

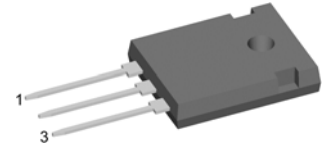
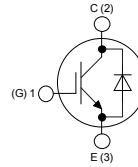
# XPT IGBT

Copack

$I_{C25} = 78 \text{ A}$   
 $V_{CES} = 1200 \text{ V}$   
 $V_{CE(sat)typ} = 1.8 \text{ V}$

Part number

**IXA45IF1200HB**



### 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

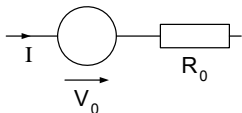
## IGBT

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				78	A
$I_{C100}$					45	A
$P_{tot}$	Total power dissipation				325	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	$I_C = 35 \text{ A}; V_{GE} = 15 \text{ V}$		1.8	2.1	V
				2.1		V
$V_{GE(th)}$	Gate emitter threshold voltage	$I_C = 1.5 \text{ mA}; V_{GE} = V_{CE}$	5.4	6	6.5	V
$Q_{Gon}$	Total gate charge	$V_{CE} = 600 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 35 \text{ A}$		106		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	$V_{CE} = 600 \text{ V}; I_C = 35 \text{ A}$		100		ns
$E_{on}$	Turn-on energy per pulse	$V_{GE} = \pm 15 \text{ V}; R_G = 27 \Omega$	$T_{VJ} = 125^\circ\text{C}$	3.8		mJ
$E_{off}$	Turn-off energy per pulse			4.1		mJ
<b>RBSOA</b>	Reverse bias safe operation area	$V_{GE} = 15 \text{ V}; R_G = 27 \Omega$ $V_{CEK} = 1200 \text{ V}$	$T_{VJ} = 125^\circ\text{C}$		105	A
<b>SCSOA</b>	Short circuit safe operation area					
$t_{sc}$	Short circuit duration	$V_{CE} = 900 \text{ V}; V_{GE} = \pm 15 \text{ V}$	$T_{VJ} = 125^\circ\text{C}$		10	$\mu\text{s}$
$I_{sc}$	Short circuit current	$R_G = 27 \Omega$ ; non-repetitive			140	A
$R_{thJC}$	Thermal resistance junction to case				0.38	K/W

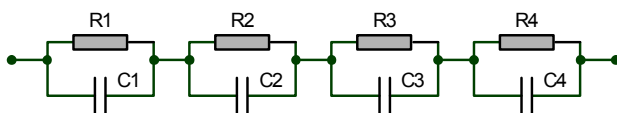
## Diode

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	$V_R = 600\text{ V}$		3.5		$\mu\text{C}$
$I_{RM}$	Maximum reverse recovery current	$di_F/dt = - 600\text{ A}/\mu\text{s};$	$T_{VJ} = 125^\circ\text{C}$	30		A
$t_{rr}$	Reverse recovery time	$I_F = 30\text{ A}$		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
$R_0$					39	m $\Omega$
$V_0$	Diode	$T_{VJ} = 150^\circ\text{C}$			1.25	V
$R_0$					28.3	m $\Omega$



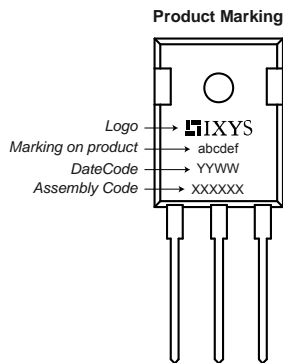
$$Z_{th}(t) = \sum_{i=1}^n \left[ R_i \cdot \left( 1 - \exp\left(-\frac{t}{\tau_i}\right) \right) \right]$$

$$\tau_i = R_i \cdot C_i$$

	IGBT	Diode
$R_1$	0.07	0.16
$R_2$	0.113	0.12
$R_3$	0.055	0.15
$R_4$	0.142	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

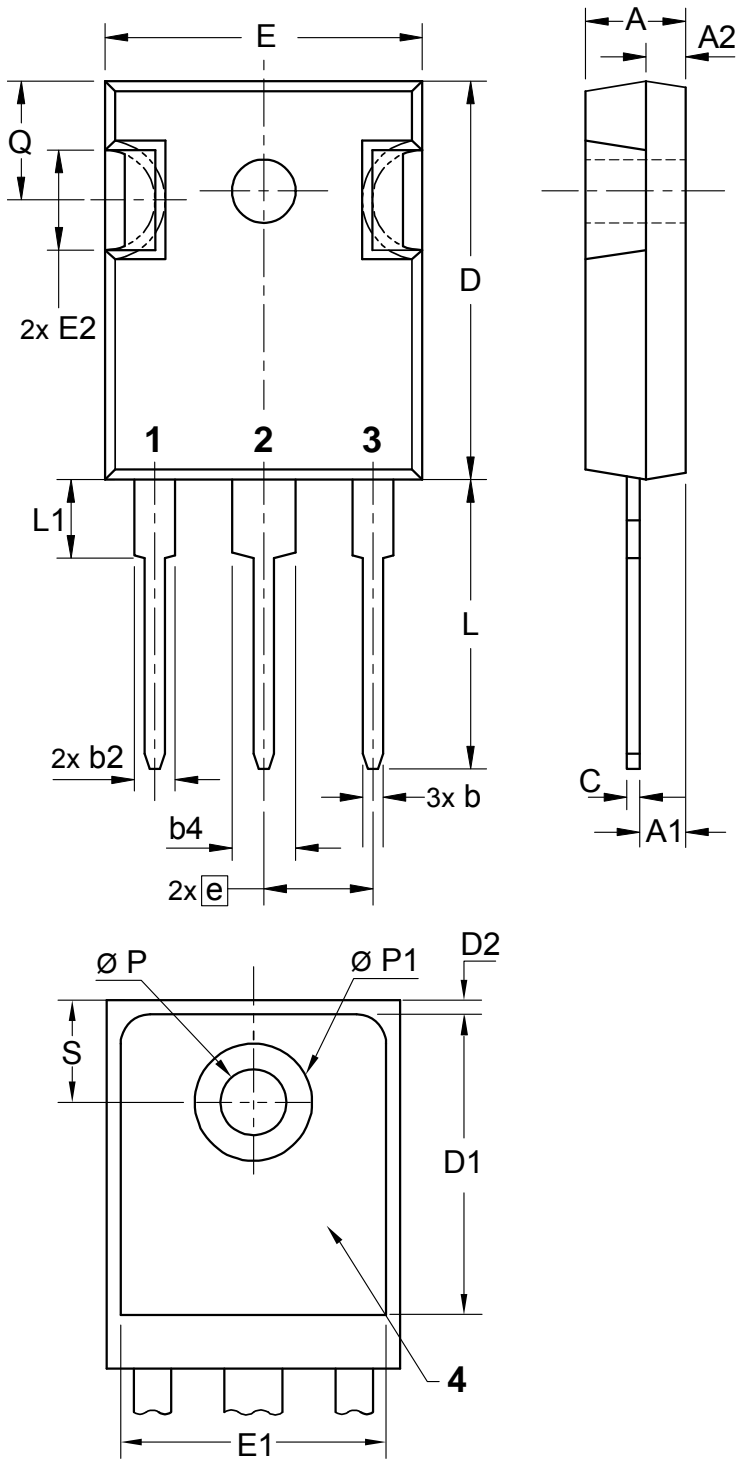
**Package TO-247**

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  
 45 = 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 45 IF 1200 HB	IXA45IF1200HB	Tube	30	507837



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
Ø 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	-
Ø P1	-	0.29	-	7.39

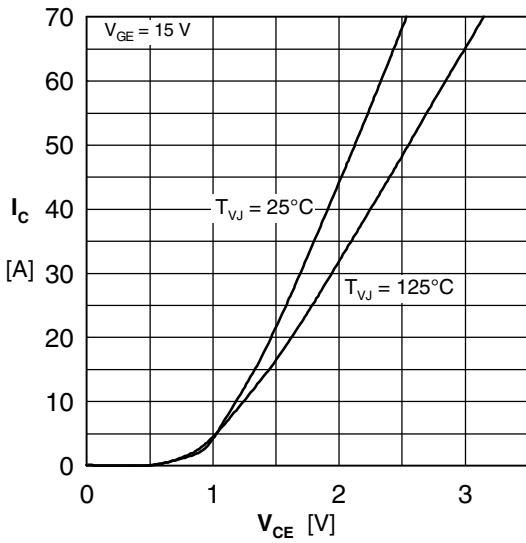


Fig. 1 Typ. output characteristics

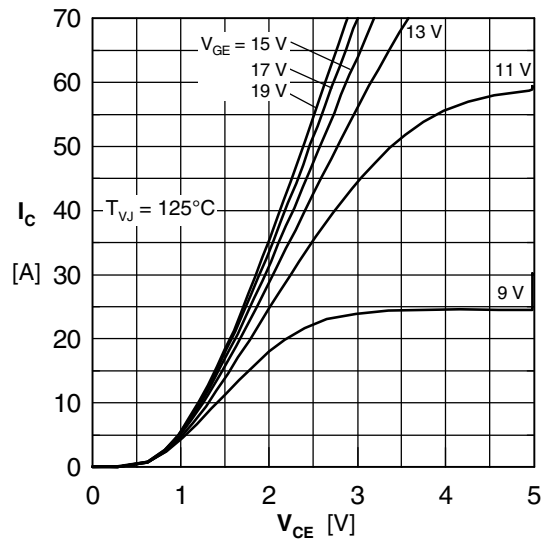


Fig. 2 Typ. output characteristics

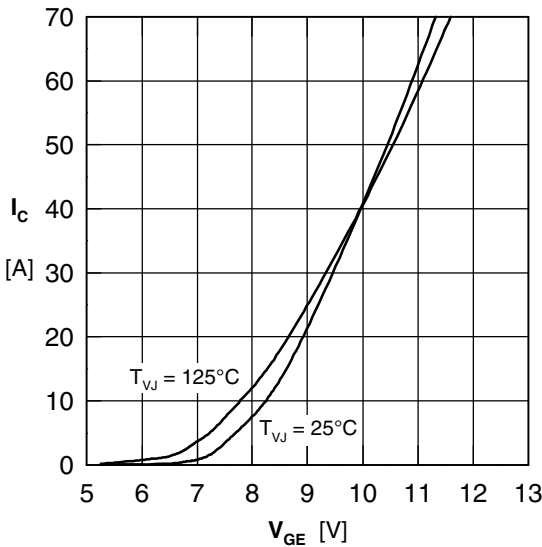


Fig. 3 Typ. transfer characteristics

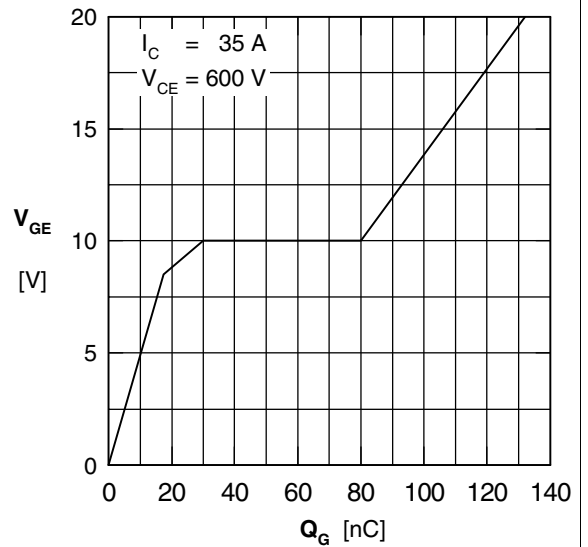


Fig. 4 Typ. turn-on gate charge

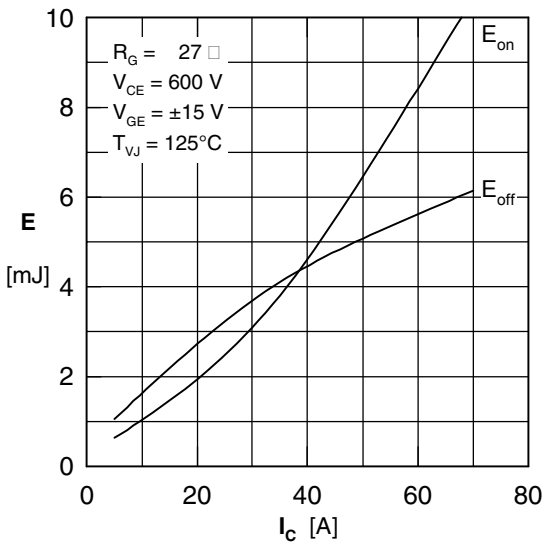


Fig. 5 Typ. switching energy vs. collector current

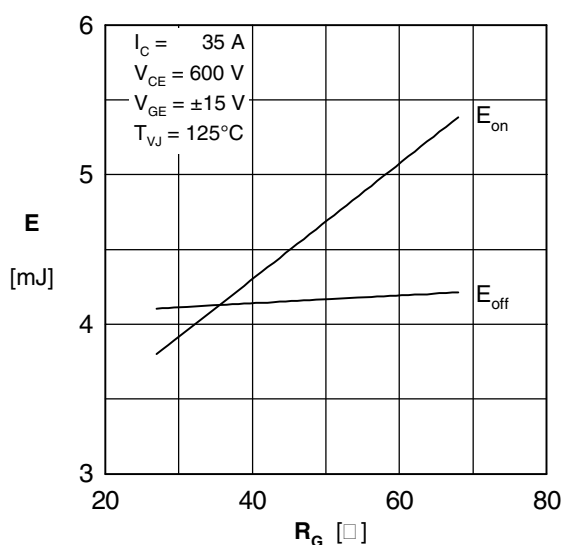


Fig. 6 Typ. switching energy vs. gate resistance

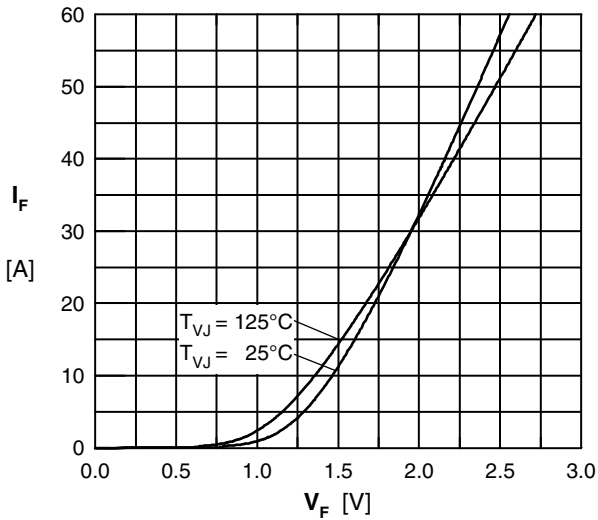


Fig. 7 Typ. Forward current versus  $V_F$

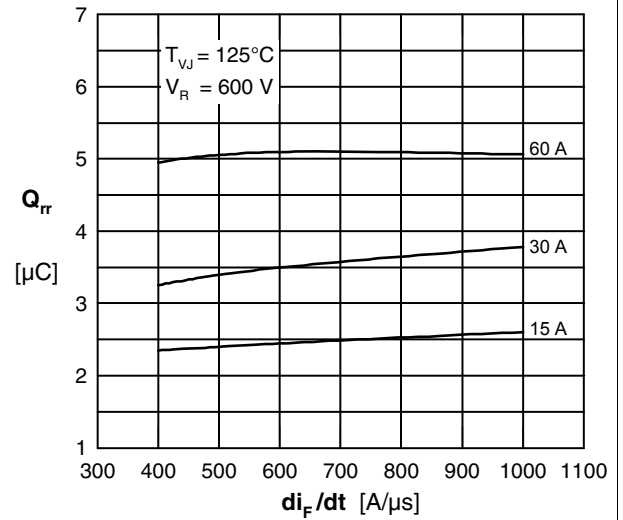


Fig. 8 Typ. reverse recov.charge  $Q_{rr}$  vs.  $di/dt$

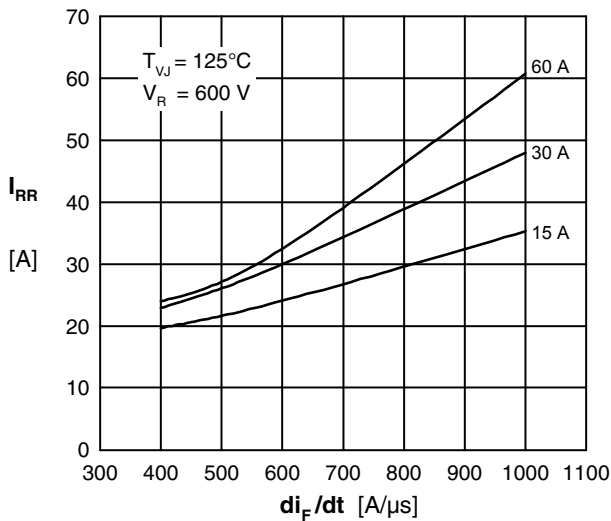


Fig. 9 Typ. peak reverse current  $I_{RM}$  vs.  $di/dt$

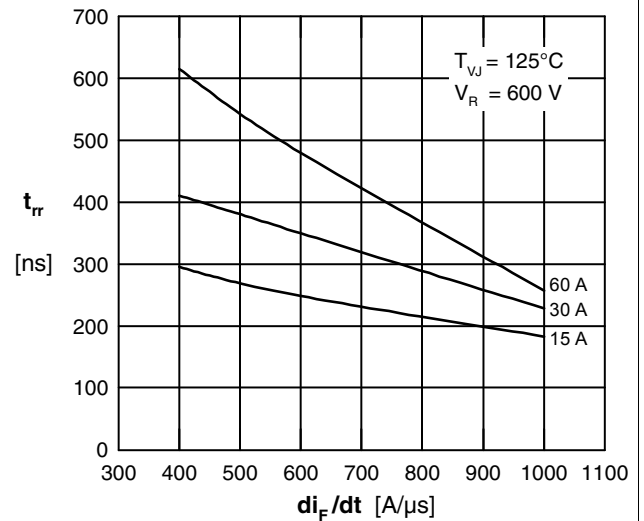


Fig. 10 Typ. recovery time  $t_{tr}$  versus  $di/dt$

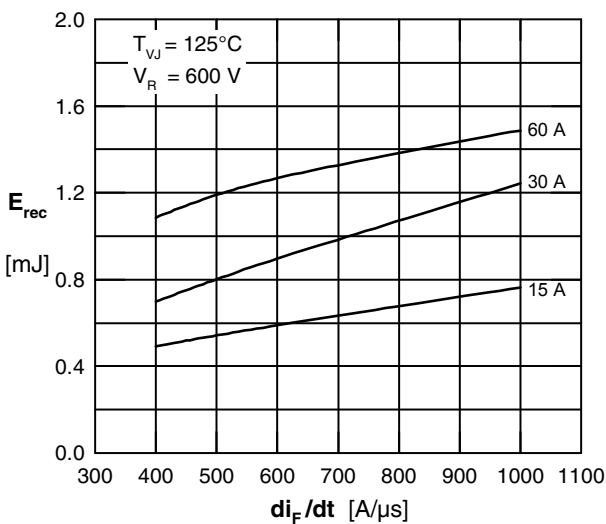


Fig. 5 Typ. recovery energy  $E_{rec}$  versus  $di/dt$

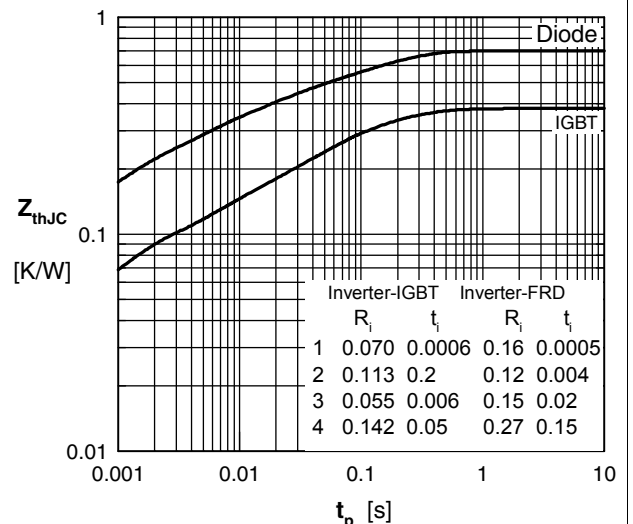


Fig. 12 Typ. transient thermal impedance