

**Polar3™**
**Power MOSFET**
**Current & Temperature Sensing**
**(Electrically Isolated Tab)**

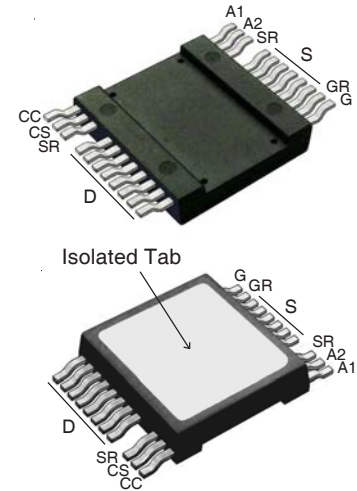
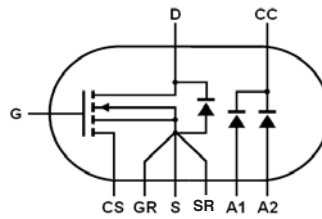
 N-Channel Enhancement Mode  
 Avalanche Rated

**MMIX1T132N50P3**

$$V_{DSS} = 500V$$

$$I_{D25} = 63A$$

$$R_{DS(on)} \leq 43m\Omega$$



**G** - Gate  
**CS** - Current Sense  
**GR** - Gate Return  
**S** - Source  
**SR** - Sense Current Return  
**A1** - Anode 1  
**A2** - Anode 2  
**CC** - Common Cathode  
**D** - Drain

Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ C$ to $150^\circ C$	500	V
$V_{DGR}$	$T_J = 25^\circ C$ to $150^\circ C$ , $R_{GS} = 1M\Omega$	500	V
$V_{GSS}$	Continuous	$\pm 30$	V
$V_{GSM}$	Transient	$\pm 40$	V
$I_{D25}$	$T_C = 25^\circ C$	63	A
$I_{DM}$	$T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$	330	A
$I_A$	$T_C = 25^\circ C$	66	A
$E_{AS}$	$T_C = 25^\circ C$	2	J
$dv/dt$	$I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 150^\circ C$	35	V/ns
$P_D$	$T_C = 25^\circ C$	520	W
$T_J$		-55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		-55 ... +150	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	Plastic Body for 10s	260	$^\circ C$
$V_{ISOL}$	50/60 Hz, 1 Minute	2500	V~
$F_C$	Mounting Force	50..200 / 11..45	N/lb.
<b>Weight</b>		8	g

**Features**

- Silicon Chip on Direct-Copper-Bond Substrate
  - High Power Dissipation
  - Isolated Mounting Surface
  - 2500V~ Electrical Isolation
- Avalanche Rated
- Low Package Inductance
- Current Mirror for MOSFET Source & Sensing
- Integrated Diodes for Sensing MOSFET Temperature
- Low  $R_{DS(on)}$

**Advantages**

- Easy to Mount
- Space Savings

**Applications**

- DC-DC Converters
- AC-DC Converters
- PFC
- Connect / Disconnect Load
- Inrush Current Control

Symbol	Test Conditions ( $T_J = 25^\circ C$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{DSS}$	$V_{GS} = 0V$ , $I_D = 3mA$	500		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 8mA$	3.0		5.0 V
$I_{GSS}$	$V_{GS} = \pm 30V$ , $V_{DS} = 0V$			$\pm 200$ nA
$I_{DSS}$	$V_{DS} = V_{DSS}$ , $V_{GS} = 0V$ Note 2, $T_J = 125^\circ C$			50 $\mu A$ 3 mA
$R_{DS(on)}$	$V_{GS} = 10V$ , $I_D = 66A$ , Note 1			43 m $\Omega$

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$V_{DS} = 10\text{V}, I_D = 66\text{A}$ , Note 1	68	110	S
$C_{iss}$	$V_{GS} = 0\text{V}, V_{DS} = 25\text{V}, f = 1\text{MHz}$		18.6	nF
$C_{oss}$			1710	pF
$C_{rss}$			12	pF
$R_{Gi}$	Gate Input Resistance		1.16	$\Omega$
$t_{d(on)}$	<b>Resistive Switching Times</b> $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 66\text{A}$ $R_G = 1\Omega$ (External)		42	ns
$t_r$			19	ns
$t_{d(off)}$			90	ns
$t_f$			15	ns
$Q_{g(on)}$	$V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 66\text{A}$		267	nC
$Q_{gs}$			95	nC
$Q_{gd}$			63	nC
$R_{thJC}$				0.24 $^\circ\text{C/W}$
$R_{thCS}$		0.05		$^\circ\text{C/W}$
$R_{thJA}$		30		$^\circ\text{C/W}$

**Source-Drain Diode**

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$I_S$	$V_{GS} = 0\text{V}$			132 A
$I_{SM}$	Repetitive, Pulse Width Limited by $T_{JM}$			530 A
$V_{SD}$	$I_F = 100\text{A}, V_{GS} = 0\text{V}$ , Note 1			1.5 V
$t_{rr}$	$I_F = 66\text{A}, -di/dt = 100\text{A}/\mu\text{s}$ $V_R = 100\text{V}, V_{GS} = 0\text{V}$		600	ns
$Q_{RM}$			12	$\mu\text{C}$
$I_{RM}$			40	A

**Notes:**

1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Part must be heatsunk for high-temp  $I_{DSS}$  measurement.

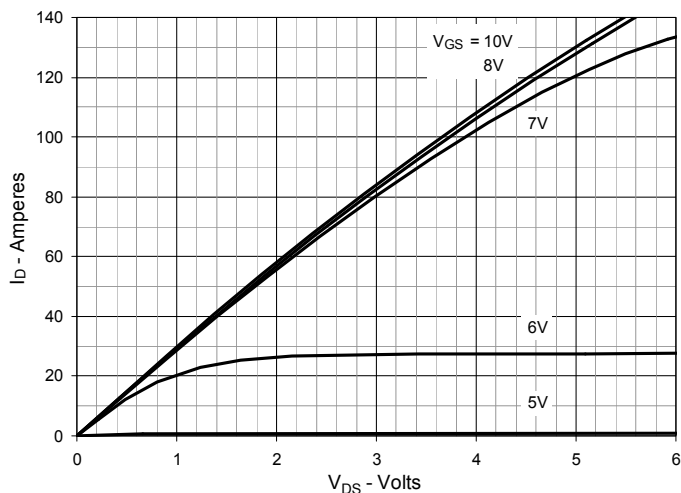
**ADVANCE TECHNICAL INFORMATION**

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.

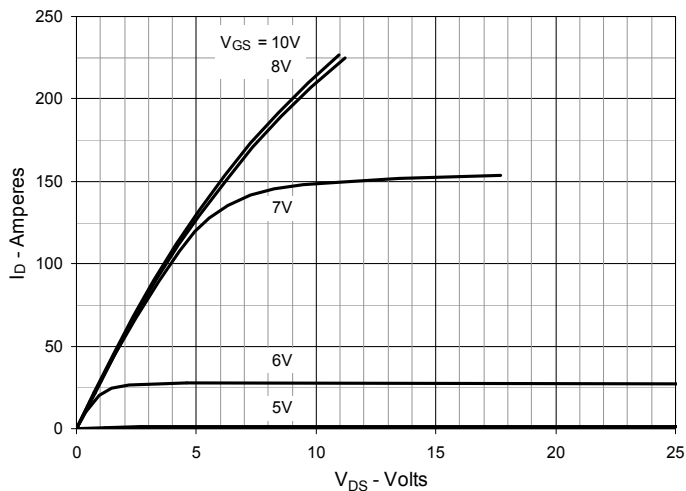
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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:	4,860,072	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	

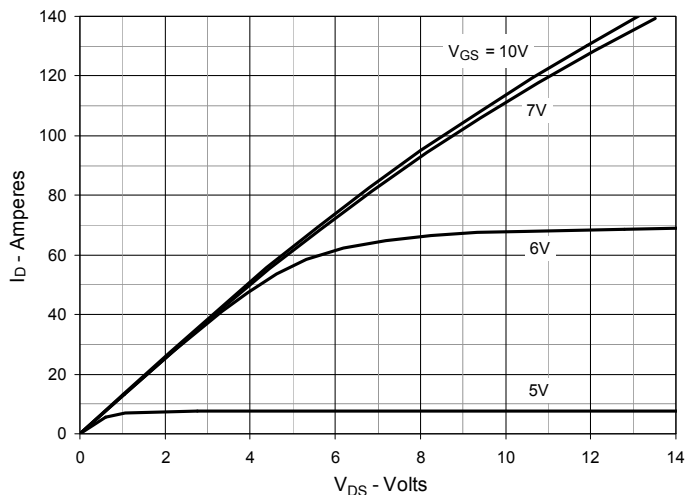
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



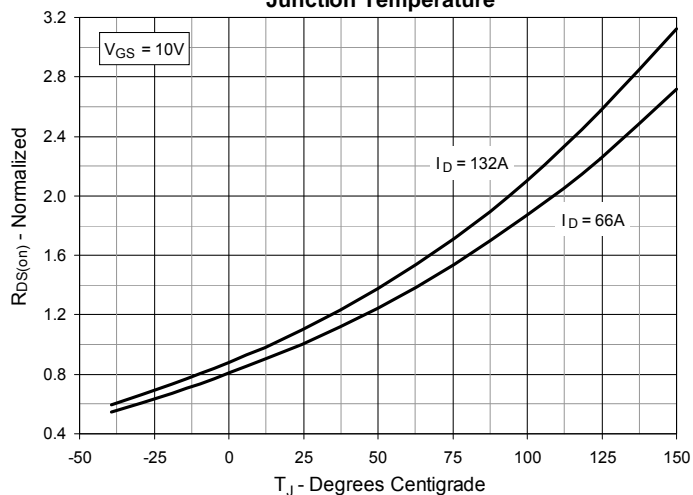
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



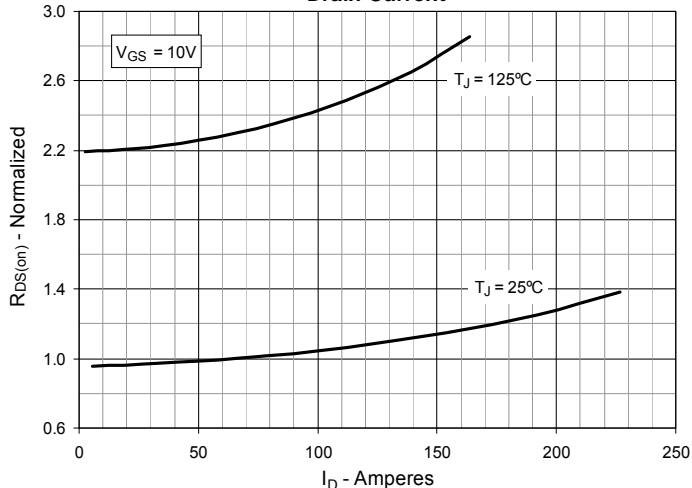
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



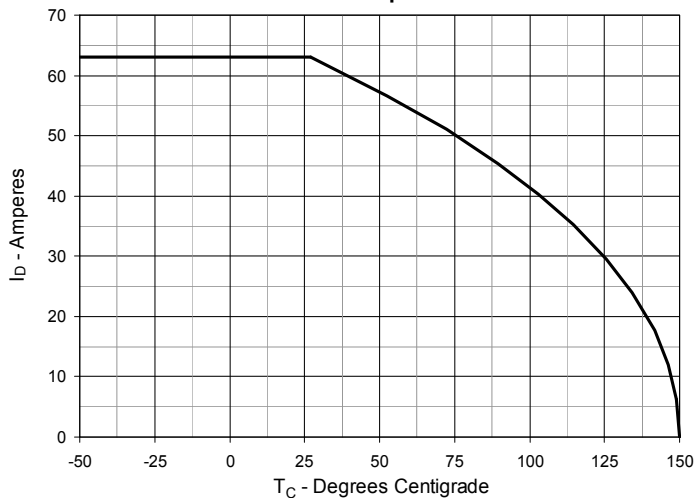
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 66\text{A}$  Value vs. Junction Temperature**



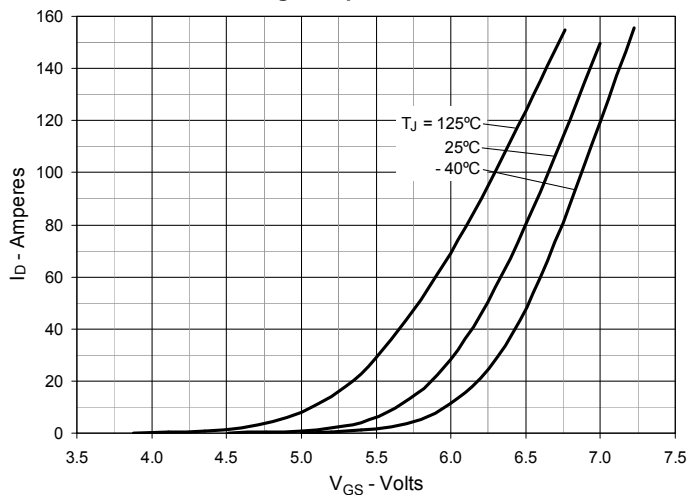
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 66\text{A}$  Value vs. Drain Current**



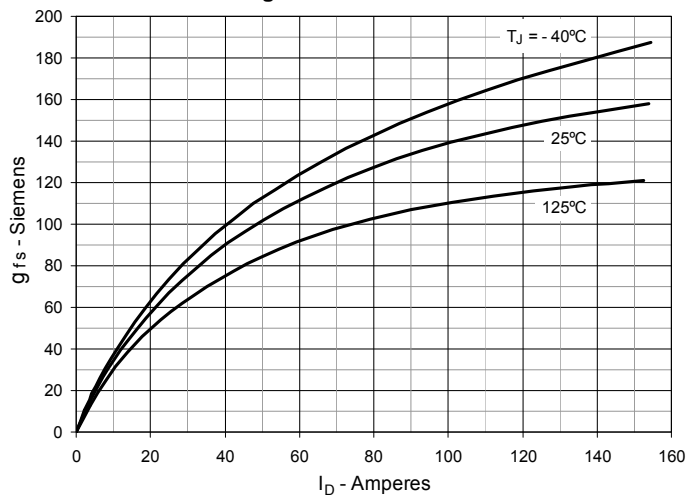
**Fig. 6. Maximum Drain Current vs. Case Temperature**



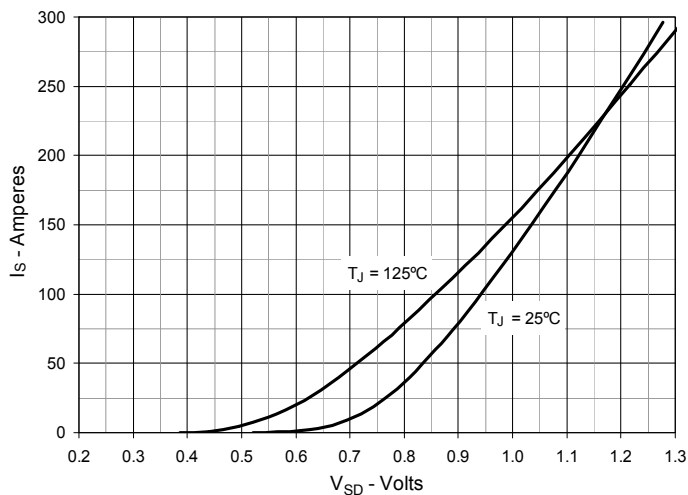
**Fig. 7. Input Admittance**



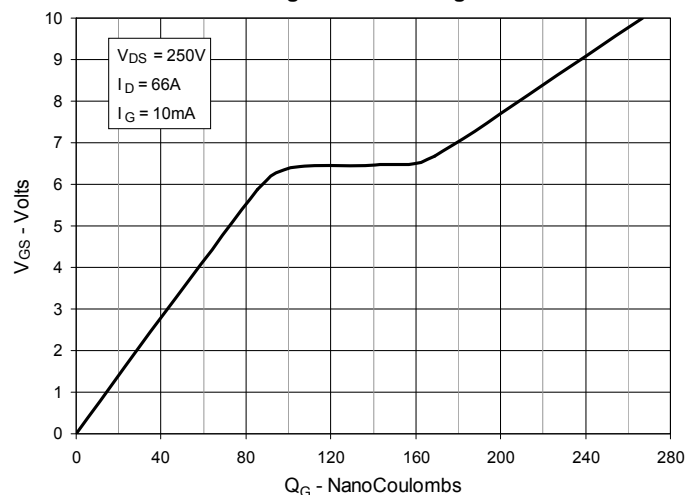
**Fig. 8. Transconductance**



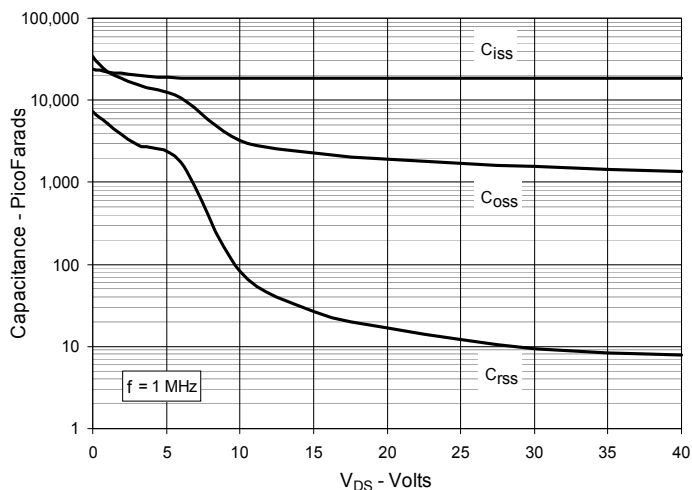
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



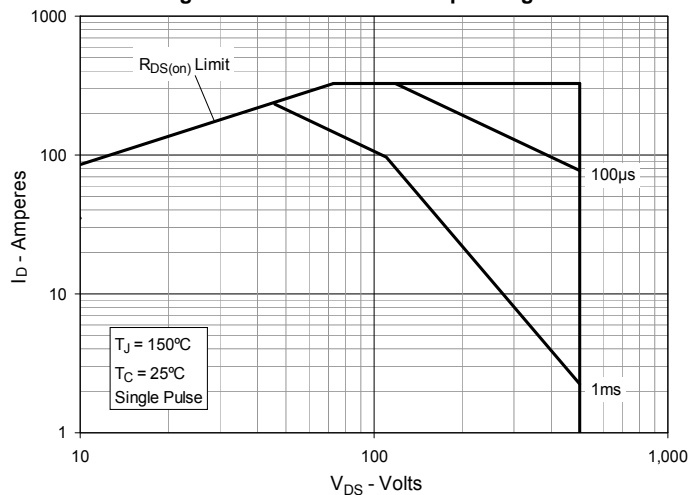
**Fig. 10. Gate Charge**



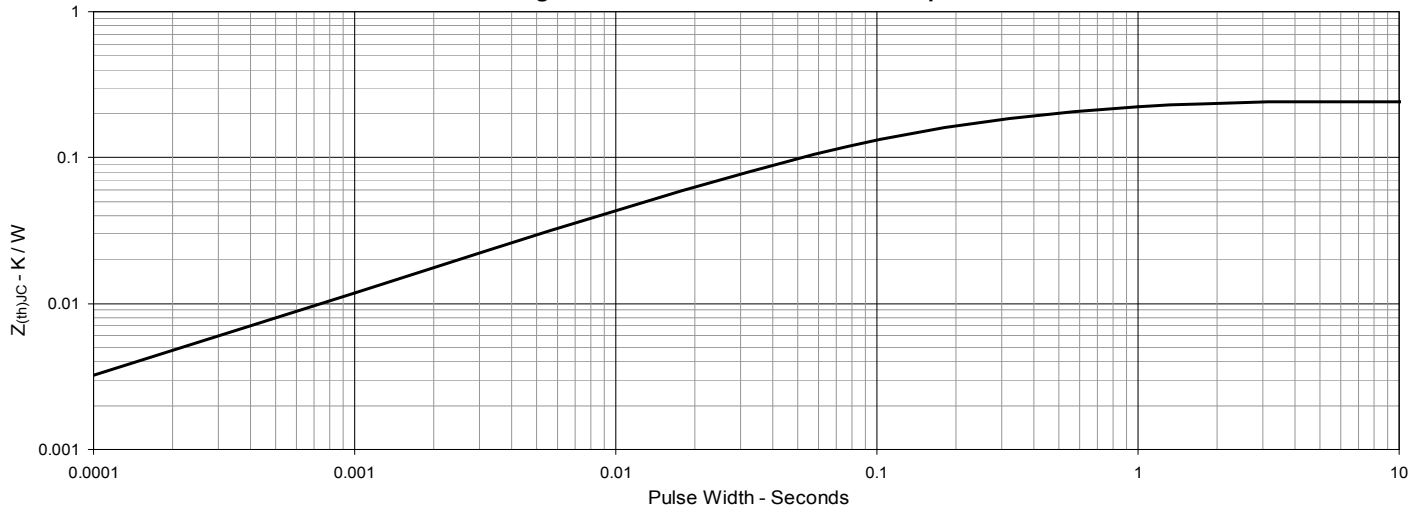
**Fig. 11. Capacitance**



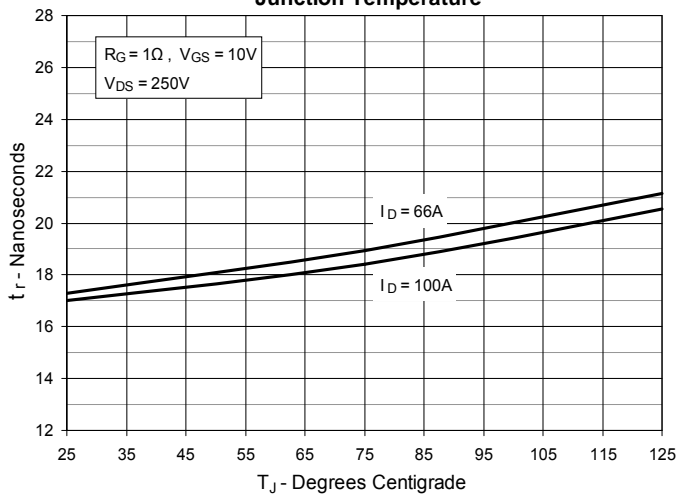
**Fig. 12. Forward-Bias Safe Operating Area**



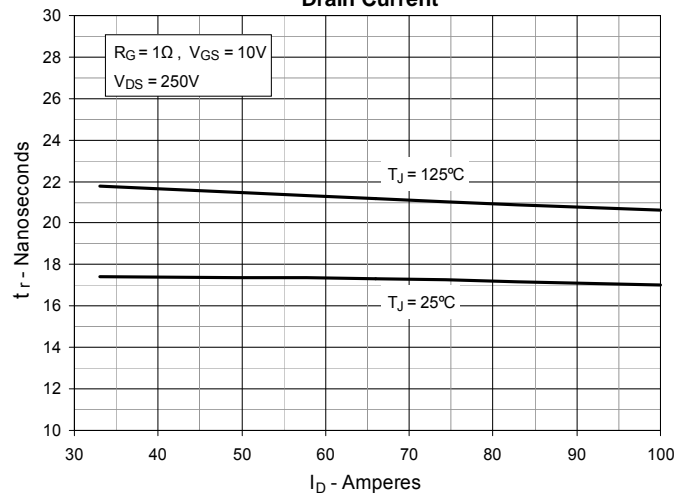
**Fig. 13. Maximum Transient Thermal Impedance**



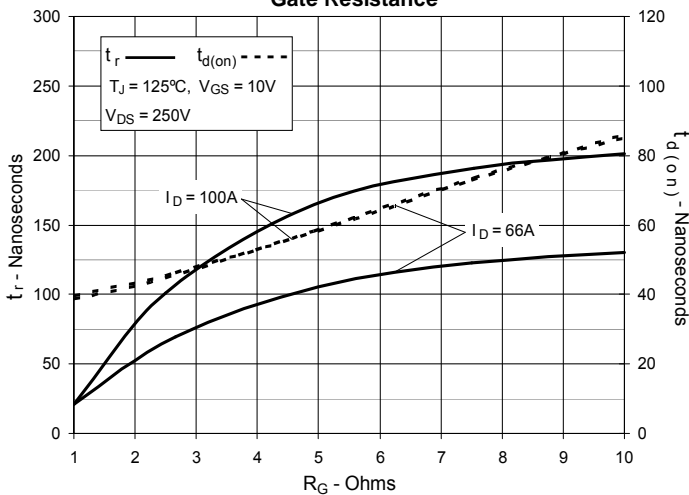
**Fig. 14. Resistive Turn-on Rise Time vs. Junction Temperature**



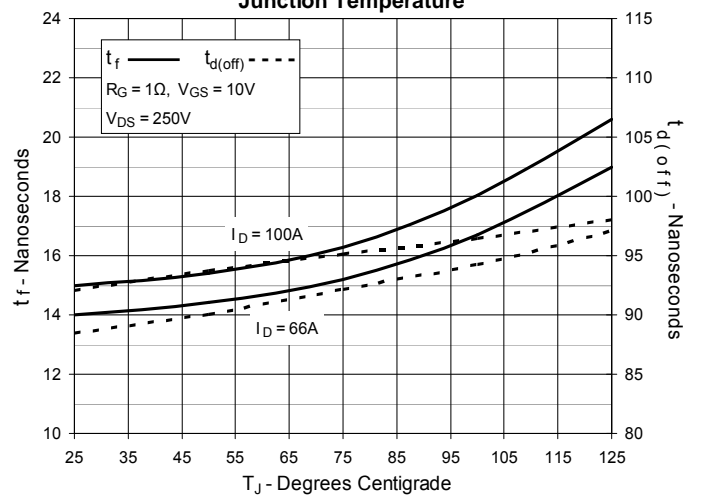
**Fig. 15. Resistive Turn-on Rise Time vs. Drain Current**



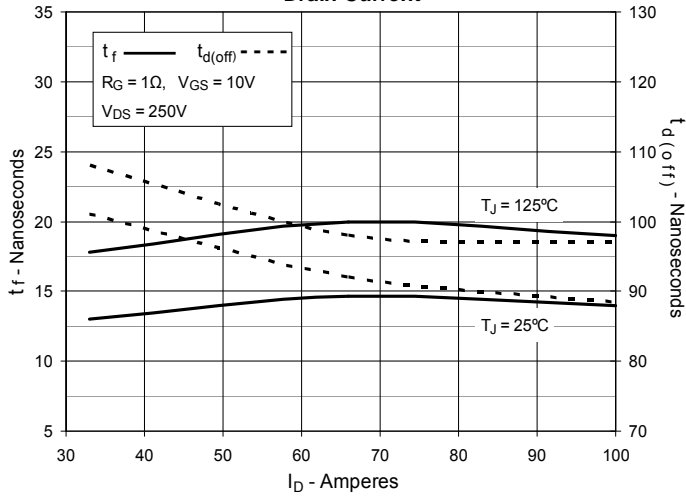
**Fig. 16. Resistive Turn-on Switching Times vs. Gate Resistance**



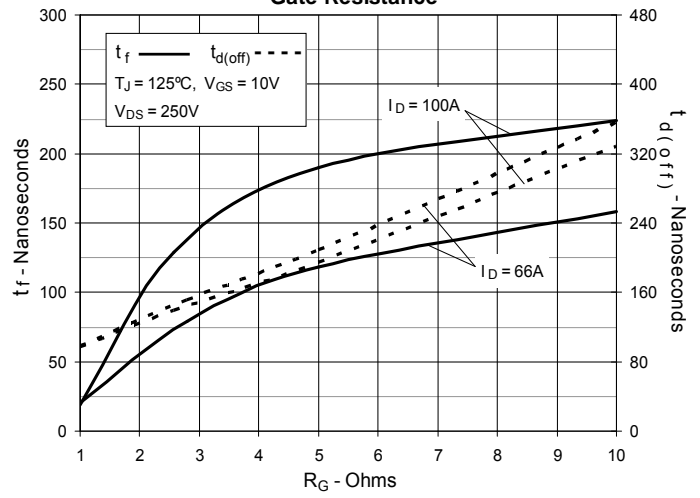
**Fig. 17. Resistive Turn-off Switching Times vs. Junction Temperature**



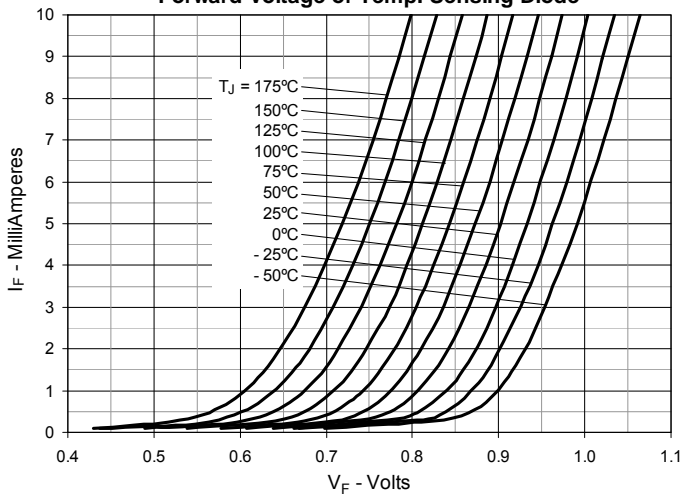
**Fig. 18. Resistive Turn-off Switching Times vs. Drain Current**



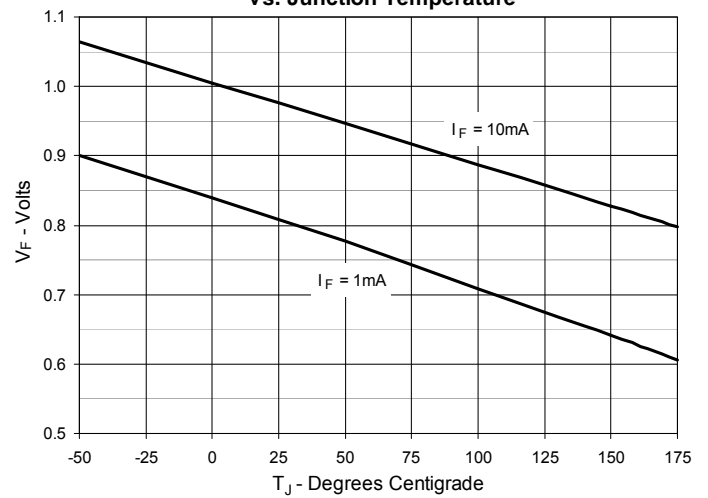
**Fig. 19. Resistive Turn-off Switching Times vs. Gate Resistance**



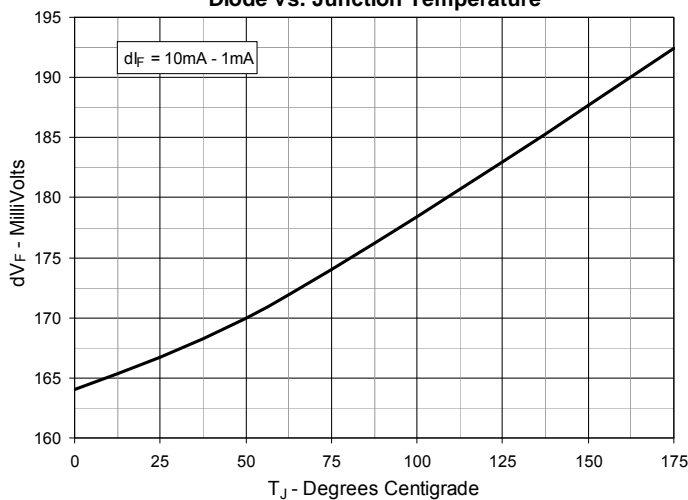
**Fig. 20. Forward Current vs. Forward Voltage of Temp. Sensing Diode**



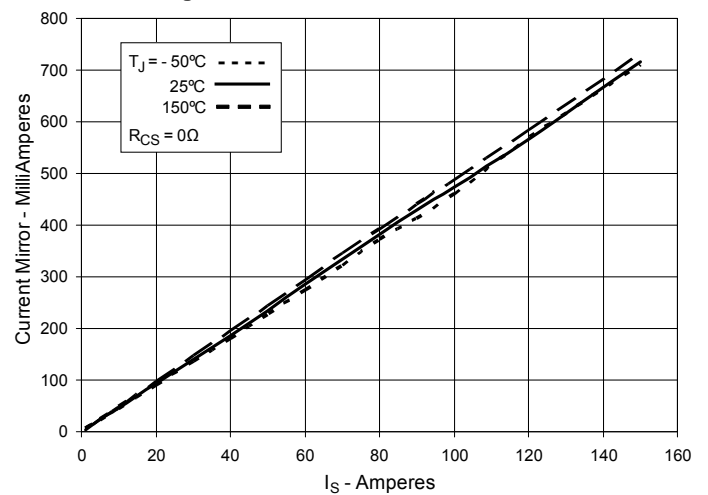
**Fig. 21. Forward Voltage of Temp. Sensing Diode vs. Junction Temperature**

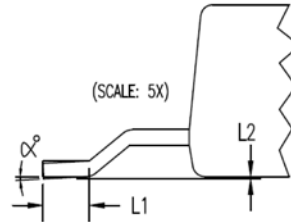
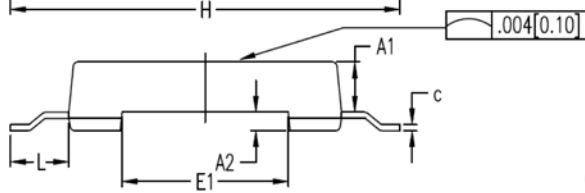
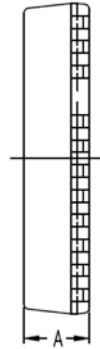
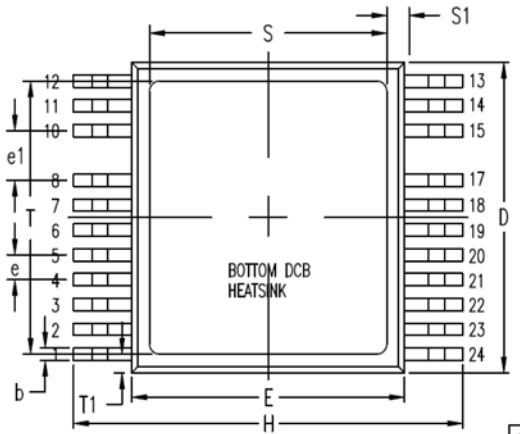


**Fig. 22. Delta Forward Voltage of Temp. Sensing Diode vs. Junction Temperature**

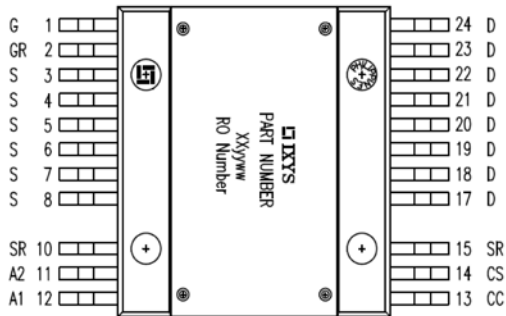


**Fig. 23. Current Mirror vs. Source Current**





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	.157 BSC		4.00 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	.748	.807	19.00	20.50
S1	.039	.079	1.00	2.00
T	.826	.886	21.00	22.50
T1	.039	.079	1.00	2.00
α	0	4°	0	4°



- G - Gate
- CS - Current Sense
- GR - Gate Return
- S - Source
- SR - Sense Current Return
- A1 - Anode 1
- A2 - Anode 2
- CC - Common Cathode
- D - Drain



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