

# High Voltage IGBT For Capacitor Discharge Applications

## MMIX4G20N250

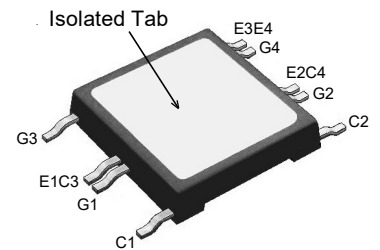
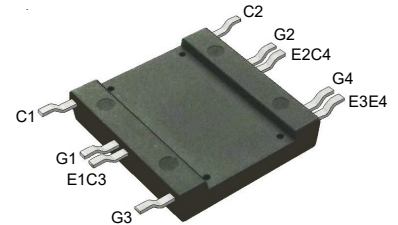
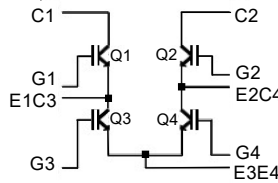
$$V_{CES} = 2500V$$

$$I_{C25} = 23A$$

$$V_{CE(sat)} \leq 3.1V$$

( Electrically Isolated Tab )

### H-Bridge Configuration



G = Gate                      E = Emitter  
C = Collector

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	2500	V
$V_{CGR}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}, R_{GE} = 1M\Omega$	2500	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	23	A
$I_{C90}$	$T_C = 90^\circ\text{C}$	14	A
$I_{CM}$	$T_C = 25^\circ\text{C}, V_{GE} = 19V, 1ms$ 10ms	105 55	A A
<b>SSOA</b>	$V_{GE} = 15V, T_{VJ} = 125^\circ\text{C}, R_G = 20\Omega$	$I_{CM} = 60$	A
<b>(RBSOA)</b>	Clamped Inductive Load	1500	V
$P_C$	$T_C = 25^\circ\text{C}$	100	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$T_{SOLD}$	Plastic Body for 10 seconds	260	$^\circ\text{C}$
$F_C$	Mounting Force	50..200 / 11..45	Nm/lb.in.
$V_{ISOL}$	50/60Hz, 1 Minute	4000	V~
<b>Weight</b>		8	g

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 4000V~ Electrical Isolation
- High Peak Current Capability
- Low Saturation Voltage
- Molding Epoxies Meet UL 94 V-0 Flammability Classification

### Advantages

- High Power Density
- Easy to Mount

### Applications

- Capacitor Discharge
- Pulser Circuits

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
$I_{CES}$	$V_{CE} = 0.8 \cdot V_{CES}, V_{GE} = 0V$ Note 2, $T_J = 125^\circ\text{C}$			10 $\mu\text{A}$ 750 $\mu\text{A}$
$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 20A, V_{GE} = 15V, \text{ Note 1}$			3.1 V

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 20\text{A}$ , $V_{CE} = 10\text{V}$ , Note 1	8	13	S
$I_{C(ON)}$	$V_{GE} = 20\text{V}$ , $V_{CE} = 15\text{V}$ , Note 1		190	A
$C_{ies}$	$V_{CE} = 15\text{V}$ , $V_{GE} = 20\text{V}$ , $f = 1\text{MHz}$		1190	pF
$C_{oes}$			53	pF
$C_{res}$			18	pF
$Q_g$	$I_C = 20\text{A}$ , $V_{GE} = 15\text{V}$ , $V_{CE} = 1000\text{V}$		53	nC
$Q_{ge}$			8	nC
$Q_{gc}$			22	nC
$t_{d(on)}$	<b>Resistive Switching Times</b> $I_C = 40\text{A}$ , $V_{GE} = 15\text{V}$ $V_{CE} = 1250\text{V}$ , $R_G = 10\Omega$		57	ns
$t_r$			160	ns
$t_{d(off)}$			136	ns
$t_f$			930	ns
$R_{thJC}$				1.25 $^\circ\text{C/W}$
$R_{thCS}$		0.05		$^\circ\text{C/W}$
$R_{thJA}$		30		$^\circ\text{C/W}$

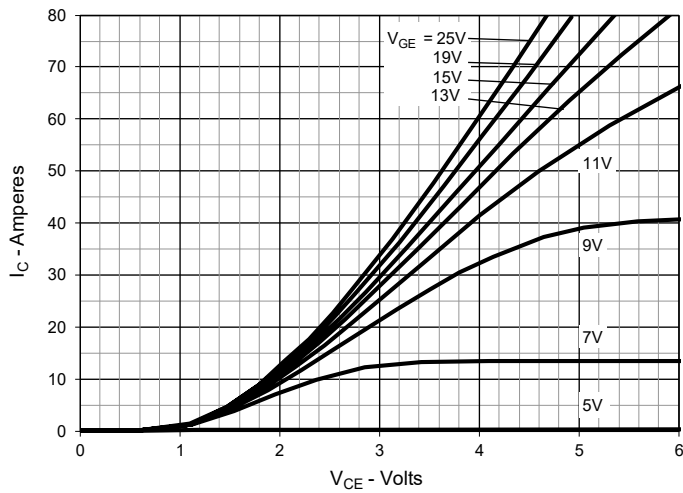
**Notes:**

1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Device must be heatsunk for high temperature leakage current measurements to avoid thermal runaway.

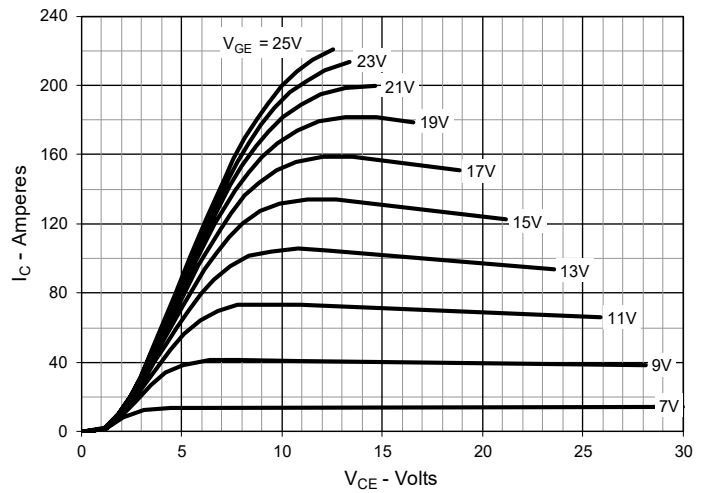
Littelfuse reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered	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
by one or more of the following U.S. patents:	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	

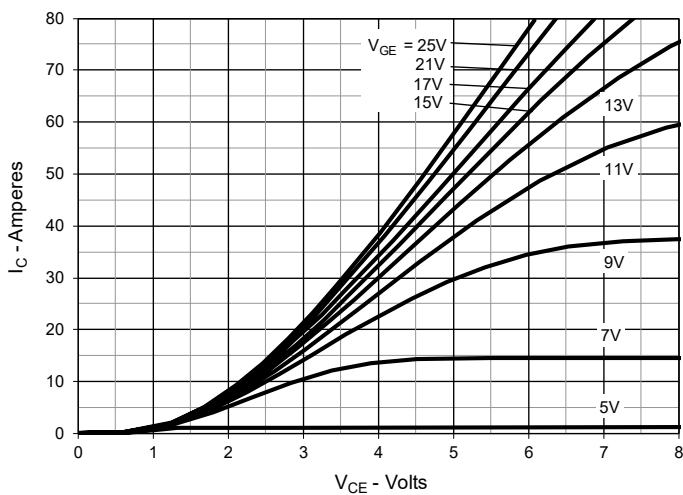
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



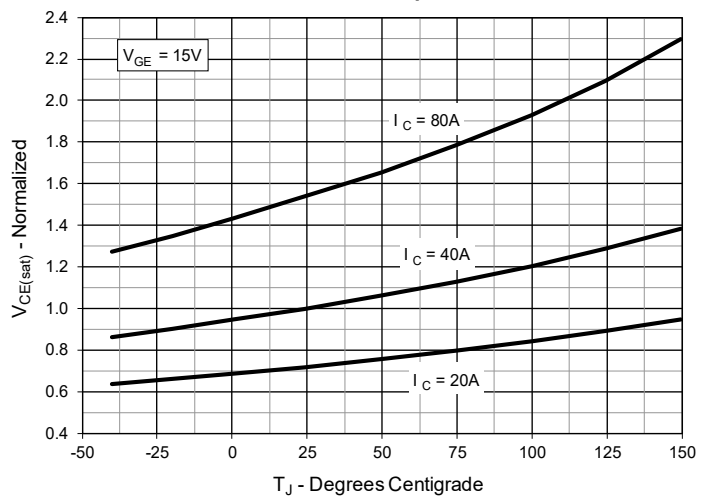
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



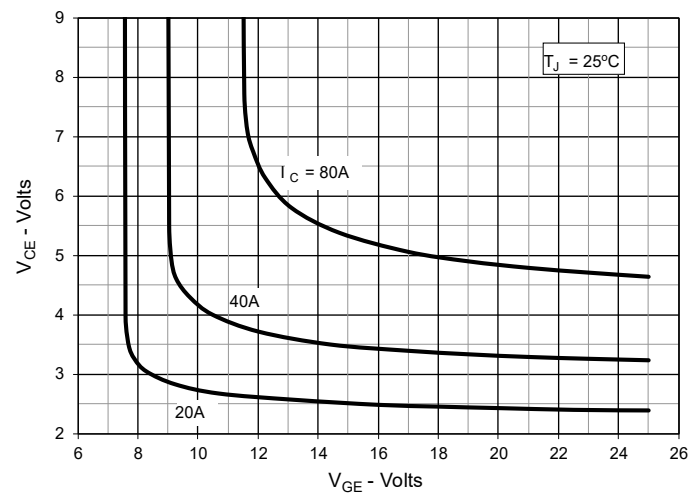
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



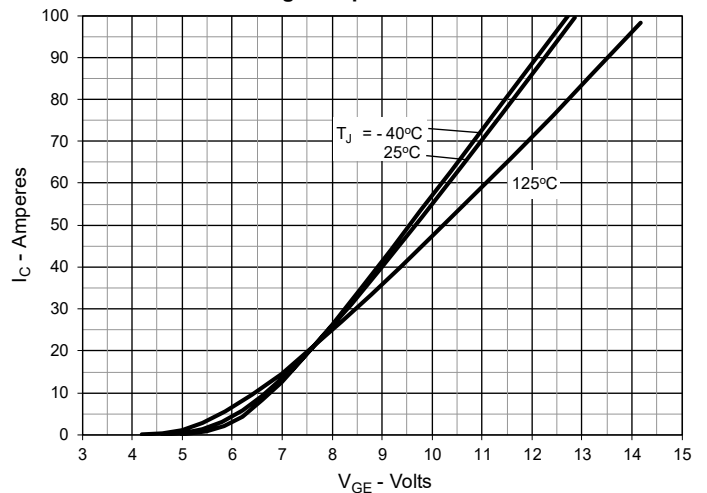
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



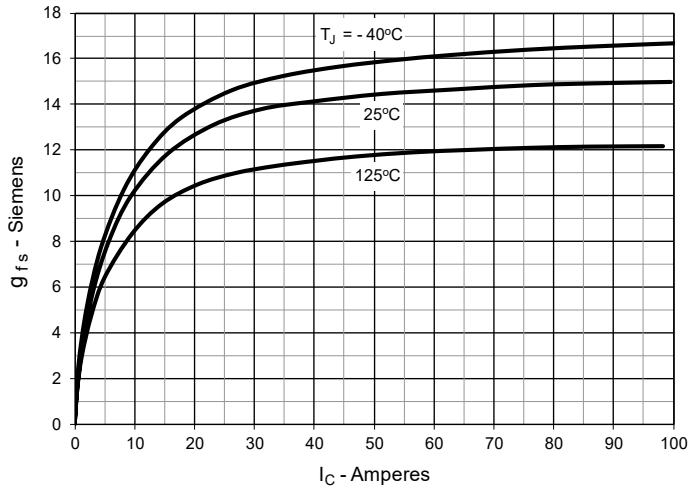
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



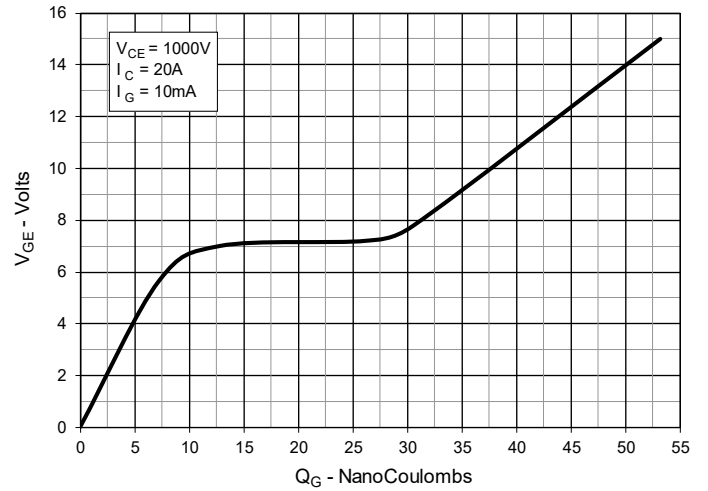
**Fig. 6. Input Admittance**



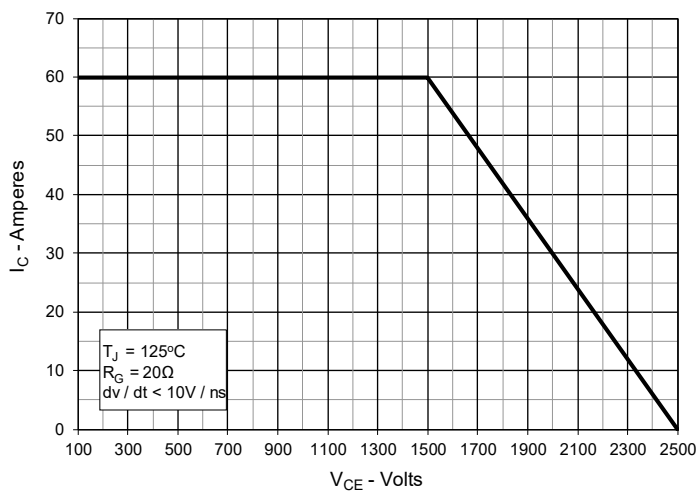
**Fig. 7. Transconductance**



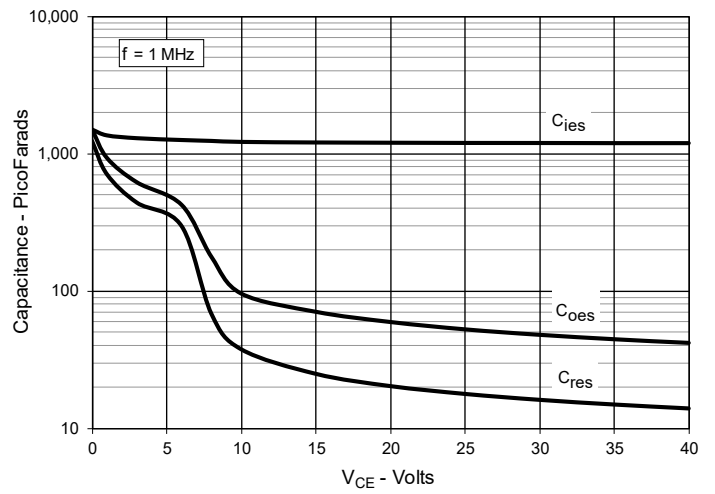
**Fig. 8. Gate Charge**



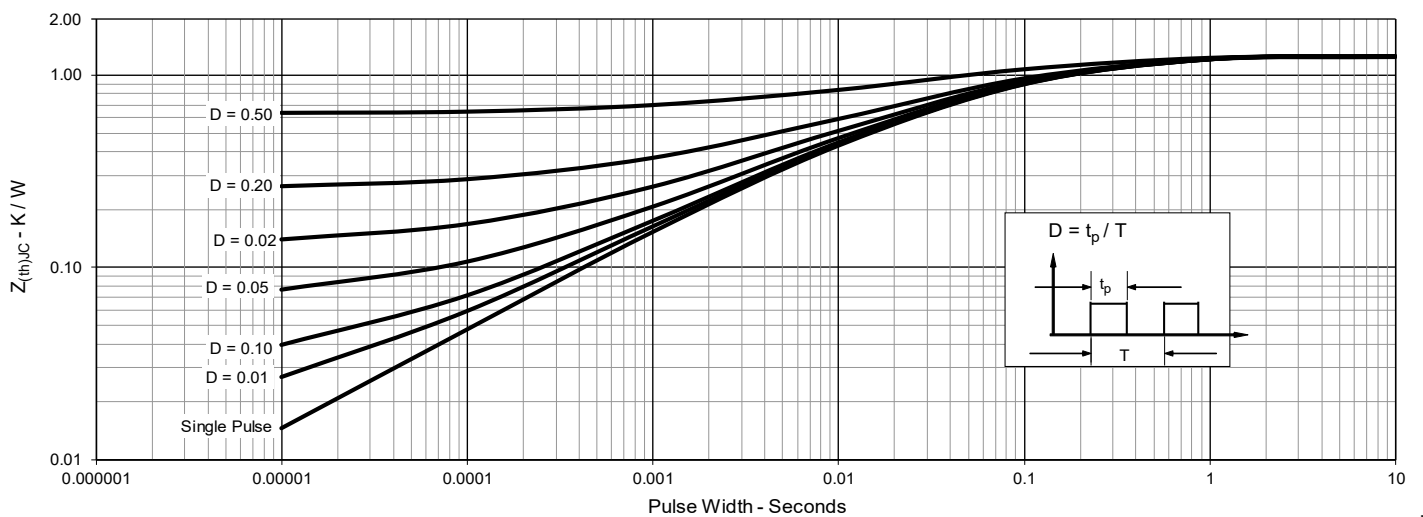
**Fig. 9. Reverse-Bias Safe Operating Area**



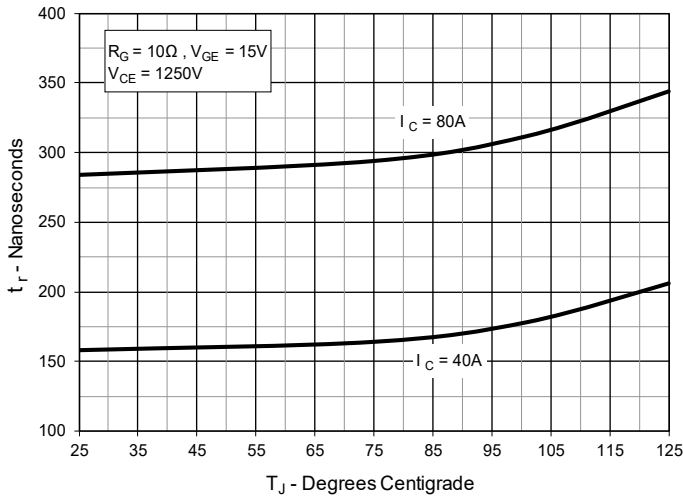
**Fig. 10. Capacitance**



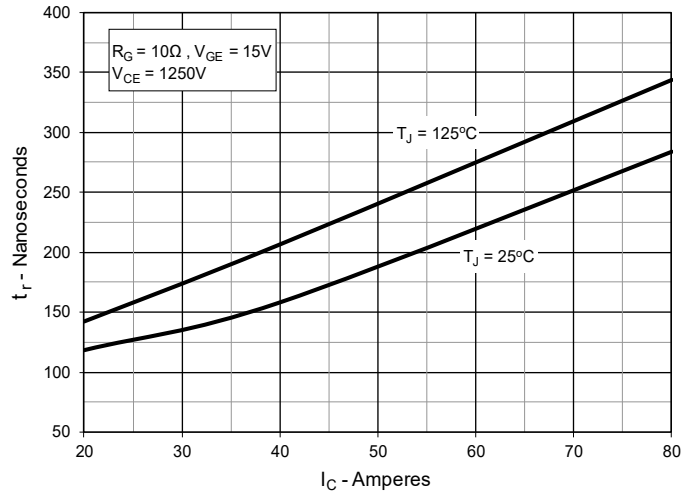
**Fig. 11. Maximum Transient Thermal Impedance**



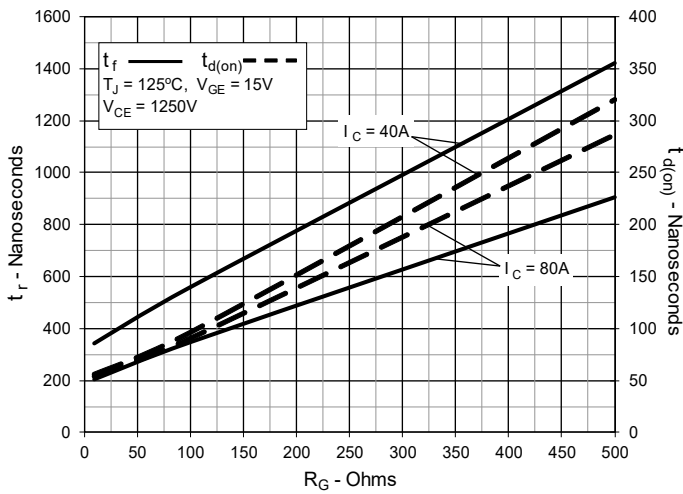
**Fig. 12. Resistive Turn-on Rise Time vs. Junction Temperature**



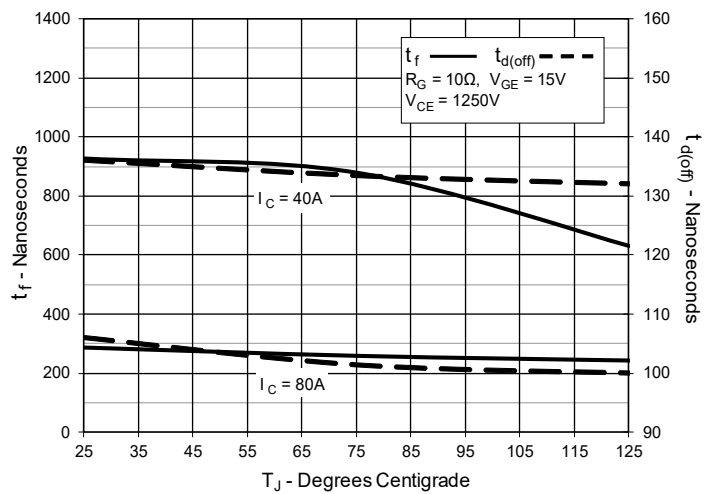
**Fig. 13. Resistive Turn-on Rise Time vs. Collector Current**



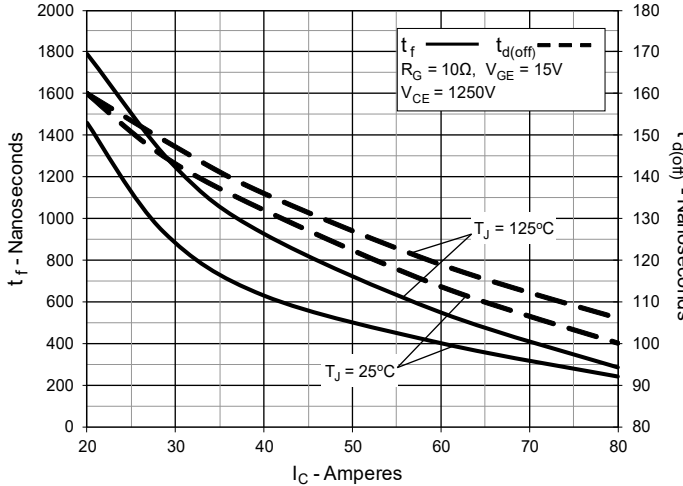
**Fig. 14. Resistive Turn-on Switching Times vs. Gate Resistance**



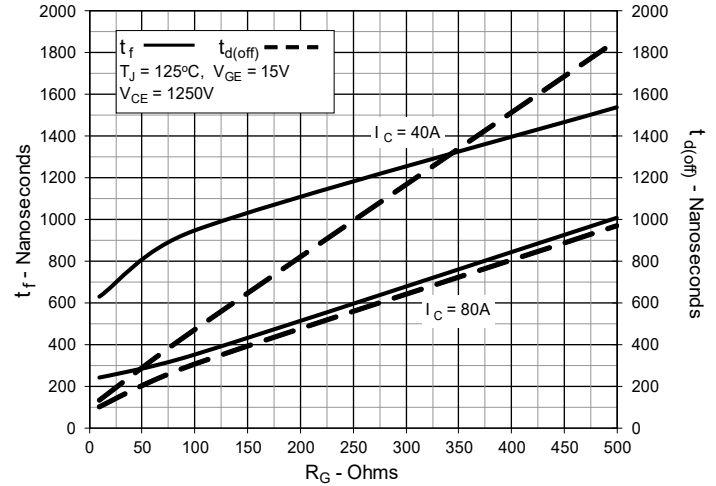
**Fig. 15. Resistive Turn-off Switching Times vs. Junction Temperature**



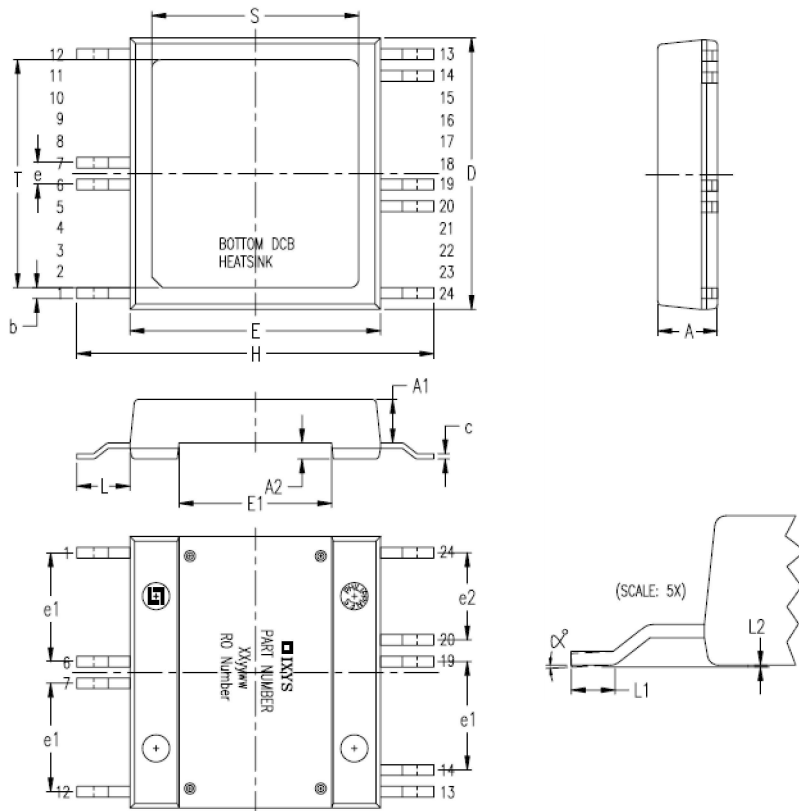
**Fig. 16. Resistive Turn-off Switching Times vs. Collector Current**



**Fig. 17. Resistive Turn-off Switching Times vs. Gate Resistance**



## 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	.394 BSC		10.00 BSC	
e2	.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°