

XPT IGBT Module

$$V_{CES} = 2 \times 1200 \text{ V}$$

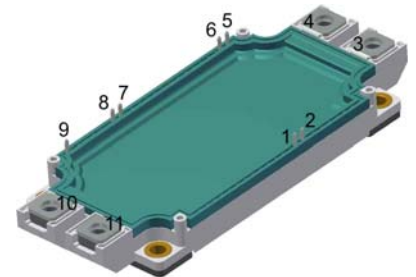
$$I_{C25} = 650 \text{ A}$$

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

Phase leg + free wheeling Diodes + NTC

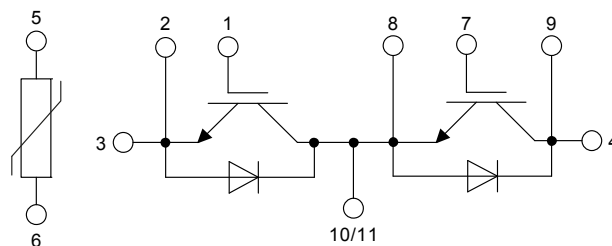
Part number

MIXA450PF1200TSF



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 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 $V_{CE(sat)}$
- Temperature sense included
- SONIC™ diode
 - fast and soft reverse recovery
 - low operating forward voltage

Applications:

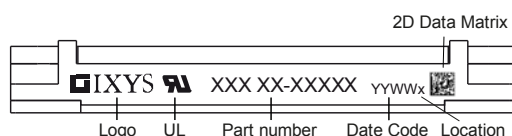
- AC motor drives
- Pumps, Fans
- Air-conditioning system
- Inverter and power supplies
- UPS

Package: SimBus F

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

IGBT				Ratings			
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				650	A
I _{C80}		T _C = 80°C				450	A
P _{tot}	total power dissipation	T _C = 25°C				2100	W
V _{CE(sat)}	collector emitter saturation voltage	I _C = 450A; V _{GE} = 15 V	T _{VJ} = 25°C T _{VJ} = 125°C		1.8 2.15	2.15	V V
V _{GE(th)}	gate emitter threshold voltage	I _C = 18mA; 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 T _{VJ} = 125°C			1	mA 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 = 450 A			1400		nC
t _{d(on)}	turn-on delay time	inductive load T_{VJ} = 125°C V_{CE} = 600V; I_C = 450A V_{GE} = ±15 V; R_G = 1.6 Ω			85		ns
t _r	current rise time				80		ns
t _{d(off)}	turn-off delay time				310		ns
t _f	current fall time				360		ns
E _{on}	turn-on energy per pulse				22		mJ
E _{off}	turn-off energy per pulse				68		mJ
RBSOA	reverse bias safe operating area	V_{GE} = ±15 V; R_G = 1.6 Ω V_{CEmax} = 1200V	T _{VJ} = 125°C				
I _{CM}						900	A
SCSOA	short circuit safe operating area	V_{CEmax} = 1200 V V_{CE} = 900 V; V_{GE} = ±15 V R_G = 1.6 Ω; non-repetitive	T _{VJ} = 125°C			10	µs
t _{SC}	short circuit duration						
I _{SC}	short circuit current			1900			A
R _{thJC}	thermal resistance junction to case					0.06	K/W
R _{thCH}	thermal resistance case to heatsink				0.03		K/W
Diode							
V _{RRM}	max. repetitive reverse voltage	T _{VJ} = 25°C				1200	V
I _{F25}	forward current	T _C = 25°C				380	A
I _{F80}		T _C = 80°C				265	A
V _F	forward voltage	I _F = 450A	T _{VJ} = 25°C T _{VJ} = 125°C			2.30	V V
I _R	reverse current	V _R = V _{RRM}	T _{VJ} = 25°C T _{VJ} = 125°C			*	mA mA
* not applicable, see Ices value above						*	
Q _{rr}	reverse recovery charge	V_R = 600 V -di_F/dt = 5400 A/µs I_F = 450A; V_{GE} = 0 V	T _{VJ} = 125°C		62		µC
I _{RM}	max. reverse recovery current				425		A
t _{rr}	reverse recovery time				360		ns
E _{rec}	reverse recovery energy				26		mJ
R _{thJC}	thermal resistance junction to case					0.095	K/W
R _{thCH}	thermal resistance case to heatsink				0.04		K/W

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	3000			V
		t = 1 minute	2500			V
$R_{pin-chip}$	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
 450 = 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	MIXA450PF1200TSF	MIXA450PF1200TSF	Box	3	511202

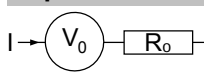
Temperature Sensor NTC

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

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

1.1

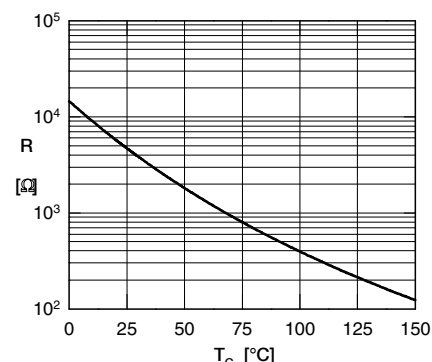
1.25

V

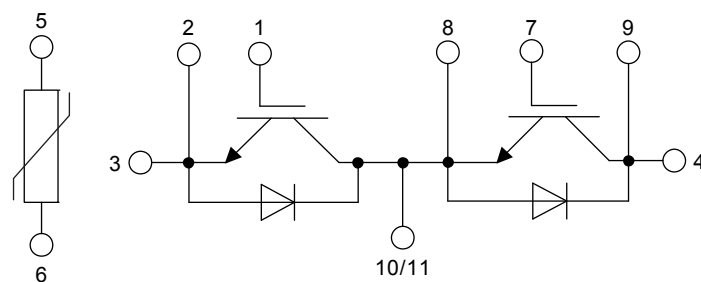
3.1

1.9

mΩ



Typ. NTC resistance vs. temperature



IGBT

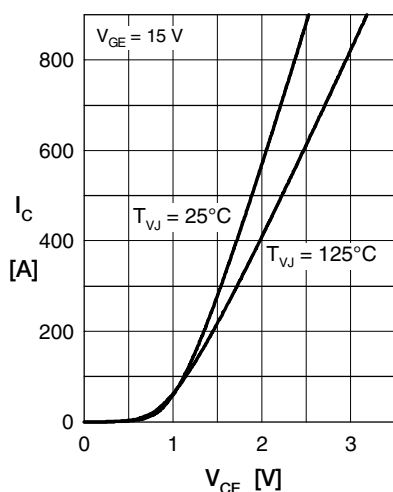


Fig. 1 Typ. output characteristics

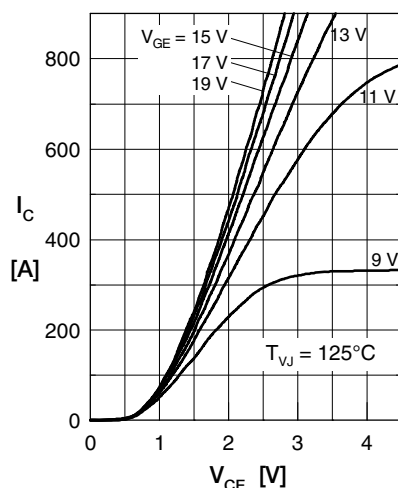


Fig. 2 Typ. output characteristics

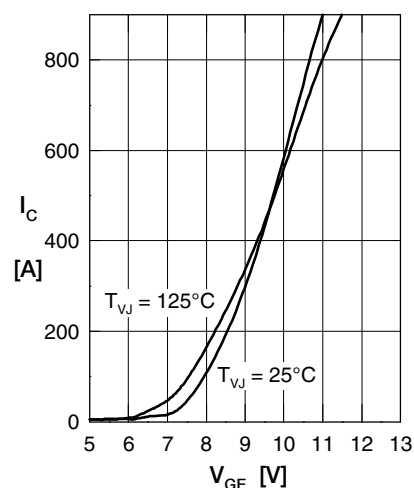


Fig. 3 Typ. transfer characteristics

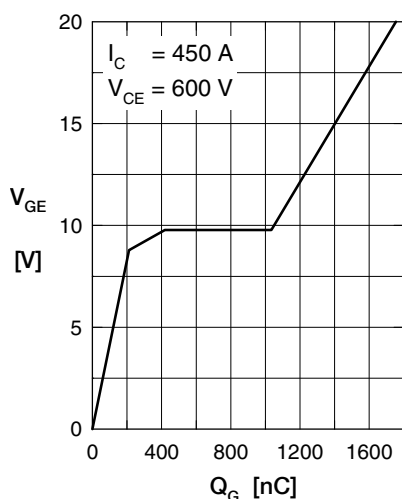


Fig. 4 Typ. turn-on gate charge

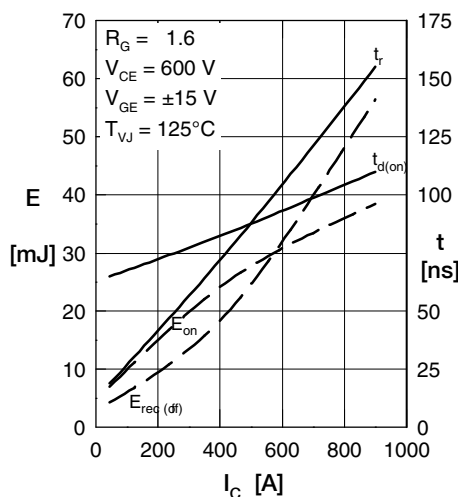


Fig. 5 Typ. turn-on energy & switching times vs. collector current, inductive switching

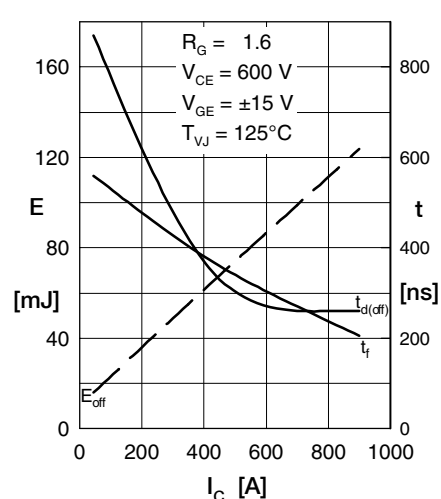


Fig. 6 Typ. switching energy versus gate resistance

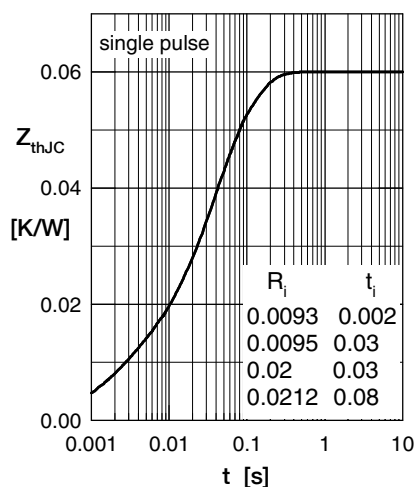


Fig. 7 Typ. trans. therm. impedance

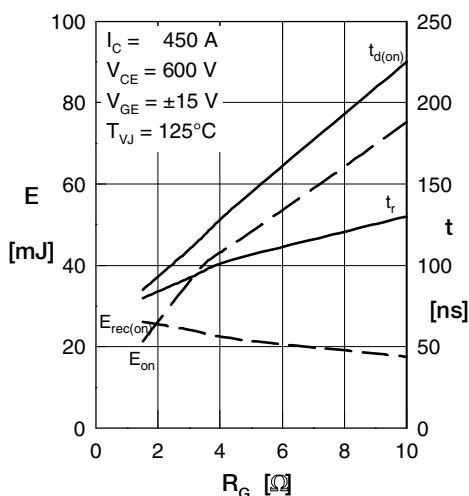


Fig. 8 Typ. turn-on energy, switching times vs. gate resistor, inductive switching

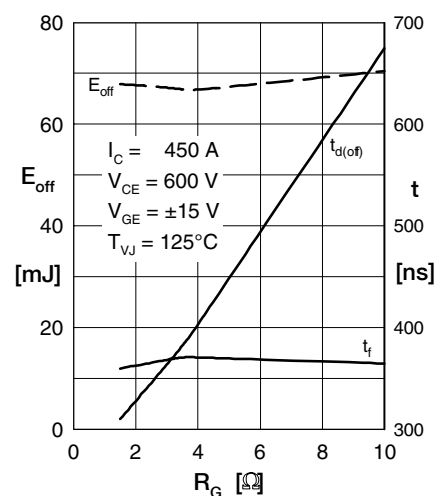


Fig. 9 Typ. turn-off energy, switching times vs. gate resistor, inductive switching

Diode

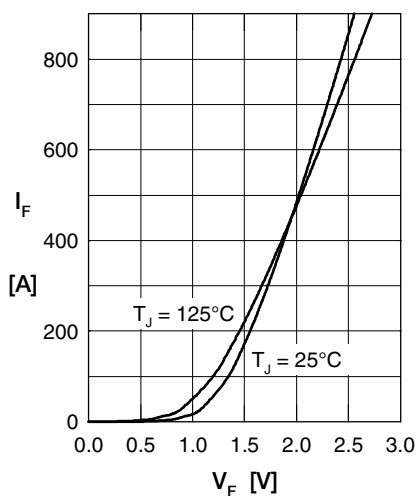


Fig. 1 Typ. Forward current versus V_F

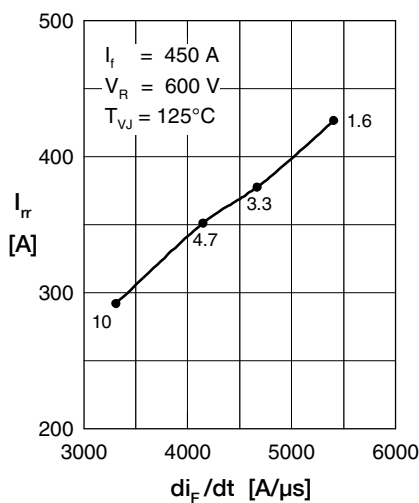


Fig. 2 Typ. reverse recovery characteristics

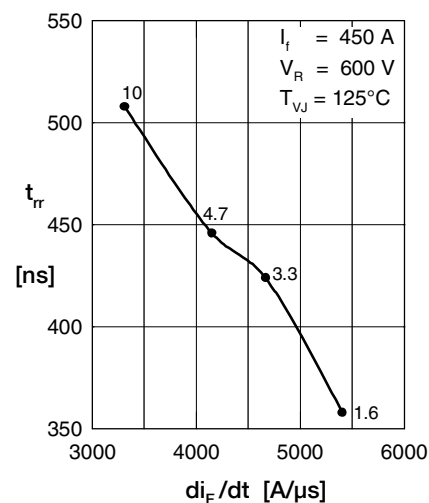


Fig. 3 Typ. reverse recovery characteristics

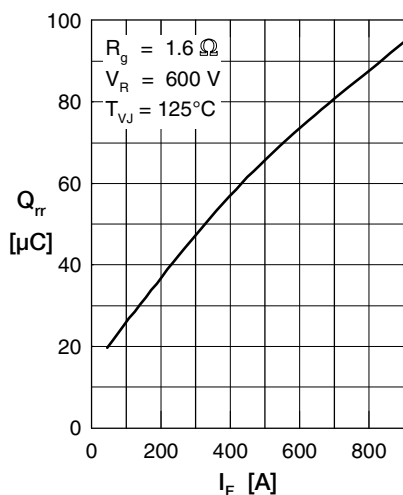


Fig. 4 Typ. reverse recovery characteristics

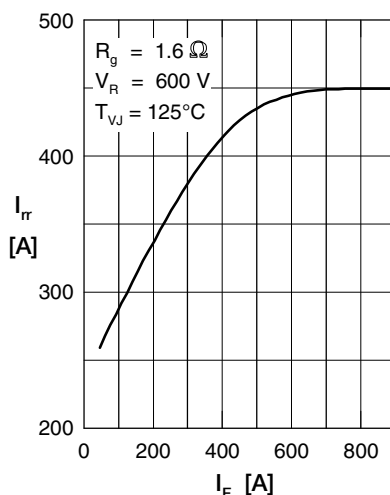


Fig. 5 Typ. reverse recovery characteristics

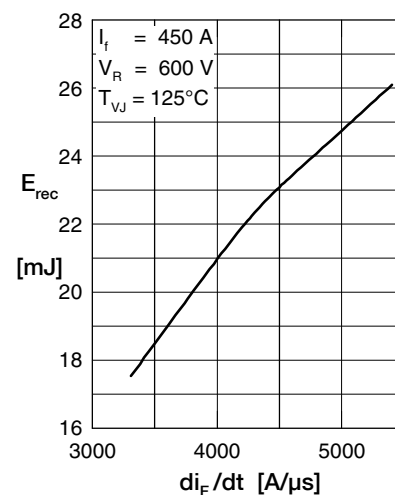


Fig. 6 Typ. recovery energy E_{rec} versus $-di/dt$

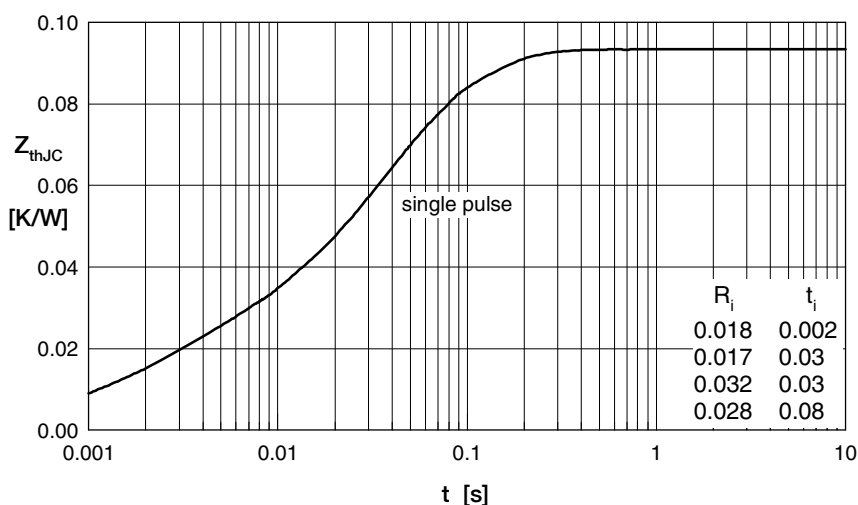


Fig. 7 Typ. transient thermal impedance junction to case

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