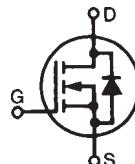


# Trench Gate Power MOSFET

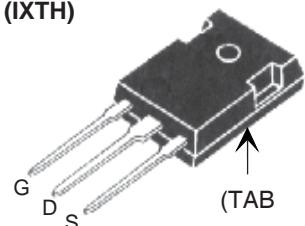
N-Channel Enhancement Mode  
Avalanche Rated

**IXTH86N25T**  
**IXTQ86N25T**  
**IXTV86N25T**

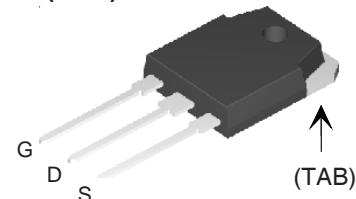


**V<sub>DSS</sub>** = 250V  
**I<sub>D25</sub>** = 86A  
**R<sub>DS(on)</sub>** ≤ 37mΩ

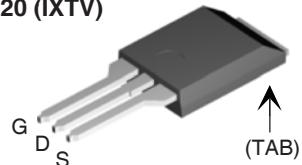
TO-247 (IXTH)



TO-3P (IXTQ)



PLUS220 (IXTV)



G = Gate  
S = Source  
TAB = Drain

## Features

- International standard packages
- Avalanche rated
- Low package inductance
  - easy to drive and to protect

## Advantages

- Easy to mount
- Space savings
- High power density

## Applications

- DC-DC converters
- Battery chargers
- Switched-mode and resonant-mode power supplies
- DC choppers
- AC motor control
- Uninterruptible power supplies

Symbol	Test Conditions	Maximum Ratings	
V <sub>DSS</sub>	T <sub>J</sub> = 25°C to 150°C	250	V
V <sub>DGR</sub>	T <sub>J</sub> = 25°C to 150°C, R <sub>GS</sub> = 1MΩ	250	V
V <sub>GSM</sub>	Transient	± 30	V
I <sub>D25</sub>	T <sub>C</sub> = 25°C	86	A
I <sub>LRMS</sub>	Lead Current Limit, RMS	75	A
I <sub>DM</sub>	T <sub>C</sub> = 25°C, pulse width limited by T <sub>JM</sub>	190	A
I <sub>AS</sub>	T <sub>C</sub> = 25°C	10	A
E <sub>AS</sub>	T <sub>C</sub> = 25°C	1.5	J
P <sub>D</sub>	T <sub>C</sub> = 25°C	540	W
T <sub>J</sub>		-55 ... +150	°C
T <sub>JM</sub>		150	°C
T <sub>stg</sub>		-55 ... +150	°C
T <sub>L</sub>	1.6mm (0.062 in.) from case for 10s	300	°C
T <sub>SOLD</sub>	Plastic body for 10 seconds	260	°C
M <sub>d</sub>	Mounting torque (TO-247 & TO-3P)	1.13 / 10	Nm/lb.in.
F <sub>c</sub>	Mounting force (PLUS220)	11..65 / 2.5..14.6	N/lb.
Weight	TO-247	6.0	g
	TO-3P	5.5	g
	PLUS220	4.0	g

Symbol	Test Conditions (T <sub>J</sub> = 25°C unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
BV <sub>DSS</sub>	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA	250		V
V <sub>GS(th)</sub>	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 1mA	3		5 V
I <sub>GSS</sub>	V <sub>GS</sub> = ± 20V, V <sub>DS</sub> = 0V		± 200	nA
I <sub>DSS</sub>	V <sub>DS</sub> = V <sub>DSS</sub> V <sub>GS</sub> = 0V		3 μA	
			250 μA	
R <sub>DS(on)</sub>	V <sub>GS</sub> = 10V, I <sub>D</sub> = 0.5 • I <sub>D25</sub> , Notes 1, 2		37	mΩ

Symbol	Test Conditions	Characteristic Values		
	( $T_J = 25^\circ\text{C}$ unless otherwise specified)	Min.	Typ.	Max.
$g_{fs}$	$V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1	45	76	S
$C_{iss}$		5330		pF
$C_{oss}$	$V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$	515		pF
$C_{rss}$		92		pF
$t_{d(on)}$		22		ns
$t_r$		28		ns
$t_{d(off)}$	$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$	55		ns
$t_f$	$R_G = 3.3\Omega$ (External)	25		ns
$Q_{g(on)}$		105		nC
$Q_{gs}$	$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 25\text{A}$	32		nC
$Q_{gd}$		28		nC
$R_{thJC}$			0.23	°C/W
$R_{thCS}$		0.25		°C/W

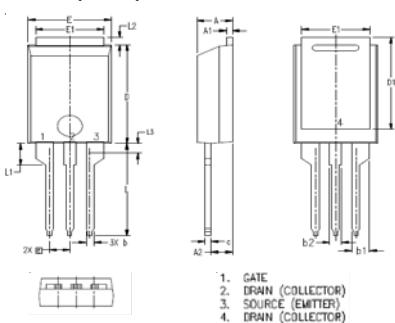
#### Source-Drain Diode

Symbol	Test Conditions	Characteristic Values		
	( $T_J = 25^\circ\text{C}$ unless otherwise specified)	Min.	Typ.	Max.
$I_s$	$V_{GS} = 0\text{V}$		86	A
$I_{SM}$	Repetitive, pulse width limited by $T_{JM}$		172	A
$V_{SD}$	$I_F = I_s$ , $V_{GS} = 0\text{V}$ , Note 1		1.5	V
$t_{rr}$		156		ns
$I_{RM}$	$I_F = 43\text{A}$ , $-di/dt = 250\text{A}/\mu\text{s}$	21		A
$Q_{RM}$	$V_R = 100\text{V}$ , $V_{GS} = 0\text{V}$	1.7		$\mu\text{C}$

Notes: 1. Pulse test,  $t \leq 300\text{ms}$ ; duty cycle,  $d \leq 2\%$ .

2. On through-hole packages,  $R_{DS(on)}$  Kelvin test contact location must be 5mm or less from the package body.

#### PLUS220 (IXTV) Outline



SYM	INCHES		MILLIMETER	
	MIN	MAX	MIN	MAX
A	.169	.185	4.30	4.70
A1	.028	.035	0.70	0.90
A2	.098	.118	2.50	3.00
b	.035	.047	0.90	1.20
b1	.080	.095	2.03	2.41
b2	.054	.064	1.37	1.63
c	.028	.035	0.70	0.90
D	.551	.591	14.00	15.00
D1	.512	.539	13.00	13.70
E	.394	.433	10.00	11.00
E1	.331	.346	8.40	8.80
e	.100	BSC	2.54	BSC
L	.512	.551	13.00	14.00
L1	.118	.138	3.00	3.50
L2	.035	.051	0.90	1.30
L3	.047	.059	1.20	1.50

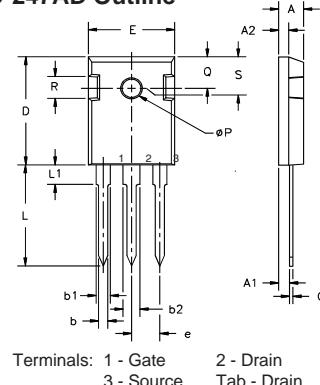
#### PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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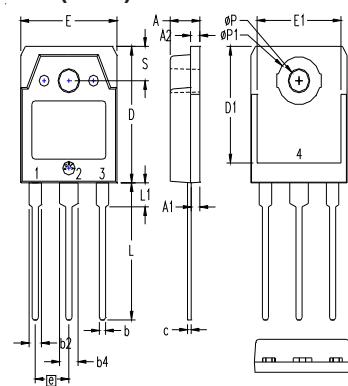
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585 7,005,734 B2 7,157,338B2 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405 B2 6,759,692 7,063,975 B2 4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463 6,771,478 B2 7,071,537

#### TO-247AD Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.7	5.3	.185	.209
A <sub>1</sub>	2.2	2.54	.087	.102
A <sub>2</sub>	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b <sub>1</sub>	1.65	2.13	.065	.084
b <sub>2</sub>	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	.205	.225
L	19.81	20.32	.780	.800
L1		4.50		.177
ÆP	3.55	3.65	.140	.144
Q	5.89	6.40	.232	.252
R	4.32	5.49	.170	.216
S	6.15	BSC	242	BSC

#### TO-3P (IXTQ) Outline

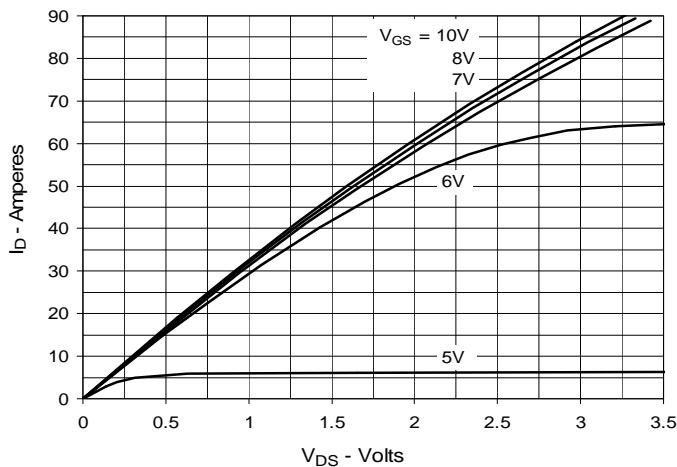


Pins: 1 - Gate  
2 - Drain  
3 - Source  
4, TAB - Drain

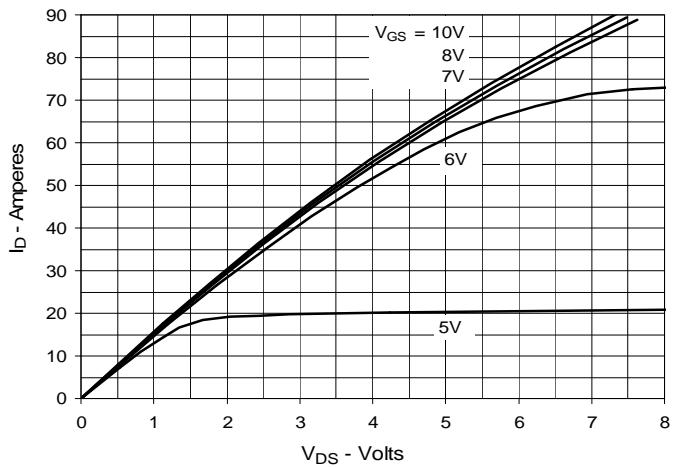
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.185	.193	4.70	4.90
A1	.051	.059	1.30	1.50
A2	.057	.065	1.45	1.65
b	.035	.045	0.90	1.15
b2	.075	.087	1.90	2.20
b4	.114	.126	2.90	3.20
c	.022	.031	0.55	0.80
D	.780	.791	19.80	20.10
D1	.665	.677	16.90	17.20
E	.610	.622	15.50	15.80
E1	.531	.539	13.50	13.70
e	.215	BSC	5.45	BSC
L	.779	.795	19.80	20.20
L1	.134	.142	3.40	3.60
ØP	.126	.134	3.20	3.40
ØP1	.272	.280	6.90	7.10
S	.193	.201	4.90	5.10

All metal areas are tin plated.

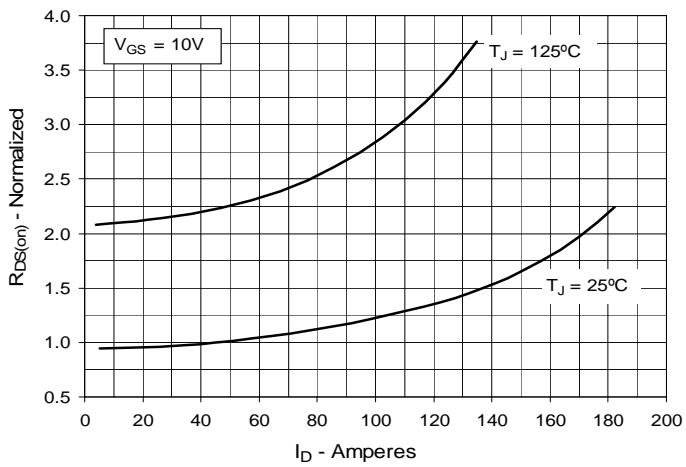
**Fig. 1. Output Characteristics  
@ 25°C**



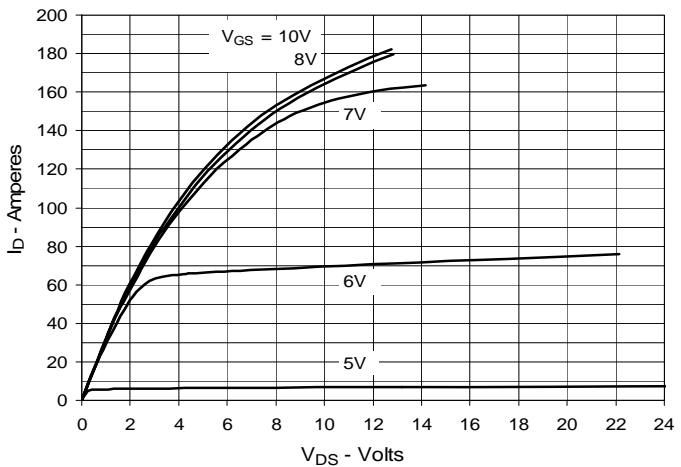
**Fig. 3. Output Characteristics  
@ 125°C**



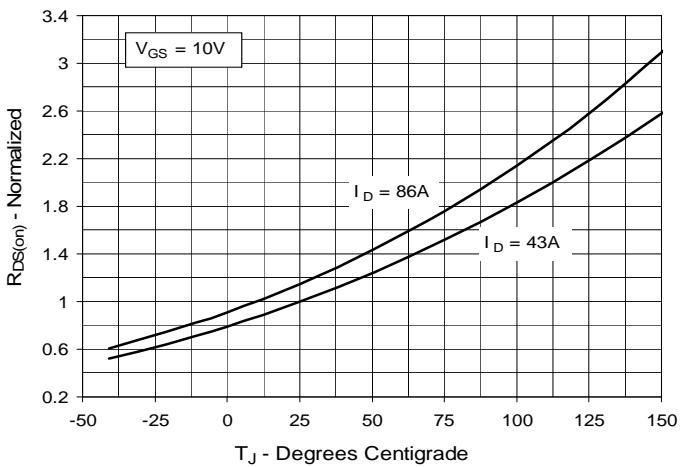
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 43A$  Value  
vs. Drain Current**



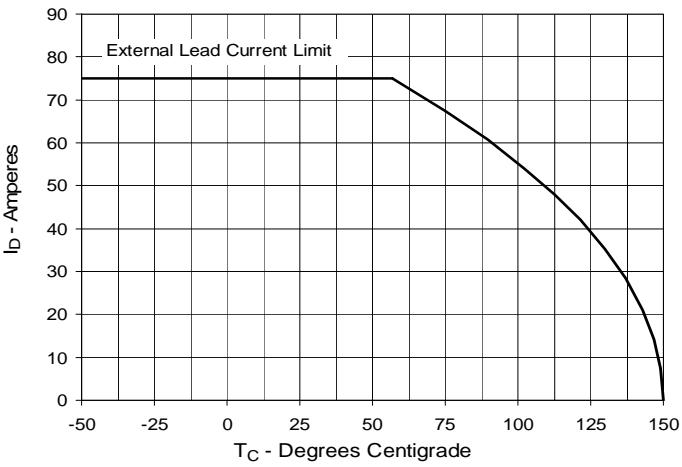
**Fig. 2. Extended Output Characteristics  
@ 25°C**

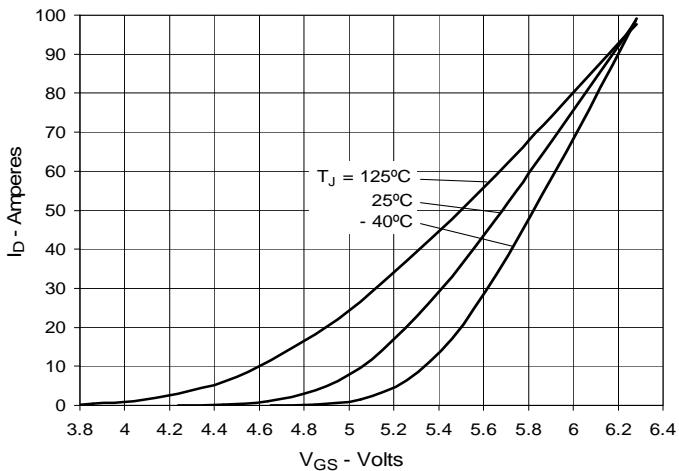
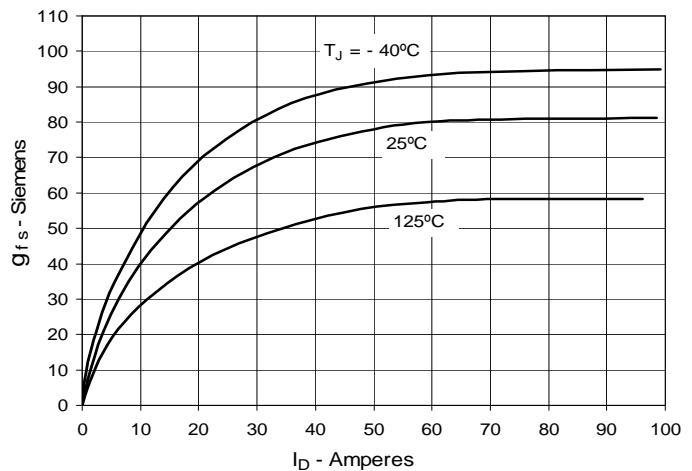
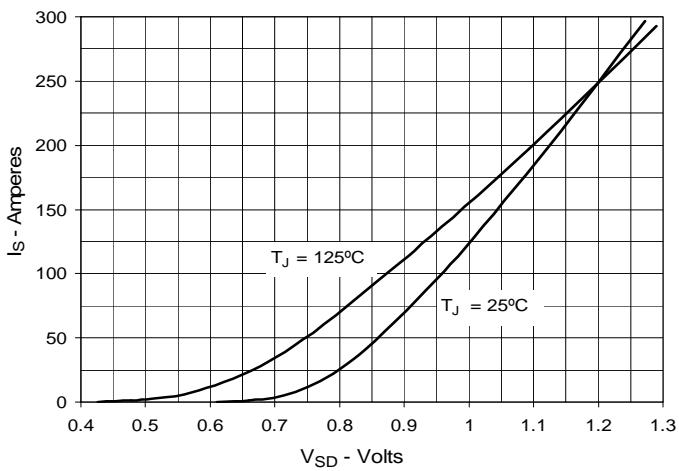
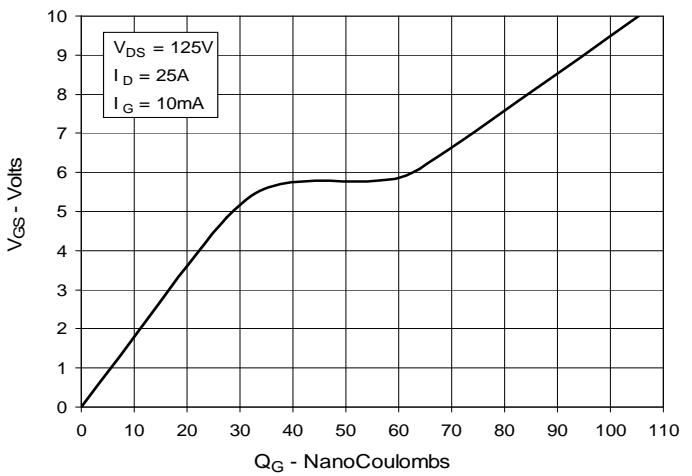
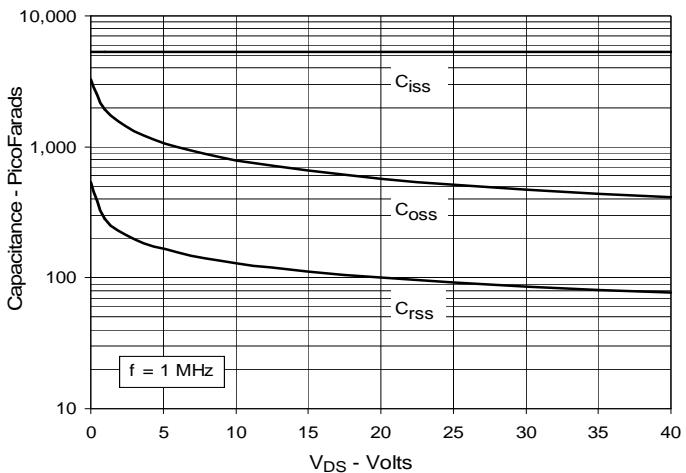
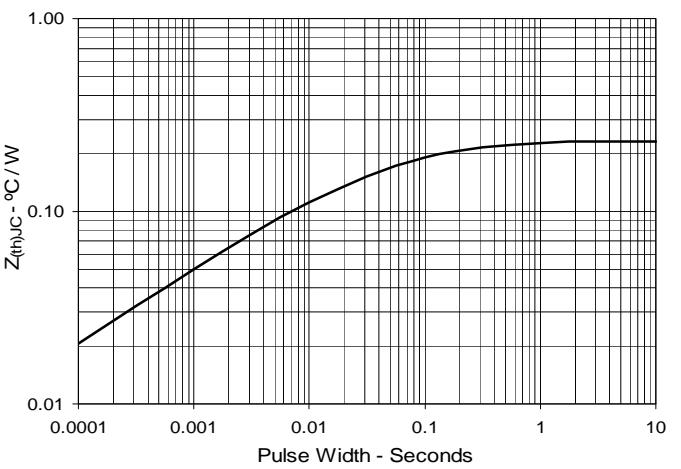


**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 43A$  Value  
vs. Junction Temperature**

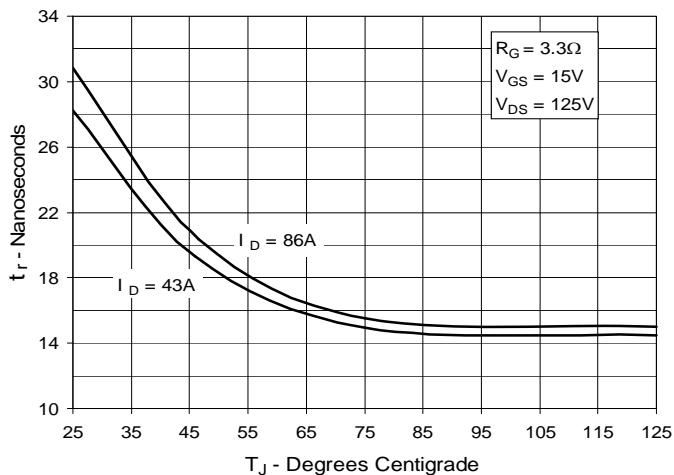


**Fig. 6. Maximum Drain Current vs.  
Case Temperature**

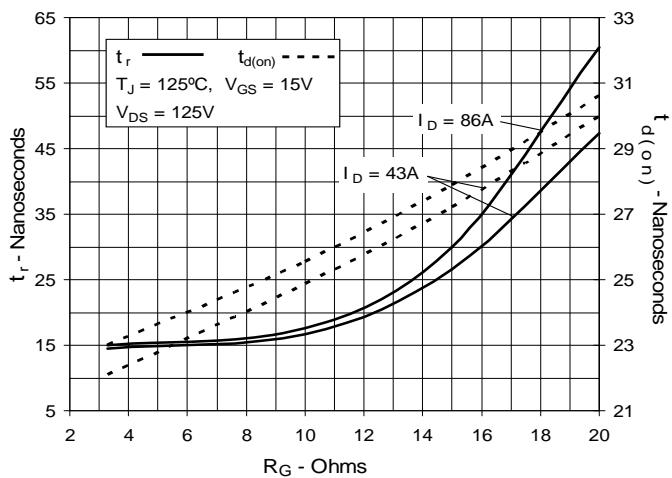


**Fig. 7. Input Admittance**

**Fig. 8. Transconductance**

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

**Fig. 10. Gate Charge**

**Fig. 11. Capacitance**

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


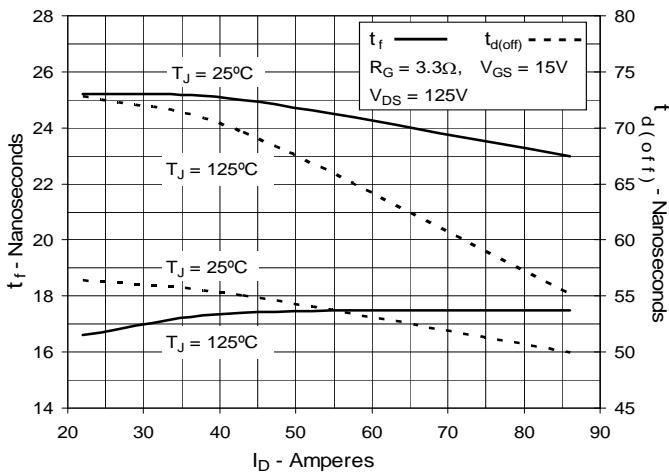
**Fig. 13. Resistive Turn-on  
Rise Time vs. Junction Temperature**



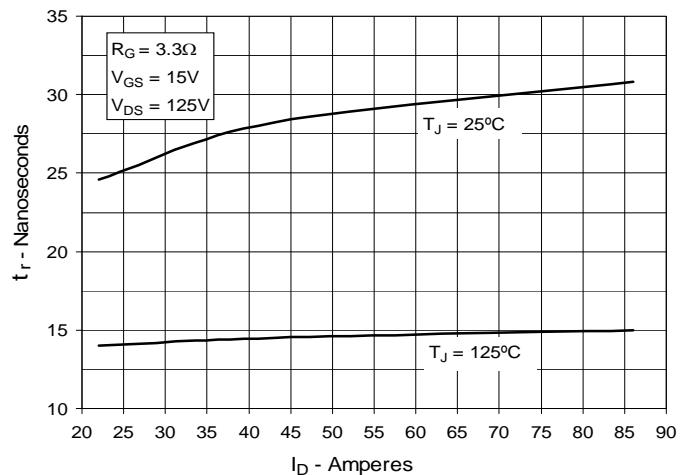
**Fig. 15. Resistive Turn-on  
Switching Times vs. Gate Resistance**



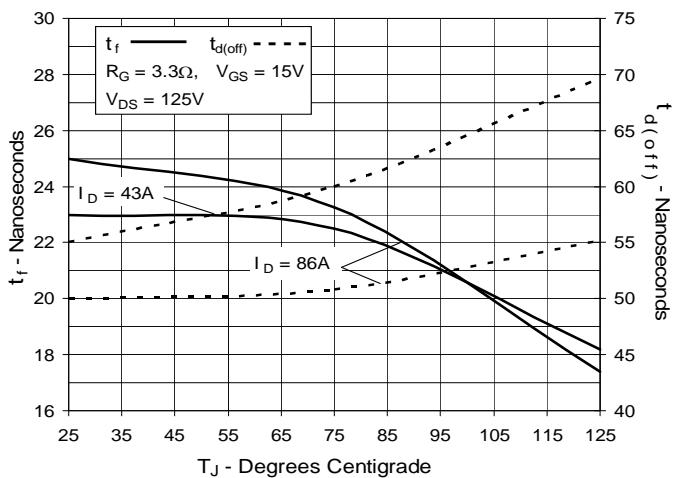
**Fig. 17. Resistive Turn-off  
Switching Times vs. Drain Current**



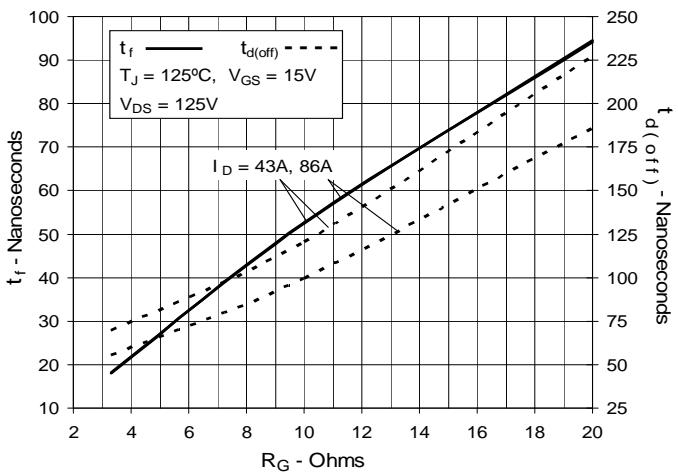
**Fig. 14. Resistive Turn-on  
Rise Time vs. Drain Current**



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



**Fig. 18. Resistive Turn-off  
Switching Times vs. Gate Resistance**





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