

# TrenchT2™ GigaMOS™ MMIX1T600N04T2

## Power MOSFET

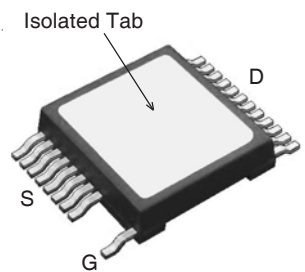
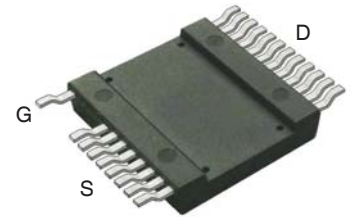
$$V_{DSS} = 40V$$

$$I_{D25} = 600A$$

$$R_{DS(on)} \leq 1.3m\Omega$$

(Electrically Isolated Tab)

N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Diode



G = Gate      D = Drain  
S = Source

Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$	40	V
$V_{DGR}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GS} = 1M\Omega$	40	V
$V_{GSM}$	Transient	$\pm 20$	V
$I_{D25}$	$T_C = 25^\circ\text{C}$ (Chip Capability)	600	A
$I_{DM}$	$T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$	2000	A
$I_A$	$T_C = 25^\circ\text{C}$	200	A
$E_{AS}$	$T_C = 25^\circ\text{C}$	3	J
$P_D$	$T_C = 25^\circ\text{C}$	830	W
$T_J$		-55 ... +175	$^\circ\text{C}$
$T_{JM}$		175	$^\circ\text{C}$
$T_{stg}$		-55 ... +175	$^\circ\text{C}$
$T_L$	1.6mm (0.062 in.) from Case for 10s	300	$^\circ\text{C}$
$T_{SOLD}$	Plastic Body for 10s	260	$^\circ\text{C}$
$V_{ISOL}$	50/60 Hz, 1 Minute	2500	V~
$F_C$	Mounting Force	50..200 / 11..45	N/lb.
<b>Weight</b>		8	g

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{DSS}$	$V_{GS} = 0V$ , $I_D = 250\mu\text{A}$	40		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\mu\text{A}$	1.5		3.5 V
$I_{GSS}$	$V_{GS} = \pm 20V$ , $V_{DS} = 0V$			$\pm 200$ nA
$I_{DSS}$	$V_{DS} = V_{DSS}$ , $V_{GS} = 0V$ $T_J = 150^\circ\text{C}$			10 $\mu\text{A}$ 1.5 mA
$R_{DS(on)}$	$V_{GS} = 10V$ , $I_D = 100A$ , Note 1			1.3 m $\Omega$

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Substrate
  - Excellent Thermal Transfer
  - Increased Temperature and Power Cycling Capability
  - High Isolation Voltage (2500V~)
- 175 $^\circ\text{C}$  Operating Temperature
- Very High Current Handling Capability
- Fast Intrinsic Diode
- Avalanche Rated
- Very Low  $R_{DS(on)}$

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- DC-DC Converters and Off-Line UPS
- Primary-Side Switch
- High Speed Power Switching Applications

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$V_{DS} = 10\text{V}$ , $I_D = 60\text{A}$ , Note 1	90	150	S
$C_{iss}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$		40	nF
$C_{oss}$			6400	pF
$C_{rss}$			1470	pF
$R_{GI}$	Gate Input Resistance		1.46	$\Omega$
$t_{d(on)}$	<b>Resistive Switching Times</b> $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 200\text{A}$ $R_G = 1\Omega$ (External)		40	ns
$t_r$			20	ns
$t_{d(off)}$			90	ns
$t_f$			250	ns
$Q_{g(on)}$	$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{DSS}$		590	nC
$Q_{gs}$			127	nC
$Q_{gd}$			163	nC
$R_{thJC}$				0.18 $^\circ\text{C/W}$
$R_{thCS}$		0.05		$^\circ\text{C/W}$

**Source-Drain Diode**

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$I_S$	$V_{GS} = 0\text{V}$			600 A
$I_{SM}$	Repetitive, Pulse Width Limited by $T_{JM}$			1800 A
$V_{SD}$	$I_F = 100\text{A}$ , $V_{GS} = 0\text{V}$ , Note 1			1.2 V
$t_{rr}$	$I_F = 150\text{A}$ , $V_{GS} = 0\text{V}$ $-di/dt = 100\text{A}/\mu\text{s}$ $V_R = 20\text{V}$		100	ns
$I_{RM}$			3.3	A
$Q_{RM}$			165	nC

Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

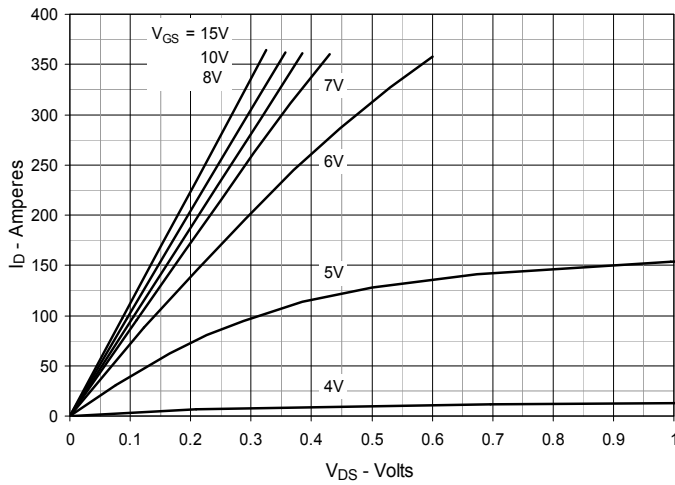
**ADVANCE TECHNICAL INFORMATION**

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.

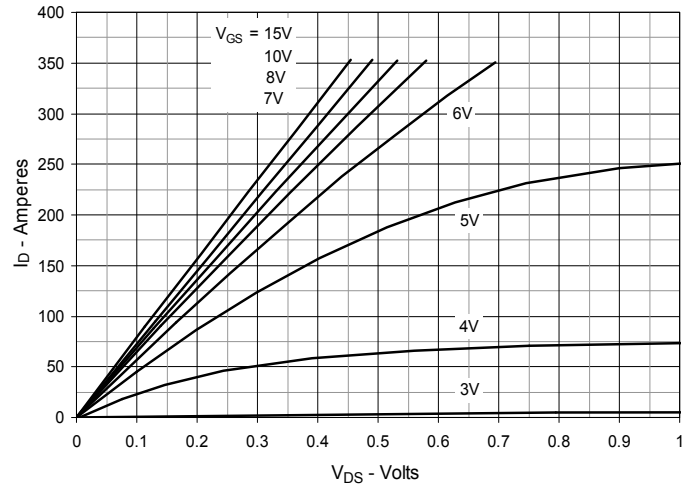
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered	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:	4,850,072	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	

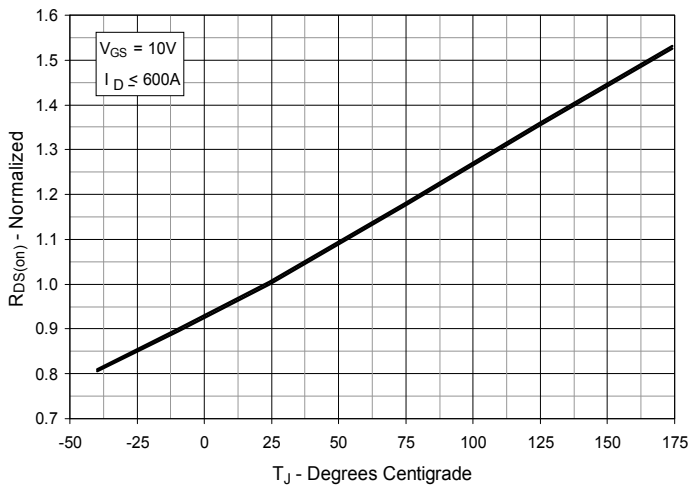
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



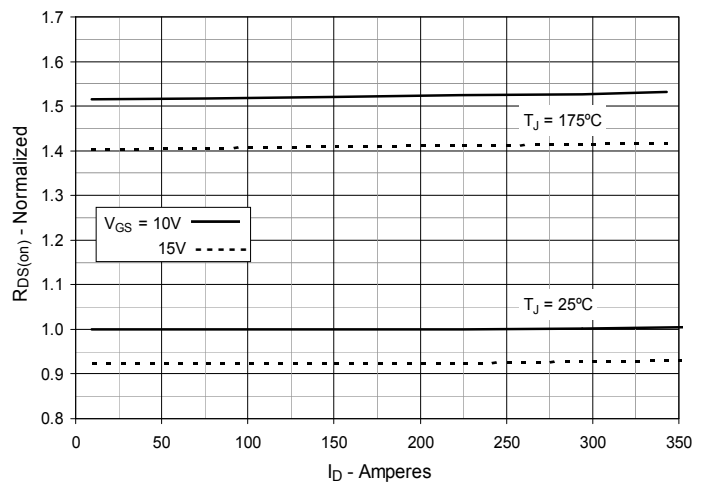
**Fig. 2. Output Characteristics @  $T_J = 150^\circ\text{C}$**



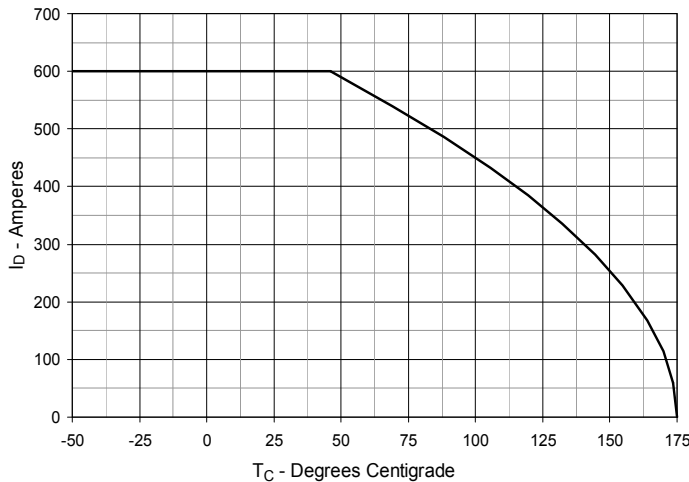
**Fig. 3. Normalized  $R_{DS(on)}$  vs. Junction Temperature**



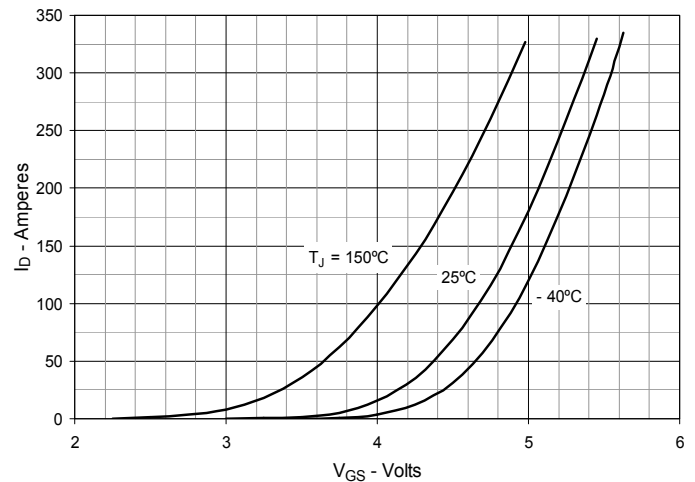
**Fig. 4. Normalized  $R_{DS(on)}$  vs. Drain Current**



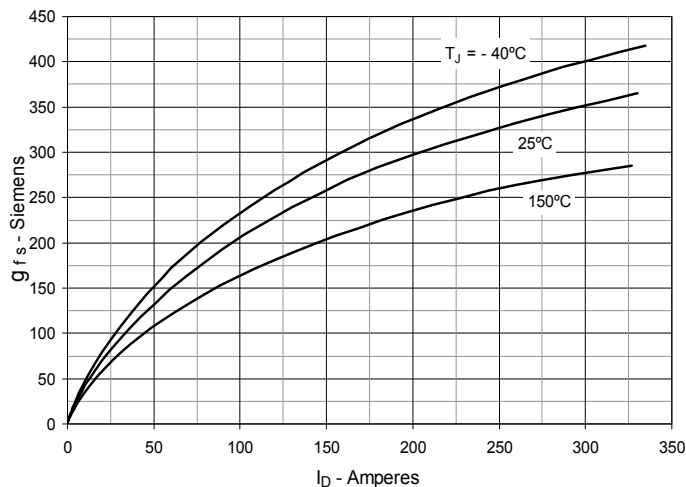
**Fig. 5. Drain Current vs. Case Temperature**



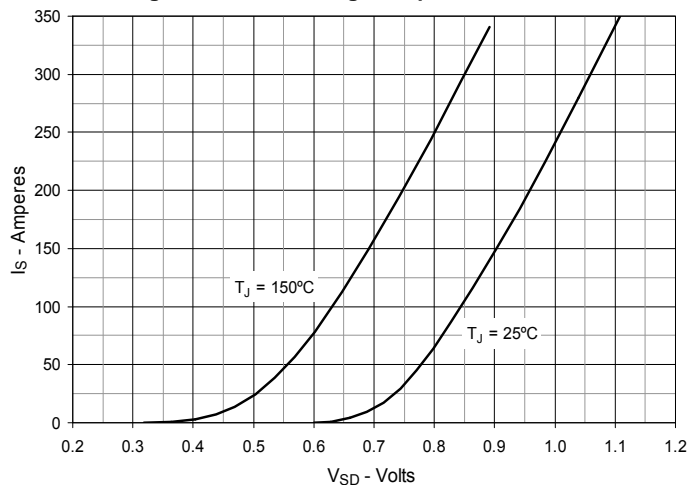
**Fig. 6. Input Admittance**



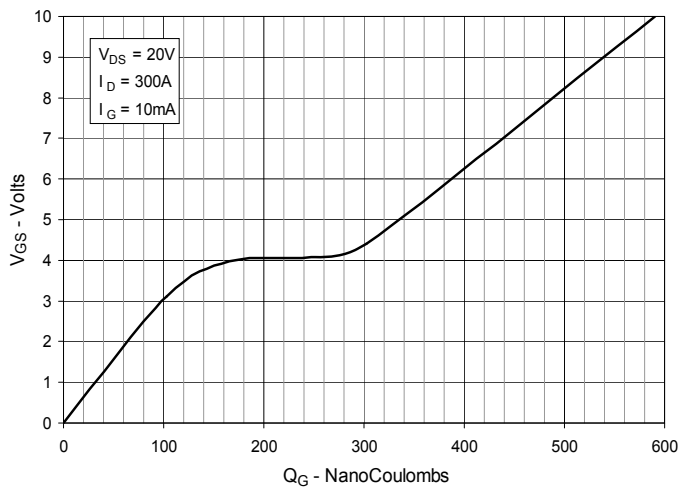
**Fig. 7. Transconductance**



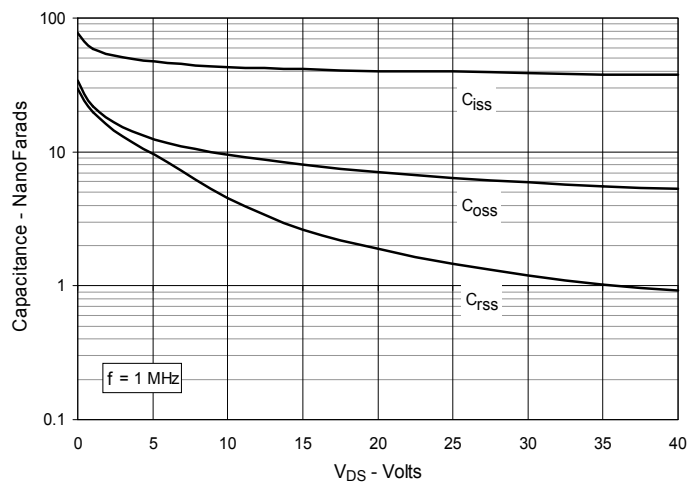
**Fig. 8. Forward Voltage Drop of Intrinsic Diode**



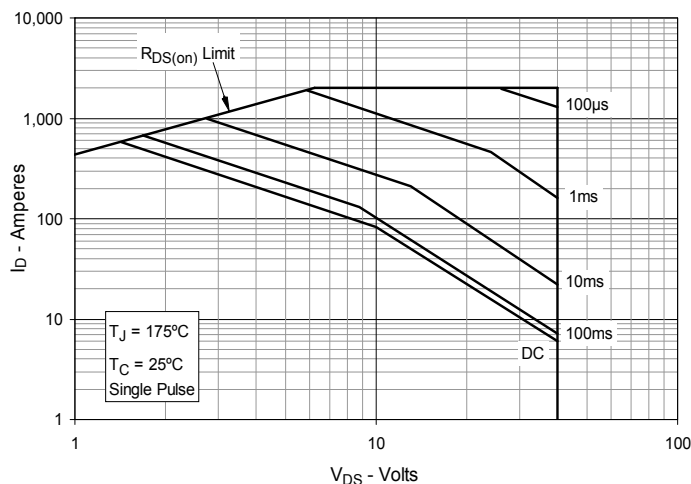
**Fig. 9. Gate Charge**



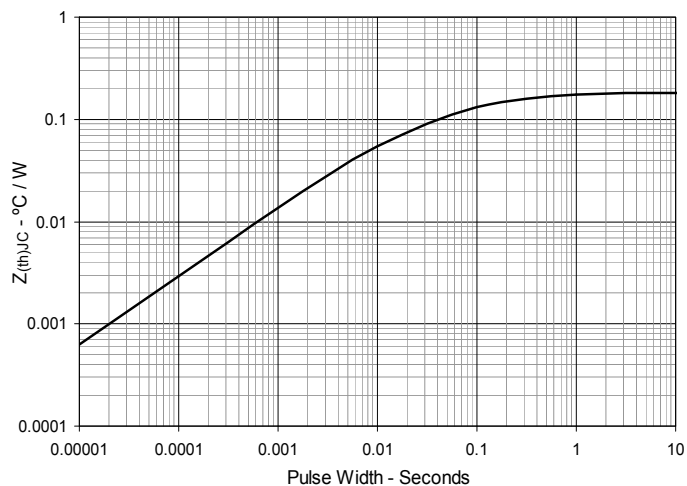
**Fig. 10. Capacitance**



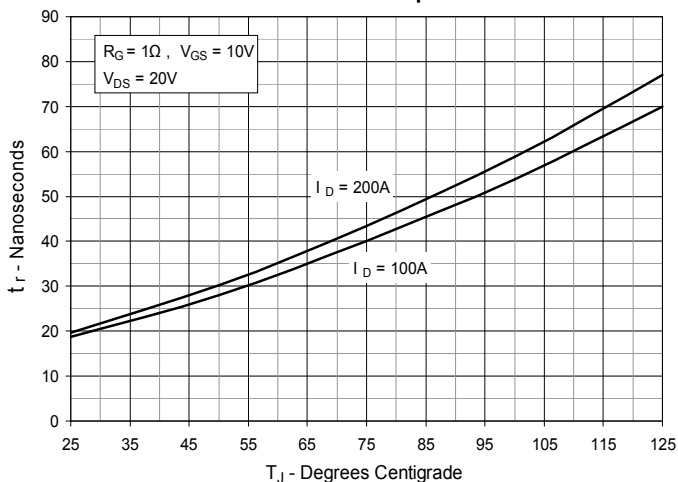
**Fig. 11. Forward-Bias Safe Operating Area**



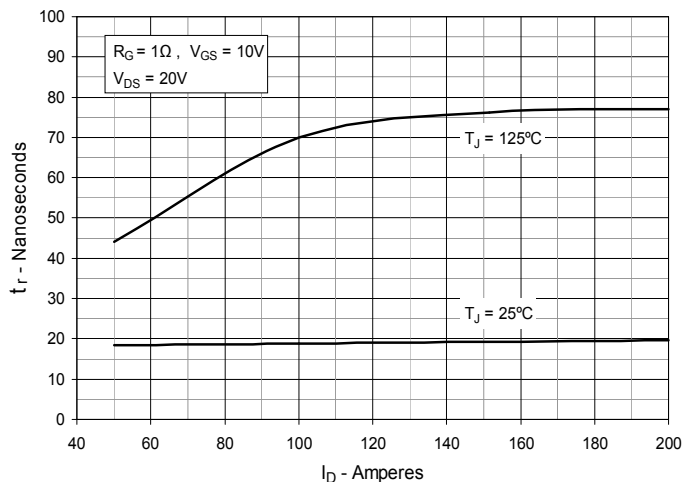
**Fig. 12. Maximum Transient Thermal Impedance**



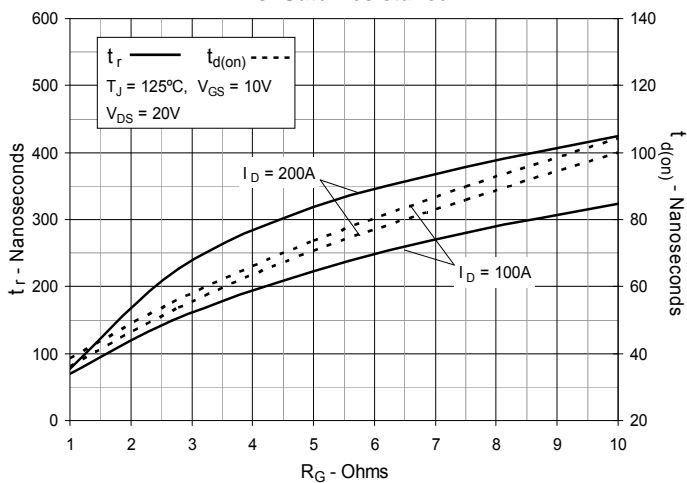
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



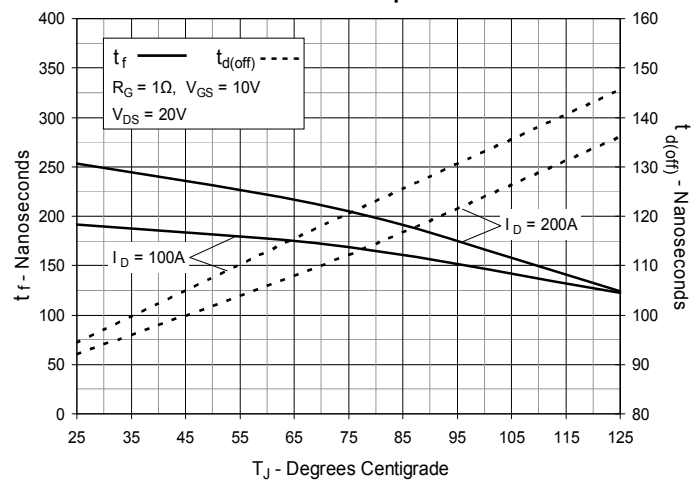
**Fig. 14. Resistive Turn-on Rise Time vs. Drain Current**



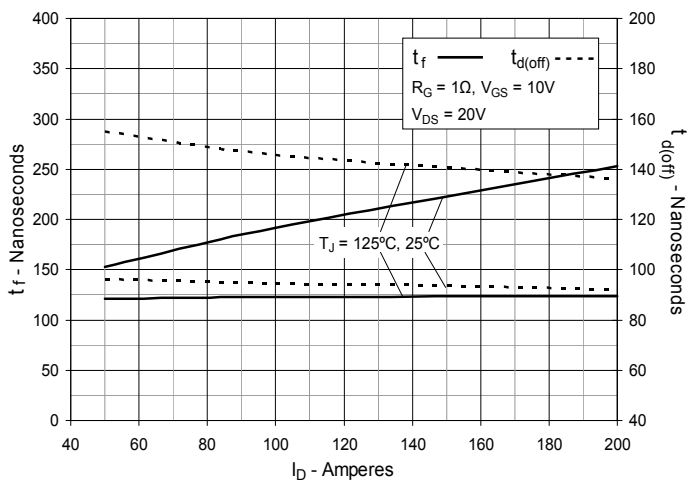
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



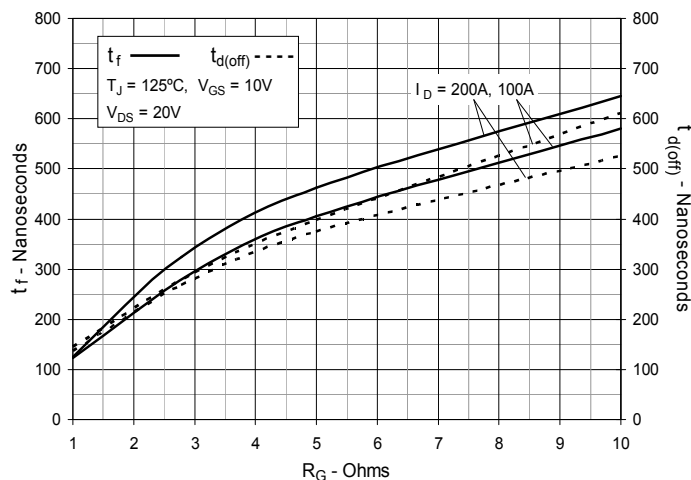
**Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature**



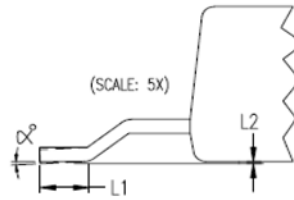
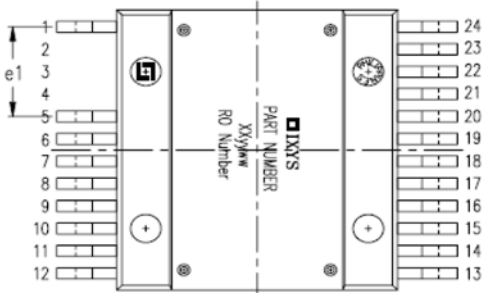
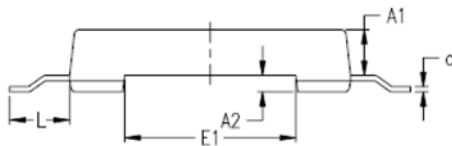
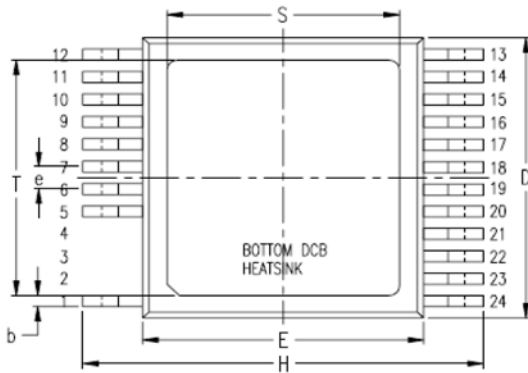
**Fig. 17. Resistive Turn-off Switching Times vs. Drain Current**



**Fig. 18. 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	.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 = Source**  
**13-24 = Drain**



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