IXYS

Advance Technical Information

Polar3™ Power MOSFET

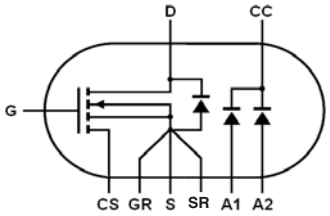
Current & Temperature Sensing

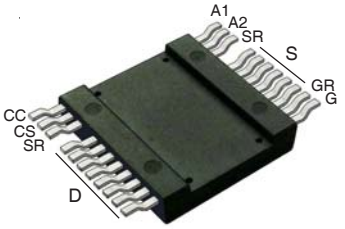
(Electrically Isolated Tab)

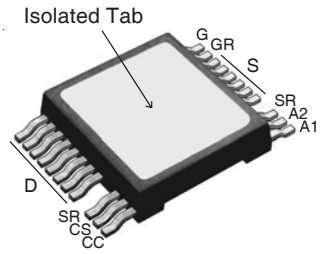
N-Channel Enhancement Mode
Avalanche Rated

MMIX1T132N50P3

V_{DSS} = 500V
I_{D25} = 63A
$R_{DS(on)}$ ≤ 43mΩ







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

Symbol	Test Conditions (T_J = 25°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} = ±30V, V_{DS} = 0V			±200	nA
I_{DSS}	$V_{DS} = V_{DSS}$, V_{GS} = 0V			50	μA
	Note 2, T_J = 125°C			3	mA
$R_{DS(on)}$	V_{GS} = 10V, I_D = 66A, Note 1			43	mΩ

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°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	V_{DS} = 10V, I_D = 66A, Note 1	68	110		S
C_{iss}	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz		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**		42		ns
t_r	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 66A		19		ns
$t_{d(off)}$	R_G = 1Ω (External)		90		ns
t_f			15		ns
$Q_{g(on)}$	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 66A		267		nC
Q_{gs}			95		nC
Q_{gd}			63		nC
R_{thJC}				0.24	°C/W
R_{thCS}			0.05		°C/W
R_{thJA}			30		°C/W

Source-Drain Diode

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

Notes:

1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 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.

Fig. 1. Output Characteristics @ T_J = 25ºC

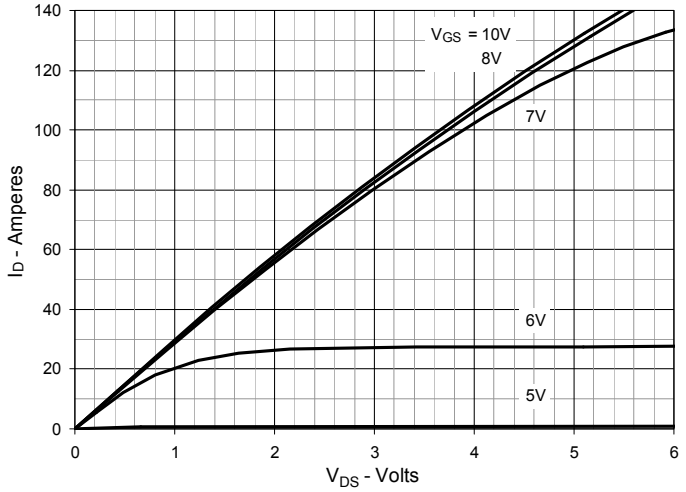


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

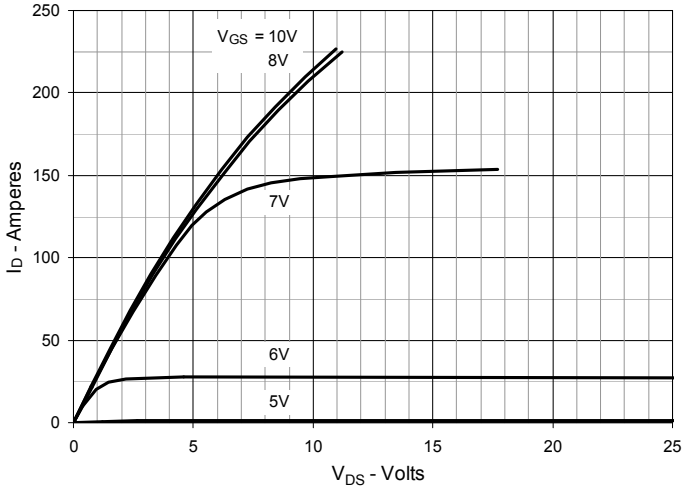


Fig. 3. Output Characteristics @ T_J = 125ºC

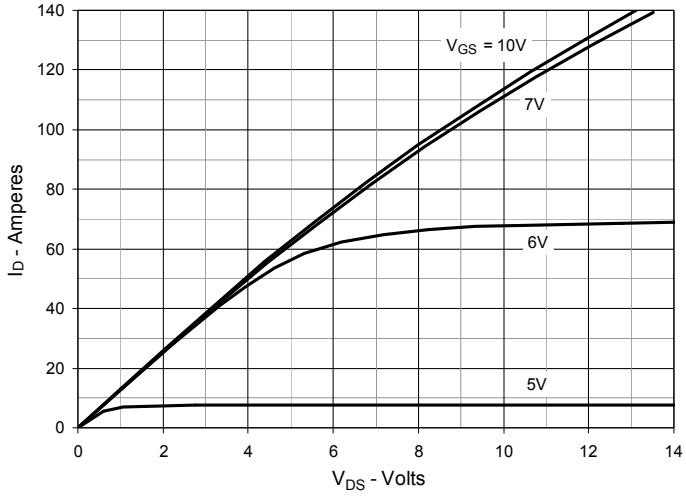


Fig. 4. $R_{DS(on)}$ Normalized to I_D = 66A Value vs. Junction Temperature

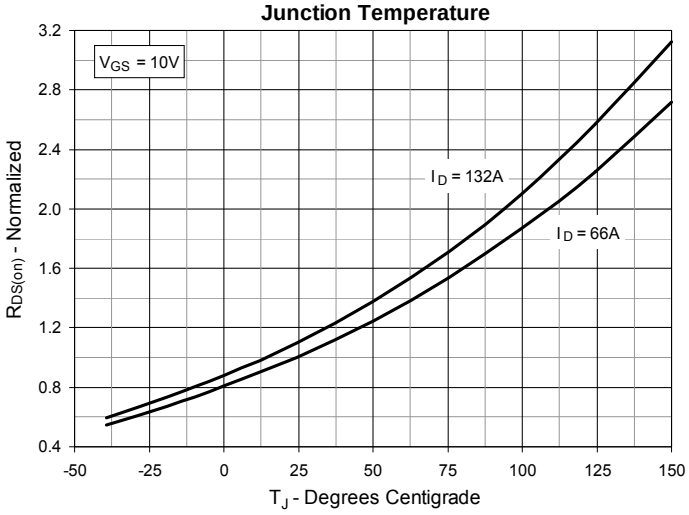


Fig. 5. $R_{DS(on)}$ Normalized to I_D = 66A Value vs. Drain Current

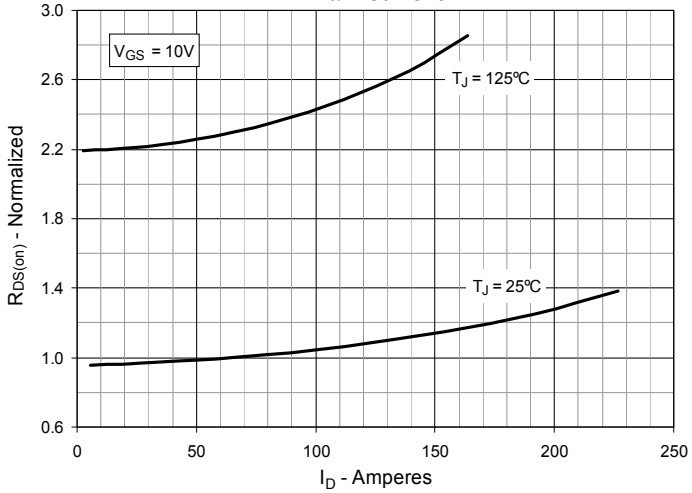


Fig. 6. Maximum Drain Current vs. Case Temperature

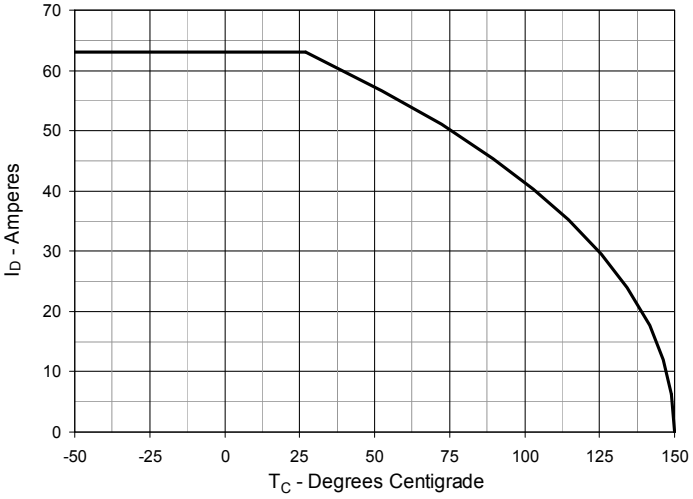


Fig. 7. Input Admittance

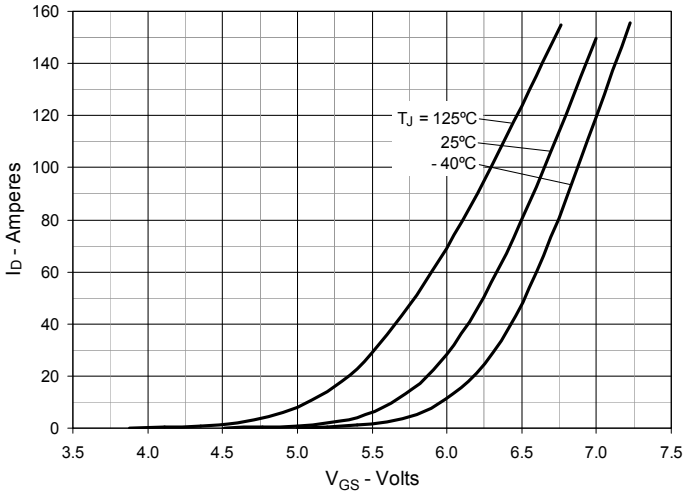


Fig. 8. Transconductance

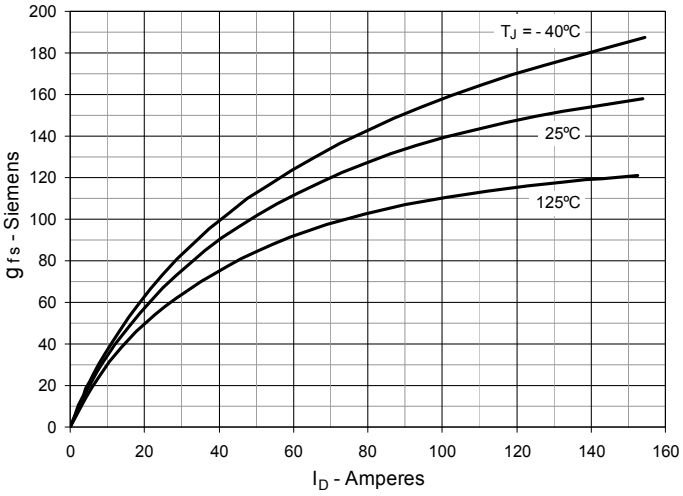


Fig. 9. Forward Voltage Drop of Intrinsic Diode

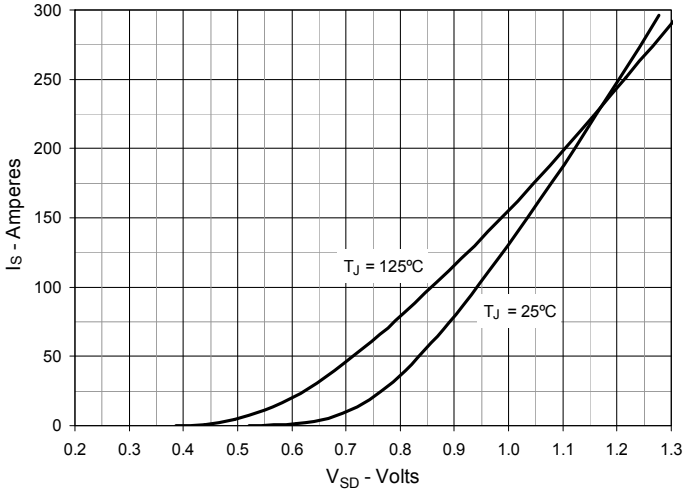


Fig. 10. Gate Charge

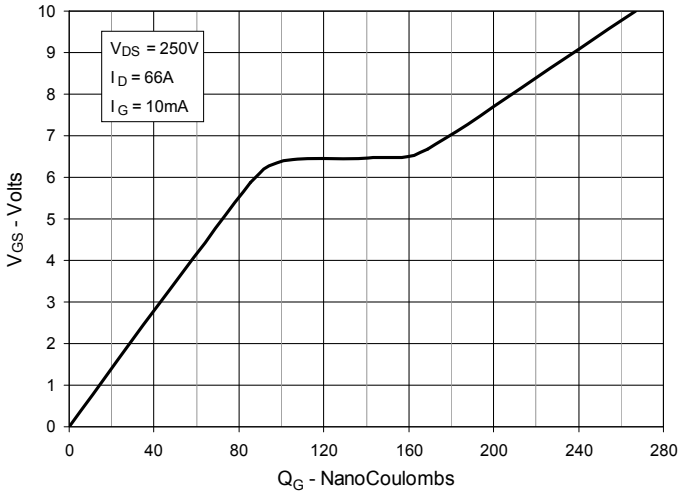


Fig. 11. Capacitance

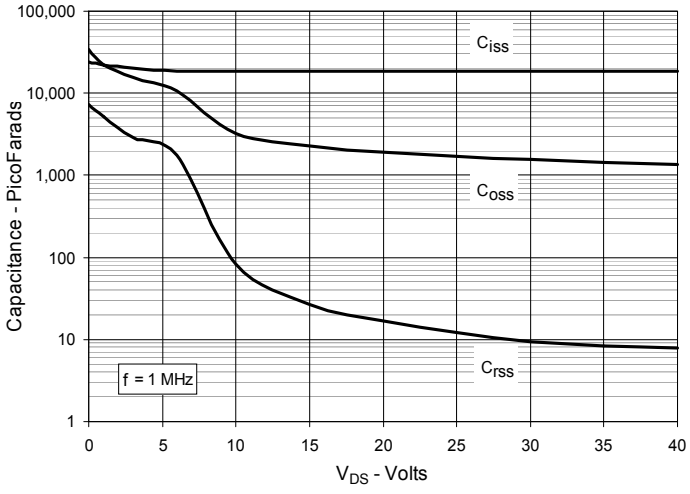


Fig. 12. Forward-Bias Safe Operating Area

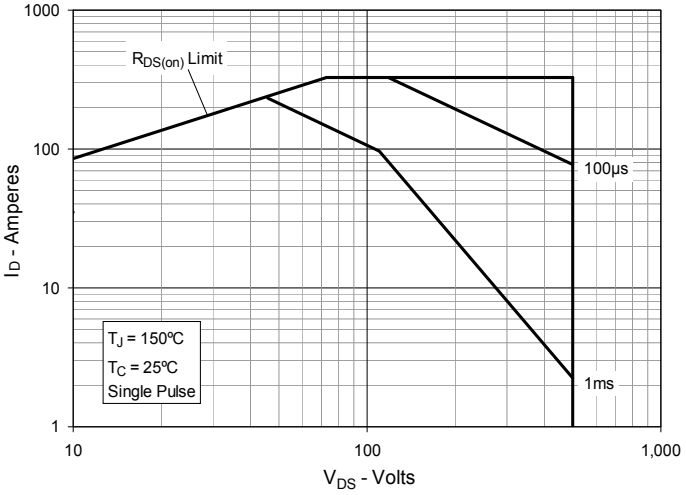


Fig. 13. Maximum Transient Thermal Impedance

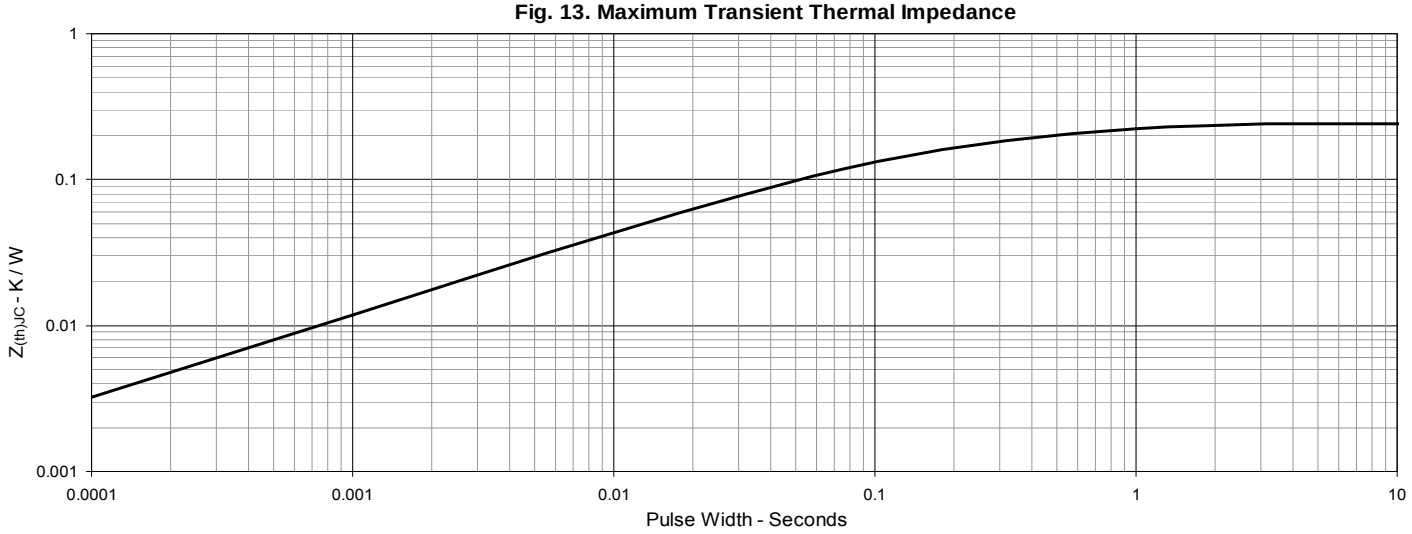


Fig. 14. Resistive Turn-on Rise Time vs. Junction Temperature

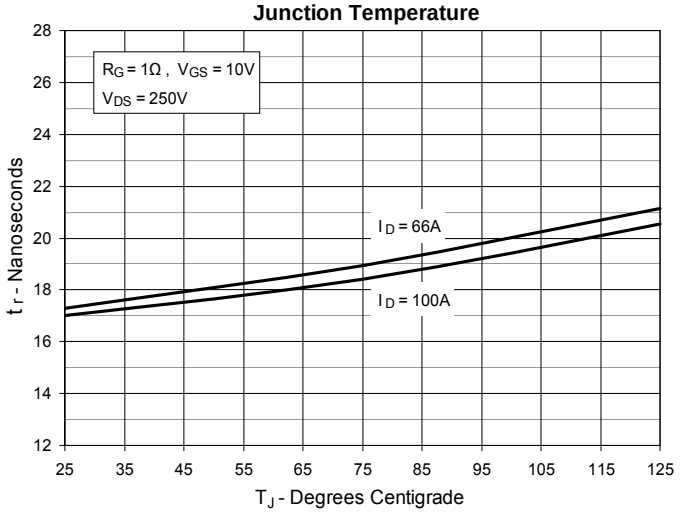


Fig. 15. Resistive Turn-on Rise Time vs. Drain Current

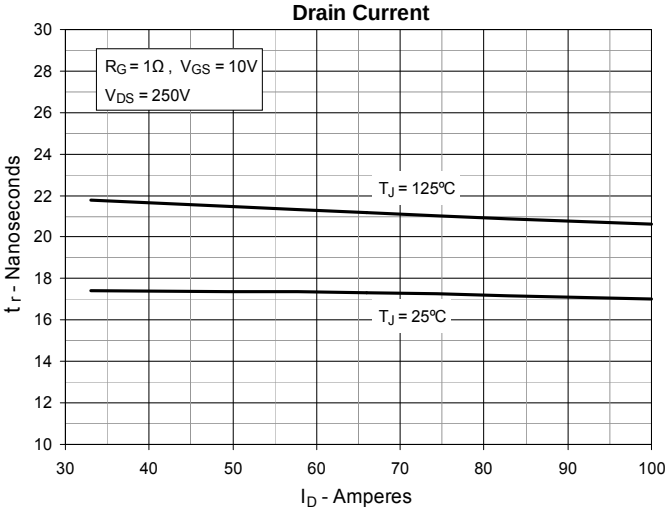


Fig. 16. Resistive Turn-on Switching Times vs. Gate Resistance

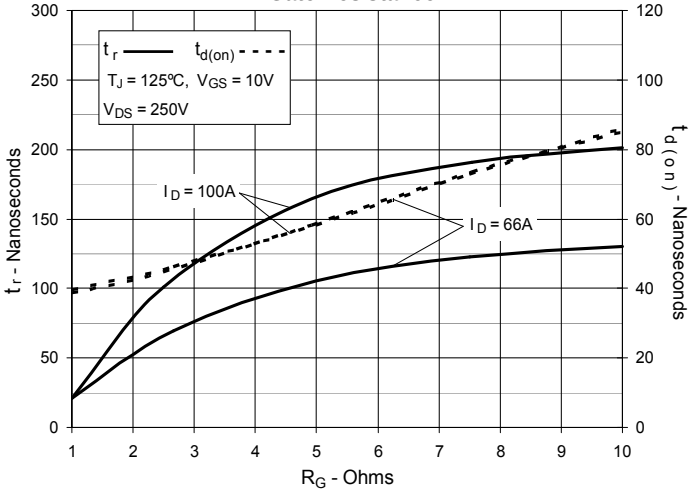


Fig. 17. Resistive Turn-off Switching Times vs. Junction Temperature

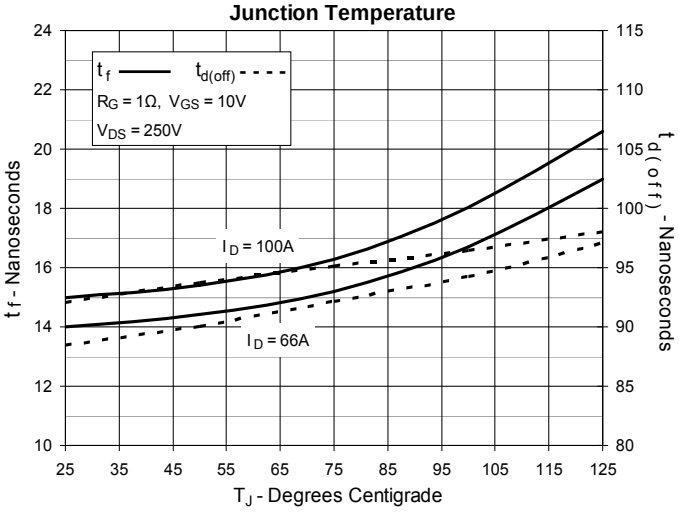


Fig. 18. Resistive Turn-off Switching Times vs. Drain Current

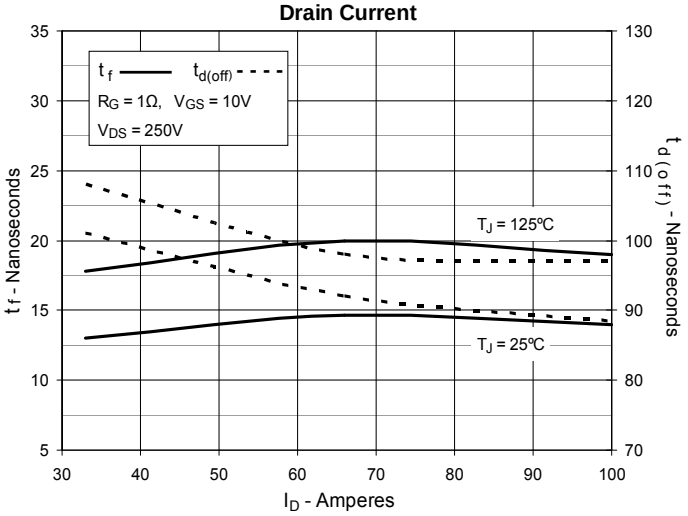


Fig. 19. Resistive Turn-off Switching Times vs. Gate Resistance

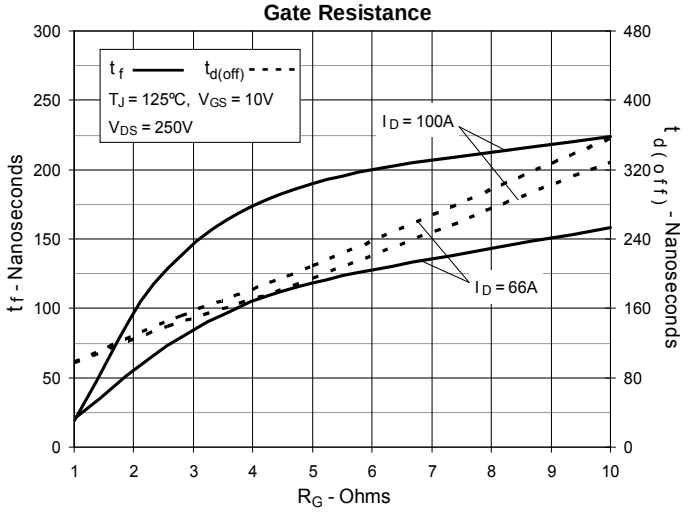


Fig. 20. Forward Current vs. Forward Voltage of Temp. Sensing Diode

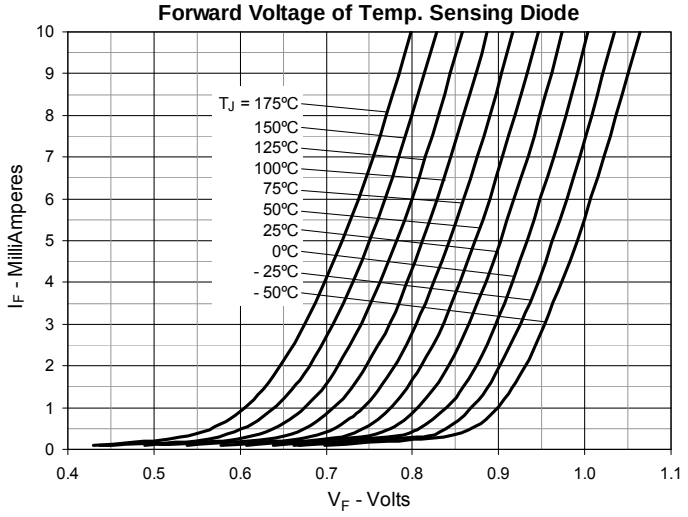


Fig. 21. Forward Voltage of Temp. Sensing Diode vs. Junction Temperature

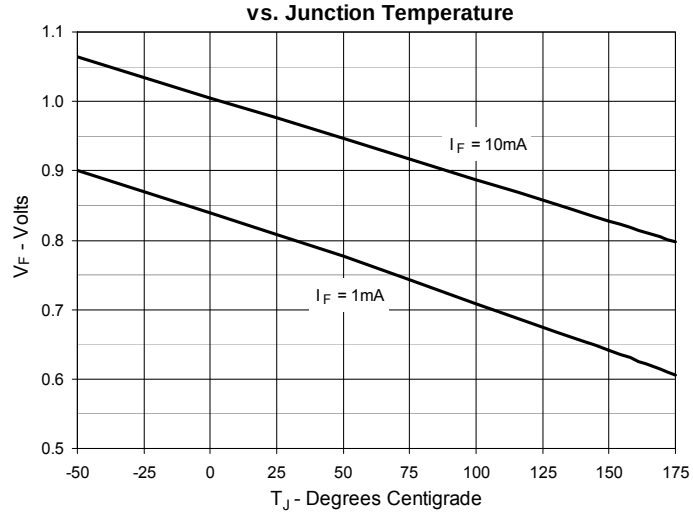


Fig. 22. Delta Forward Voltage of Temp. Sensing Diode vs. Junction Temperature

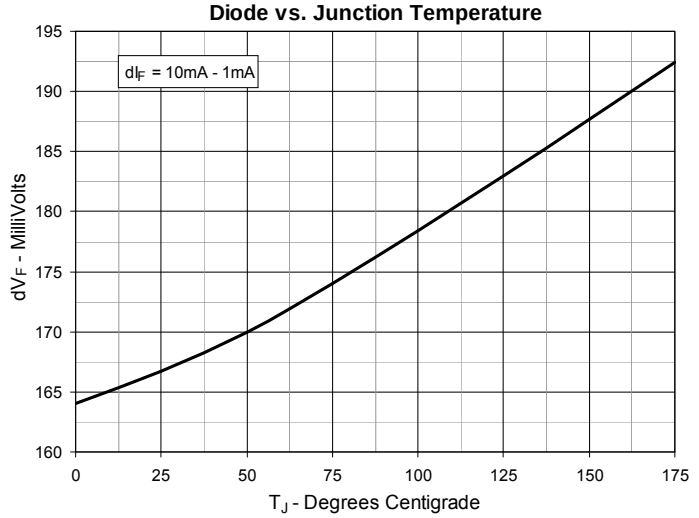
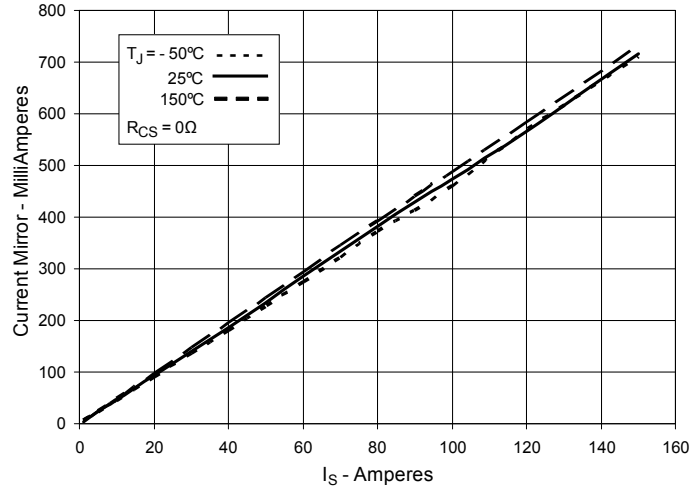
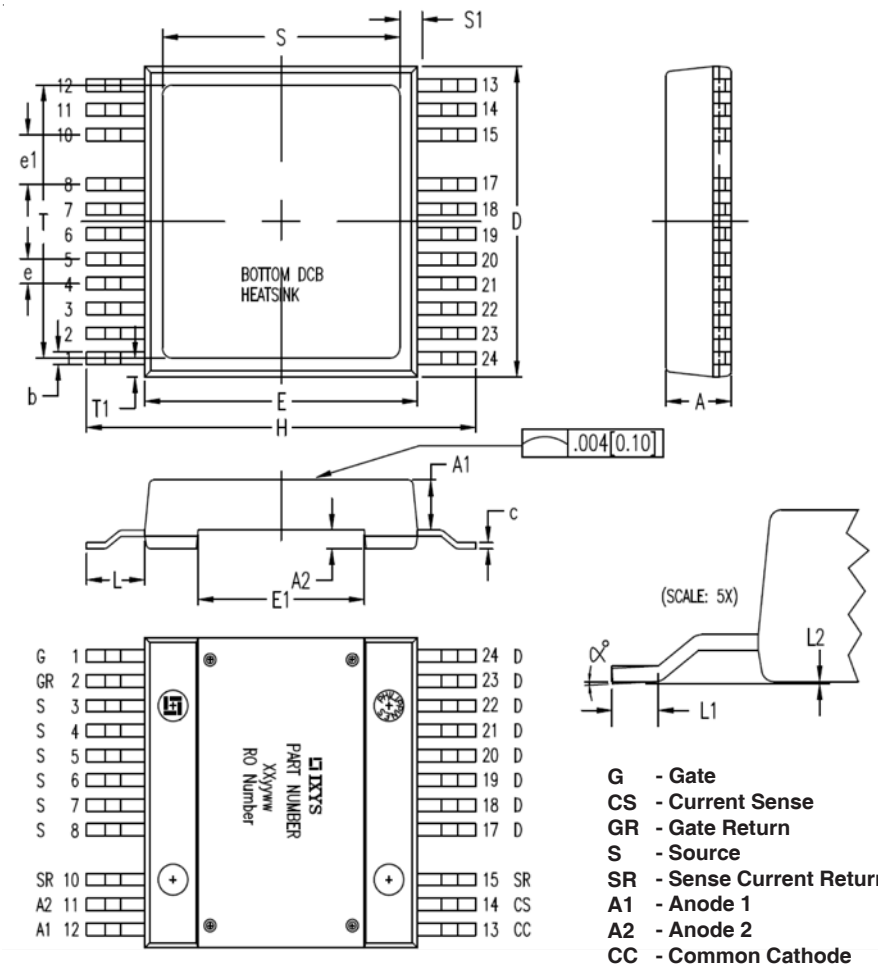


Fig. 23. Current Mirror vs. Source Current





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
∝	0	4°	0	4°

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