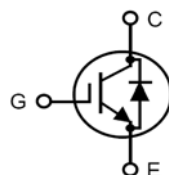


# XPT™ 650V GenX4™ IXXR110N65B4H1 w/ Sonic Diode

(Electrically Isolated Tab)

Extreme Light Punch Through  
IGBT for 10-30kHz Switching



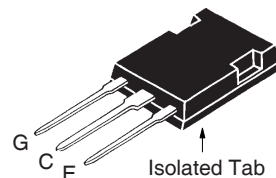
$$V_{CES} = 650V$$

$$I_{C110} = 70A$$

$$V_{CE(sat)} \leq 2.10V$$

$$t_{fi(typ)} = 43ns$$

ISOPLUS247™



G = Gate      C = Collector  
E = Emitter

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ to $175^\circ C$	650	V
$V_{CGR}$	$T_J = 25^\circ C$ to $175^\circ C$ , $R_{GE} = 1M\Omega$	650	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$ (Chip Capability)	165	A
$I_{C110}$	$T_C = 110^\circ C$	70	A
$I_{F110}$	$T_C = 110^\circ C$	48	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	490	A
<b>SSOA (RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 150^\circ C$ , $R_G = 2\Omega$ Clamped Inductive Load	$I_{CM} = 220$ @ $V_{CE} \leq V_{CES}$	A
<b><math>t_{sc}</math> (SCSOA)</b>	$V_{GE} = 15V$ , $V_{CE} = 360V$ , $T_J = 150^\circ C$ $R_G = 82\Omega$ , Non Repetitive	10	$\mu s$
$P_C$	$T_C = 25^\circ C$	455	W
$T_J$		-55 ... +175	$^\circ C$
$T_{JM}$		175	$^\circ C$
$T_{stg}$		-55 ... +175	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	1.6 mm (0.062in.) from Case for 10s	260	$^\circ C$
$V_{ISOL}$	50/60 Hz, 1 Minute	2500	V~
$F_C$	Mounting Force	20..120/4.5..27	N/lb
<b>Weight</b>		5	g

## Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Optimized for 10-30kHz Switching
- Square RBSOA
- Short Circuit Capability
- Anti-Parallel Sonic Diode
- High Current Handling Capability

## Advantages

- High Power Density
- Low Gate Drive Requirement

## Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts
- High Frequency Power Inverters

Symbol	Test Conditions ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 250\mu A$ , $V_{GE} = 0V$	650		V
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	4.0		6.5 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ $T_J = 150^\circ C$			25 $\mu A$ 3 $\mu A$
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 110A$ , $V_{GE} = 15V$ , Note 1 $T_J = 150^\circ C$	1.72 2.05		2.10 V V

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 60\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$	30	52	S
$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		5500	pF
$C_{oes}$			470	pF
$C_{res}$			80	pF
$Q_{g(on)}$	$I_C = 110\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		183	nC
$Q_{ge}$			32	nC
$Q_{gc}$			83	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 55\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 2\Omega$ Note 2		26	ns
$t_{ri}$			40	ns
$E_{on}$			2.20	mJ
$t_{d(off)}$			146	ns
$t_{fi}$			43	ns
$E_{off}$			1.05	1.70 mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 150^\circ\text{C}</math></b> $I_C = 55\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 2\Omega$ Note 2		25	ns
$t_{ri}$			40	ns
$E_{on}$			3.00	mJ
$t_{d(off)}$			140	ns
$t_{fi}$			110	ns
$E_{off}$			2.16	mJ
$R_{thJC}$				0.33 $^\circ\text{C/W}$
$R_{thCS}$		0.15		$^\circ\text{C/W}$

**Reverse Sonic Diode (FRD)**

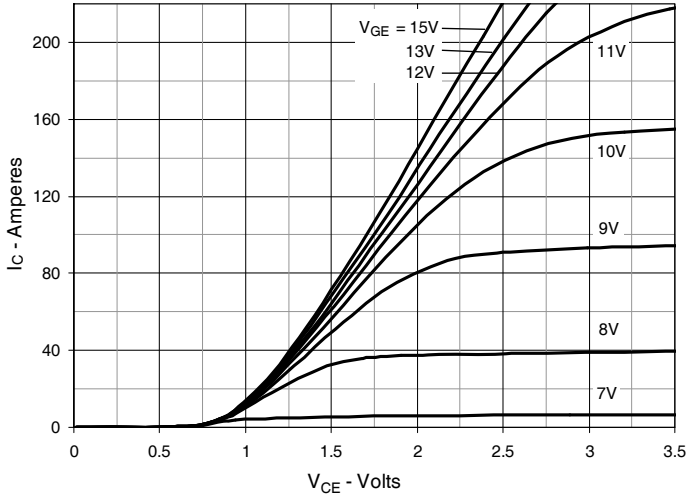
Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 100\text{A}, V_{GE} = 0\text{V}, \text{Note 1}$		1.7	2.3 V
	$T_J = 150^\circ\text{C}$		1.8	V
$I_{RM}$	$I_F = 100\text{A}, V_{GE} = 0\text{V}, T_J = 150^\circ\text{C}$ $-di_F/dt = 1500\text{A}/\mu\text{s}, V_R = 300\text{V}$		95	A
$t_{rr}$			100	ns
$R_{thJC}$				0.70 $^\circ\text{C/W}$

**Notes:**

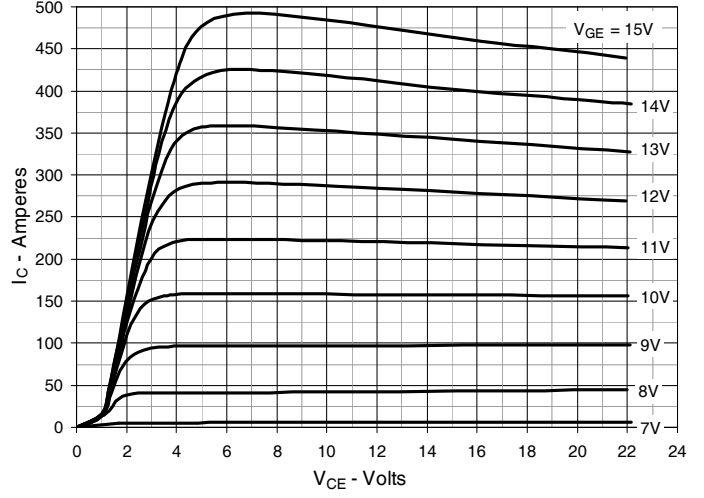
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Switching times & energy losses may increase for higher  $V_{CE}(\text{Clamp})$ ,  $T_J$  or  $R_G$ .

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

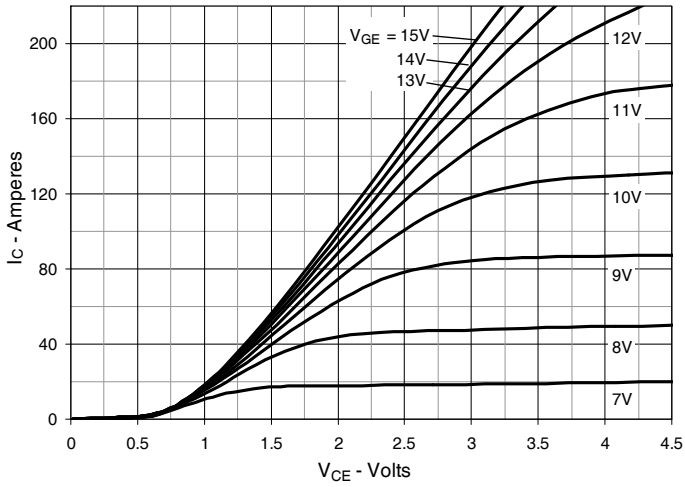
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



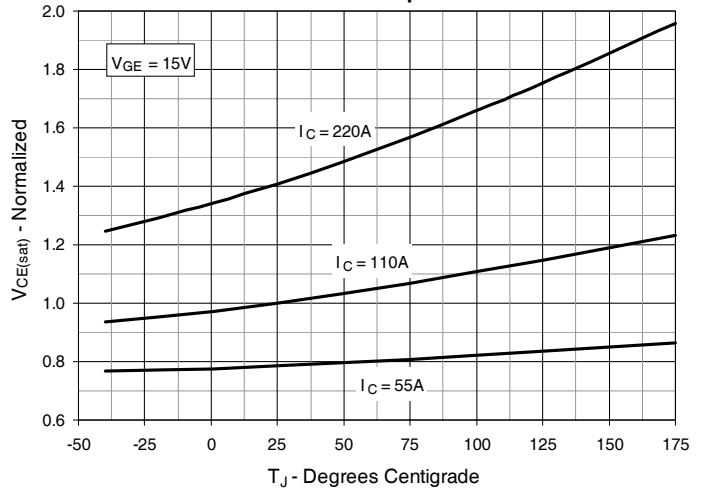
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



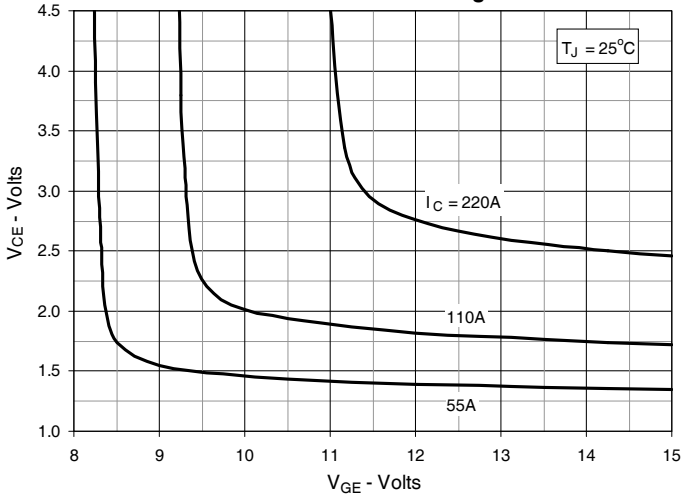
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



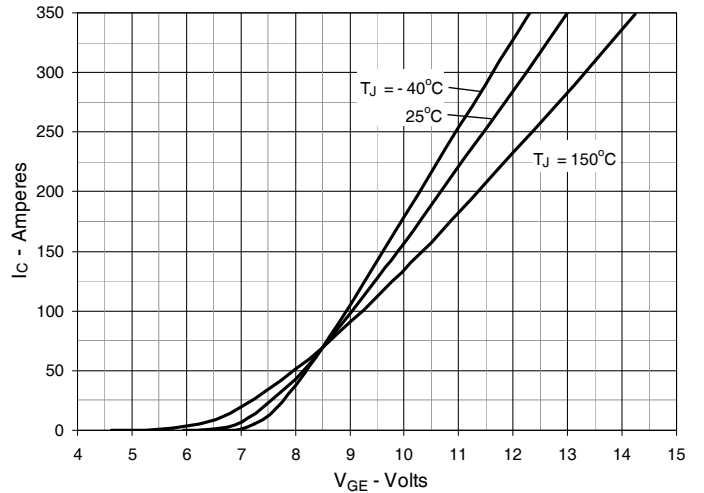
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



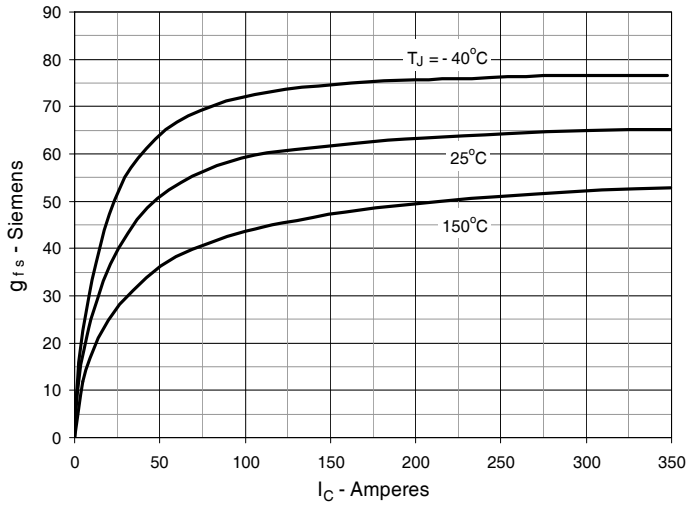
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



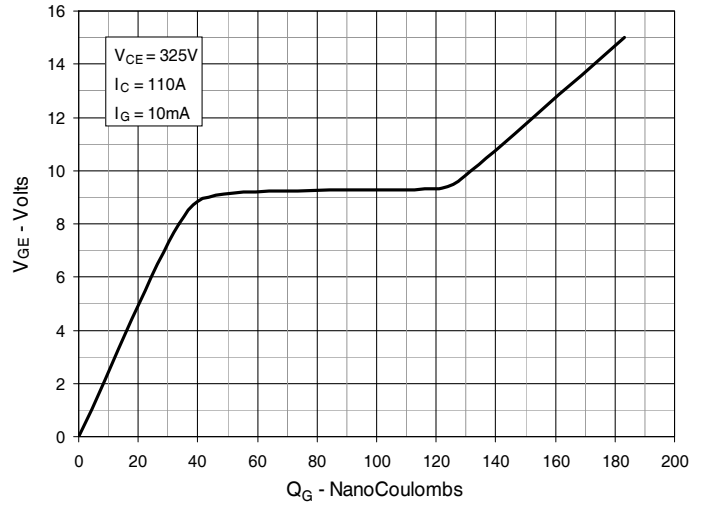
**Fig. 6. Input Admittance**



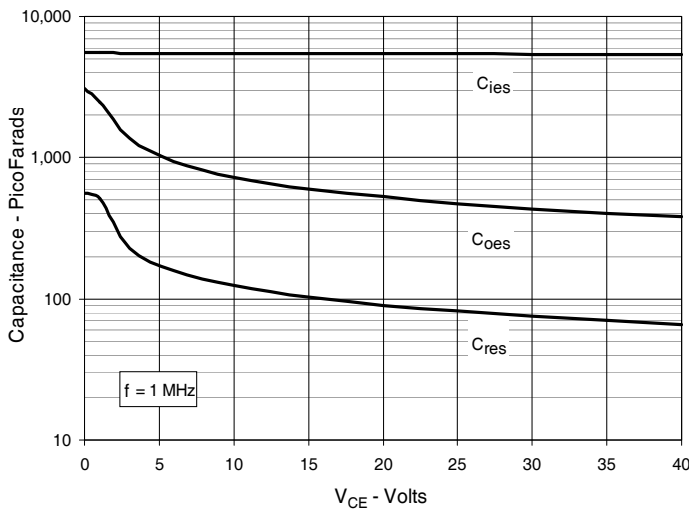
**Fig. 7. Transconductance**



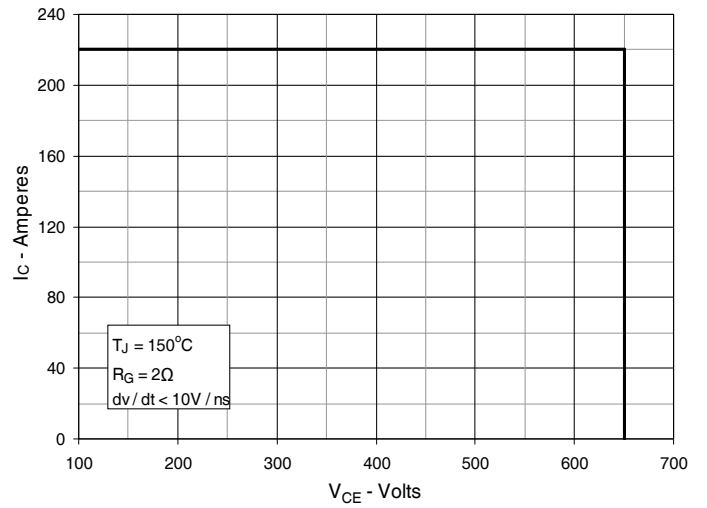
**Fig. 8. Gate Charge**



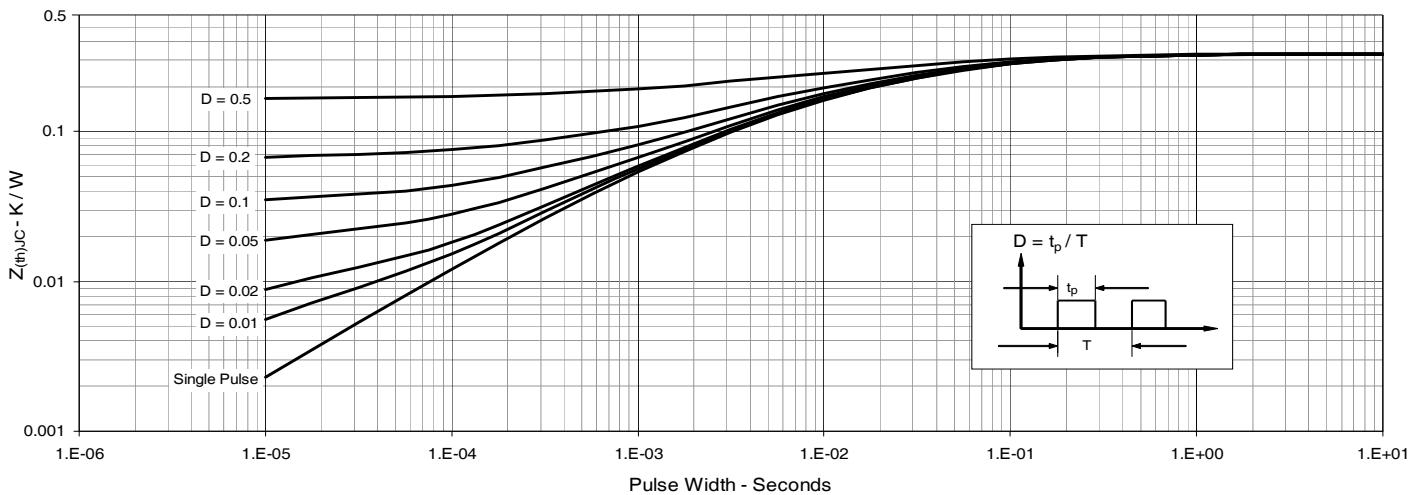
**Fig. 9. Capacitance**

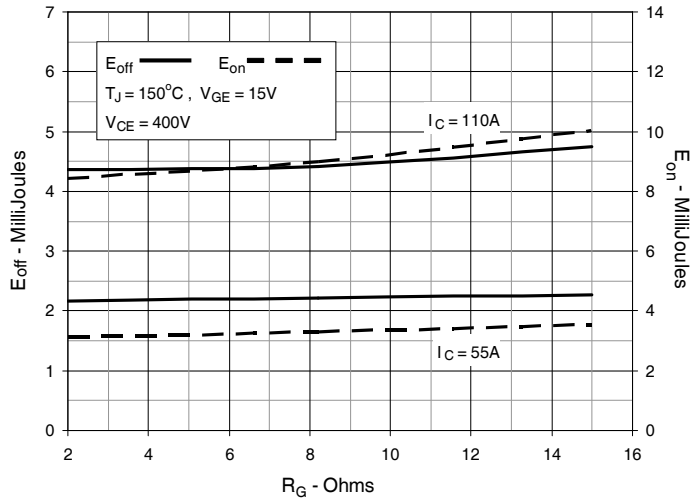
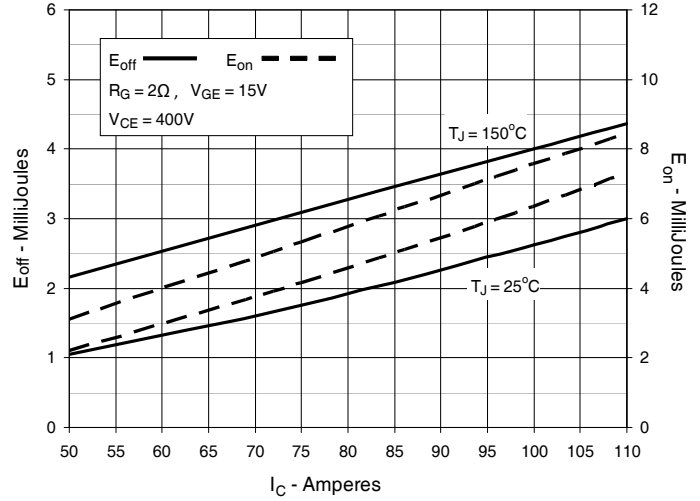
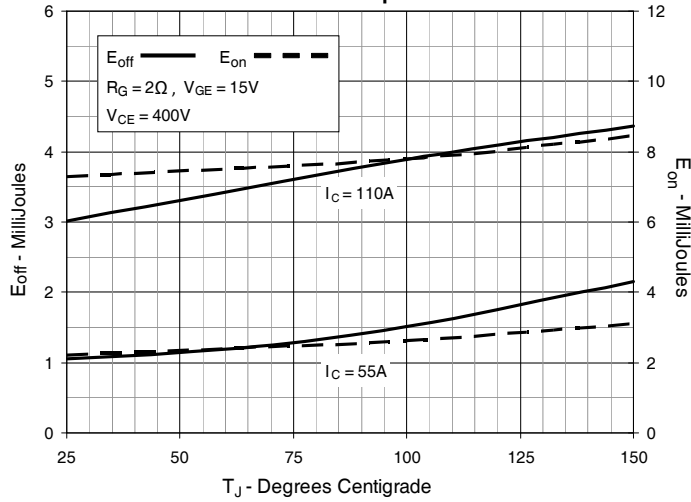
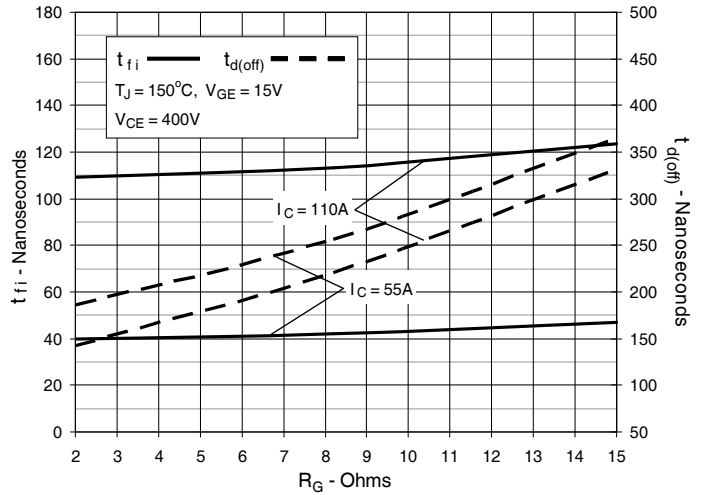
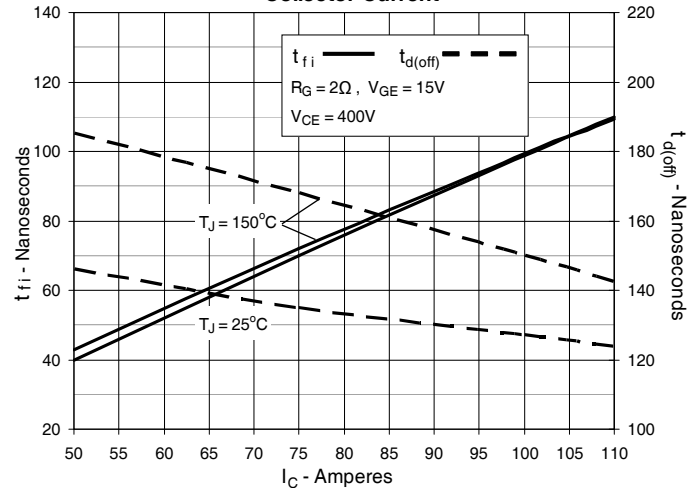
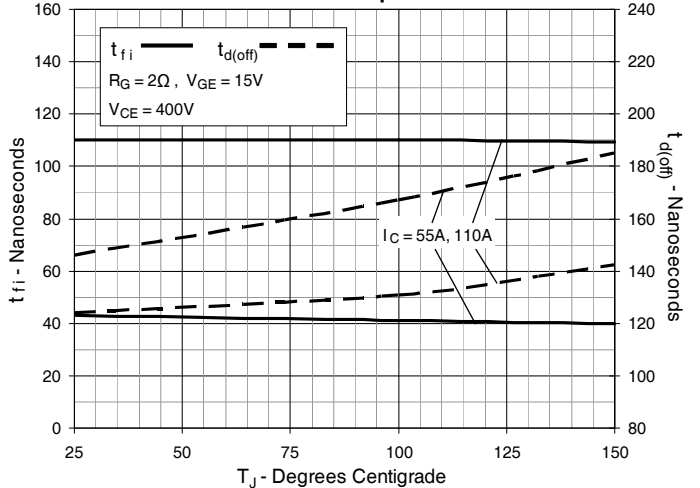


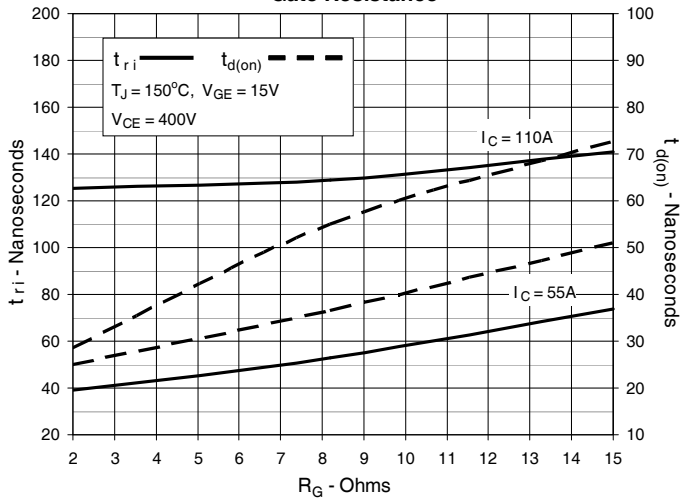
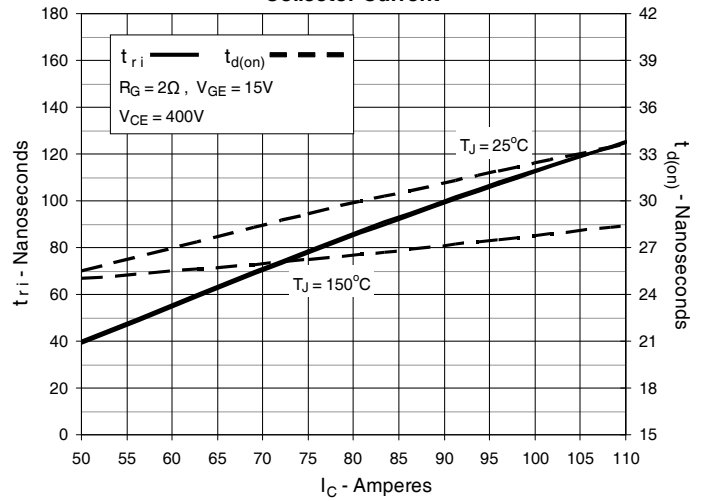
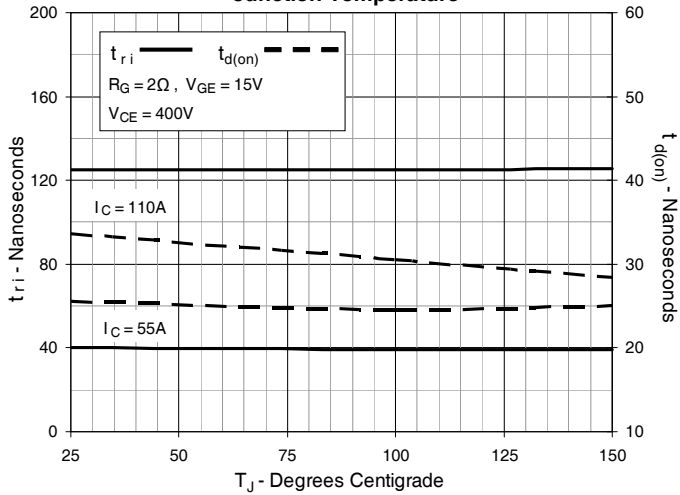
**Fig. 10. Reverse-Bias Safe Operating Area**



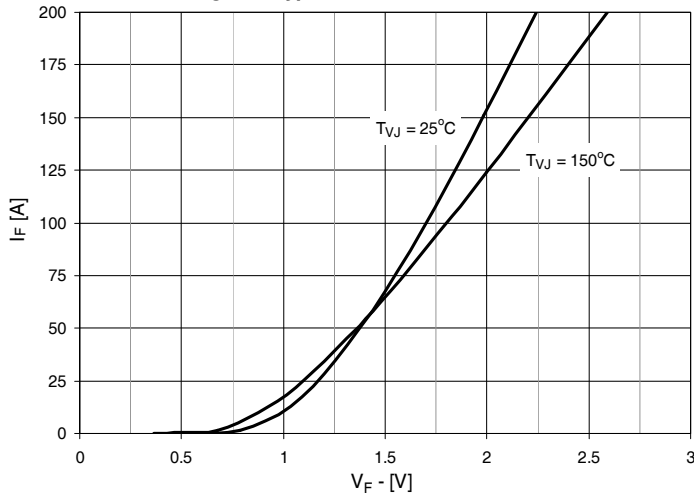
**Fig. 11. Maximum Transient Thermal Impedance (IGBT)**



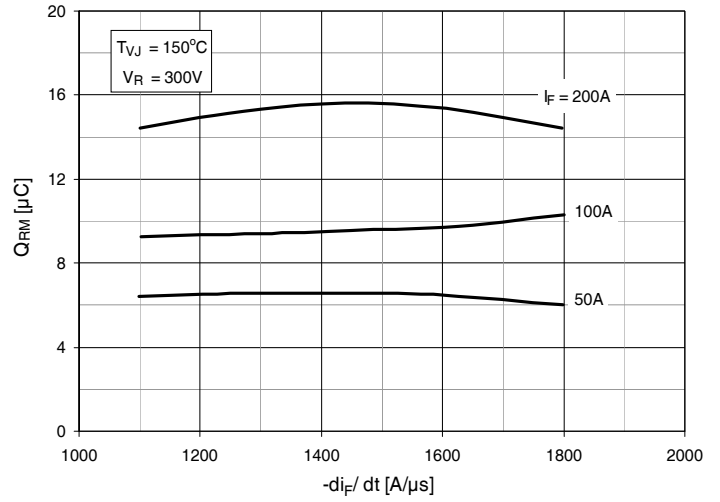
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**

**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**

**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**

**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**

**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**

**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**


**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**

**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**

**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**


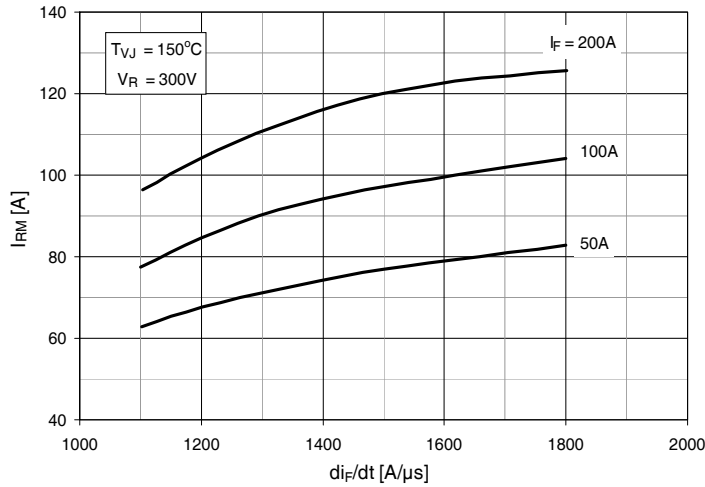
**Fig. 21. Typ. Forward characteristics**



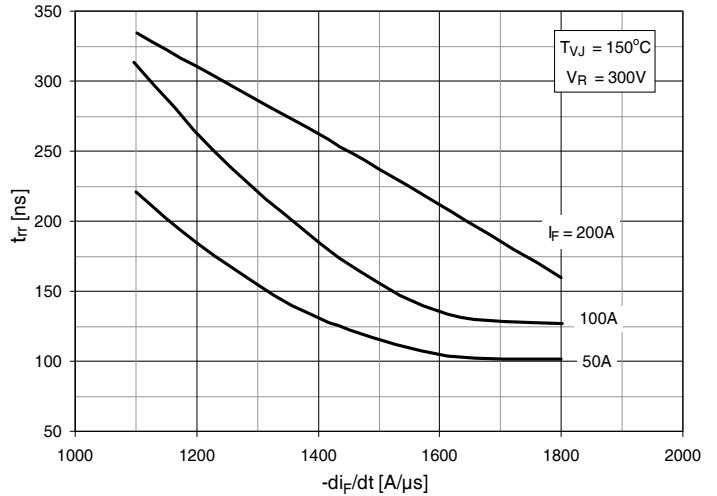
**Fig. 22. Typ. Reverse Recovery Charge  $Q_{rr}$  vs.  $-di_F/dt$**



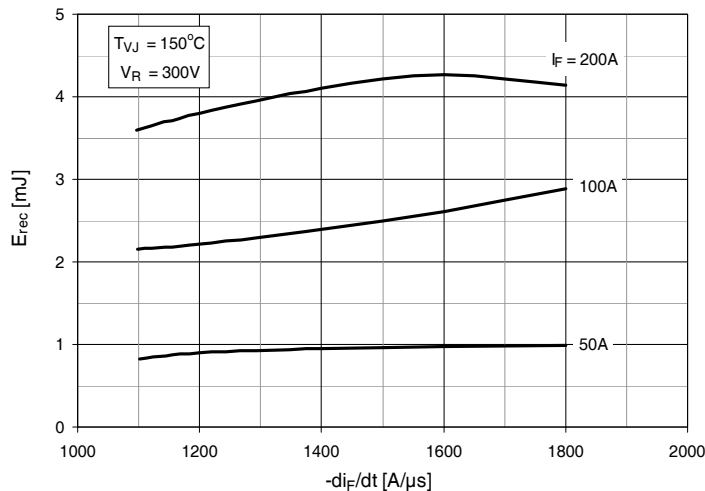
**Fig. 23. Typ. Peak Reverse Current  $I_{RM}$  vs.  $-di_F/dt$**



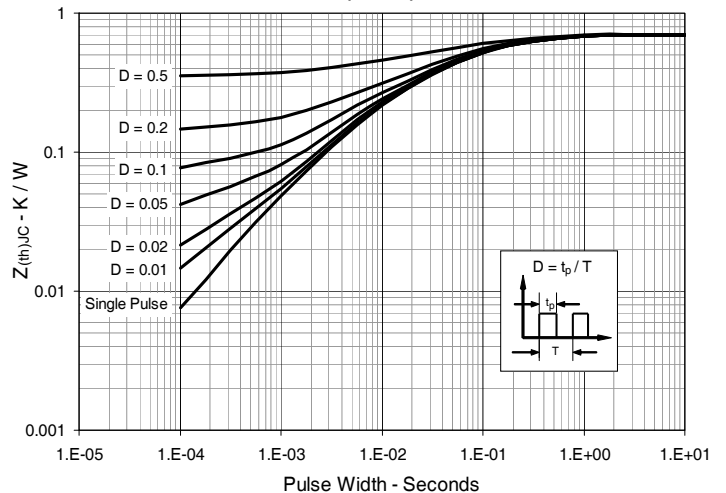
**Fig. 24. Typ. Recovery Time  $t_{rr}$  vs.  $-di_F/dt$**

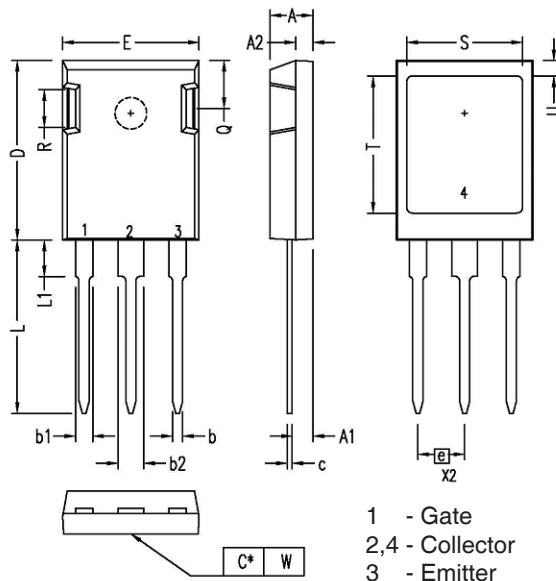


**Fig. 25. Typ. Recovery Energy  $E_{rec}$  vs.  $-di_F/dt$**



**Fig. 26. Maximum Transient Thermal Impedance (Diode)**



**ISOPLUS247 (IXXR) Outline**


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b1	.075	.085	1.91	2.15
b2	.115	.126	2.92	3.20
C	.024	.033	0.61	0.83
D	.819	.840	20.80	21.34
E	.620	.635	15.75	16.13
e	.215 BSC		5.45 BSC	
L	.780	.811	19.81	20.60
L1	.150	.172	3.81	4.38
Q	.220	.244	5.59	6.20
R	.170	.191	4.32	4.85
S	.520	.540	13.21	13.72
T	.620	.640	15.75	16.26
U	.065	.080	1.65	2.03
W	0	.004	0	0.10

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.  
 C\* - Convex bow of substrate is typ<0.04mm over plastic surface level of device bottom side.  
 LEAD FINISH - External leads are Pb free solder dip.





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