

# High Voltage XPT™ IGBT w/ Diode

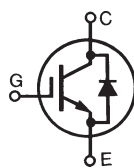
## MMIX1Y25N250CV1

$$V_{CES} = 2500V$$

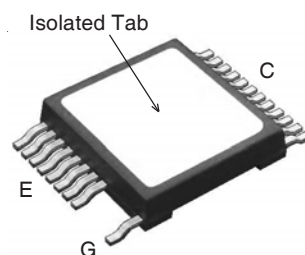
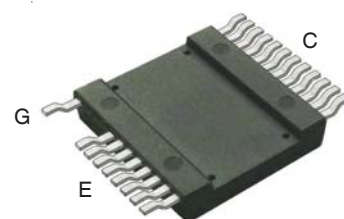
$$I_{C110} = 18A$$

$$V_{CE(sat)} \leq 4.0V$$

(Electrically Isolated Tab)



Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$	2500	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GE} = 1M\Omega$	2500	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	36	A
$I_{C110}$	$T_C = 110^\circ\text{C}$	18	A
$I_{F110}$	$T_C = 110^\circ\text{C}$	14	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1ms	270	A
<b>SSOA (RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 150^\circ\text{C}$ , $R_G = 5\Omega$ Clamped Inductive Load	$I_{CM} = 100$	A
		1500	V
$P_C$	$T_C = 25^\circ\text{C}$	230	W
$T_J$		-55 ... +175	$^\circ\text{C}$
$T_{JM}$		175	$^\circ\text{C}$
$T_{stg}$		-55 ... +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ\text{C}$
$T_{SOLD}$	1.6 mm (0.062 in.) from Case for 10	260	$^\circ\text{C}$
$V_{ISOL}$	50/60Hz, 1 minute	2500	V~
$F_C$	Mounting Force	50..200/11..45	N/lb.
<b>Weight</b>		8	g



G = Gate  
C = Collector

E = Emitter

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Heatsink Surface
- 2500V~ Electrical Isolation
- Anti-Parallel Diode
- High Current Handling Capability

### Advantages

- High Power Density
- Low Gate Drive Requirement

### Applications

- Switch-Mode and Resonant-Mode Power Supplies
- Uninterruptible Power Supplies (UPS)
- Laser Generators
- Capacitor Discharge Circuits
- AC Switches

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 250\mu\text{A}$ , $V_{GE} = 0V$	2500		V
$V_{GE(th)}$	$I_C = 250\mu\text{A}$ , $V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ Note 2, $T_J = 100^\circ\text{C}$		100	25 $\mu\text{A}$ $\mu\text{A}$
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 25A$ , $V_{GE} = 15V$ , Note 1 $T_J = 150^\circ\text{C}$		3.4 4.7	V V

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 25\text{A}, V_{CE} = 10\text{V}$ , Note 1	16	27	S
$R_{Gi}$	Gate Input Resistance		2.8	$\Omega$
$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		3060	pF
$C_{oes}$			166	pF
$C_{res}$			43	pF
$Q_{g(on)}$	$I_C = 25\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		147	nC
$Q_{ge}$			16	nC
$Q_{gc}$			68	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 25\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 0.5 \cdot V_{CES}, R_G = 5\Omega$ Note 3		15	ns
$t_{ri}$			34	ns
$E_{on}$			8.3	mJ
$t_{d(off)}$			230	ns
$t_{fi}$			246	ns
$E_{off}$			7.3	mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 150^\circ\text{C}</math></b> $I_C = 25\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 0.5 \cdot V_{CES}, R_G = 5\Omega$ Note 3		18	ns
$t_{ri}$			33	ns
$E_{on}$			11.0	mJ
$t_{d(off)}$			225	ns
$t_{fi}$			350	ns
$E_{off}$			10.5	mJ
$R_{thJC}$				0.65 $^\circ\text{C/W}$
$R_{thCS}$		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.
$V_F$	$I_F = 25\text{A}, V_{GE} = 0\text{V}$ , Note 1 $T_J = 150^\circ\text{C}$		3.1	3.5 V V
$I_{RM}$	$I_F = 25\text{A}, V_{GE} = 0\text{V}, T_J = 150^\circ\text{C}$ $-di_F/dt = 500\text{A}/\mu\text{s}, V_R = 1200\text{V}$		38	A
$t_{rr}$			185	ns
$R_{thJC}$				0.86 $^\circ\text{C/W}$

Notes:

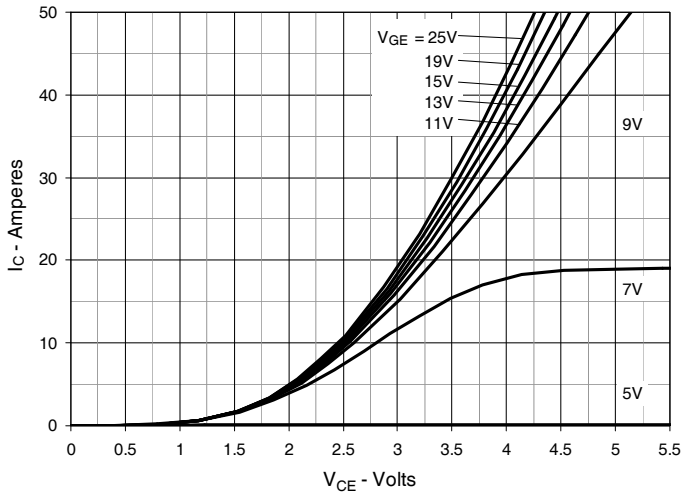
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Part must be heatsunk for high-temp  $I_{ces}$  measurement.
3. Switching times & energy losses may increase for higher  $V_{CE( Clamp)}$ ,  $T_J$  or  $R_G$ .

**ADVANCE TECHNICAL INFORMATION**

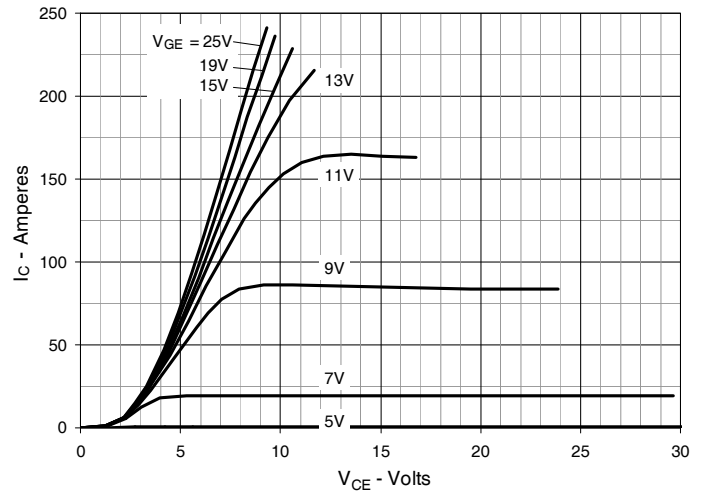
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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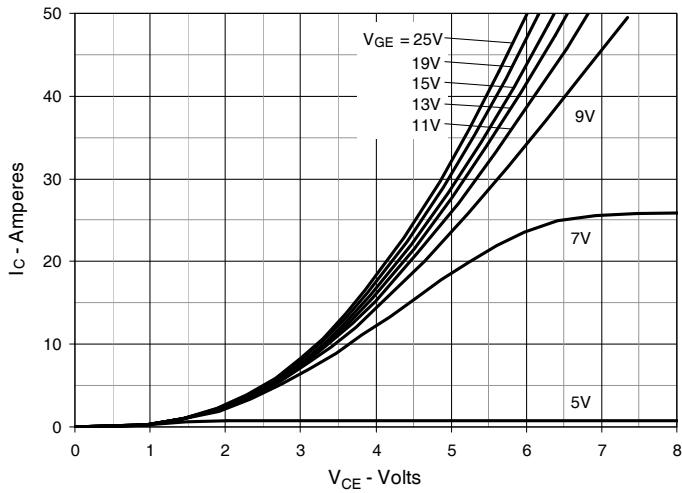
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



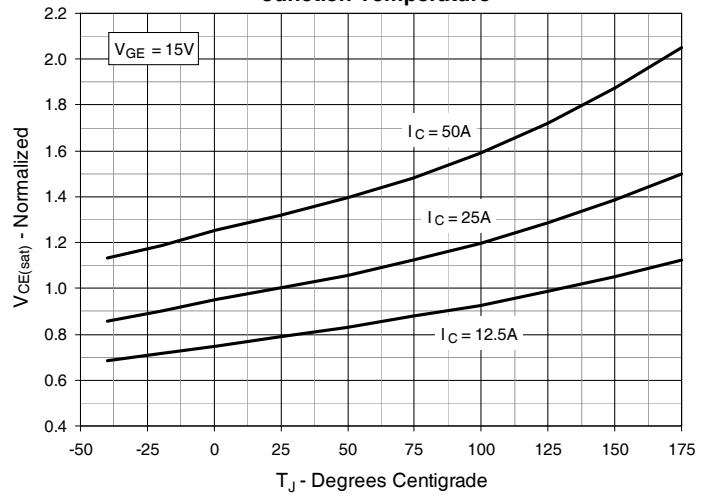
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



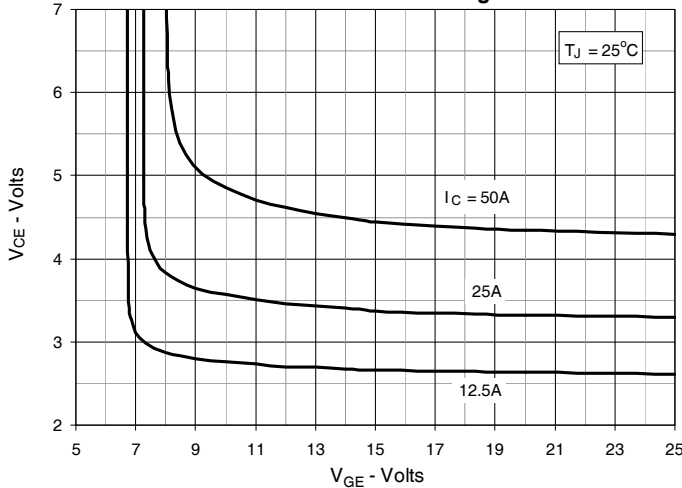
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



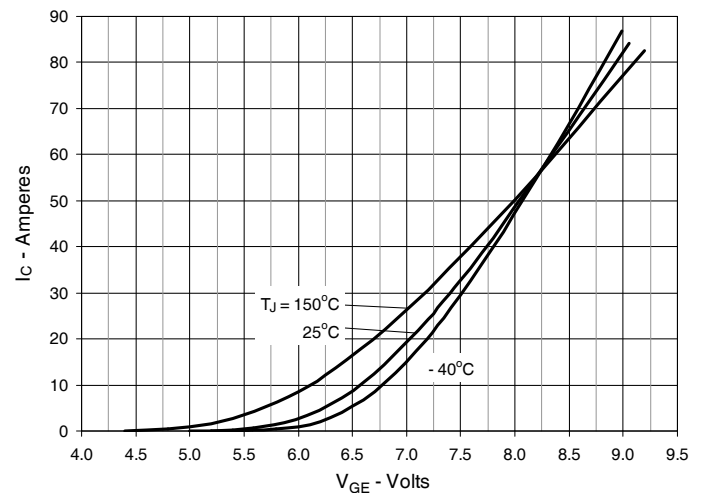
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



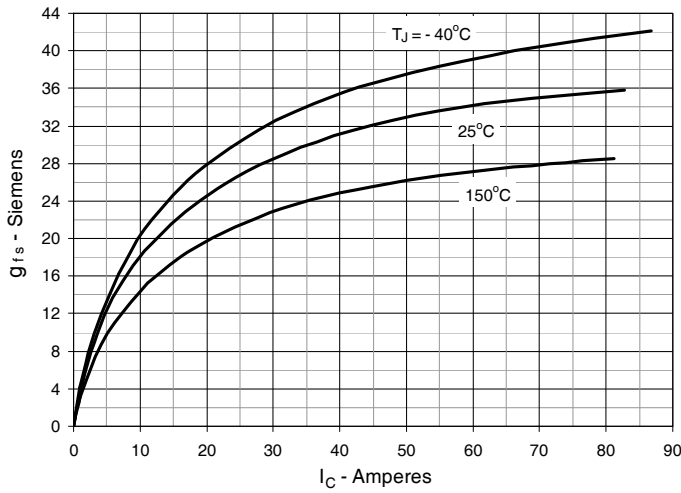
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



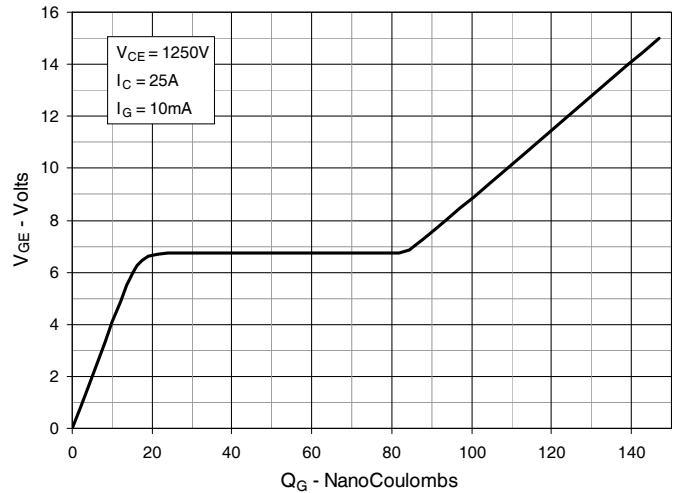
**Fig. 6. Input Admittance**



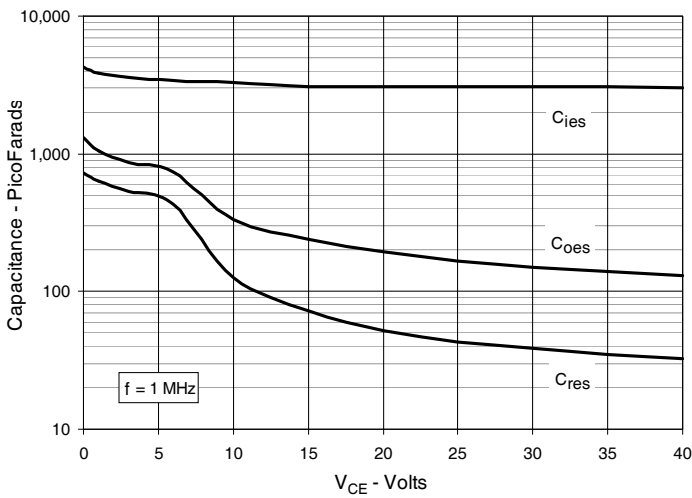
**Fig. 7. Transconductance**



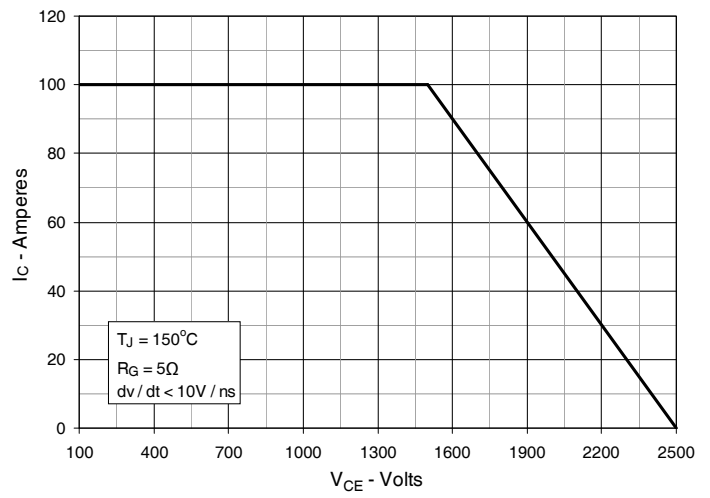
**Fig. 8. Gate Charge**



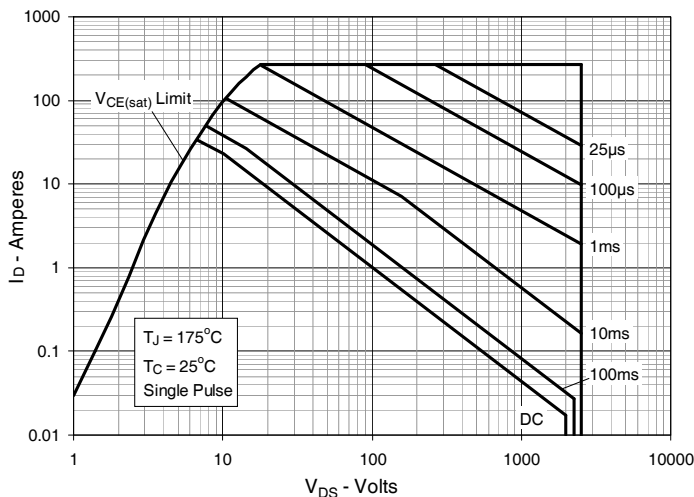
**Fig. 9. Capacitance**



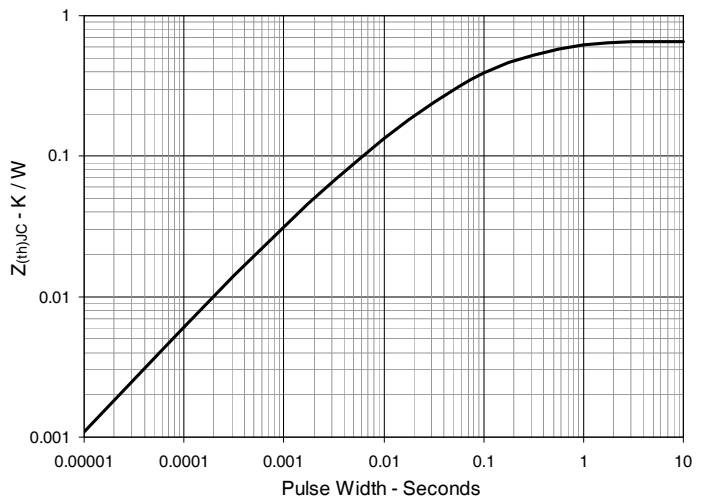
**Fig. 10. Reverse-Bias Safe Operating Area**



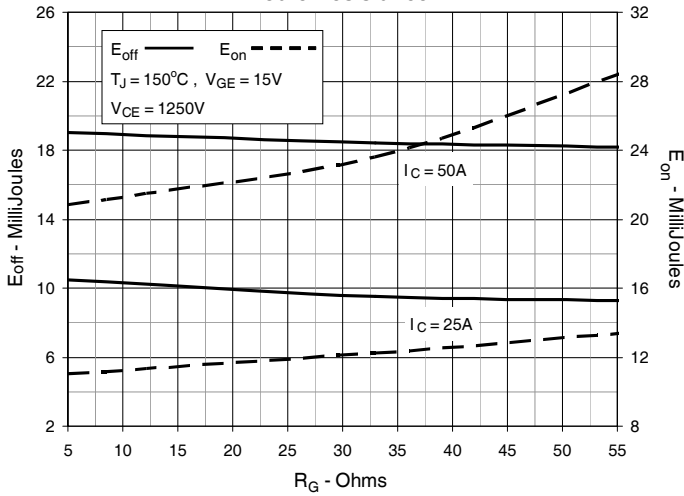
**Fig. 11. Forward-Bias Safe Operating Area**



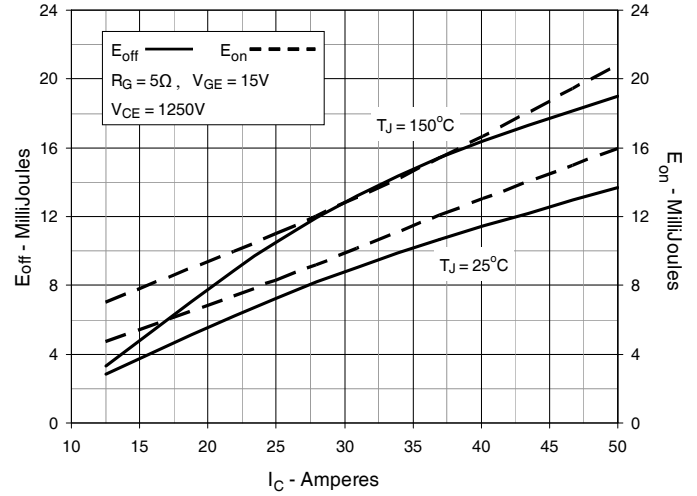
**Fig. 12. Maximum Transient Thermal Impedance (IGBT)**



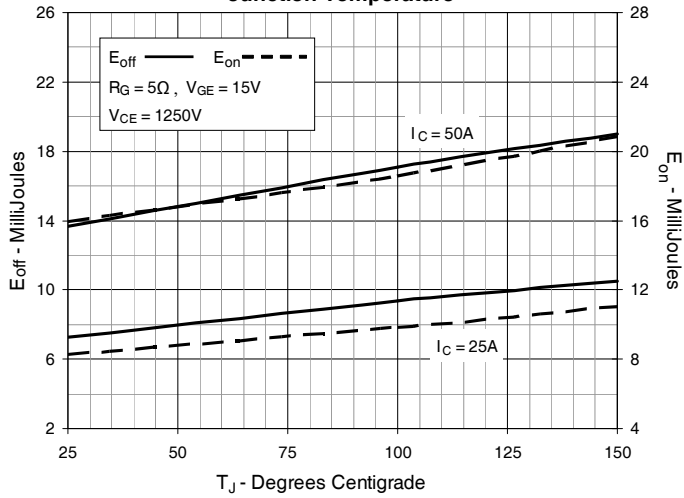
**Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance**



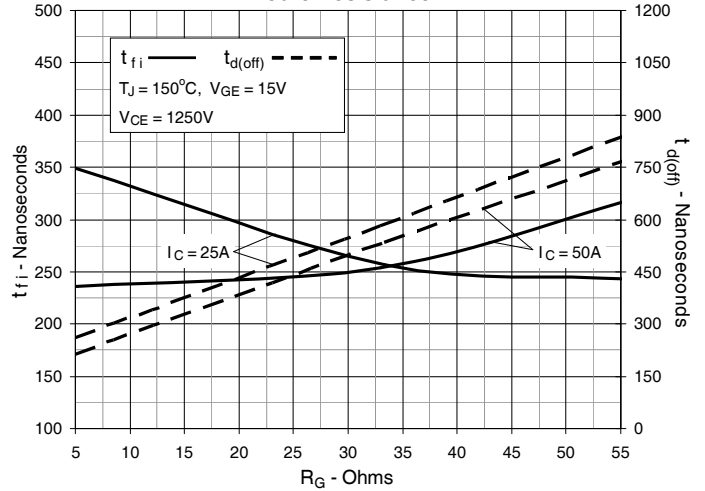
**Fig. 14. Inductive Switching Energy Loss vs. Collector Current**



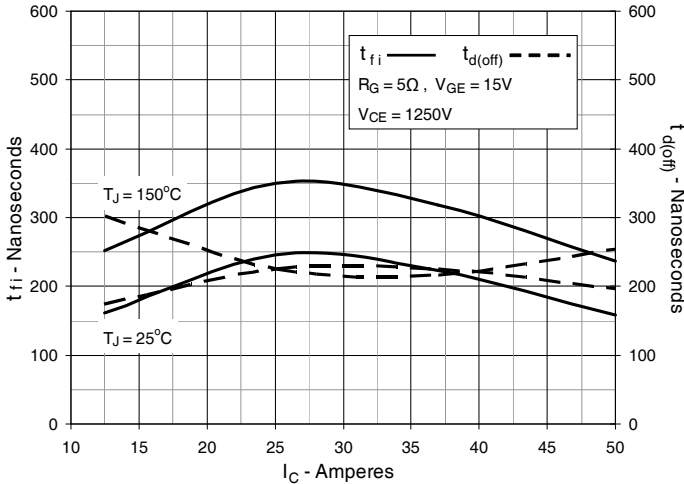
**Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature**



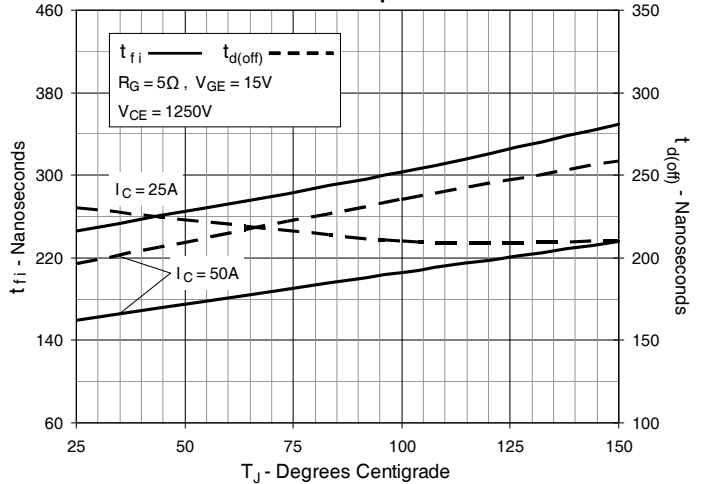
**Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance**

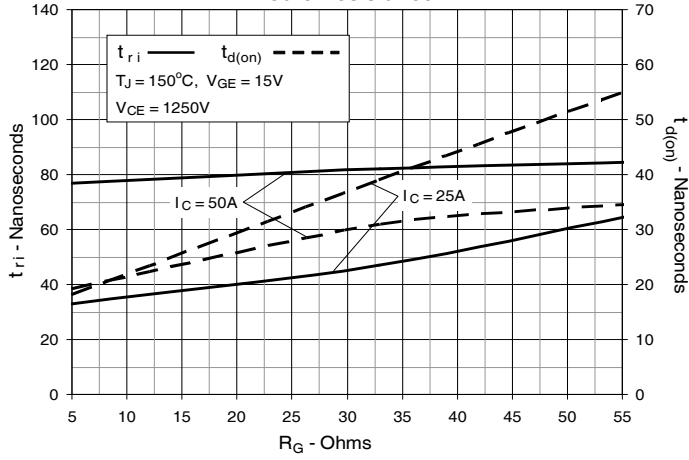
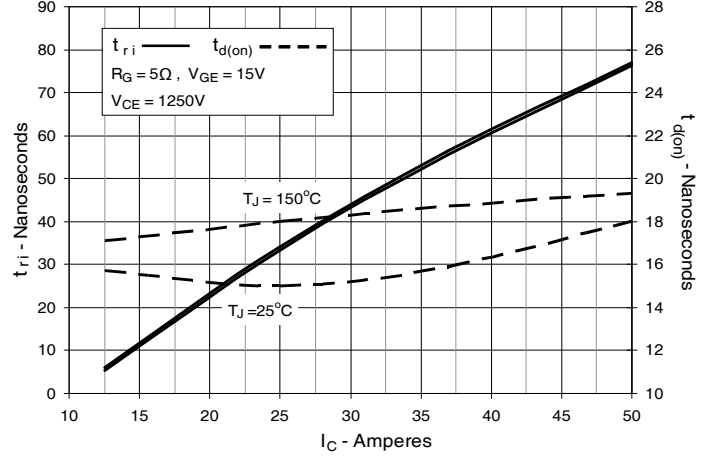
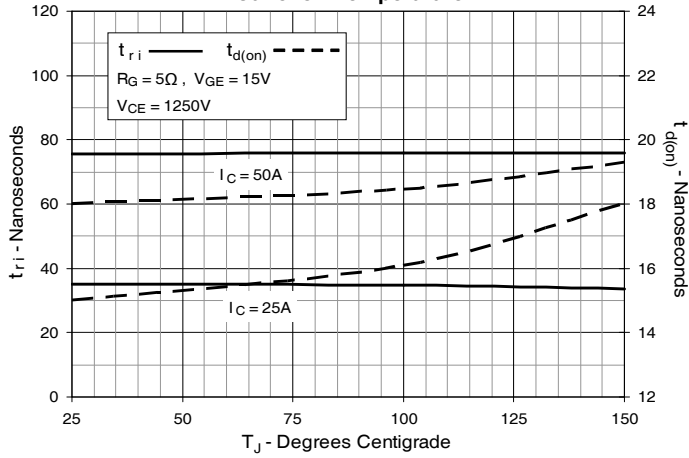


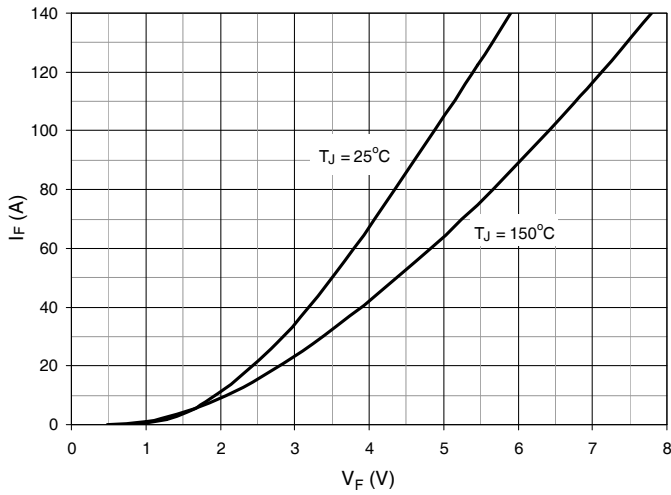
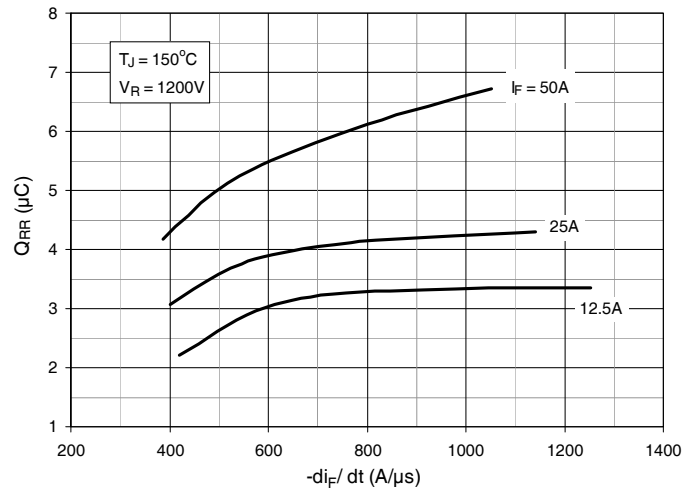
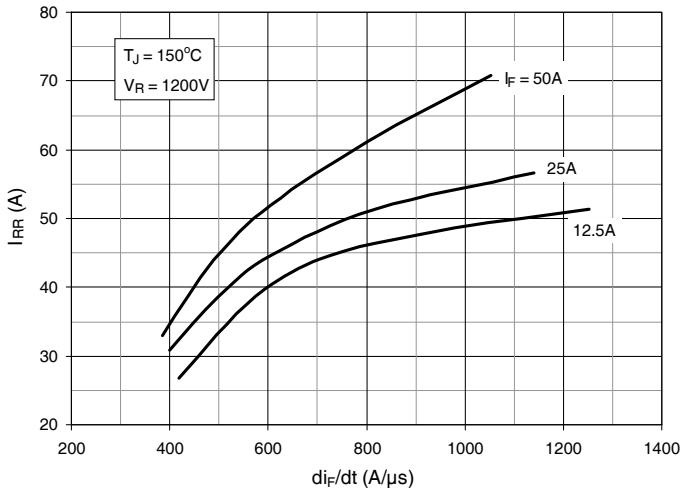
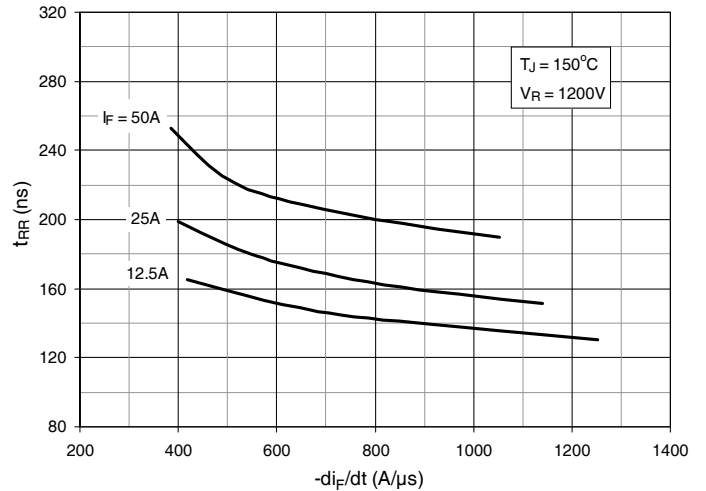
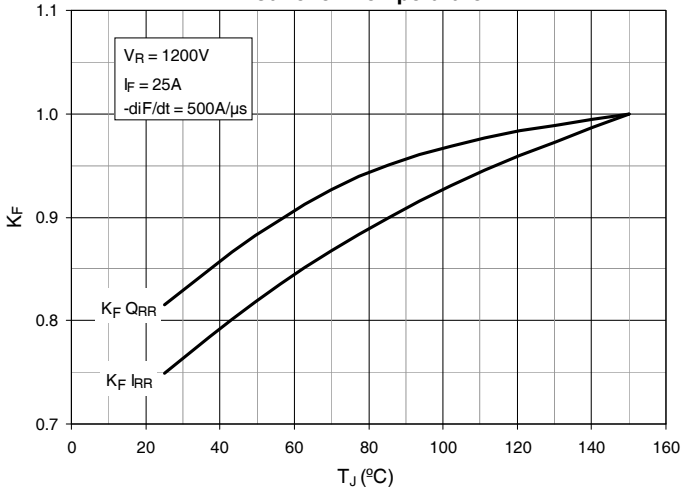
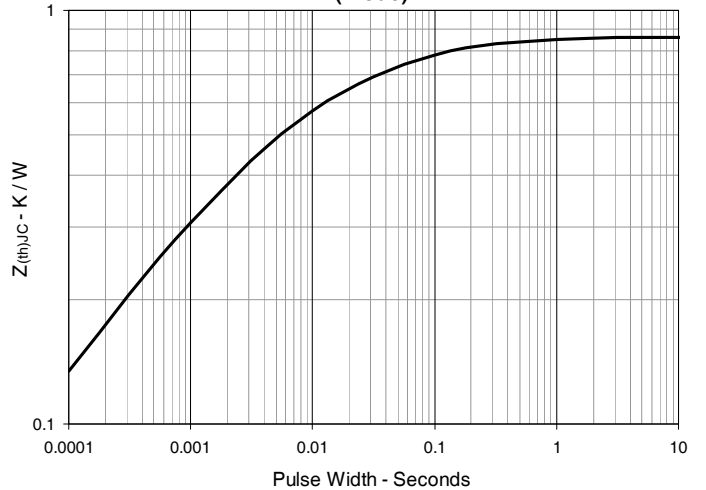
**Fig. 17. Inductive Turn-off Switching Times vs. Collector Current**

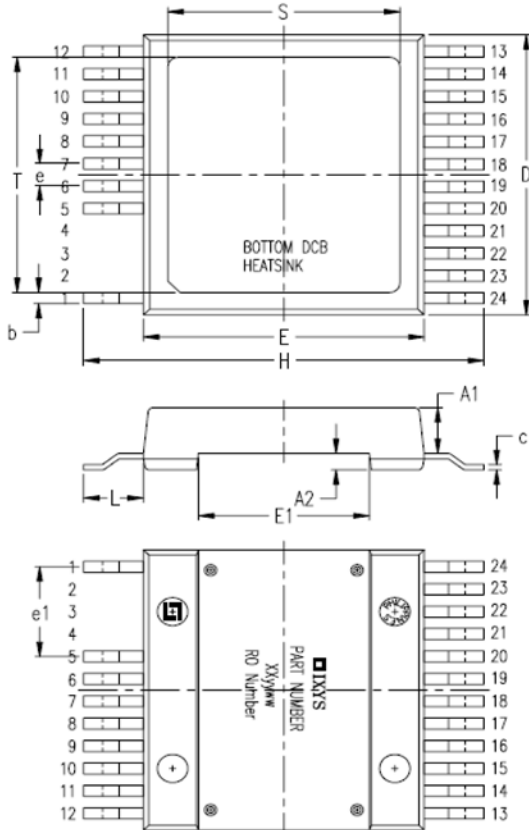


**Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature**



**Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance**

**Fig. 20. Inductive Turn-on Switching Times vs. Collector Current**

**Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature**


**Fig. 22. Diode Forward Characteristics**

**Fig. 23. Reverse Recovery Charge vs.  $-di_F/dt$** 

**Fig. 24. Reverse Recovery Current vs.  $-di_F/dt$** 

**Fig. 25. Reverse Recovery Time vs.  $-di_F/dt$** 

**Fig. 26. Dynamic Parameters  $Q_{RR}$ ,  $I_{RR}$  vs. Junction Temperature**

**Fig. 27. Maximum Transient Thermal Impedance (Diode)**


**Package Outline**


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.209	.224	5.30	5.70
A1	.154	.161	3.90	4.10
A2	.055	.063	1.40	1.60
b	.035	.045	0.90	1.15
c	.018	.026	0.45	0.65
D	.976	.994	24.80	25.25
E	.898	.915	22.80	23.25
E1	.543	.559	13.80	14.20
e	.079 BSC		2.00 BSC	
e1	.315 BSC		8.00 BSC	
H	1.272	1.311	32.30	33.30
L	.181	.209	4.60	5.30
L1	.051	.067	1.30	1.70
L2	.000	.006	0.00	0.15
S	.736	.760	18.70	19.30
T	.815	.839	20.70	21.30
α	0	4°	0	4°

**PIN: 1 = Gate**  
**5-12 = Emitter**  
**13-24 = Collector**





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