preliminary

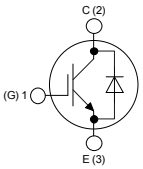
XPT IGBT

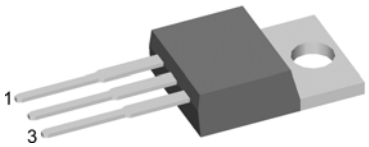
Copack

I_{C25} = 20 A
V_{CES} = 1200 V
$V_{CE(sat)typ}$ = 1.8 V

Part number

IXA12IF1200PB





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 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)
- 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

Package:

- Housing: TO-220
- Industry standard outline
- Epoxy meets UL 94V-0
- RoHS compliant

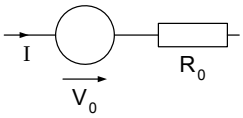
IGBT

				Ratings			
Symbol	**Definition**	**Conditions**		**min.**	**typ.**	**max.**	**Unit**
V_{CES}	*Collector emitter voltage*	V_{GE} = 0 V	T_{VJ} = 25°C			1200	V
V_{GES}	*Maximum DC gate voltage*		T_{VJ} = 25°C			±20	V
I_{C25}	*Collector current*		T_C = 25°C			20	A
I_{C90}			T_C = 90°C			13	A
P_{tot}	*Total power dissipation*		T_{VJ} = 25°C			85	W
I_{CES}	*Collector emitter leakage current*	$V_{CE} = V_{CES}$; V_{GE} = 0 V	T_{VJ} = 25°C			0.1	mA
			T_{VJ} = 125°C		0.1		mA
I_{GES}	*Gate emitter leakage current*	V_{CE} = 0 V; V_{GE} = ±20 V				500	nA
$V_{CE(sat)}$	*Collector emitter saturation voltage*	I_C = 9 A; 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 = 0.3 mA; V_{GE} = V_{CE}		5.4	6	6.5	V
$_{Gon}$	*Total gate charge*	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 10 A			27		nC
$t_{d(on)}$	*Turn-on delay time*				70		ns
t_r	*Current rise time*				40		ns
$t_{d(off)}$	*Turn-off delay time*	Inductive load			250		ns
t_f	*Current fall time*	V_{CE} = 600 V; I_C = 10 A			100		ns
E_{on}	*Turn-on energy per pulse*	V_{GE} = ±15 V; R_G = 100 Ω	T_{VJ} = 125°C		1.1		mJ
E_{off}	*Turn-off energy per pulse*				1.1		mJ
RBSOA	*Reverse bias safe operation area*	V_{GE} = 15 V; R_G = 100 Ω V_{CEK} = 1200 V	T_{VJ} = 125°C			30	A
SCSOA	*Short circuit safe operation area*						
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 = 100 Ω; non-repetitive				40	A
R_{thJC}	*Thermal resistance juntion to case*					1.5	K/W

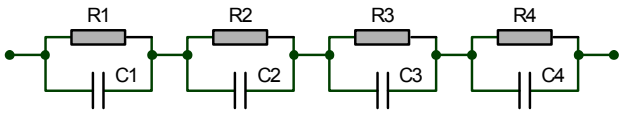
Diode

Symbol	Definition	Conditions		Ratings min.	typ.	max.	Unit
I_{F25}	*Forward current*	T_C = 25°C				22	A
I_{F90}		T_C = 90 °C				14	A
V_F	*Forward voltage*	I_F = 10 A	T_{VJ} = 25°C		1.95	2.2	V
			T_{VJ} = 125 °C		1.95		V
Q_{rr}	*Reverse recovery charge*	V_R = 600 V di_F/dt = - 250 A/µs; I_F = 10 A	T_{VJ} = 125 °C		1.3		µC
I_{RM}	*Maximum reverse recovery current*				10.5		A
t_{rr}	*Reverse recovery time*				350		ns
$E_{rec(off)}$	*Reverse recovery losses at turn-off*				0.35		mJ
R_{thJC}	*Thermal resistance juntion to case*					1.8	K/W

Equivalent Circuits for Simulation



Symbol	Definition		Ratings min.	typ.	max.	Unit
V_0	*IGBT*	T_{VJ} = 150 °C			1.1	V
R_0					153	mΩ
V_0	*Diode*	T_{VJ} = 150 °C			1.25	V
R_0					85	mΩ



$$Zth(t) = \sum_{i=1}^{n} \left[R_i \cdot \left(1 - \exp\left(-\frac{t}{\tau_i} \right) \right) \right]$$

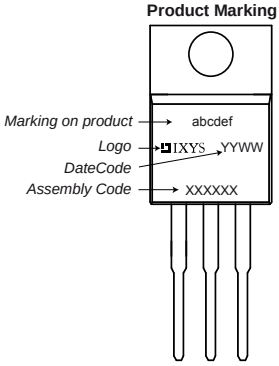
$$\tau_i = R_i \cdot C_i$$

	IGBT	Diode
R_1	tbd	tbd
R_2	tbd	tbd
R_3	tbd	tbd
R_4	tbd	tbd
τ_1	tbd	tbd
τ_2	tbd	tbd
τ_3	tbd	tbd
τ_4	tbd	tbd

Package TO-220

Symbol	Definition	Conditions	Ratings min.	typ.	max.	Unit
T_{VJ}	*Virtual junction temperature*		-55		150	°C
T_{stg}	*Storage temperature*		-55		150	°C
R_{thCH}	*Thermal resistance case to heatsink*			0.50		K/W
Weight				2		g
M_D	*Mounting torque*		0.4		0.6	Nm
F_C	*Mounting force with clip*		20		60	N

Product Marking

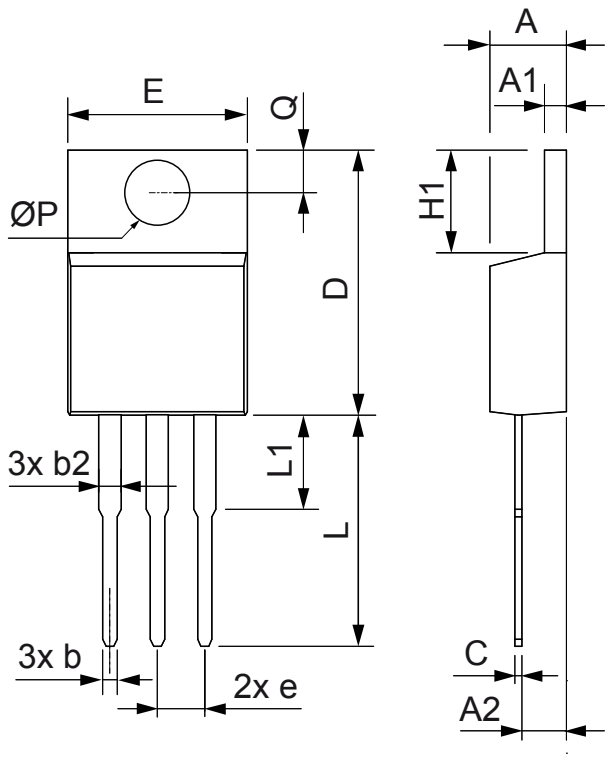


Part number

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 Name	Marking on Product	Delivering Mode	Base Qty	Code Key
Standard	IXA 12 IF 1200 PB	IXA12IF1200PB	Tube	50	507428

Similar Part	Package	Voltage class
IXA12IF1200PC	TO-263AB (D2Pak)	1200
IXA12IF1200HB	TO-247AD (3)	1200
IXA12IF1200TC	TO-268AA (D3Pak)	1200



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

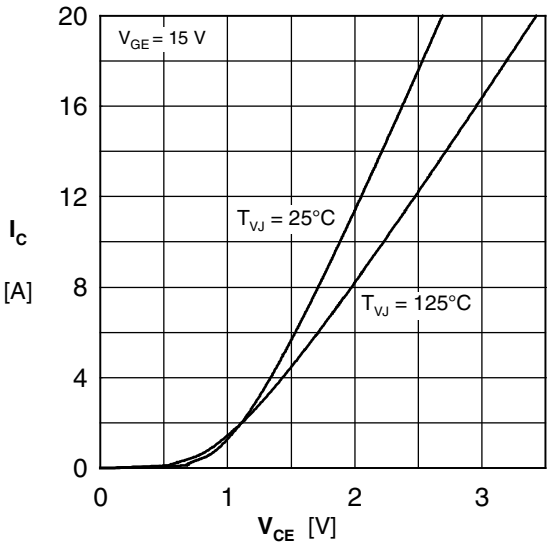


Fig. 1 Typ. output characteristics

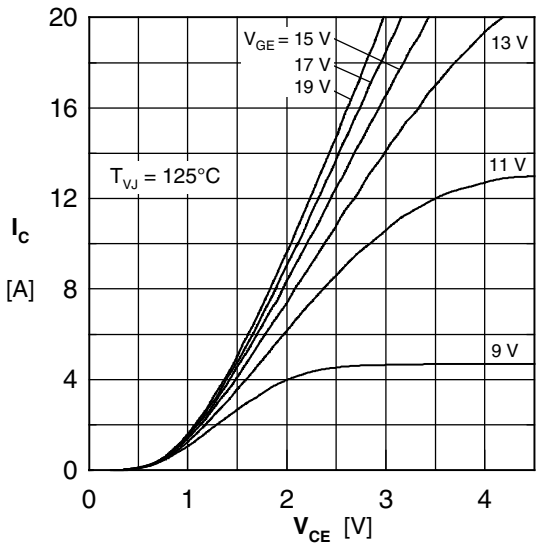


Fig. 2 Typ. output characteristics

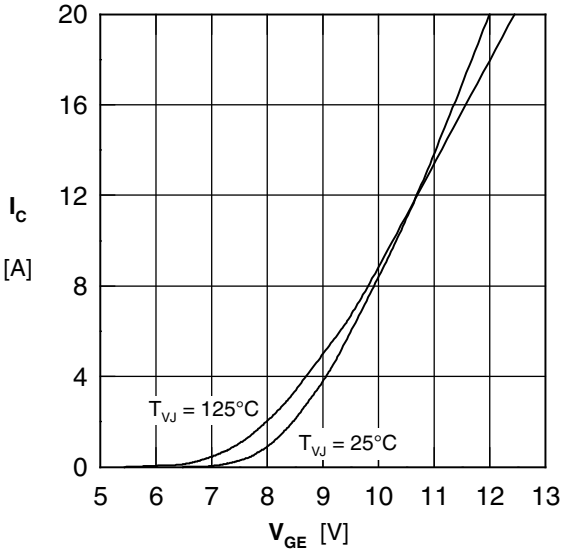


Fig. 3 Typ. tranfer characteristics

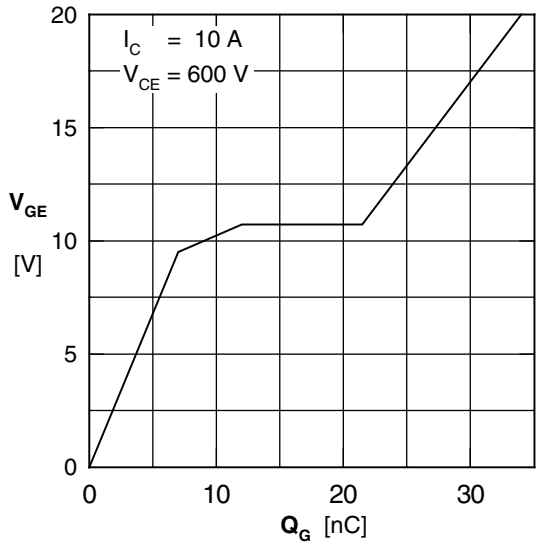


Fig. 4 Typ. turn-on gate charge

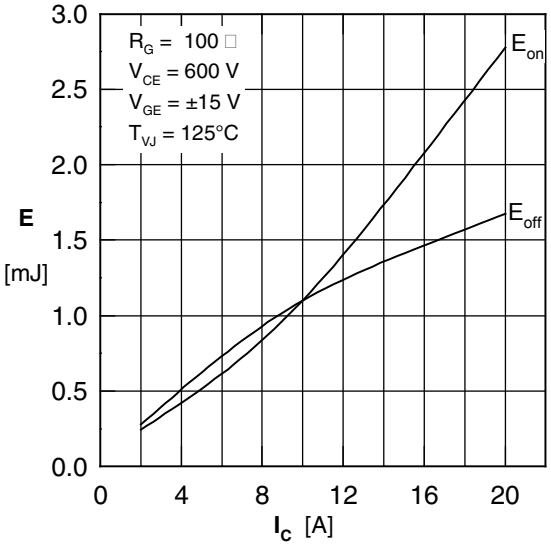


Fig. 5 Typ. switching energy vs. collector current

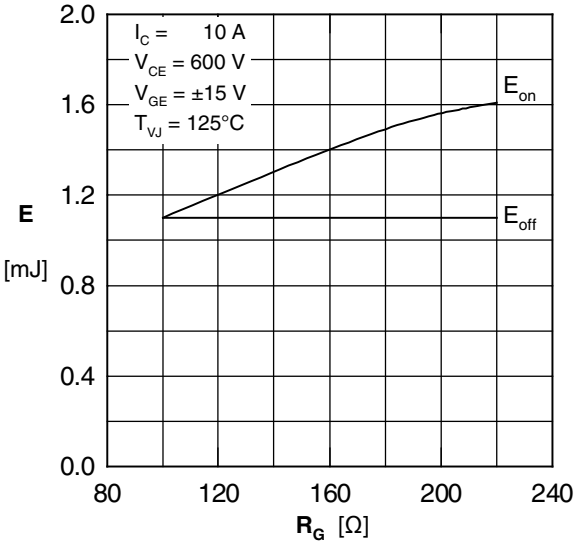


Fig. 6 Typ. switching energy vs. gate resistance

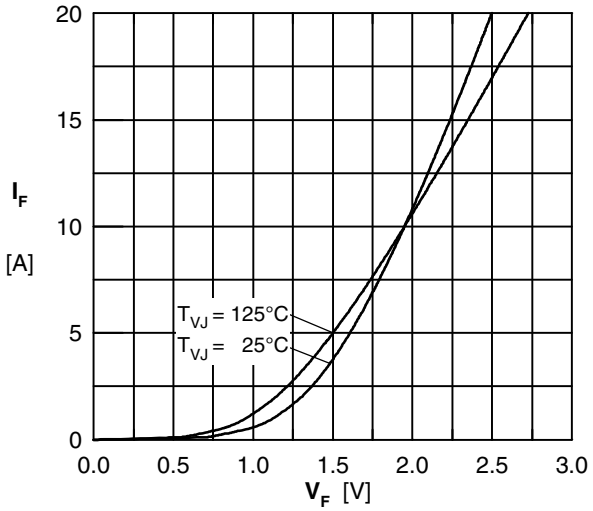


Fig. 7 Typ. forward characteristics

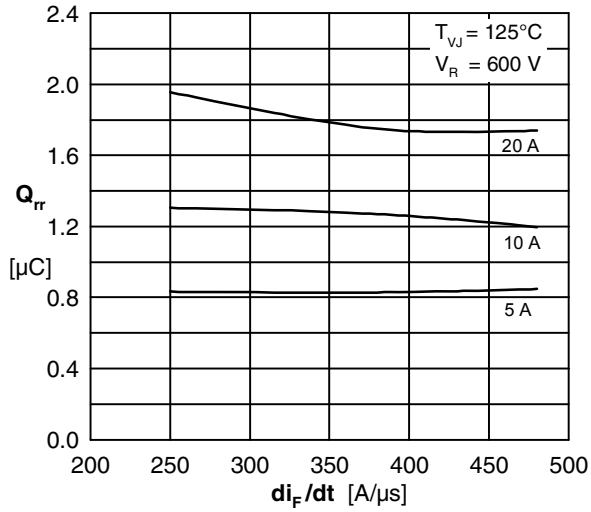


Fig. 8 Typical reverse recovery charge Q_{rr} versus. di_F/dt (125°C)

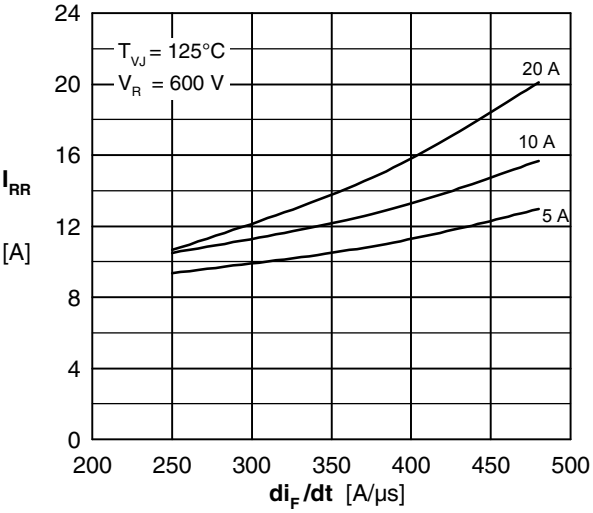


Fig. 9 Typical peak reverse current I_{RR} versus di_F/dt (125°C)

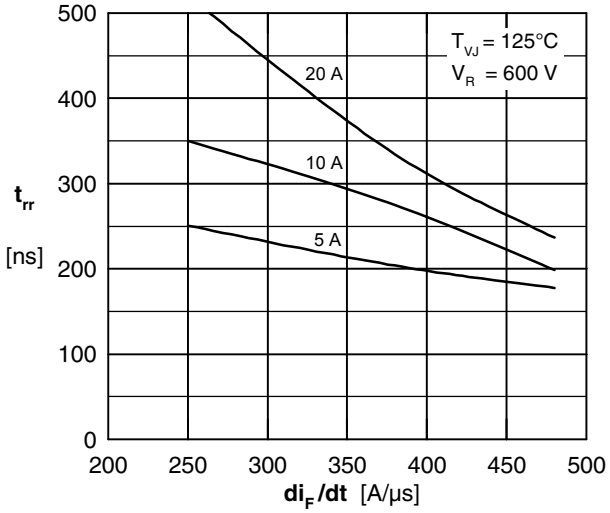


Fig. 10 Typ. recovery time t_{rr} vs. di/dt (125°C)

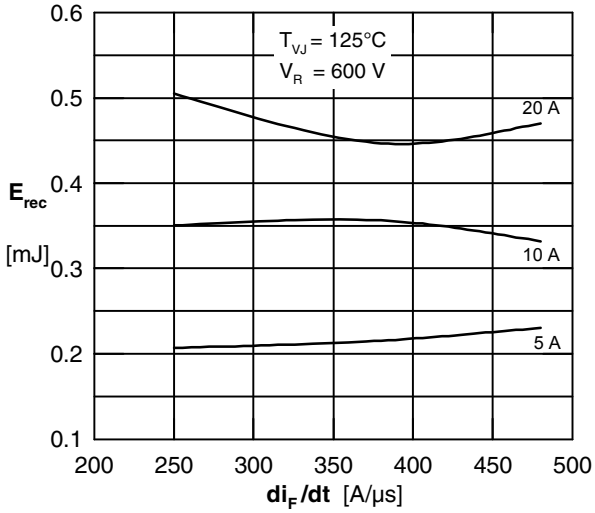


Fig. 11 Typ. recovery energy E_{rec} vs. di_F/dt (125°C)