

# XPT IGBT

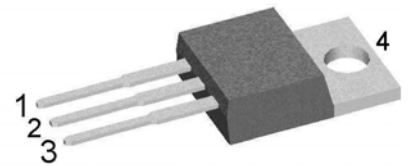
preliminary

$$V_{CES} = 1200V$$

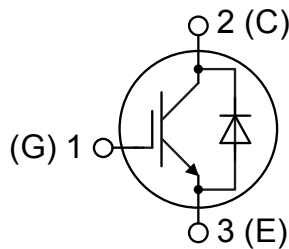
$$I_{C25} = 20A$$

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

Copack

**Part number**
**IXA12IF1200PB**


Backside: collector


**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 Ic
- Thin wafer technology combined with the XPT design results in a competitive low VCE(sat)
- SONIC™ diode
  - fast and soft reverse recovery
  - low operating forward voltage

**Applications:**

- AC motor drives
- Solar inverter
- Medical equipment
- Uninterruptible power supply
- Air-conditioning systems
- Welding equipment
- Switched-mode and resonant-mode power supplies
- Inductive heating, cookers
- Pumps, Fans

**Package: TO-220**

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

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	$T_C = 25^{\circ}\text{C}$			20	A	
$I_{C100}$		$T_C = 100^{\circ}\text{C}$			13	A	
$P_{tot}$	total power dissipation	$T_C = 25^{\circ}\text{C}$			85	W	
$V_{CE(sat)}$	collector emitter saturation voltage	$I_C = 10\text{A}; V_{GE} = 15\text{V}$		1.8	2.1	V	
				2.1		V	
$V_{GE(th)}$	gate emitter threshold voltage	$I_C = 0.3\text{mA}; V_{GE} = V_{CE}$	5.4	5.9	6.5	V	
$I_{CES}$	collector emitter leakage current	$V_{CE} = V_{CES}; V_{GE} = 0\text{V}$			0.1	mA	
				0.1		mA	
$I_{GES}$	gate emitter leakage current	$V_{GE} = \pm 20\text{V}$			500	nA	
$Q_{G(on)}$	total gate charge	$V_{CE} = 600\text{V}; V_{GE} = 15\text{V}; I_C = 10\text{A}$		27		nC	
$t_{d(on)}$	turn-on delay time	inductive load $V_{CE} = 600\text{V}; I_C = 10\text{A}$ $V_{GE} = \pm 15\text{V}; R_G = 100\Omega$		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				1.1		mJ
$E_{off}$	turn-off energy per pulse				1.1		mJ
<b>RBSOA</b>	reverse bias safe operating area	$V_{GE} = \pm 15\text{V}; R_G = 100\Omega$					
$I_{CM}$		$V_{CEmax} = 1200\text{V}$			30	A	
<b>SCSOA</b>	short circuit safe operating area	$V_{CEmax} = 900\text{V}$					
$t_{sc}$	short circuit duration	$V_{CE} = 900\text{V}; V_{GE} = \pm 15\text{V}$			10	$\mu\text{s}$	
$I_{sc}$	short circuit current	$R_G = 100\Omega; \text{non-repetitive}$		40		A	
$R_{thJC}$	thermal resistance junction to case				1.5	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.50		K/W	
<b>Diode</b>							
$V_{RRM}$	max. repetitive reverse voltage	$T_{VJ} = 25^{\circ}\text{C}$			1200	V	
$I_{F25}$	forward current	$T_C = 25^{\circ}\text{C}$			22	A	
$I_{F100}$		$T_C = 100^{\circ}\text{C}$			14	A	
$V_F$	forward voltage	$I_F = 10\text{A}$			2.20	V	
				1.95		V	
$I_R$	reverse current	$V_R = V_{RRM}$			*	mA	
	* not applicable, see Ices value above				*	mA	
$Q_{rr}$	reverse recovery charge	$V_R = 600\text{V}$ $-di_F/dt = -250\text{A}/\mu\text{s}$ $I_F = 10\text{A}; V_{GE} = 0\text{V}$		1.3		$\mu\text{C}$	
$I_{RM}$	max. reverse recovery current		$T_{VJ} = 125^{\circ}\text{C}$		10.5		A
$t_{rr}$	reverse recovery time				350		ns
$E_{rec}$	reverse recovery energy				0.35		mJ
$R_{thJC}$	thermal resistance junction to case				1.8	K/W	
$R_{thCH}$	thermal resistance case to heatsink			0.50		K/W	

preliminary

Package TO-220			Ratings			
Symbol	Definition	Conditions	min.	typ.	max.	Unit
$I_{RMS}$	RMS current	per terminal			35	A
$T_{VJ}$	virtual junction temperature		-40		150	°C
$T_{op}$	operation temperature		-40		125	°C
$T_{stg}$	storage temperature		-40		150	°C
<b>Weight</b>				2		g
$M_D$	mounting torque		0.4		0.6	Nm
$F_C$	mounting force with clip		20		60	N

### Product Marking



### Part number

- I = IGBT
- X = XPT IGBT
- A = Gen 1 / std
- 12 = Current Rating [A]
- IF = Copack
- 1200 = Reverse Voltage [V]
- PB = TO-220AB (3)

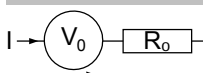
Ordering	Part Number	Marking on Product	Delivery Mode	Quantity	Code No.
Standard	IXA12IF1200PB	IXA12IF1200PB	Tube	50	507428

Similar Part	Package	Voltage class
IXA12IF1200HB	TO-247AD (3)	1200
IXA12IF1200TC	TO-268AA (D3Pak) (2)	1200

### Equivalent Circuits for Simulation

\* on die level

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

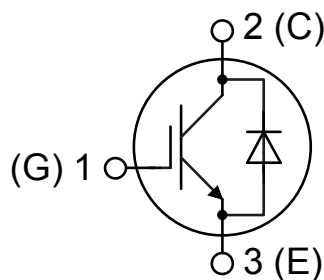


	IGBT	Diode	
$V_{0\text{ max}}$	1.1	1.25	V
$R_{0\text{ max}}$	153	85	mΩ

Outlines TO-220



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.32	4.82	0.170	0.190
A1	1.14	1.39	0.045	0.055
A2	2.29	2.79	0.090	0.110
b	0.64	1.01	0.025	0.040
b2	1.15	1.65	0.045	0.065
C	0.35	0.56	0.014	0.022
D	14.73	16.00	0.580	0.630
E	9.91	10.66	0.390	0.420
e	2.54	BSC	0.100	BSC
H1	5.85	6.85	0.230	0.270
L	12.70	13.97	0.500	0.550
L1	2.79	5.84	0.110	0.230
ØP	3.54	4.08	0.139	0.161
Q	2.54	3.18	0.100	0.125



## IGBT

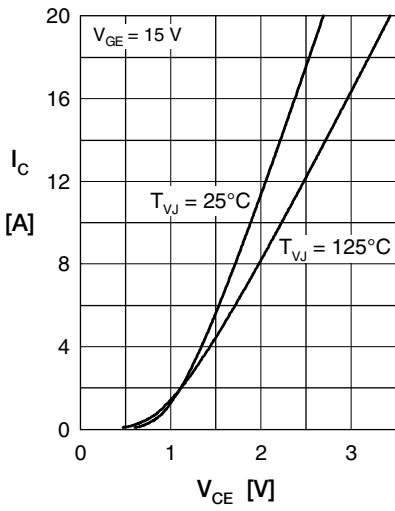


Fig. 1 Typ. output characteristics

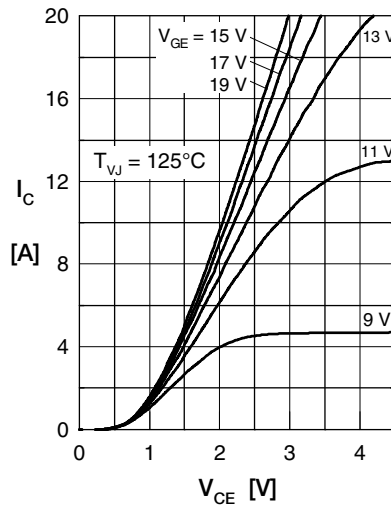


Fig. 2 Typ. output characteristics

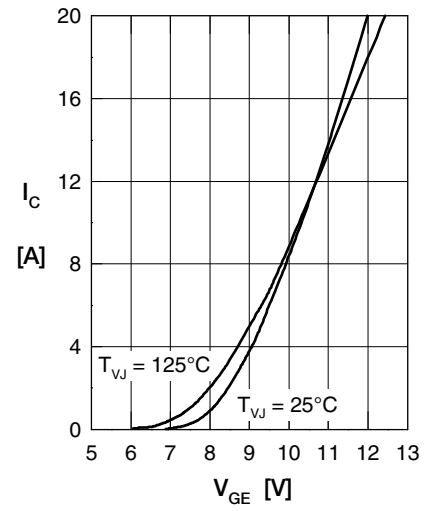


Fig. 3 Typ. transfer characteristics

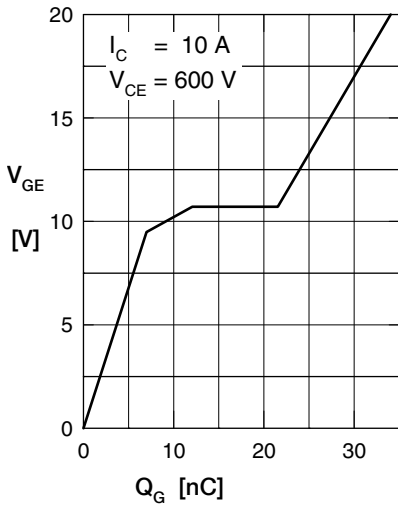


Fig. 4 Typ. turn-on gate charge

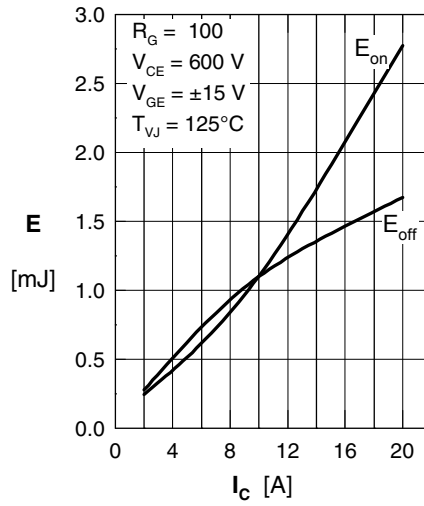


Fig. 5 Typ. switching energy vs. collector current

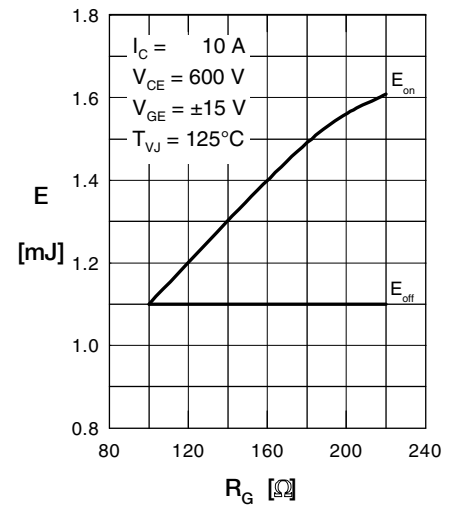


Fig. 6 Typ. switching energy vs. gate resistance

Fig. 7 Typ. transient thermal impedance junction to case

## Diode

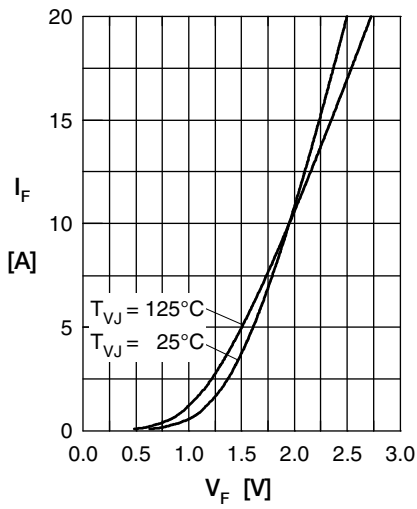


Fig. 1 Typ. forward current versus  $V_F$

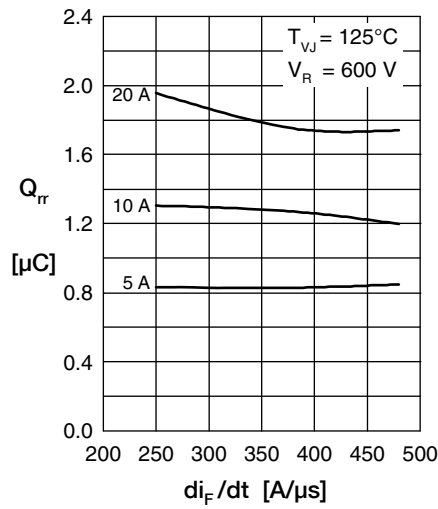


Fig. 2 Typical reverse recov. charge  $Q_{rr}$  versus  $di_F/dt$

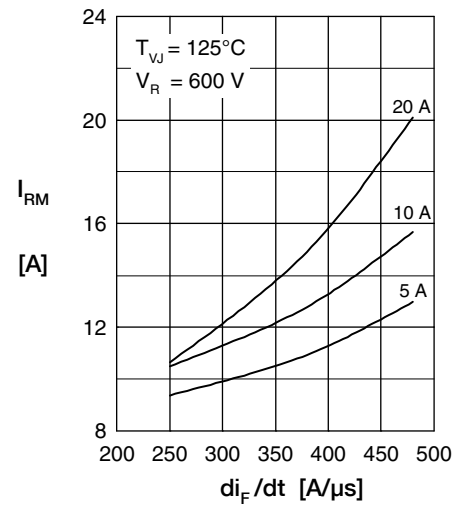


Fig. 3 Typ. peak reverse current  $I_{RM}$  versus  $di_F/dt$

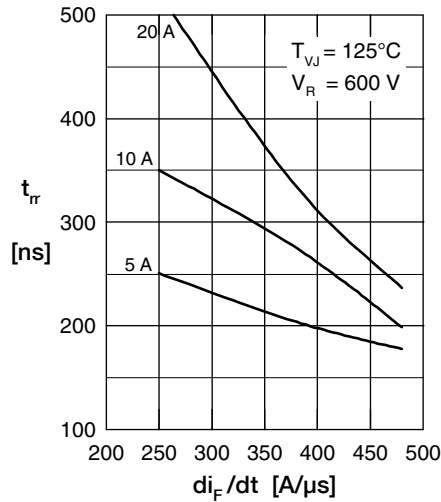


Fig. 4 Dynamic parameters  $Q_{rr}$ ,  $I_{RM}$  versus  $T_{VJ}$

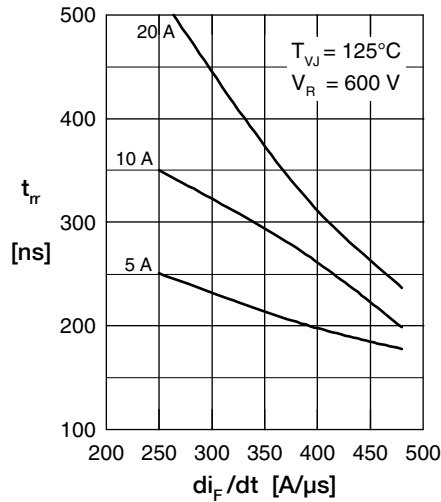


Fig. 5 Typ. recovery time  $t_{rr}$  versus  $di_F/dt$

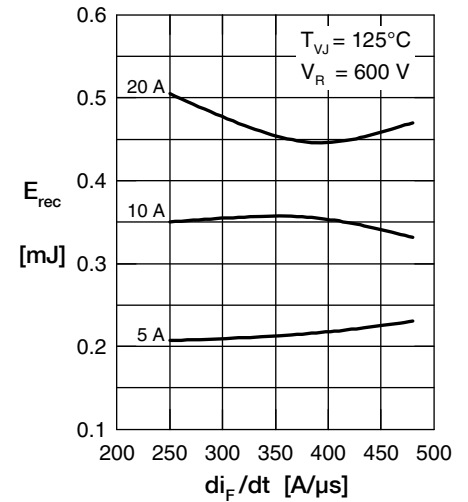


Fig. 6 Typ. recovery energy  $E_{rec}$  vs.  $di_F/dt$

Fig. 7 Typ. transient thermal impedance junction to case



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