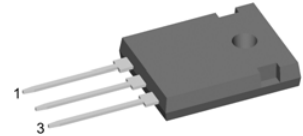
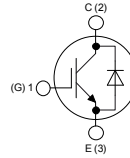


# XPT IGBT

Copack

$I_{C25} = 58 \text{ A}$   
 $V_{CES} = 1200 \text{ V}$   
 $V_{CE(sat)typ} = 1.8 \text{ V}$

**Part number**  
**IXA33IF1200HB**



### 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  $\mu\text{sec}$ .
  - 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:

- 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:

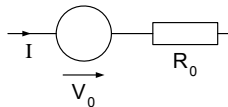
- Housing: TO-247
- Industry standard outline
- Epoxy meets UL 94V-0
- RoHS compliant

## IGBT

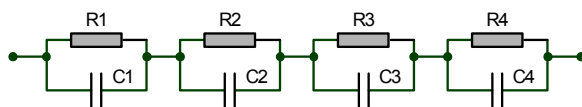
Symbol	Definition	Conditions	Ratings			Unit
			min.	typ.	max.	
$V_{CES}$	Collector emitter voltage	$V_{GE} = 0 \text{ V}$			1200	V
$V_{GES}$	Maximum DC gate voltage				$\pm 20$	V
$I_{C25}$	Collector current				58	A
$I_{C100}$					34	A
$P_{tot}$	Total power dissipation				250	W
$I_{CES}$	Collector emitter leakage current	$V_{CE} = V_{CES} ; V_{GE} = 0 \text{ V}$			0.1	mA
				0.1		mA
$I_{GES}$	Gate emitter leakage current	$V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$			500	nA
$V_{CE(sat)}$	Collector emitter saturation voltage	$I_C = 25 \text{ A}; V_{GE} = 15 \text{ V}$		1.8	2.1	V
				2.1		V
$V_{GE(th)}$	Gate emitter threshold voltage	$I_C = 1 \text{ mA}; V_{GE} = V_{CE}$	5.4	6	6.5	V
$Q_{Gon}$	Total gate charge	$V_{CE} = 600 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 25 \text{ A}$		76		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	$V_{CE} = 600 \text{ V}; I_C = 25 \text{ A}$		100		ns
$E_{on}$	Turn-on energy per pulse	$V_{GE} = \pm 15 \text{ V}; R_G = 39 \Omega$		2.5		mJ
$E_{off}$	Turn-off energy per pulse			3.0		mJ
<b>RBSOA</b>	Reverse bias safe operation area	$V_{GE} = 15 \text{ V}; R_G = 39 \Omega$ $V_{CEK} = 1200 \text{ V}$			75	A
<b>SCSOA</b>	Short circuit safe operation area					
$t_{sc}$	Short circuit duration	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15 \text{ V}$			10	$\mu\text{s}$
$I_{sc}$	Short circuit current	$R_G = 39 \Omega$ ; non-repetitive			100	A
$R_{thJC}$	Thermal resistance junction to case				0.5	K/W

**Diode**

Symbol	Definition	Conditions	Ratings			Unit	
			min.	typ.	max.		
$I_{F25}$	Forward current	$T_C = 25^\circ\text{C}$			60	A	
$I_{F100}$		$T_C = 100^\circ\text{C}$			33	A	
$V_F$	Forward voltage	$I_F = 30\text{ A}$		$T_{VJ} = 25^\circ\text{C}$	1.95	2.2	V
				$T_{VJ} = 125^\circ\text{C}$	1.95		V
$Q_{rr}$	Reverse recovery charge	$V_R = 600\text{ V}$		$T_{VJ} = 125^\circ\text{C}$	3.5		$\mu\text{C}$
$I_{RM}$	Maximum reverse recovery current				30		A
$t_{rr}$	Reverse recovery time	$I_F = 30\text{ A}$		$T_{VJ} = 125^\circ\text{C}$	350		ns
$E_{rec(off)}$	Reverse recovery losses at turn-off				0.9		mJ
$R_{thJC}$	Thermal resistance junction to case				0.7		K/W

**Equivalent Circuits for Simulation**


Symbol	Definition		Ratings			Unit
			min.	typ.	max.	
$V_0$	IGBT	$T_{VJ} = 150^\circ\text{C}$			1.1	V
$R_0$			55		$\text{m}\Omega$	
$V_0$	Diode	$T_{VJ} = 150^\circ\text{C}$			1.25	V
$R_0$			28.3		$\text{m}\Omega$	



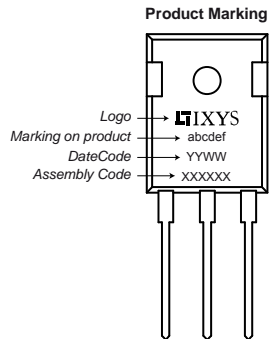
$$Z_{th}(t) = \sum_{i=1}^n \left[ R_i \cdot \left( 1 - \exp\left(-\frac{t}{\tau_i}\right) \right) \right]$$

$$\tau_i = R_i \cdot C_i$$

	IGBT	Diode
$R_1$	0.116	0.16
$R_2$	0.1	0.12
$R_3$	0.112	0.15
$R_4$	0.172	0.27
$\tau_1$	0.0006	0.0005
$\tau_2$	0.2	0.004
$\tau_3$	0.006	0.02
$\tau_4$	0.05	0.15

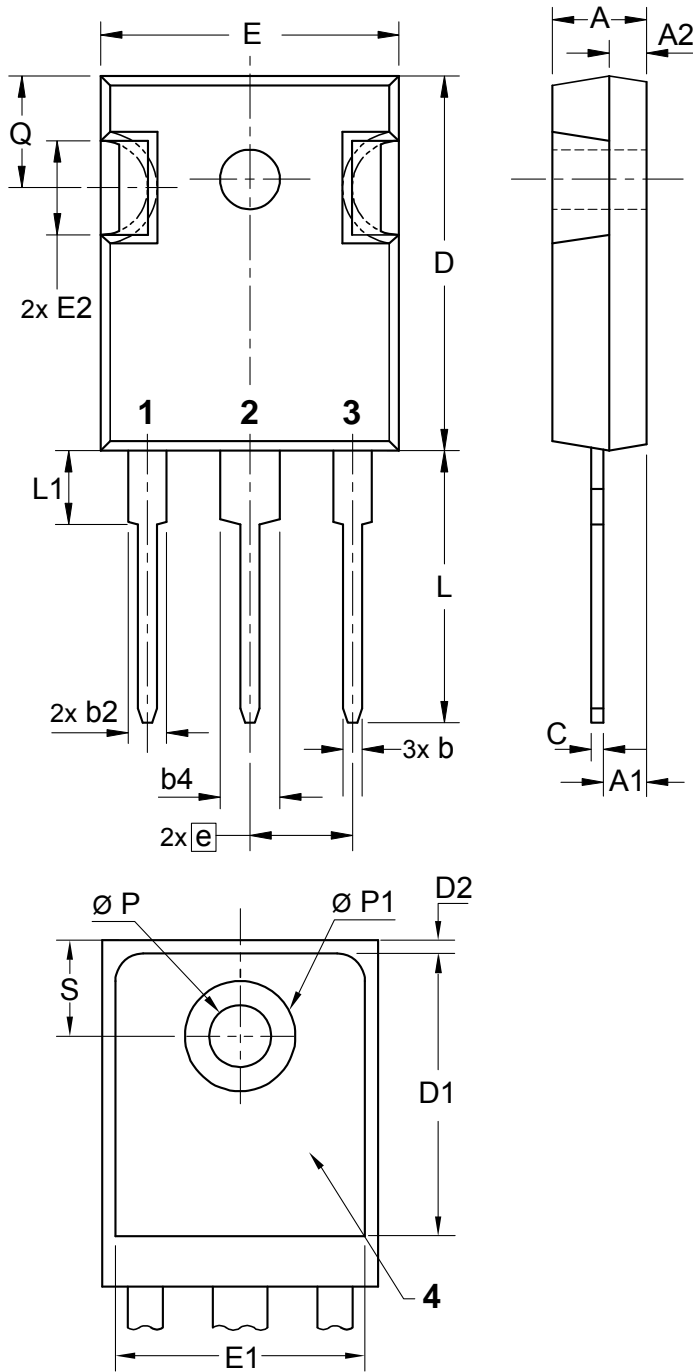
**Package TO-247**

Symbol	Definition	Conditions	Ratings			Unit
			min.	typ.	max.	
$T_{vj}$	Virtual junction temperature		-55		150	°C
$T_{stg}$	Storage temperature		-55		150	°C
$R_{thCH}$	Thermal resistance case to heatsink			0.25		K/W
<b>Weight</b>				6		g
$M_D$	Mounting torque		0.8		1.2	Nm
$F_c$	Mounting force with clip		20		120	N


**Part number**

I = IGBT  
 X = XPT IGBT  
 A = Gen 1 / std  
 33 = Current Rating [A]  
 IF = Copack  
 1200 = Reverse Voltage [V]  
 HB = TO-247AD (3)

Ordering	Part Name	Marking on Product	Delivering Mode	Base Qty	Code Key
Standard	IXA 33 IF 1200 HB	IXA33IF1200HB			



Sym.	Inches		Millimeter	
	min.	max.	min.	max.
A	0.185	0.209	4.70	5.30
A1	0.087	0.102	2.21	2.59
A2	0.059	0.098	1.50	2.49
D	0.819	0.845	20.79	21.45
E	0.610	0.640	15.48	16.24
E2	0.170	0.216	4.31	5.48
e	0.215 BSC		5.46 BSC	
L	0.780	0.800	19.80	20.30
L1	-	0.177	-	4.49
$\varnothing P$	0.140	0.144	3.55	3.65
Q	0.212	0.244	5.38	6.19
S	0.242 BSC		6.14 BSC	
b	0.039	0.055	0.99	1.40
b2	0.065	0.094	1.65	2.39
b4	0.102	0.135	2.59	3.43
c	0.015	0.035	0.38	0.89
D1	0.515	-	13.07	-
D2	0.020	0.053	0.51	1.35
E1	0.530	-	13.45	-
$\varnothing P1$	-	0.29	-	7.39

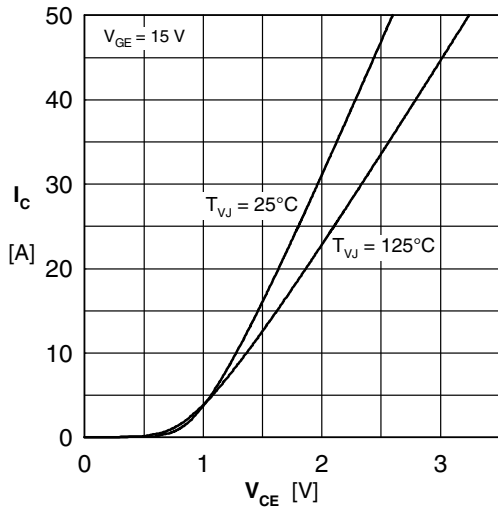


Fig. 1 Typ. output characteristics

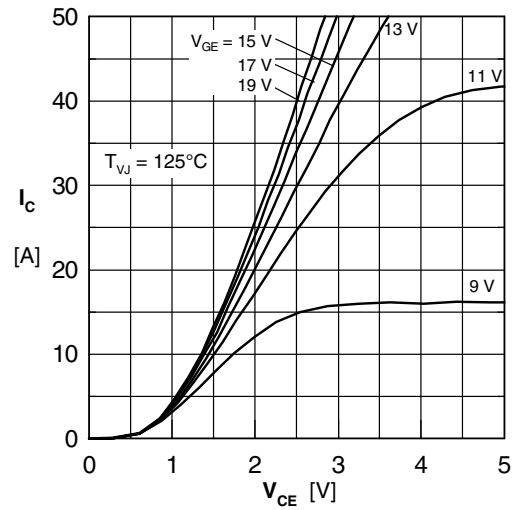


Fig. 2 Typ. output characteristics

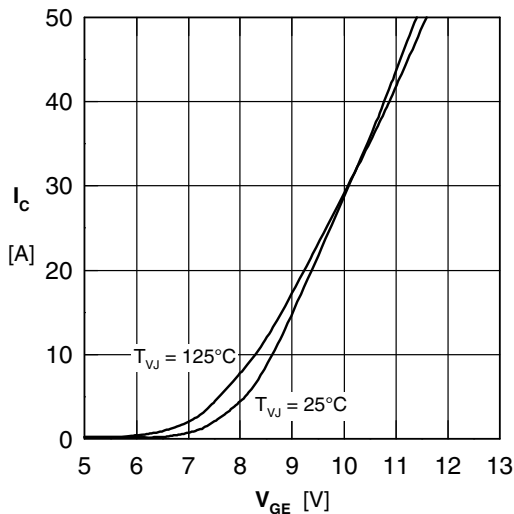


Fig. 3 Typ. transfer characteristics

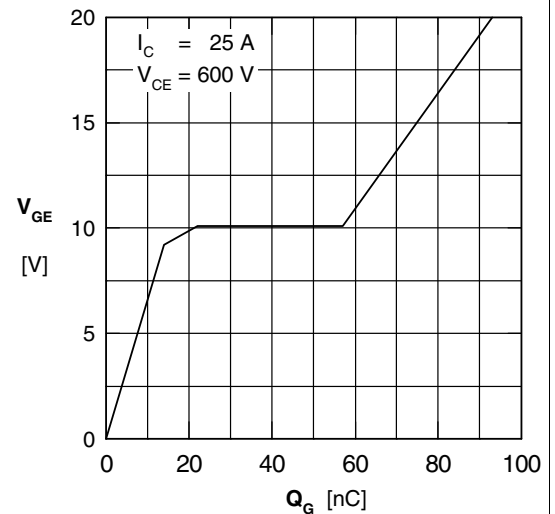


Fig. 4 Typ. turn-on gate charge

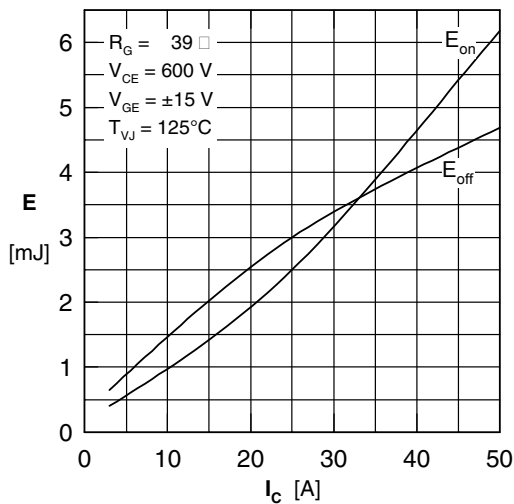


Fig. 5 Typ. switching energy vs. collector current

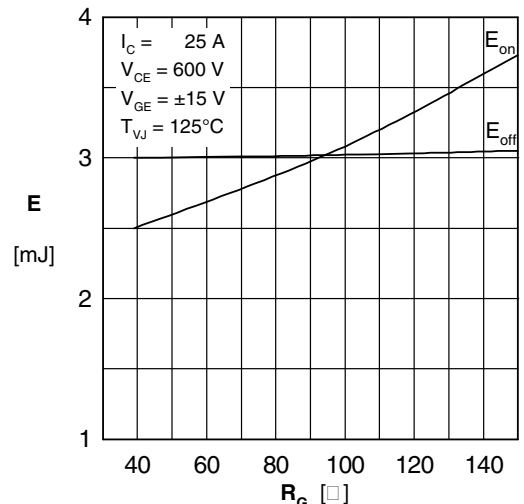


Fig. 6 Typ. switching energy vs. gate resistance

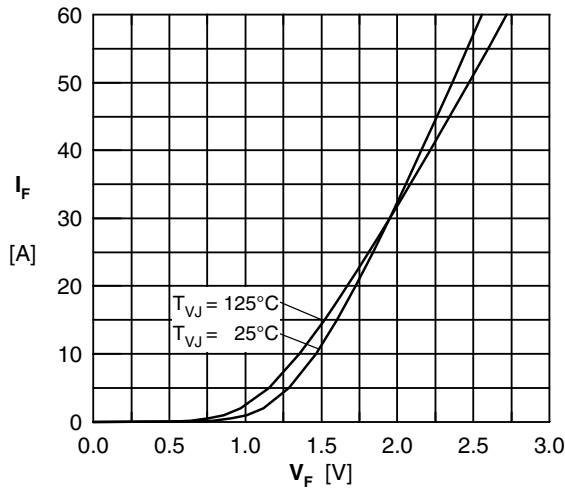


Fig. 7 Typ. Forward current versus  $V_F$

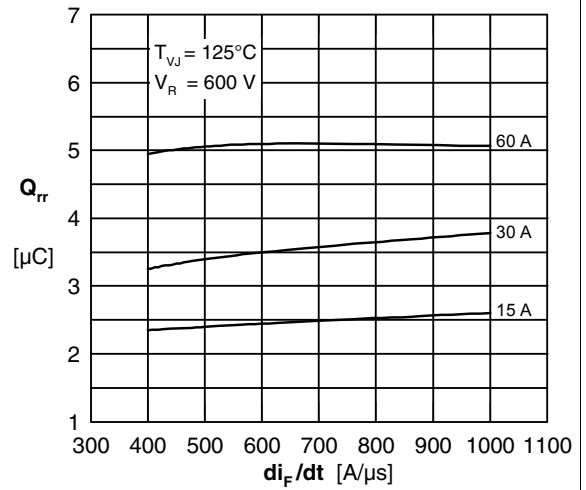


Fig. 8 Typ. reverse recov.charge  $Q_{rr}$  vs.  $di/dt$

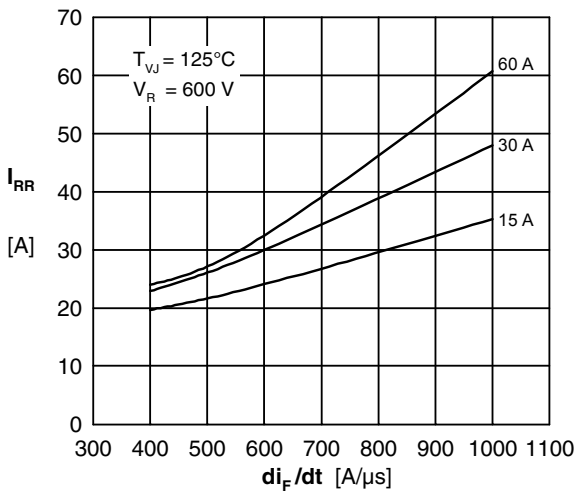


Fig. 9 Typ. peak reverse current  $I_{RM}$  vs.  $di/dt$

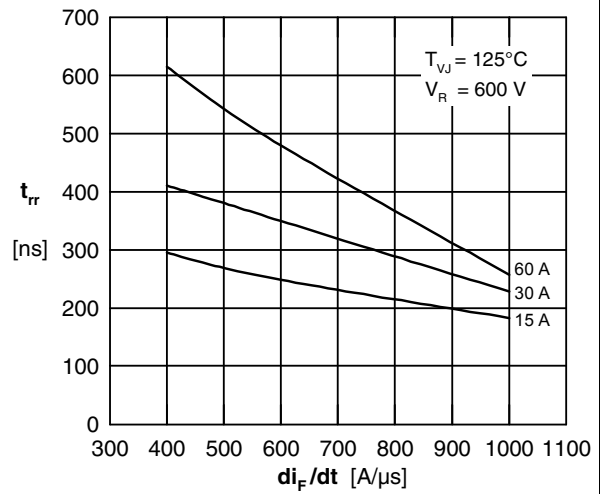


Fig. 10 Typ. recovery time  $t_{rr}$  versus  $di/dt$

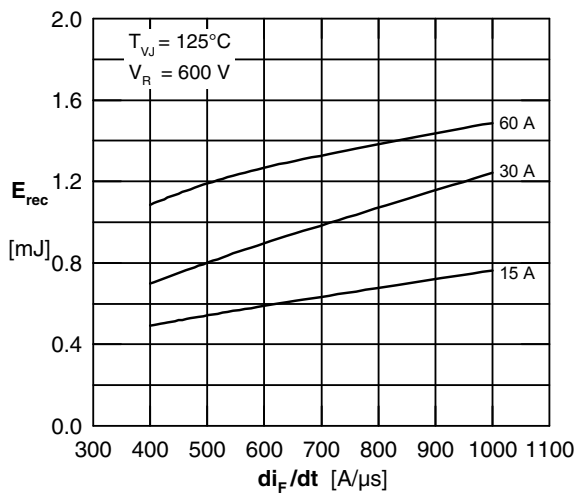


Fig. 11 Typ. recovery energy  $E_{rec}$  versus  $di/dt$

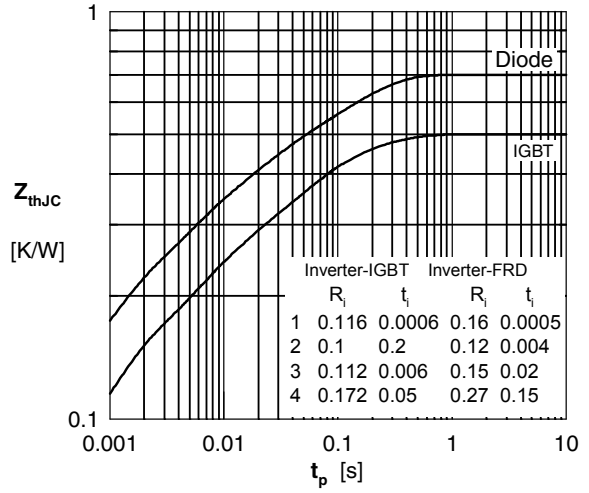


Fig. 12 Typ. transient thermal impedance