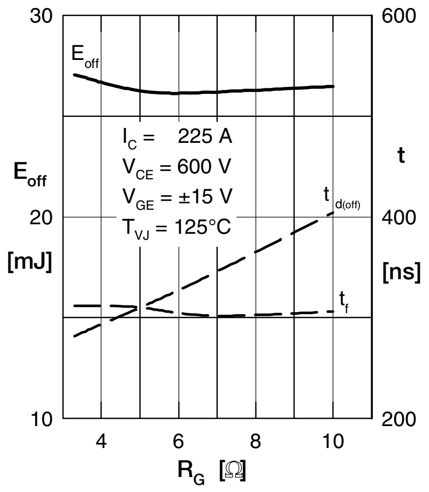


Fig. 9 Typ. switching energy versus gate resistance

Diode

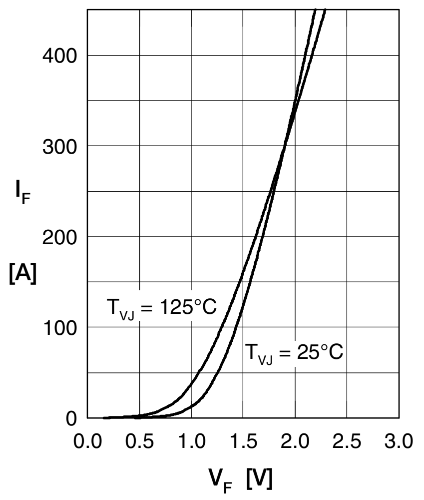


Fig. 1 Typ. forward current versus V_F

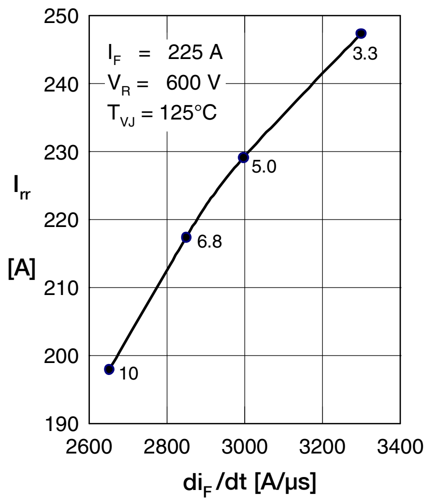


Fig. 2 Typ. reverse recovery characteristics

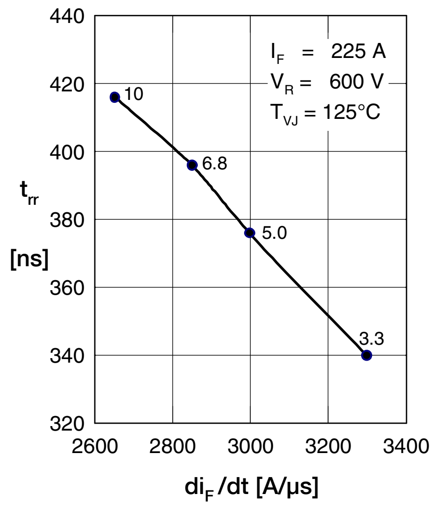


Fig. 3 Typ. reverse recovery characteristics

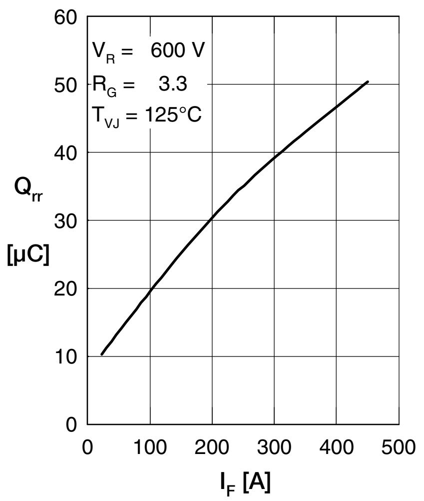


Fig. 4 Typ. reverse recovery characteristics

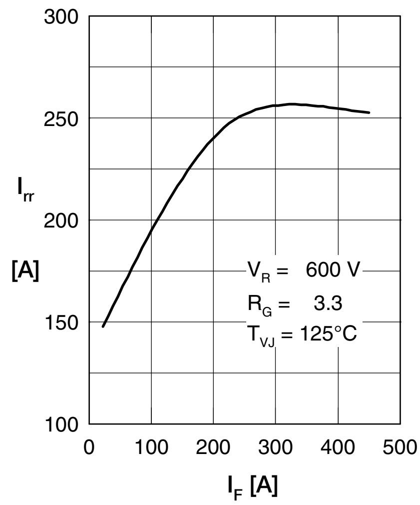


Fig. 3 Typ. reverse recovery characteristics

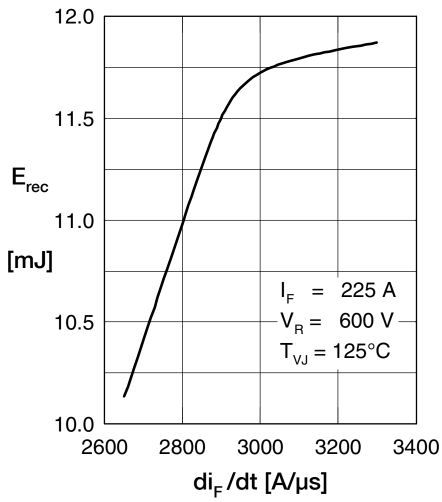


Fig. 6 Typ. recovery energy E_{rec} versus di_F/dt

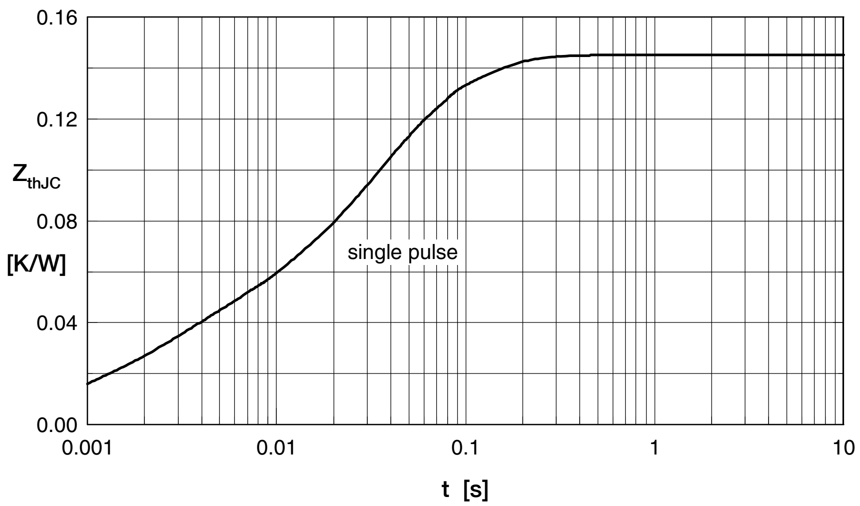


Fig. 7 Typ. transient thermal impedance junction to case