

preliminary

XPT IGBT Module

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

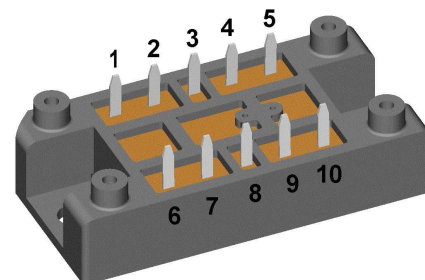
$$I_{C25} = 85 \text{ A}$$

$$V_{CE(sat)} = 1.8 \text{ V}$$

H~ Bridge, Buck / Boost - Combination

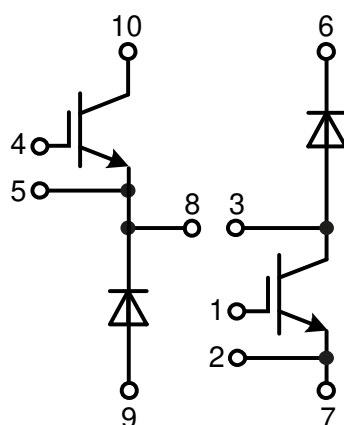
Part number

MIXA60HU1200VA



Backside: isolated

 E72873



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 μ 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

Disclaimer Notice

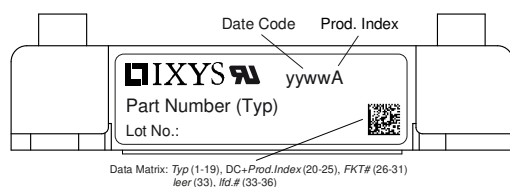
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IGBT				Ratings			
Symbol	Definition	Conditions		min.	typ.	max.	Unit
V_{CES}	collector emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$				1200	V
V_{GES}	max. DC gate voltage					± 20	V
V_{GEM}	max. transient gate emitter voltage					± 30	V
I_{C25}	collector 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	$I_C = 55\text{A}; V_{GE} = 15\text{V}$	$T_{VJ} = 25^{\circ}\text{C}$		1.8	2.1	V
			$T_{VJ} = 125^{\circ}\text{C}$		2.1		V
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 2\text{mA}; V_{GE} = V_{CE}$	$T_{VJ} = 25^{\circ}\text{C}$	5.4	5.9	6.5	V
I_{CES}	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{V}$	$T_{VJ} = 25^{\circ}\text{C}$			0.5	mA
			$T_{VJ} = 125^{\circ}\text{C}$		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 $V_{CE} = 600\text{V}; I_C = 55\text{A}$ $V_{GE} = \pm 15\text{V}; R_G = 15\Omega$	$T_{VJ} = 125^{\circ}\text{C}$		70		ns
t_r	current rise time				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
RBSOA	reverse bias safe operating area	$V_{GE} = \pm 15\text{V}; R_G = 15\Omega$	$T_{VJ} = 125^{\circ}\text{C}$			150	A
I_{CM}		$V_{CEmax} = 1200\text{V}$					
SCSOA	short circuit safe operating area	$V_{CEmax} = 1200\text{V}$	$T_{VJ} = 125^{\circ}\text{C}$			10	μs
t_{SC}	short circuit duration	$V_{CE} = 900\text{V}; V_{GE} = \pm 15\text{V}$					
I_{SC}	short circuit current	$R_G = 15\Omega$; non-repetitive		200			
R_{thJC}	thermal resistance junction to case					0.5	K/W
R_{thCH}	thermal resistance case to heatsink				0.30		K/W
Diode							
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	$I_F = 60\text{A}$	$T_{VJ} = 25^{\circ}\text{C}$			2.20	V
			$T_{VJ} = 125^{\circ}\text{C}$		1.95		V
I_R	reverse current	$V_R = V_{RRM}$	$T_{VJ} = 25^{\circ}\text{C}$			0.3	mA
			$T_{VJ} = 125^{\circ}\text{C}$		1.2		mA
Q_{rr}	reverse recovery charge	$V_R = 600\text{V}$ $-di_F/dt = 1200\text{A}/\mu\text{s}$ $I_F = 60\text{A}; V_{GE} = 0\text{V}$	$T_{VJ} = 125^{\circ}\text{C}$		8		μC
I_{RM}	max. reverse recovery current				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				0.2		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
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; $I_{ISOL} \leq 1$ mA	3600			V
		t = 1 minute		3000			V



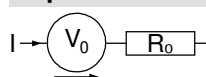
Part description

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	518854

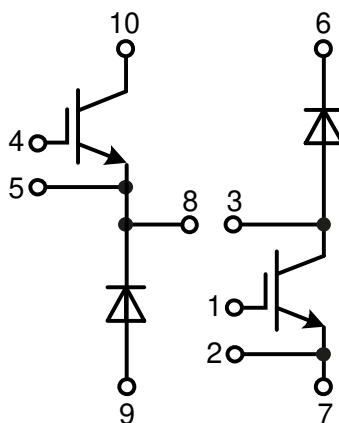
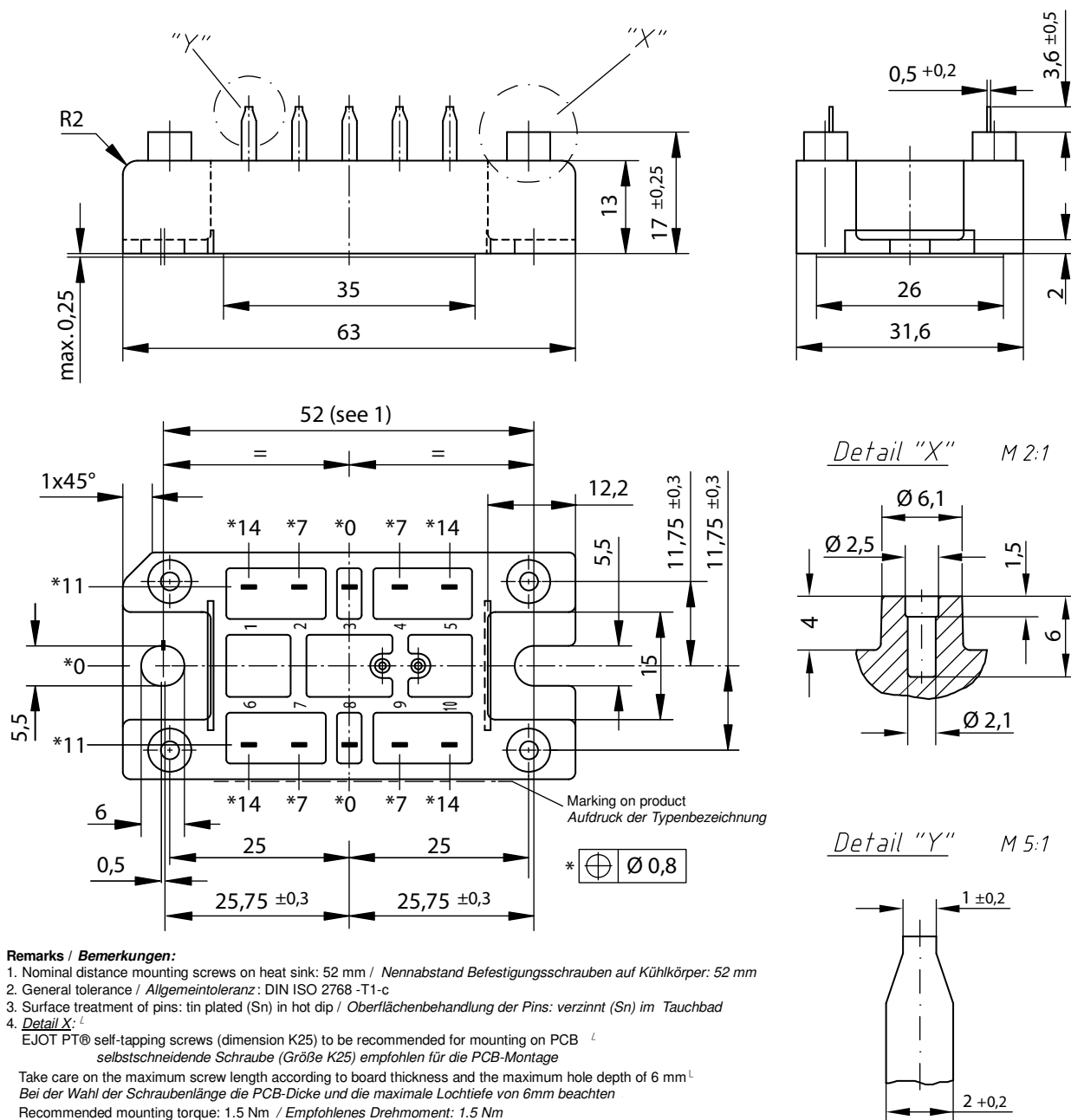
Equivalent Circuits for Simulation

* on die level

 $T_{VJ} = 150^{\circ}\text{C}$

 $V_{0\max}$ threshold voltage

 $R_{0\max}$ slope resistance *

	IGBT	Diode	
$V_{0\max}$	1.1	1.22	V
$R_{0\max}$	25.1	13	mΩ

Outlines V1-A-Pack


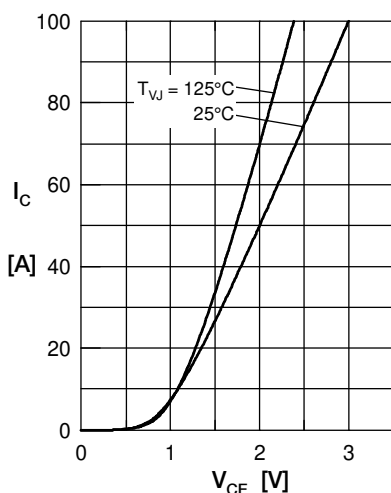
IGBT


Fig. 1 Typ. output characteristics

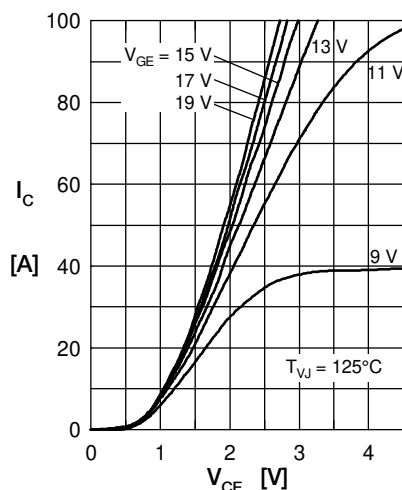


Fig. 2 Typ. output characteristics

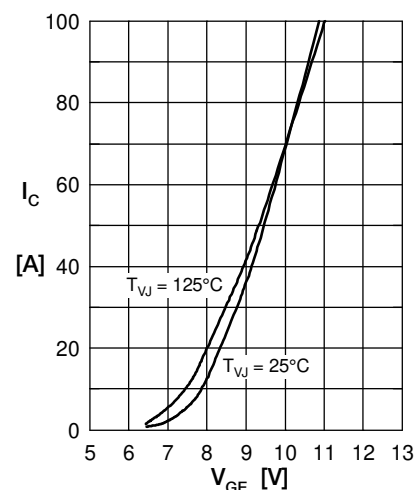


Fig. 3 Typ. transfer characteristics

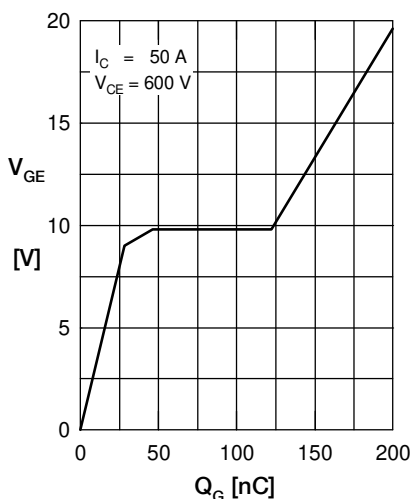
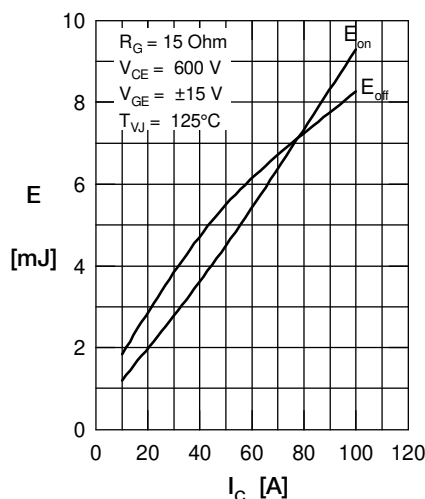
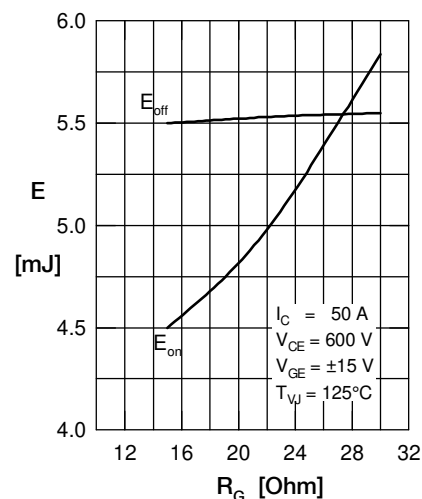
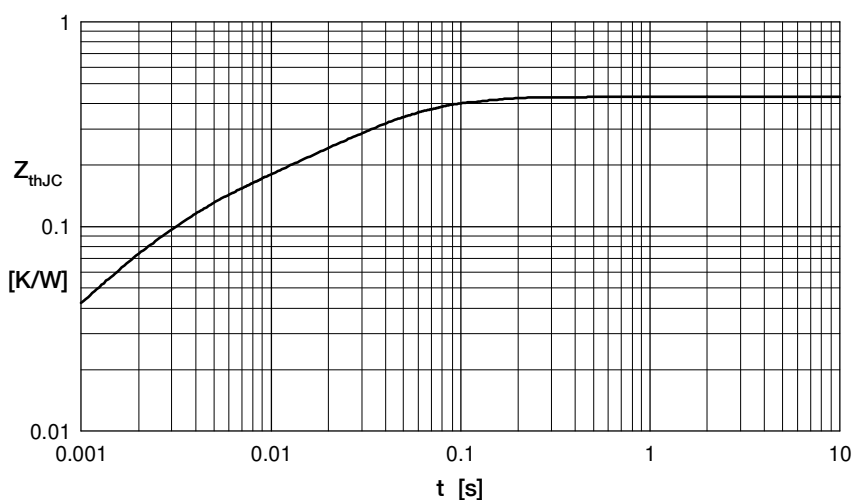

 Fig. 4 Dynamic parameters
 Q_r , I_{RM} versus T_{VJ}

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

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


Fig. 7 Transient thermal impedance junction to case

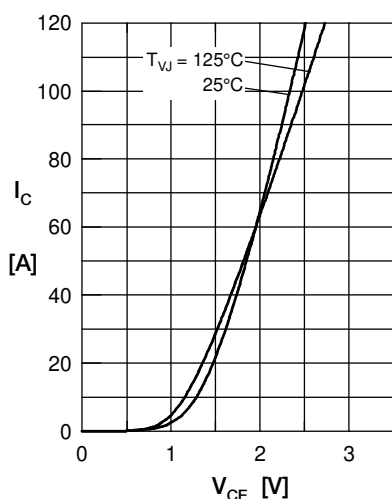
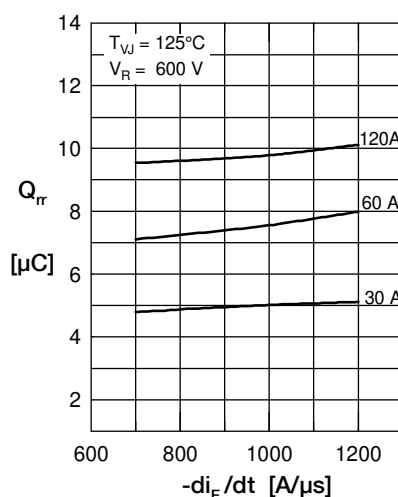
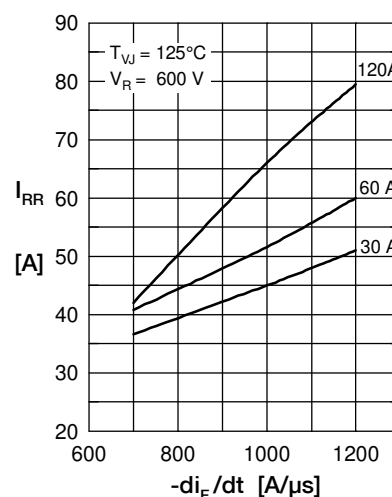
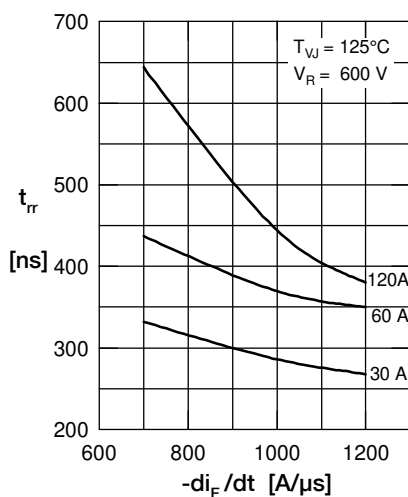
Diode

 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}

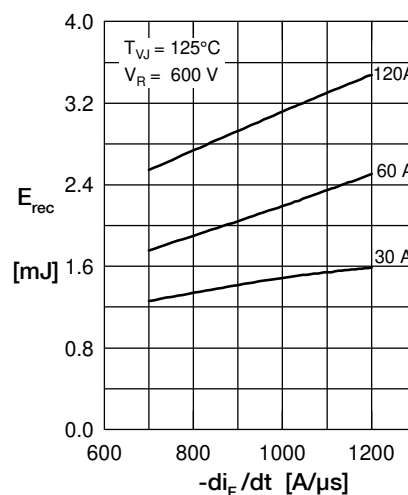
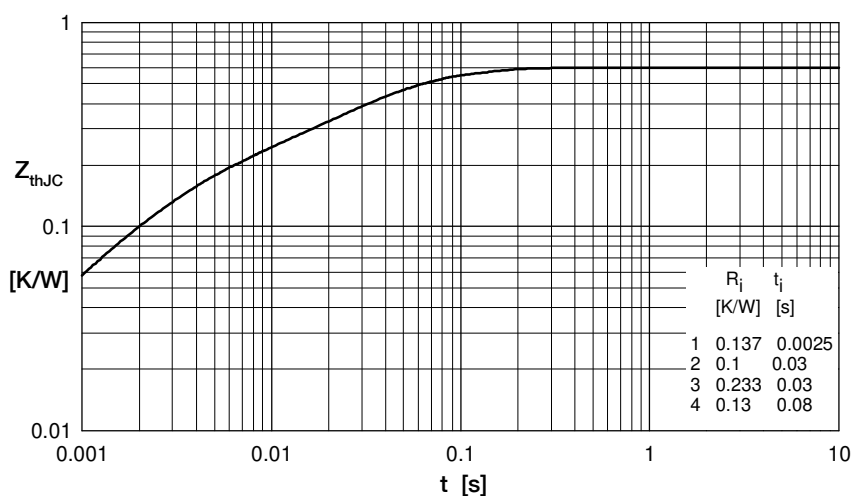
 Fig. 5 Typ. recovery time t_{rr} versus $-di_F/dt$

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


Fig. 7 Transient thermal impedance junction to case