preliminary

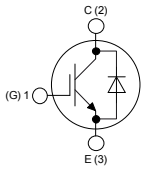
XPT IGBT

Copack

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

Part number

IXA12IF1200TC



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-268AA (D3Pak)
- Industry standard outline
- Epoxy meets UL 94V-0
- RoHS compliant

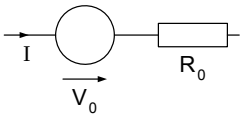
IGBT

				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_{C100}			T_C = 100°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

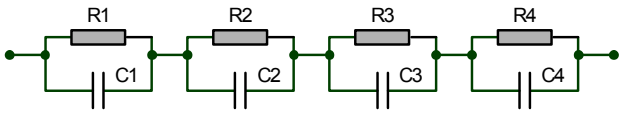
Diode

Symbol	Definition	Conditions		Ratings min.	typ.	max.	Unit
I_{F25}	*Forward current*	T_C = 25°C				22	A
I_{F100}		T_C = 100 °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



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

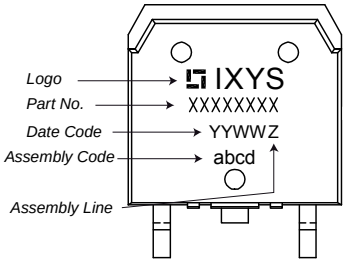
$$\tau_i = R_i \cdot C_i$$

	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-268AA (D3Pak)

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*			0.15		K/W
Weight				5		g
F_C	*Mounting force with clip*		20		120	N

Product Marking

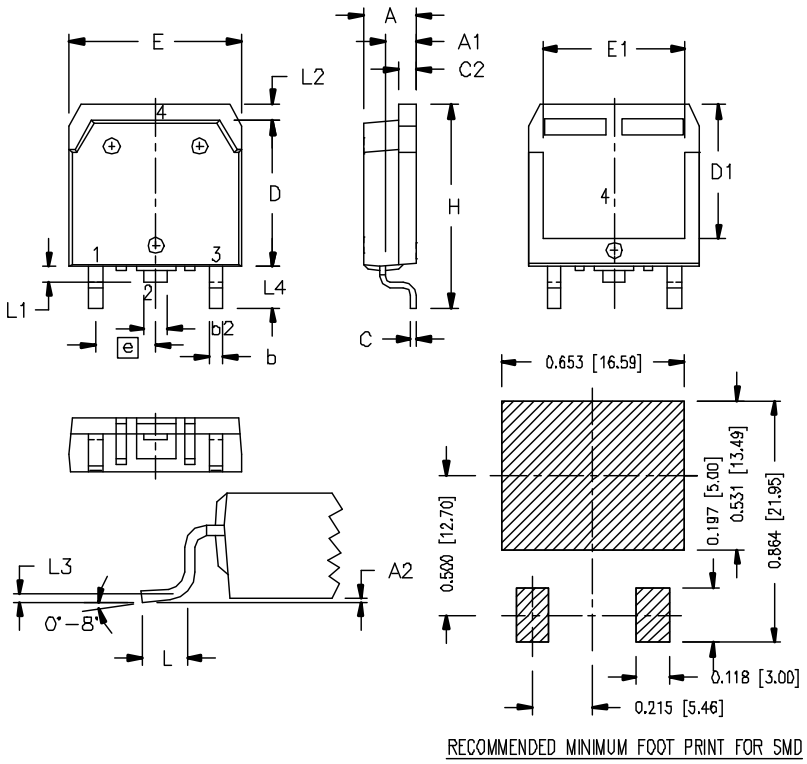


Part number

I = IGBT
X = XPT IGBT
A = Gen 1 / std
12 = Current Rating [A]
IF = Copack
1200 = Reverse Voltage [V]
TC = TO-268AA (D3Pak) (2)

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Code Key
Standard	IXA 12 IF 1200 TC	IXA12IF1200TC			

Similar Part	Package	Voltage class
IXA12IF1200HB	TO-247AD (3)	1200
IXA12IF1200PB	TO-220AB (3)	1200
IXA12IF1200PC	TO-263AB (D2Pak)	1200



RECOMMENDED MINIMUM FOOT PRINT FOR SMD

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
H	.736	.752	18.70	19.10
L	.094	.106	2.40	2.70
L1	.047	.055	1.20	1.40
L2	.039	.045	1.00	1.15
L3	.010 BSC		0.25 BSC	
L4	.150	.161	3.80	4.10

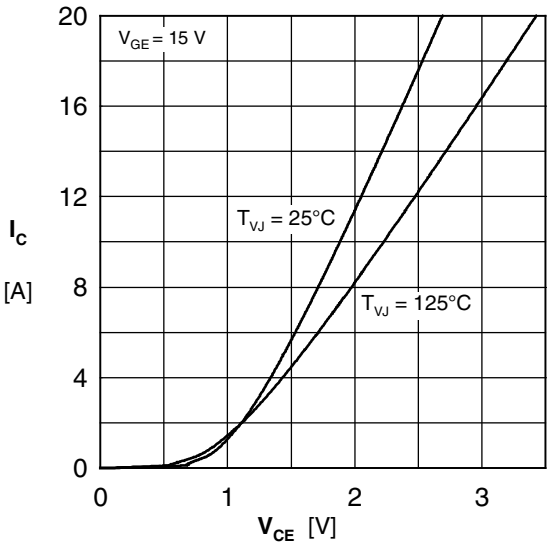


Fig. 1 Typ. output characteristics

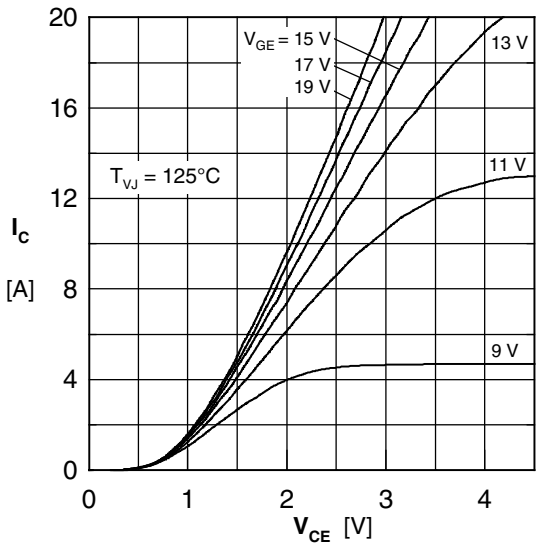


Fig. 2 Typ. output characteristics

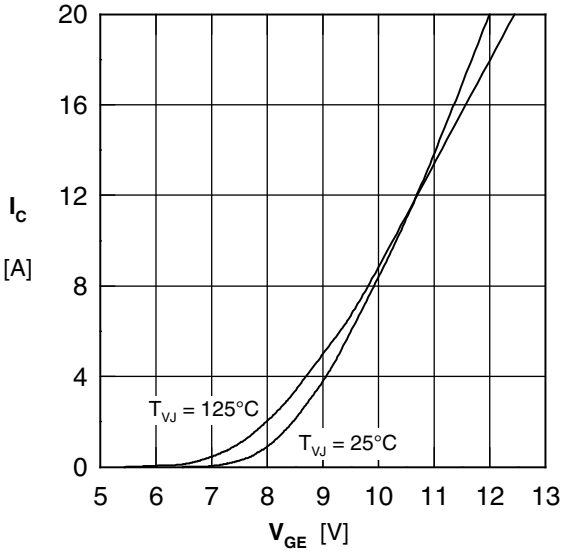


Fig. 3 Typ. tranfer characteristics

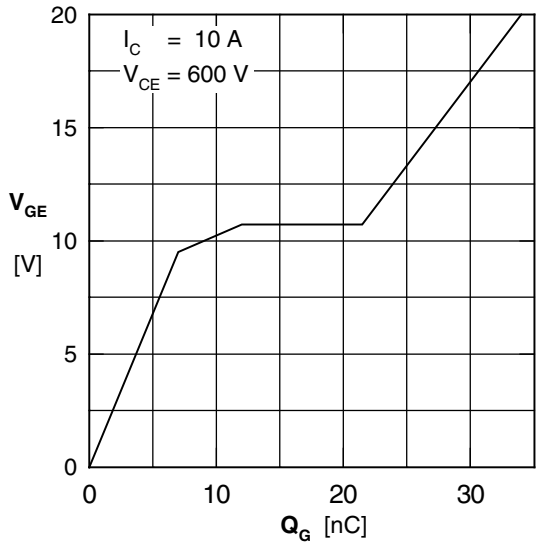


Fig. 4 Typ. turn-on gate charge

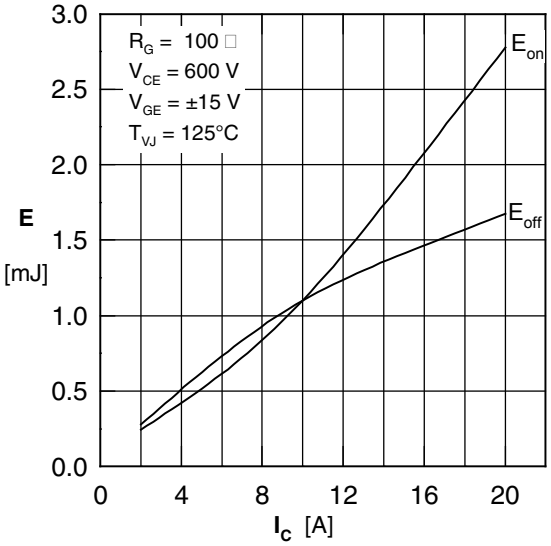


Fig. 5 Typ. switching energy vs. collector current

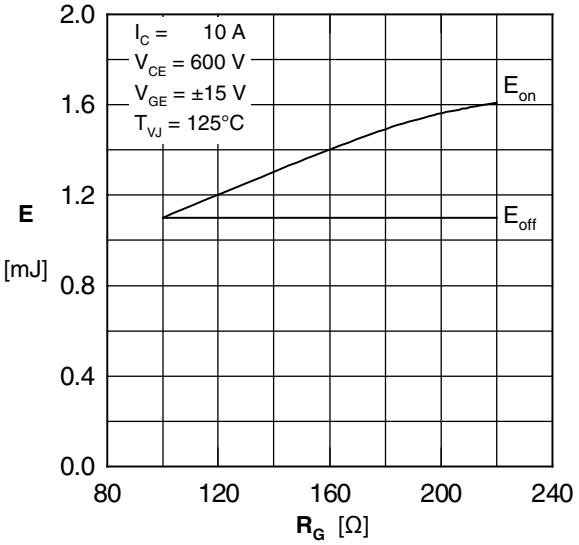


Fig. 6 Typ. switching energy vs. gate resistance

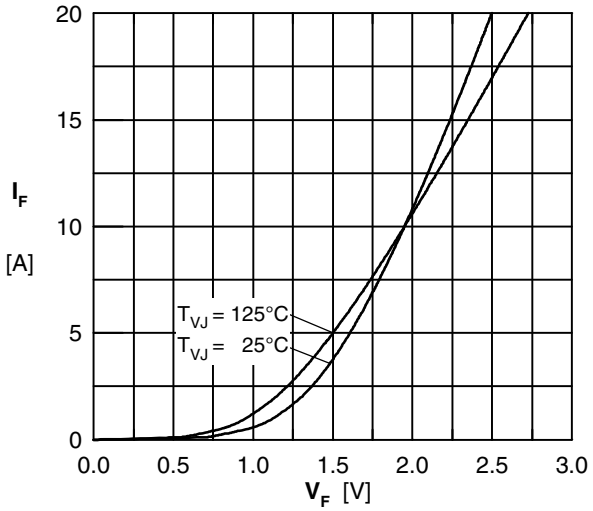


Fig. 7 Typ. forward characteristics

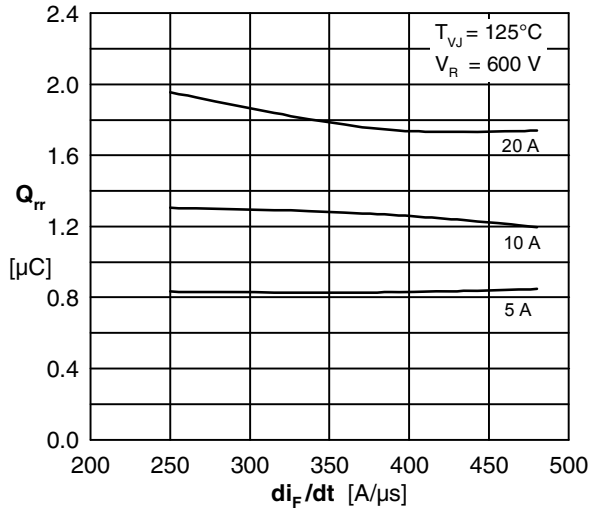


Fig. 8 Typical reverse recovery charge Q_{rr} versus. di_F/dt (125°C)

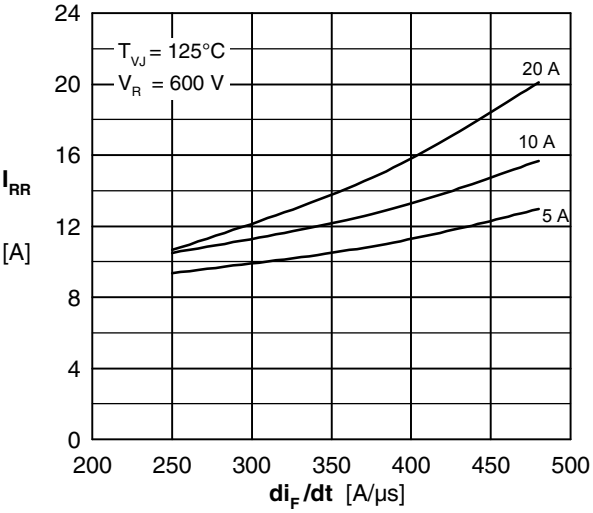


Fig. 9 Typical peak reverse current I_{RR} versus di_F/dt (125°C)

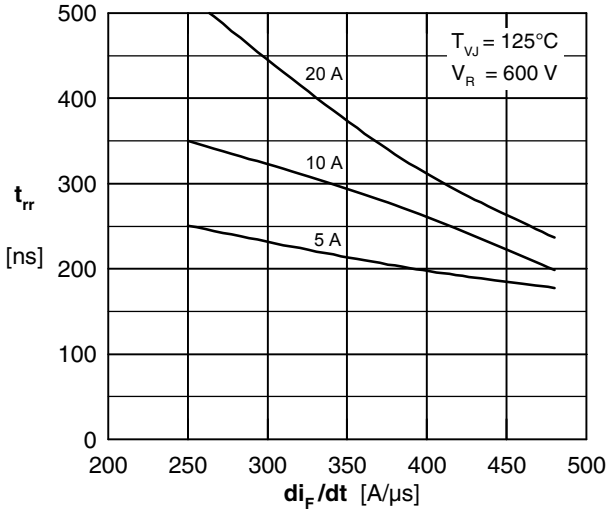


Fig. 10 Typ. recovery time t_{rr} vs. di/dt (125°C)

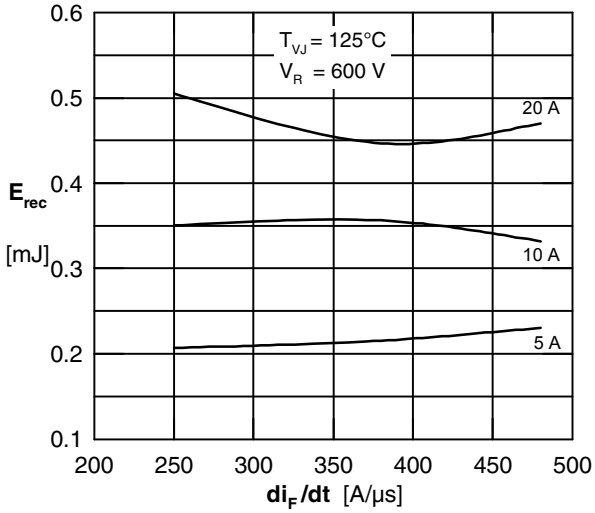


Fig. 11 Typ. recovery energy E_{rec} vs. di_F/dt (125°C)