

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

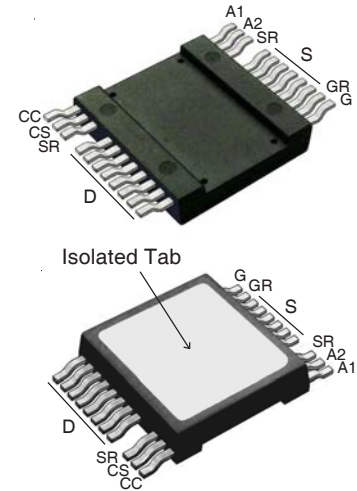
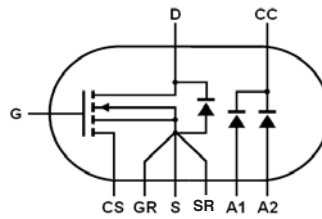
 N-Channel Enhancement Mode
 Avalanche Rated

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	± 30	V
V_{GSM}	Transient	± 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.
Weight		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}	$V_{GS} = \pm 30V$, $V_{DS} = 0V$			± 200 nA
I_{DSS}	$V_{DS} = V_{DSS}$, $V_{GS} = 0V$ Note 2, $T_J = 125^\circ C$			50 μA 3 mA
$R_{DS(on)}$	$V_{GS} = 10V$, $I_D = 66A$, Note 1			43 m Ω

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	Ω
$t_{d(on)}$	Resistive Switching Times $V_{GS} = 10\text{V}, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 66\text{A}$ $R_G = 1\Omega$ (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	μC
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.

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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 @ $T_J = 25^\circ\text{C}$

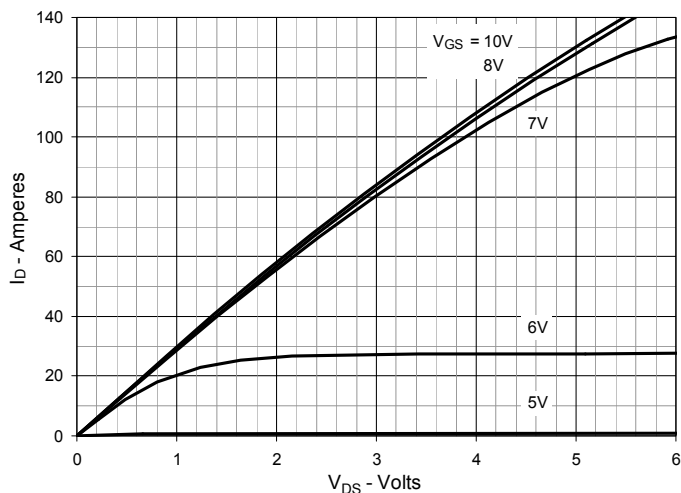


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

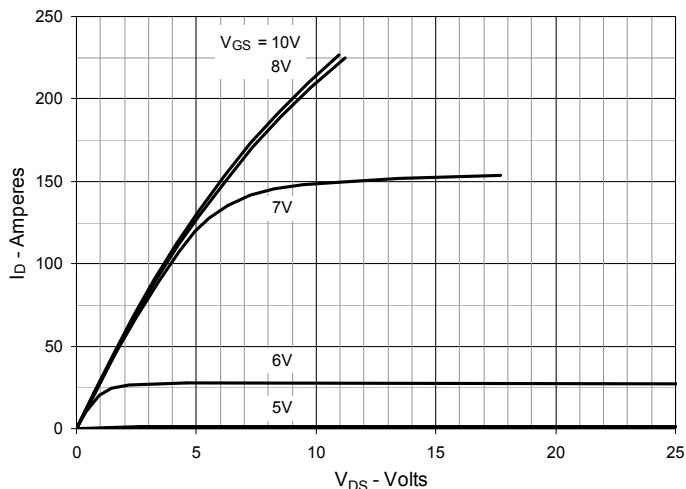


Fig. 3. Output Characteristics @ $T_J = 125^\circ\text{C}$

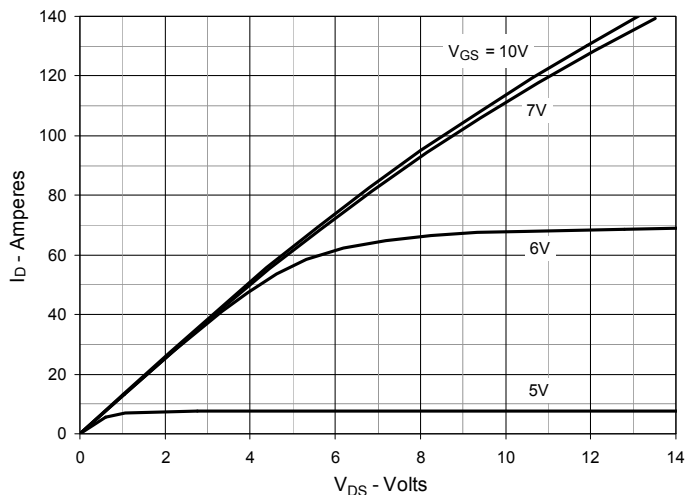


Fig. 4. $R_{DS(on)}$ Normalized to $I_D = 66\text{A}$ Value vs. Junction Temperature

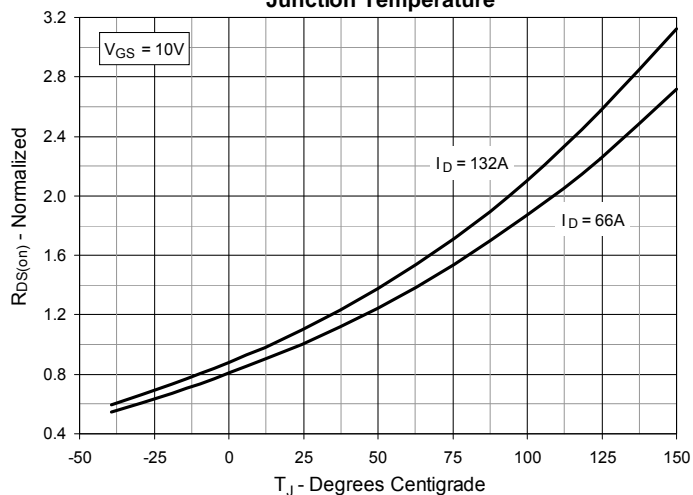


Fig. 5. $R_{DS(on)}$ Normalized to $I_D = 66\text{A}$ Value vs. Drain Current

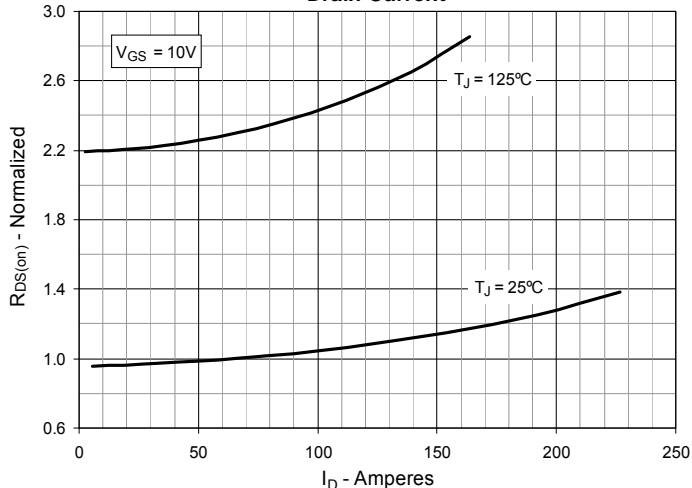


Fig. 6. Maximum Drain Current vs. Case Temperature

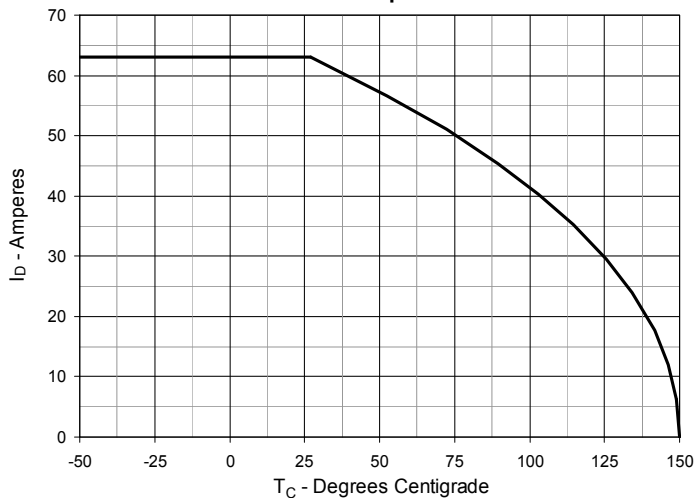


Fig. 7. Input Admittance

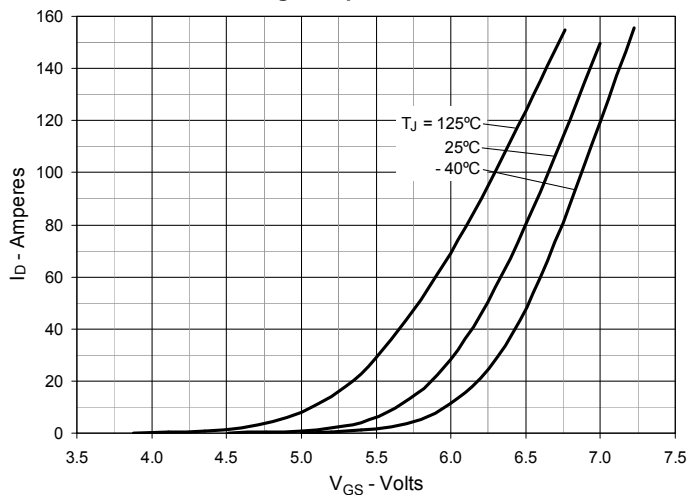


Fig. 8. Transconductance

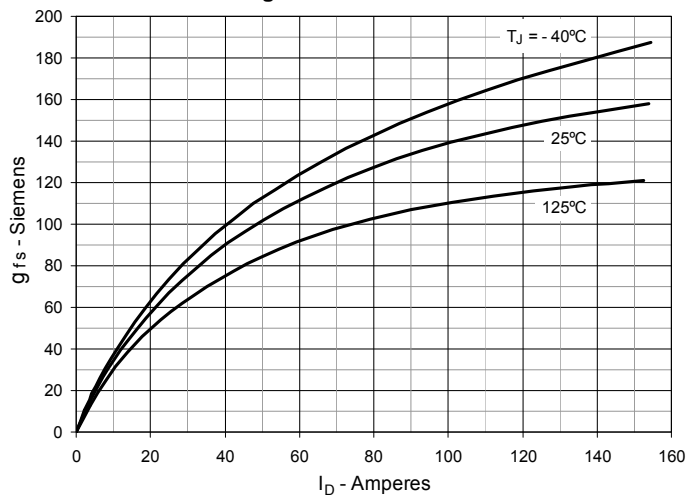


Fig. 9. Forward Voltage Drop of Intrinsic Diode

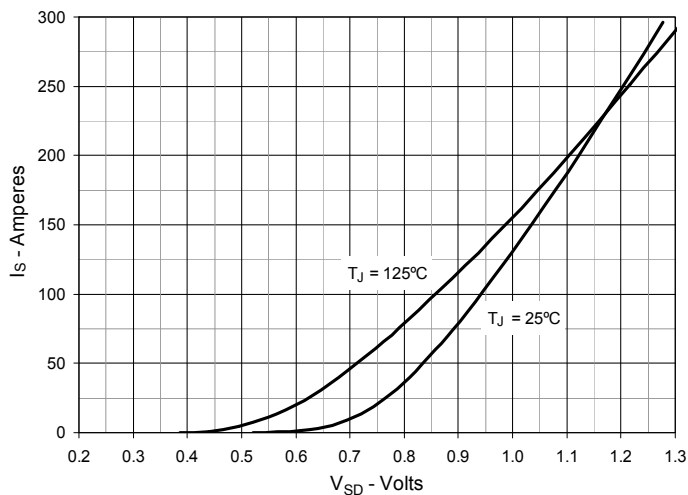


Fig. 10. Gate Charge

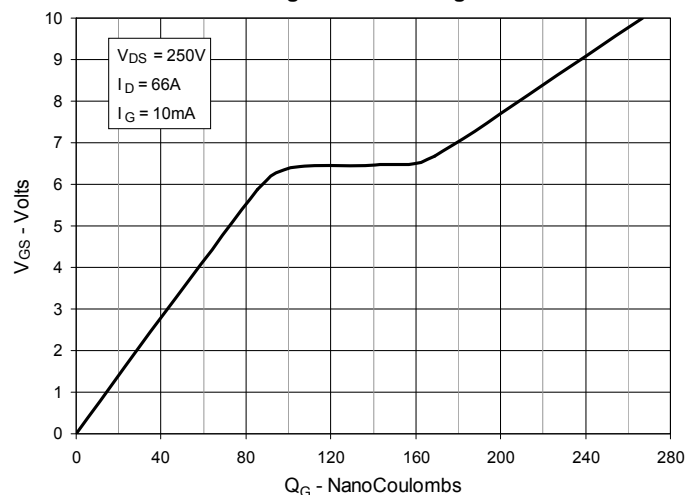


Fig. 11. Capacitance

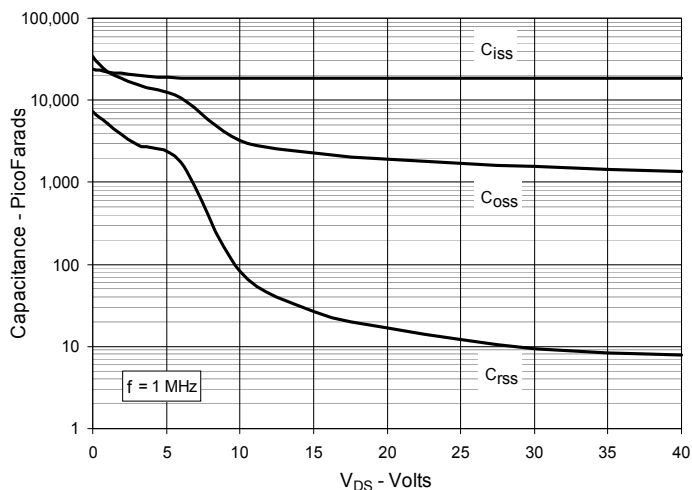


Fig. 12. Forward-Bias Safe Operating Area

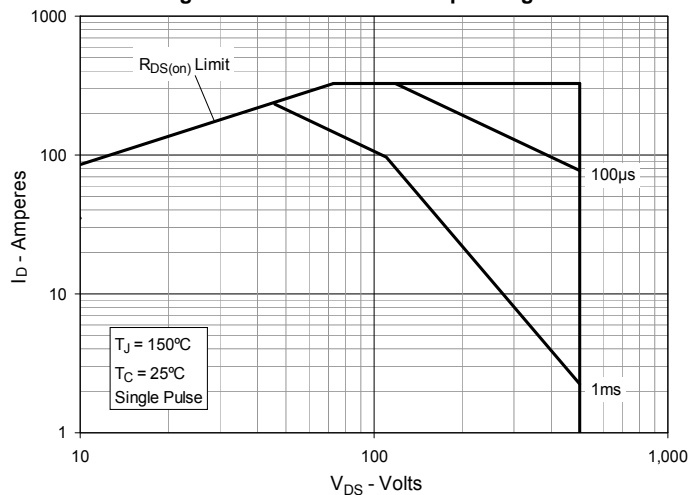


Fig. 13. Maximum Transient Thermal Impedance

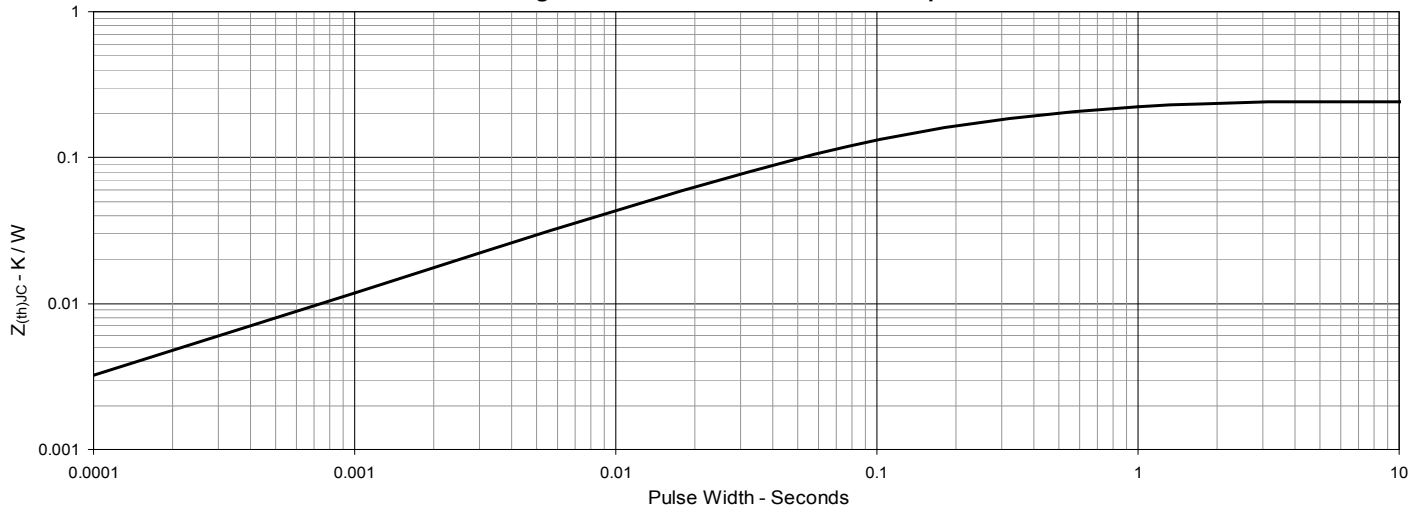


Fig. 14. Resistive Turn-on Rise Time vs. Junction Temperature

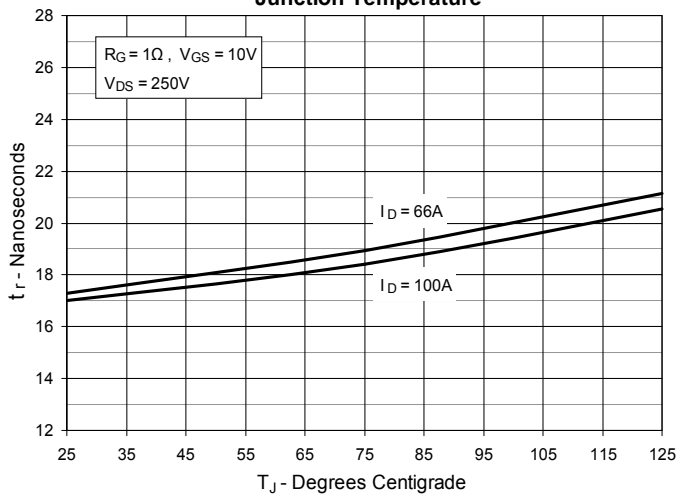


Fig. 15. Resistive Turn-on Rise Time vs. Drain Current

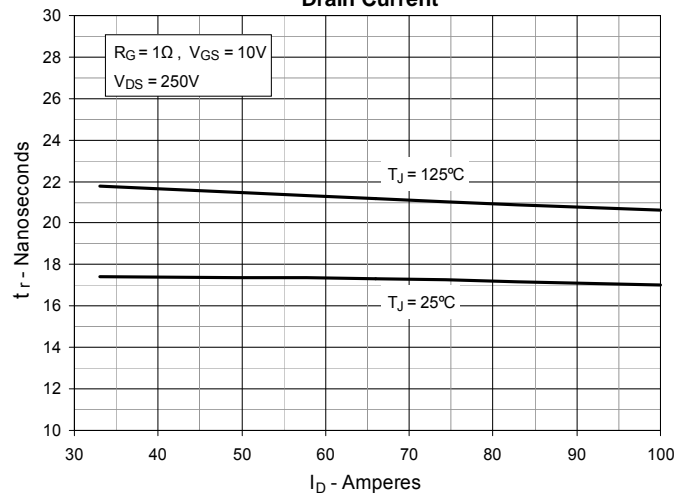


Fig. 16. Resistive Turn-on Switching Times vs. Gate Resistance

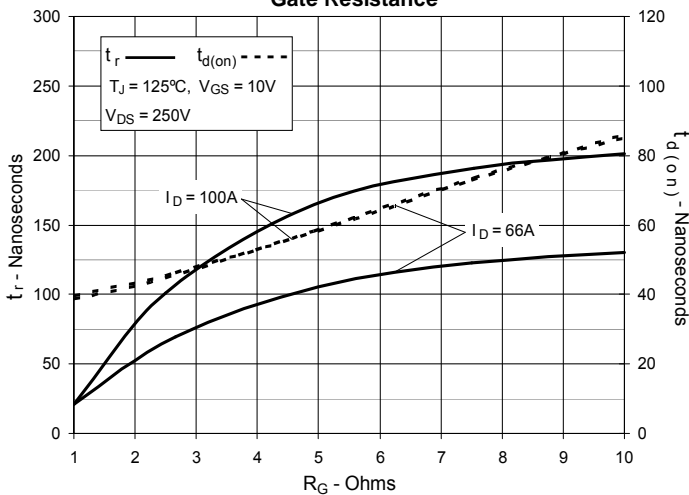


Fig. 17. Resistive Turn-off Switching Times vs. Junction Temperature

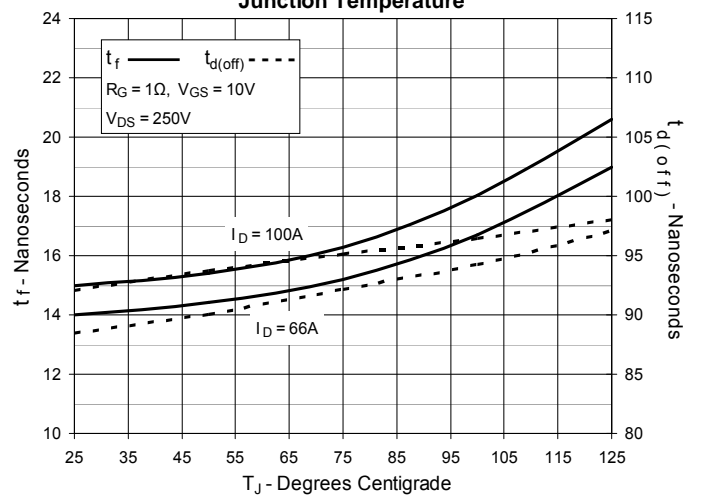


Fig. 18. Resistive Turn-off Switching Times vs. Drain Current

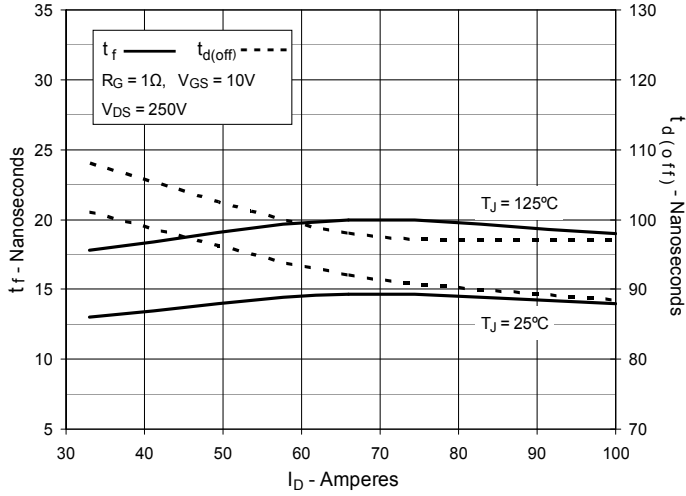


Fig. 19. Resistive Turn-off Switching Times vs. Gate Resistance

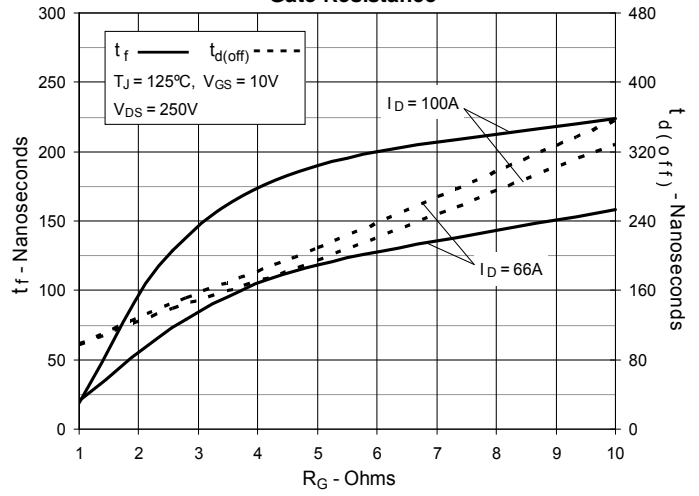


Fig. 20. Forward Current vs. Forward Voltage of Temp. Sensing Diode

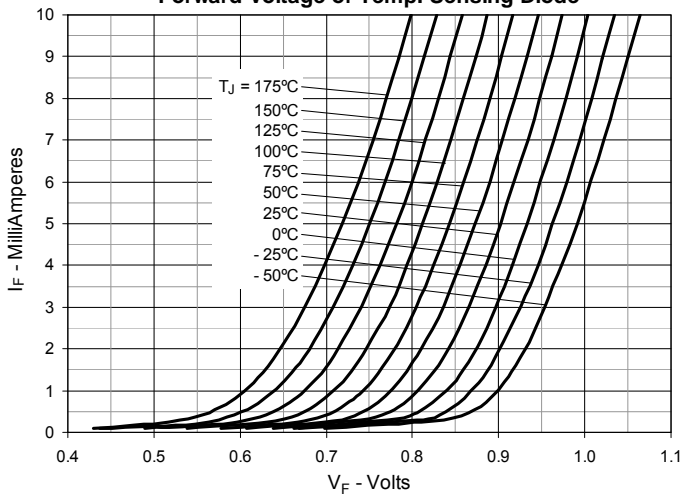


Fig. 21. Forward Voltage of Temp. Sensing Diode vs. Junction Temperature

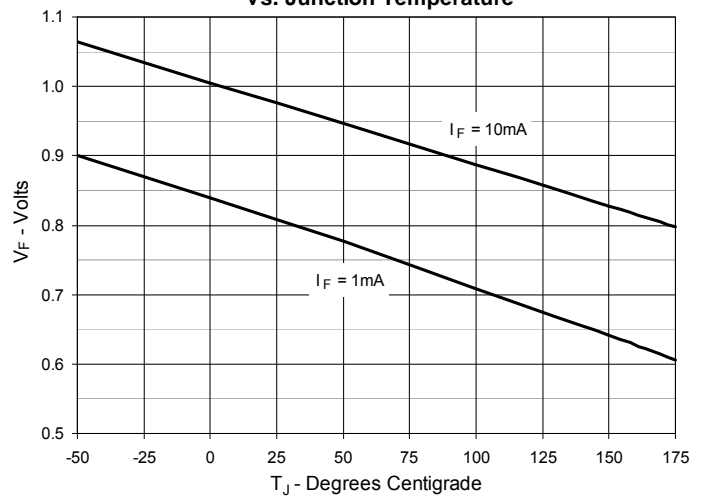


Fig. 22. Delta Forward Voltage of Temp. Sensing Diode vs. Junction Temperature

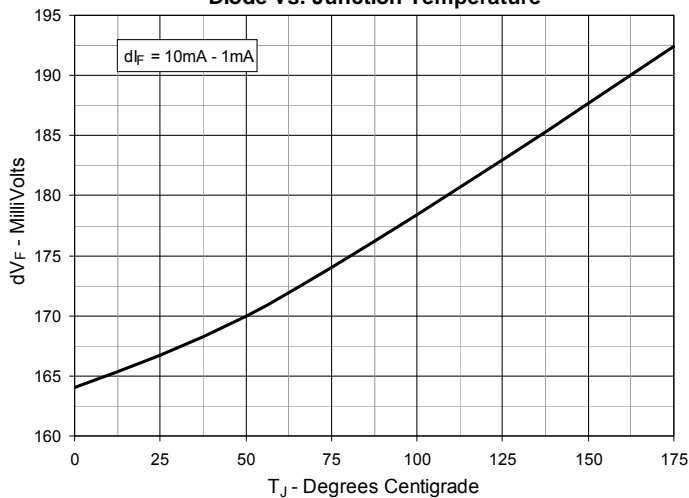
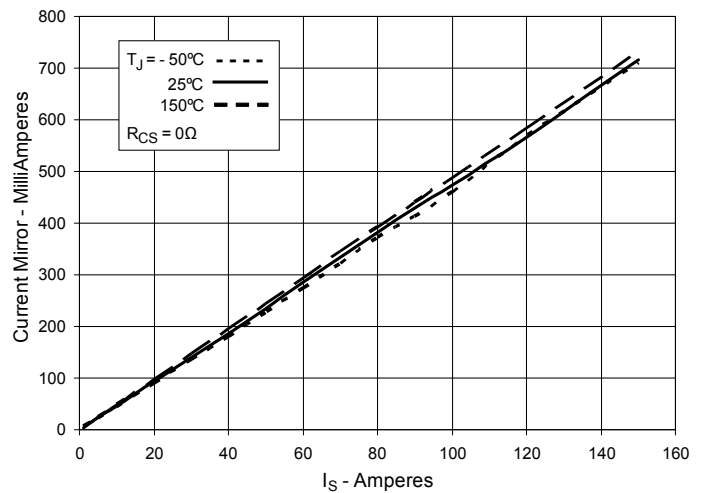
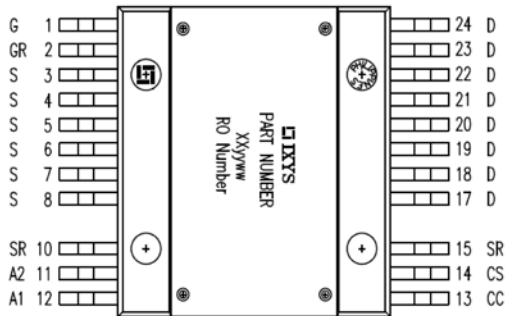
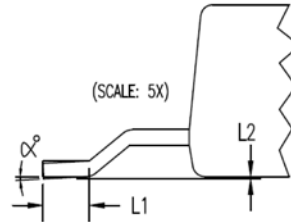
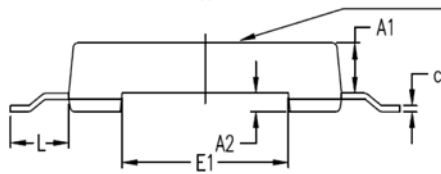
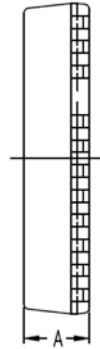
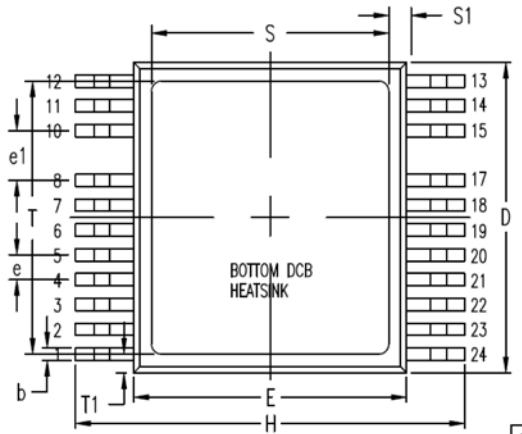


Fig. 23. Current Mirror vs. Source Current





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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