

# High Voltage XPT™ IGBT w/ Diode

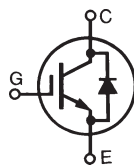
## MMIX1Y25N250CV1

$$V_{CES} = 2500V$$

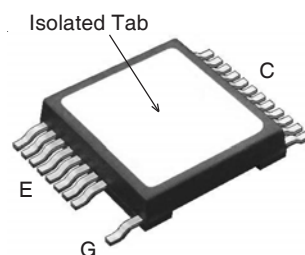
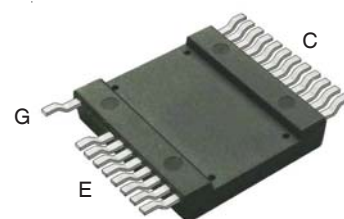
$$I_{C110} = 18A$$

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

(Electrically Isolated Tab)



Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ to $175^\circ C$	2500	V
$V_{CGR}$	$T_J = 25^\circ C$ to $175^\circ C$ , $R_{GE} = 1M\Omega$	2500	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$	36	A
$I_{C110}$	$T_C = 110^\circ C$	18	A
$I_{F110}$	$T_C = 110^\circ C$	14	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	270	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 150^\circ C$ , $R_G = 5\Omega$ Clamped Inductive Load	$I_{CM} = 100$ 1500	A V
$P_C$	$T_C = 25^\circ C$	230	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 (0.062 in.) from Case for 10	260	$^\circ C$
$V_{ISOL}$	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 ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 250\mu A$ , $V_{GE} = 0V$	2500		V
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ Note 2, $T_J = 100^\circ C$		100	25 $\mu A$ $\mu A$
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 25A$ , $V_{GE} = 15V$ , Note 1 $T_J = 150^\circ C$		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  $R_G$ .

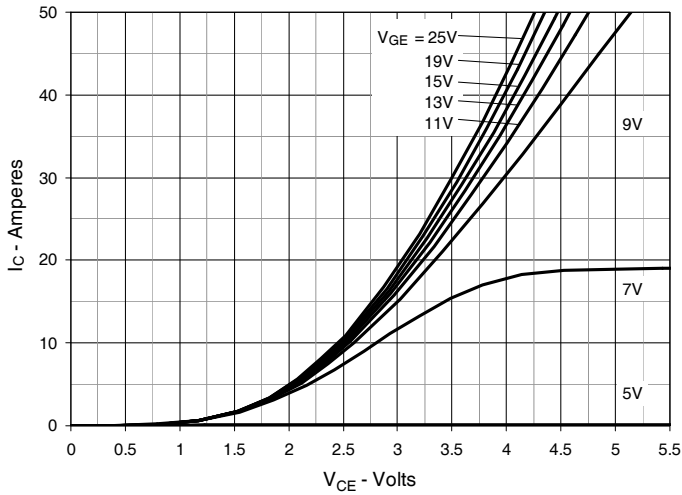
**ADVANCE TECHNICAL INFORMATION**

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.

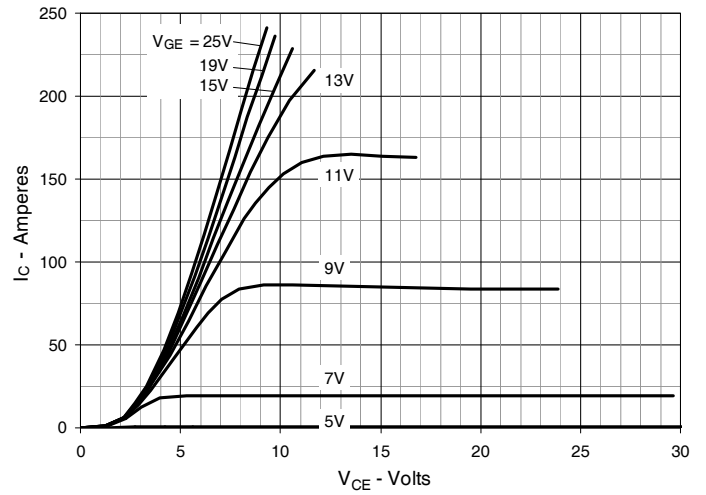
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585	7,005,734 B2	7,157,338B2
	4,860,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692	7,063,975 B2	
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6,771,478 B2	7,071,537	

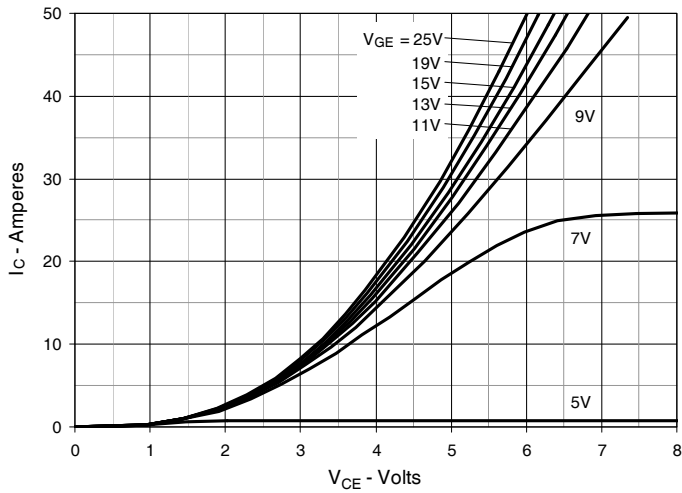
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



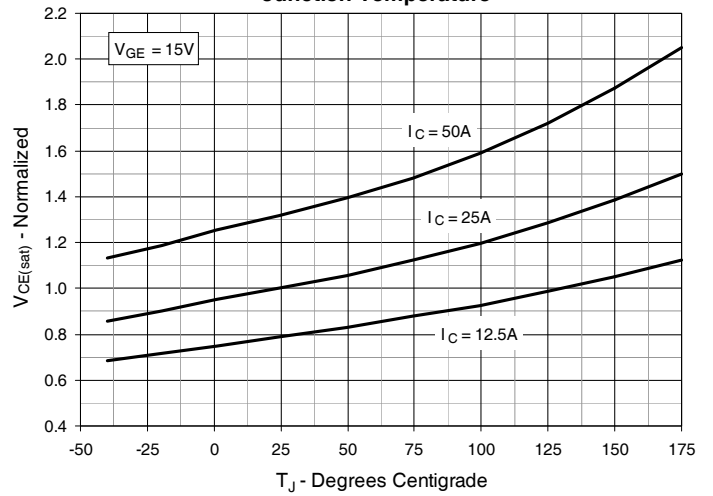
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



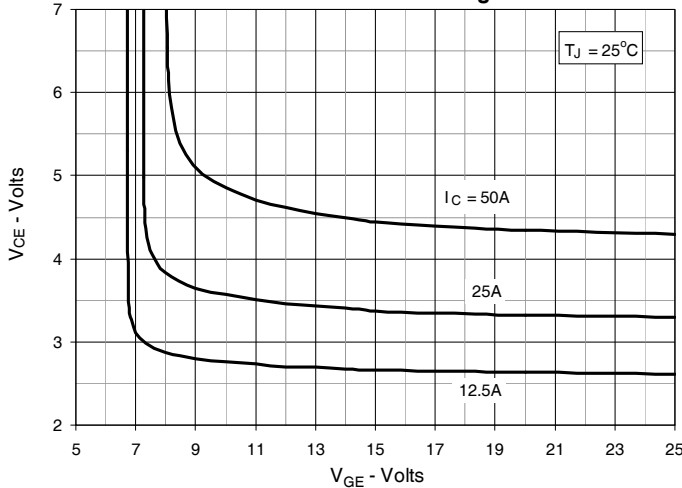
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



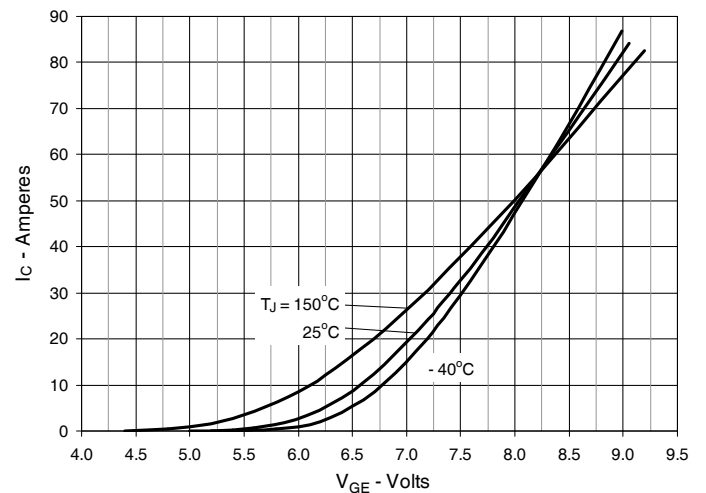
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



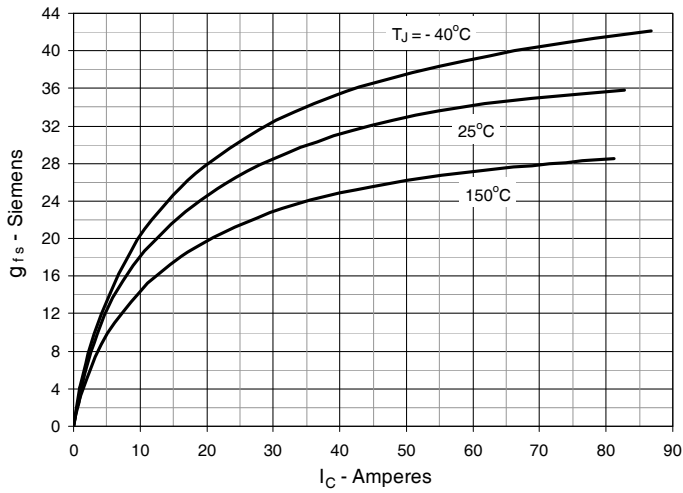
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



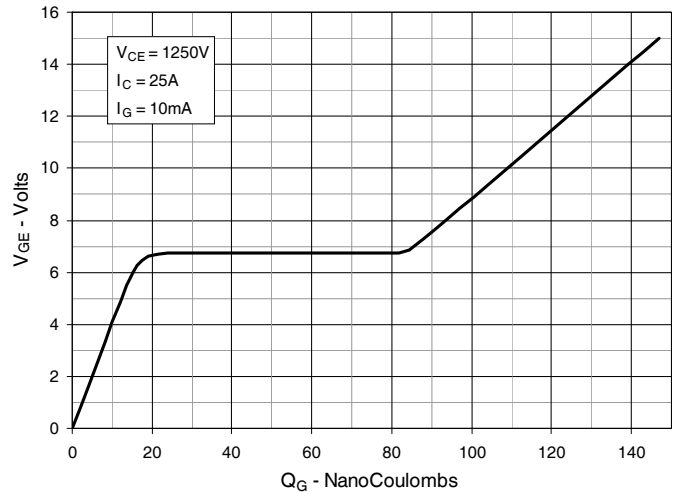
**Fig. 6. Input Admittance**



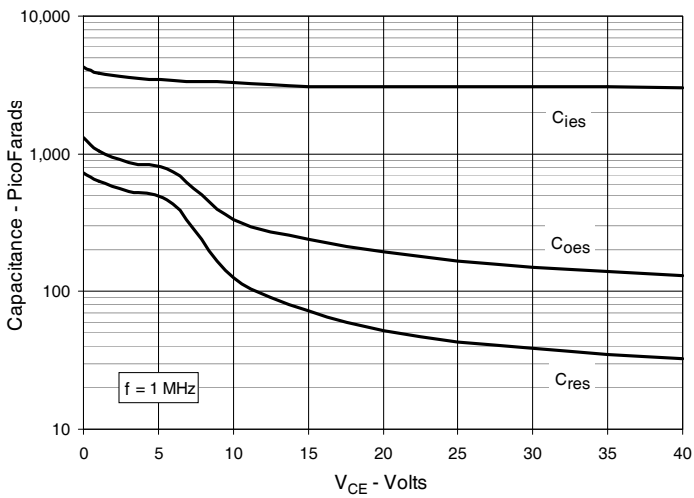
**Fig. 7. Transconductance**



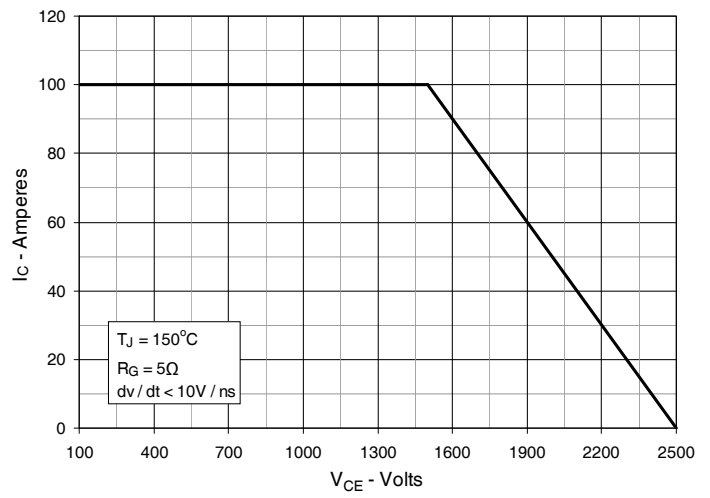
**Fig. 8. Gate Charge**



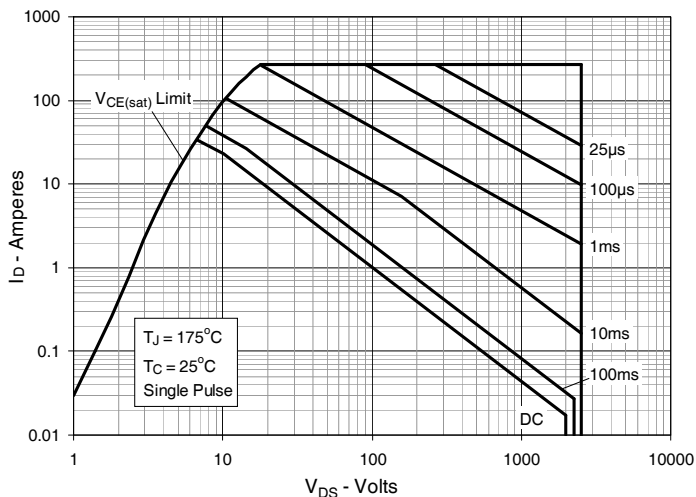
**Fig. 9. Capacitance**



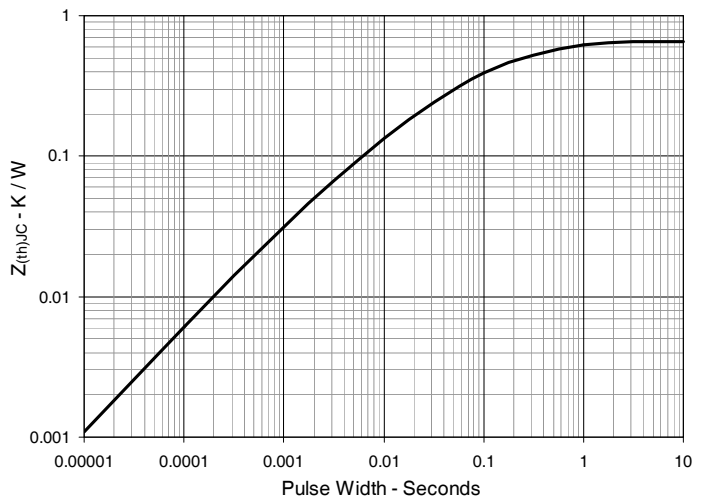
**Fig. 10. Reverse-Bias Safe Operating Area**



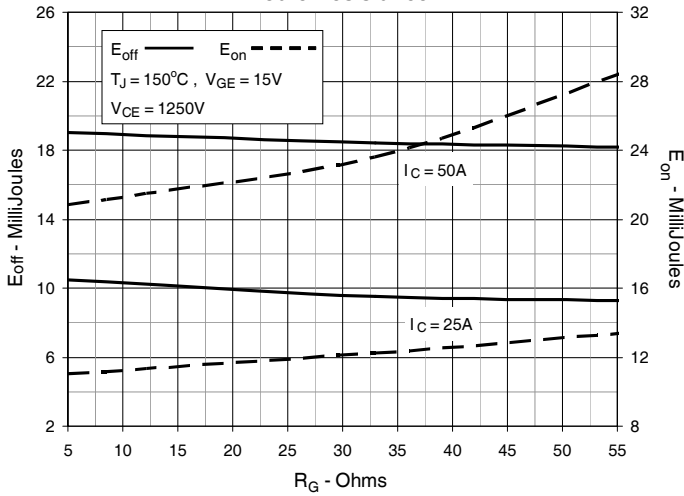
**Fig. 11. Forward-Bias Safe Operating Area**



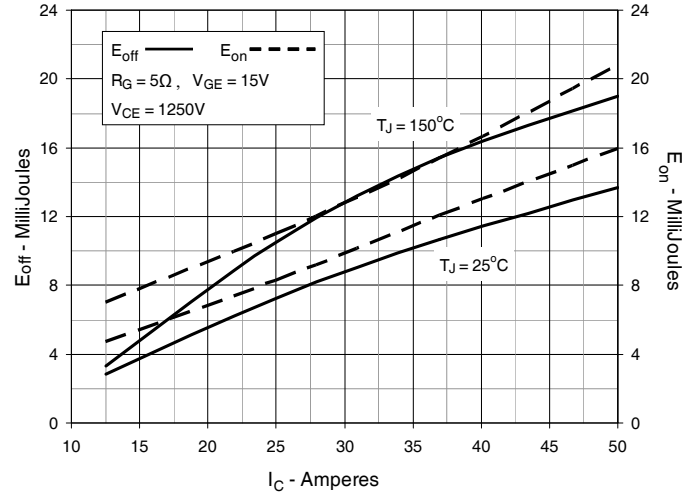
**Fig. 12. Maximum Transient Thermal Impedance (IGBT)**



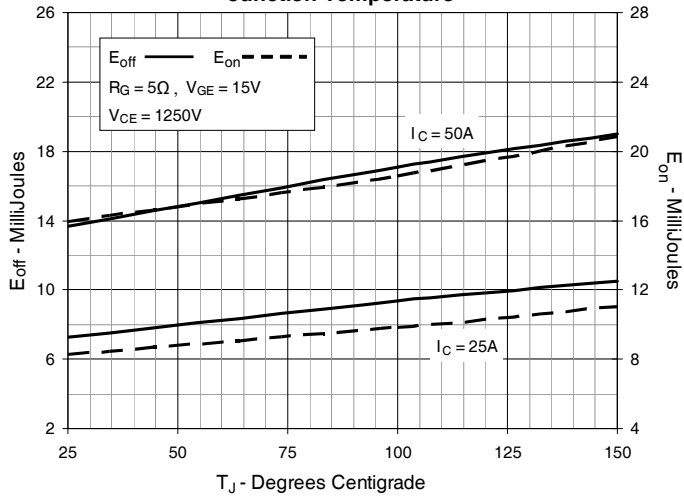
**Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance**



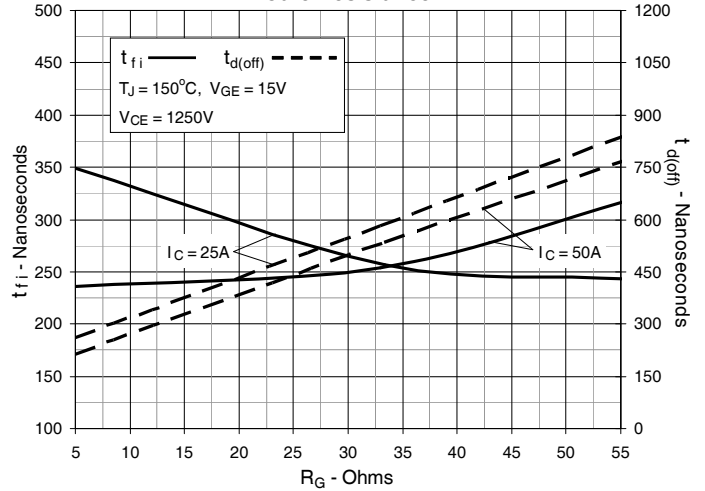
**Fig. 14. Inductive Switching Energy Loss vs. Collector Current**



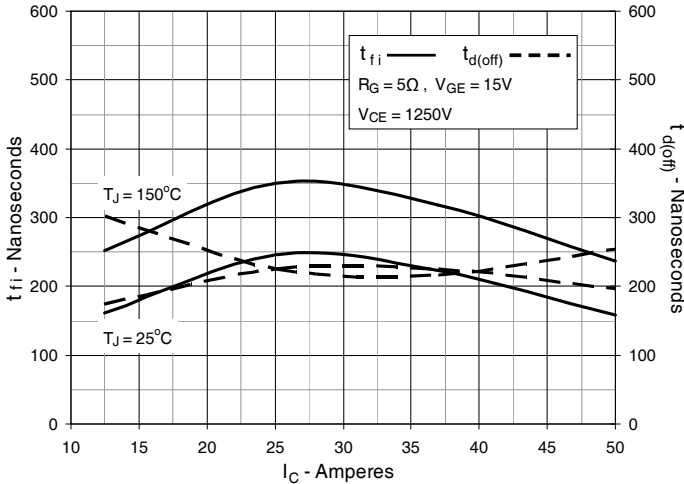
**Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature**



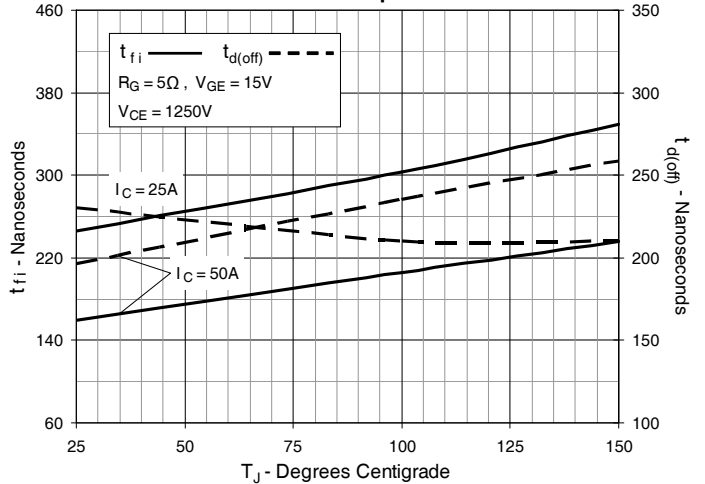
**Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance**



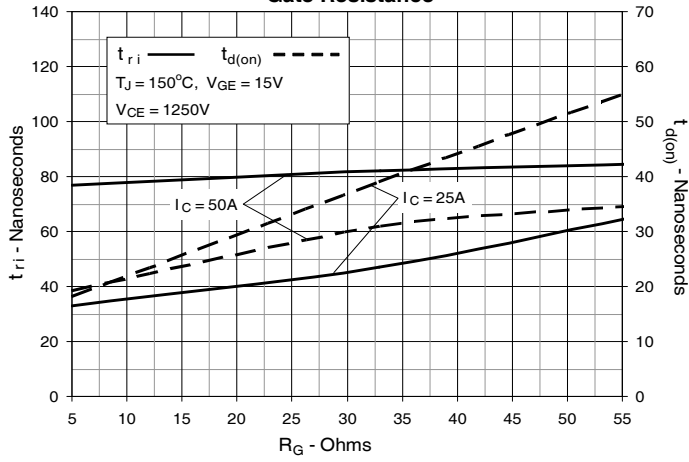
**Fig. 17. Inductive Turn-off Switching Times vs. Collector Current**



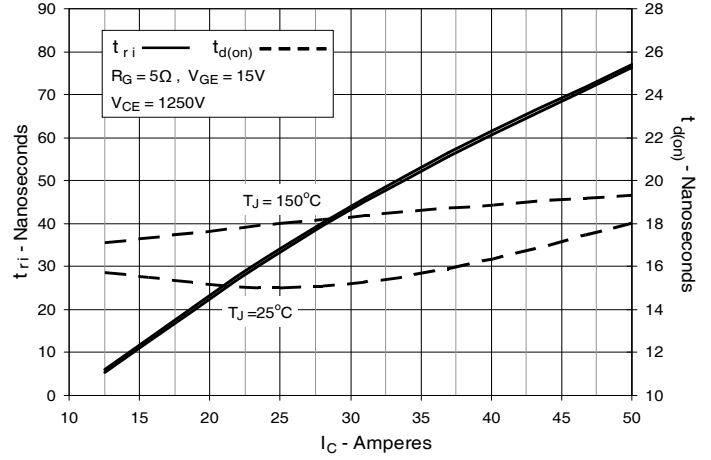
**Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature**



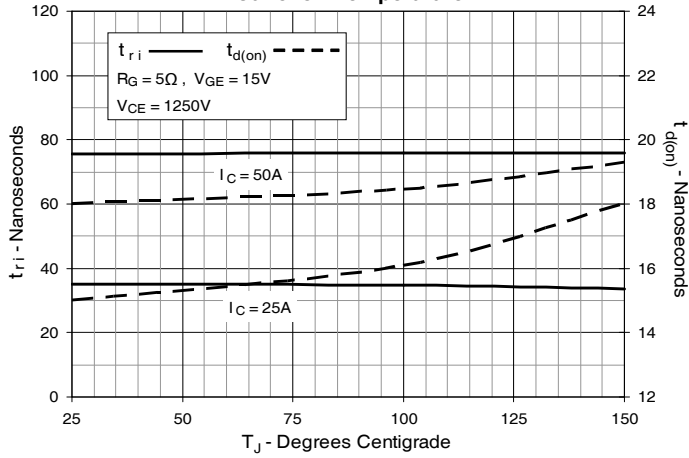
**Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance**

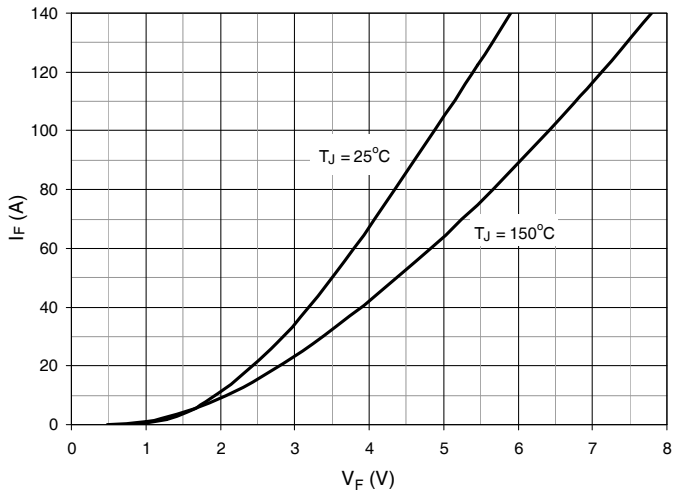
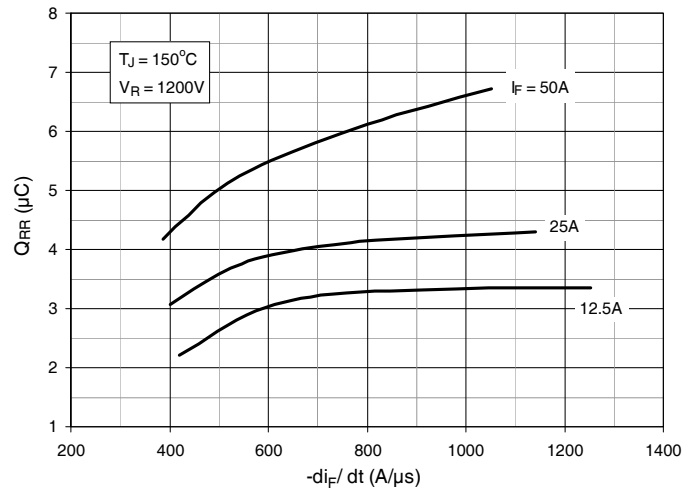
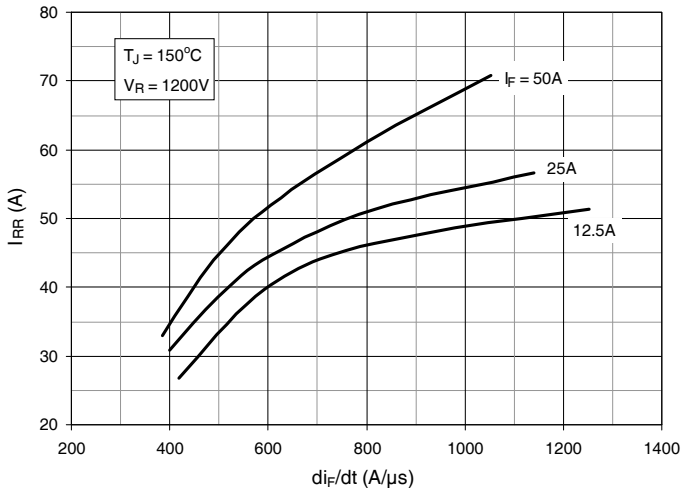
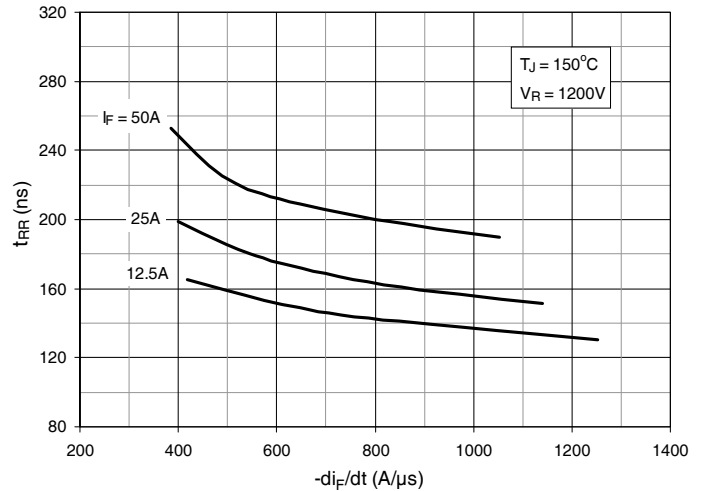
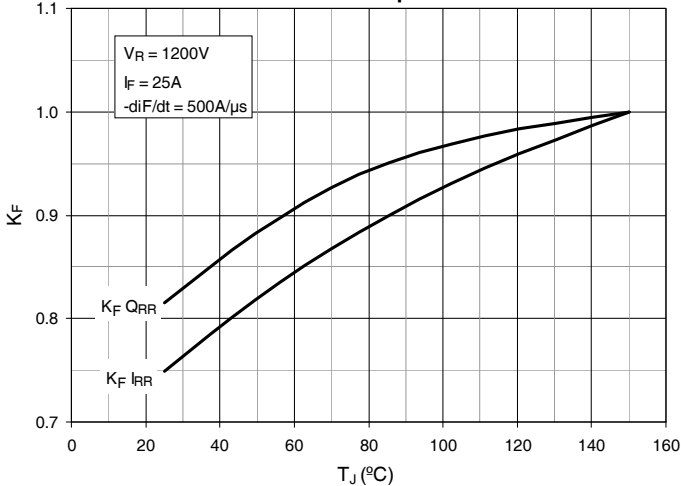
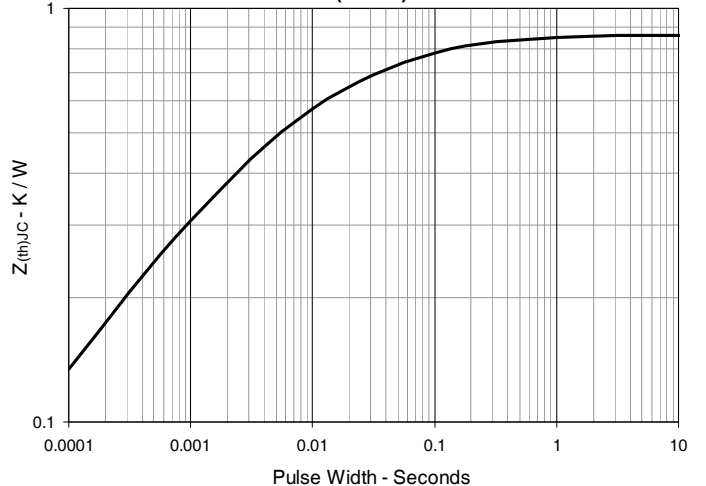


**Fig. 20. Inductive Turn-on Switching Times vs. Collector Current**

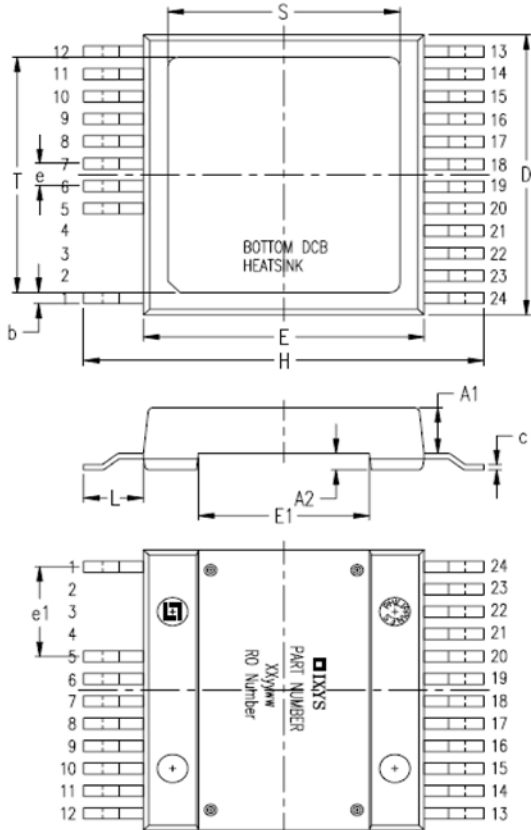


**Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature**



**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





---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).