

# TrenchT2™ HiperFET N-Channel Power MOSFET

## FMM110-015X2F

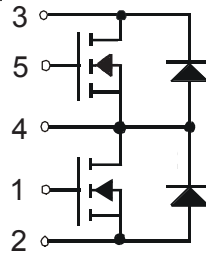
$$V_{DSS} = 150V$$

$$I_{D25} = 53A$$

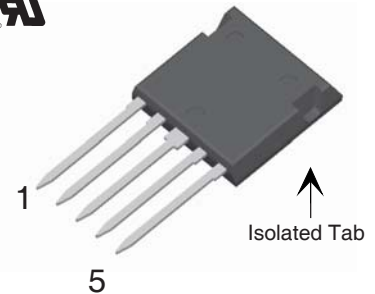
$$R_{DS(on)} \leq 20m\Omega$$

$$t_{rr(typ)} = 85ns$$

### Phase Leg Topology



### ISOPLUS i4-Pak™



Symbol	Test Conditions	Maximum Ratings	
$T_J$		-55 ... +175	°C
$T_{JM}$		175	°C
$T_{stg}$		-55 ... +175	°C
$V_{ISOLD}$	50/60Hz, RMS, t = 1min, Leads-to-Tab	2500	~V
$T_L$	1.6mm (0.062 in.) from Case for 10s	300	°C
$T_{SOLD}$	Plastic Body for 10s	260	°C
$F_C$	Mounting Force	20..120 / 4.5..27	N/lb.

Symbol	Test Conditions	Maximum Ratings	
$V_{DSS}$	$T_J = 25^\circ C$ to $175^\circ C$	150	V
$V_{DGR}$	$T_J = 25^\circ C$ to $175^\circ C$ , $R_{GS} = 1M\Omega$	150	V
$V_{GSM}$	Transient	$\pm 30$	V
$I_{D25}$	$T_C = 25^\circ C$	53	A
$I_{DM}$	$T_C = 25^\circ C$ , Pulse Width Limited by $T_{JM}$	300	A
$I_A$	$T_C = 25^\circ C$	55	A
$E_{AS}$	$T_C = 25^\circ C$	800	mJ
$dV/dt$	$I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ C$	10	V/ns
$P_D$	$T_C = 25^\circ C$	180	W

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
  - UL Recognized Package
  - Isolated Mounting Surface
  - 2500V Electrical Isolation
- Avalanche Rated
- Low  $Q_G$
- Low Drain-to-Tab Capacitance
- Low Package Inductance

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

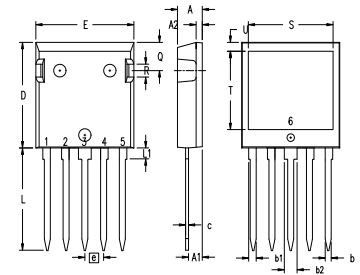
### Applications

- DC-DC Converters
- Battery Chargers
- Switched-Mode and Resonant-Mode Power Supplies
- DC Choppers
- AC Motor Drives
- Uninterruptible Power Supplies
- High Speed Power Switching Applications

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$C_p$	Coupling Capacitance Between Shorted Pins and Mounting Tab in the Case		40	pF
$d_S, d_A$	Pin - Pin	1.7		mm
$d_S, d_A$	Pin - Backside Metal	5.5		mm
<b>Weight</b>			9	g

Symbol	Test Conditions <sup>2</sup> ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{DSS}$	$V_{GS} = 0V, I_D = 250\mu A$	150		V
$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\mu A$	2.5		4.5 V
$I_{GSS}$	$V_{GS} = \pm 20V, V_{DS} = 0V$			$\pm 200$ nA
$I_{DSS}$	$V_{DS} = V_{DSS}, V_{GS} = 0V$ $T_J = 150^\circ\text{C}$			2 $\mu A$ 500 $\mu A$
$R_{DS(on)}$	$V_{GS} = 10V, I_D = 55A, \text{Note 1}$			20 m $\Omega$
$g_{fs}$	$V_{DS} = 10V, I_D = 55A, \text{Note 1}$	75	115	S
$C_{iss}$	$V_{GS} = 0V, V_{DS} = 25V, f = 1\text{ MHz}$		8600	pF
$C_{oss}$			685	pF
$C_{rss}$			77	pF
$t_{d(on)}$	<b>Resistive Switching Times</b> $V_{GS} = 10V, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 55A$ $R_G = 3.3\Omega$ (External)		33	ns
$t_r$			16	ns
$t_{d(off)}$			33	ns
$t_f$			18	ns
$Q_{g(on)}$	$V_{GS} = 10V, V_{DS} = 0.5 \cdot V_{DSS}, I_D = 55A$		150	nC
$Q_{gs}$			42	nC
$Q_{gd}$			46	nC
$R_{thJC}$				0.83 $^\circ\text{C/W}$
$R_{thCS}$		0.15		$^\circ\text{C/W}$

### ISOPLUS i4-Pak™ Outline



NOTE: Bottom heatsink meets 3000 Volts AC 1 sec isolation to the other pins.

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.102	.118	2.59	3.00
A2	.046	.085	1.17	2.16
b	.045	.055	1.14	1.40
b1	.058	.068	1.47	1.73
b2	.100	.110	2.54	2.79
C	.020	.029	0.51	0.74
D	.819	.840	20.80	21.34
E	.770	.799	19.56	20.29
e	.150 BSC		3.81 BSC	
L	.780	.840	19.81	21.34
L1	.083	.102	2.11	2.59
Q	.210	.244	5.33	6.20
R	.100	.180	2.54	4.57
S	.660	.690	16.76	17.53
T	.590	.620	14.99	15.75
U	.065	.080	1.65	2.03

Ref: IXYS CO 0077 R0

### Source-Drain Diode

Symbol	Test Conditions <sup>3</sup>	Characteristic Values		
		Min.	Typ.	Max.
$I_S$	$V_{GS} = 0V$			110 A
$I_{SM}$	Repetitive, Pulse Width Limited by $T_{JM}$			440 A
$V_{SD}$	$I_F = 100A, V_{GS} = 0V, \text{Note 1}$			1.3 V
$t_{rr}$	$I_F = 55A, -di/dt = 100A/\mu s$ $V_R = 100V, V_{GS} = 0V$		85	ns
$I_{RM}$			6.80	A
$Q_{RM}$			0.29	$\mu C$

Note 1: Pulse Test,  $t \leq 300\mu s$ , Duty Cycle,  $d \leq 2\%$ .

### ADVANCE TECHNICAL INFORMATION

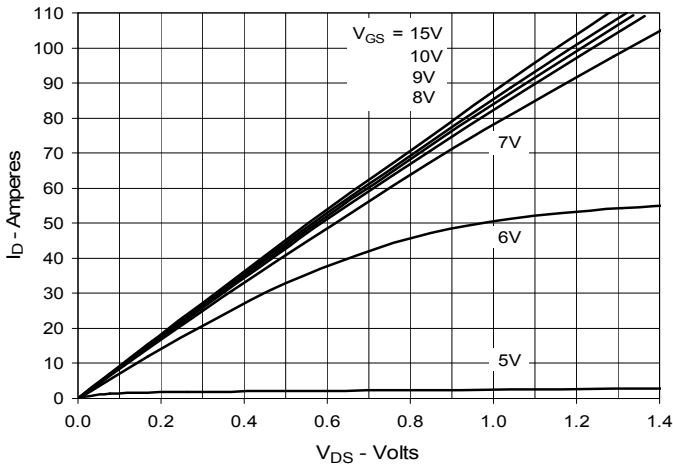
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated objective result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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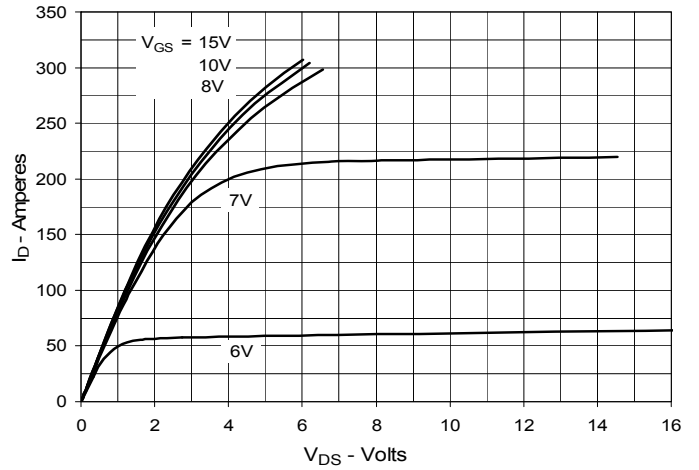
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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	

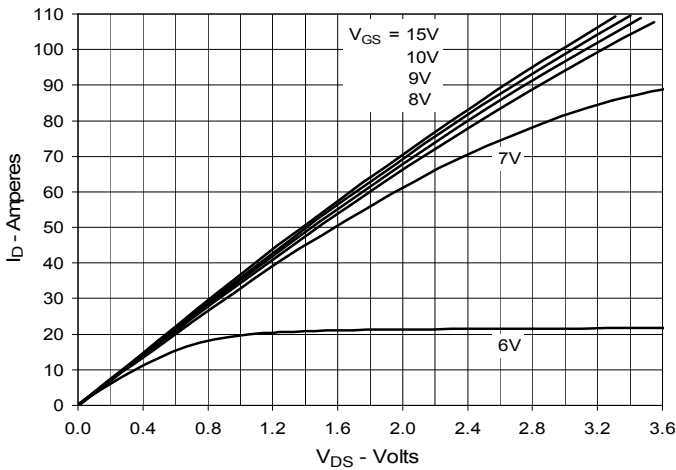
**Fig. 1. Output Characteristics @ 25°C**



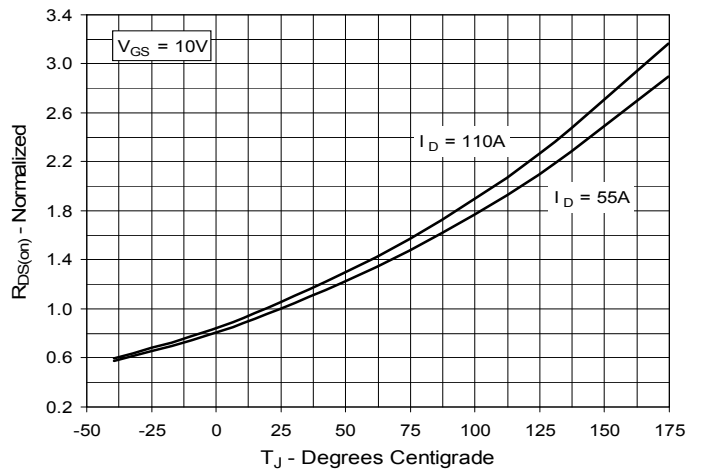
**Fig. 2. Extended Output Characteristics @ 25°C**



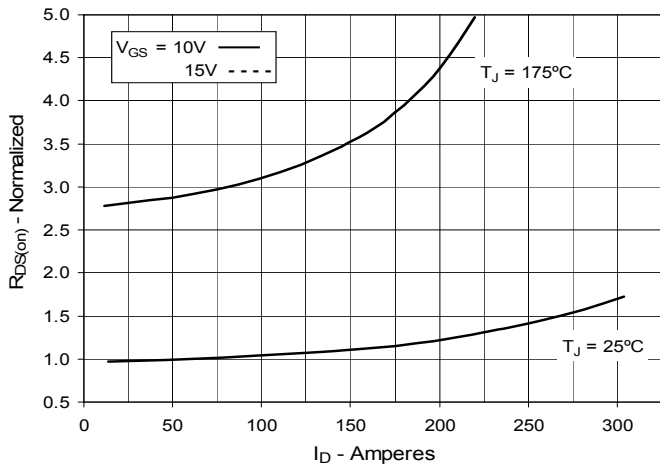
**Fig. 3. Output Characteristics @ 150°C**



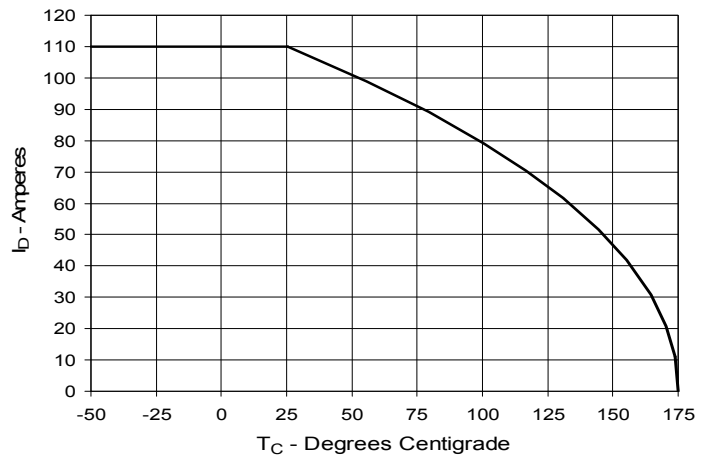
**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 55A$  Value vs. Junction Temperature**



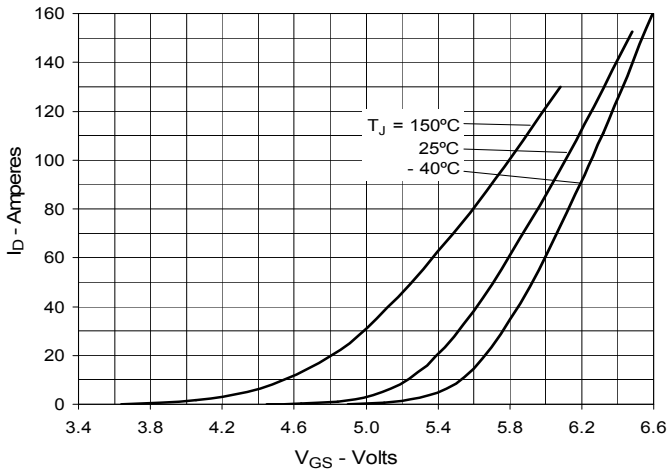
**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 55A$  Value vs. Drain Current**



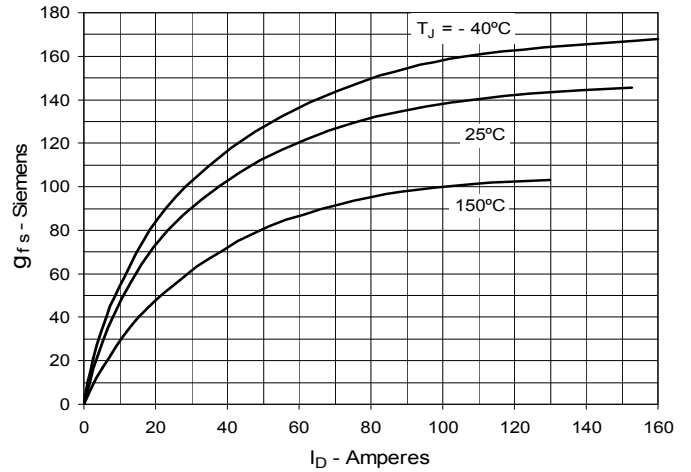
**Fig. 6. Drain Current vs. Case Temperature**



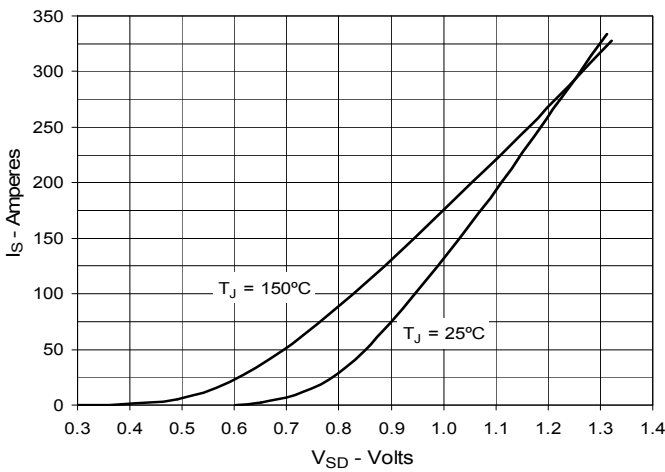
**Fig. 7. Input Admittance**



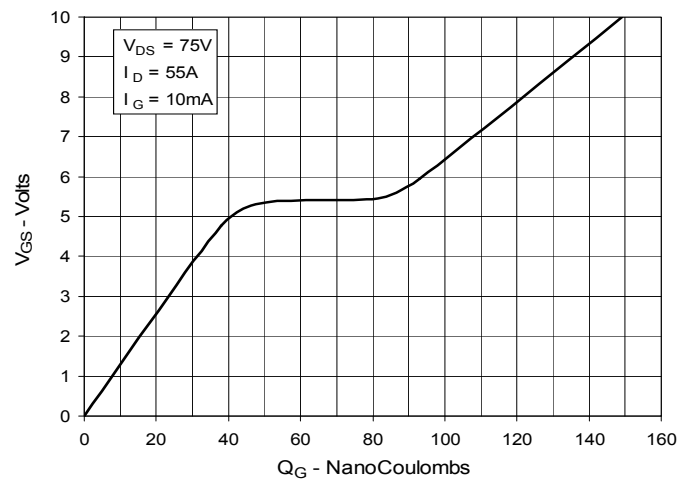
**Fig. 8. Transconductance**



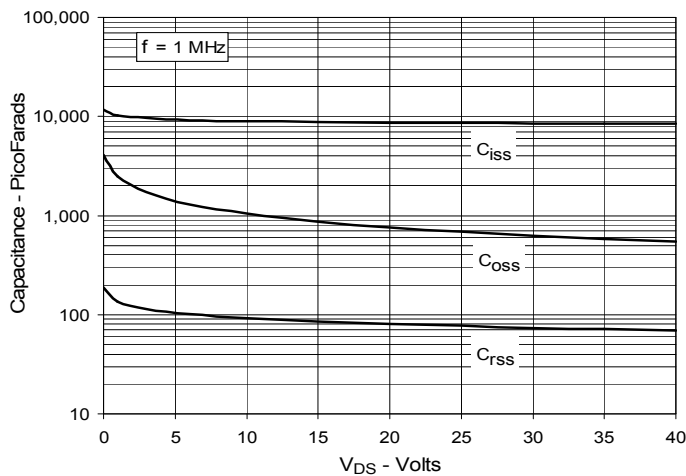
**Fig. 9. Forward Voltage Drop of Intrinsic Diode**



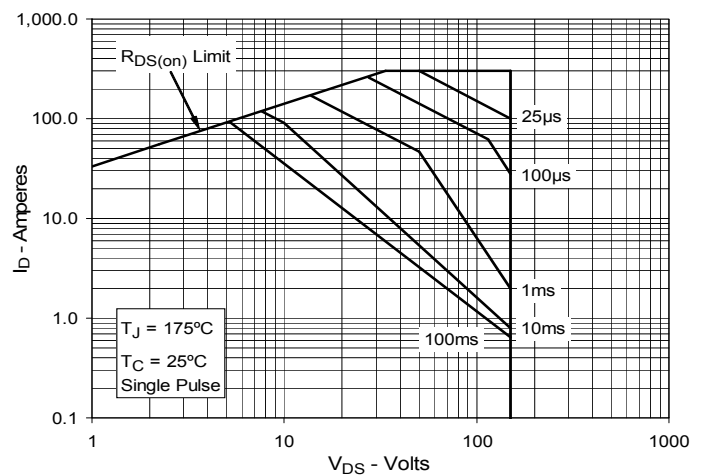
**Fig. 10. Gate Charge**



**Fig. 11. Capacitance**



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



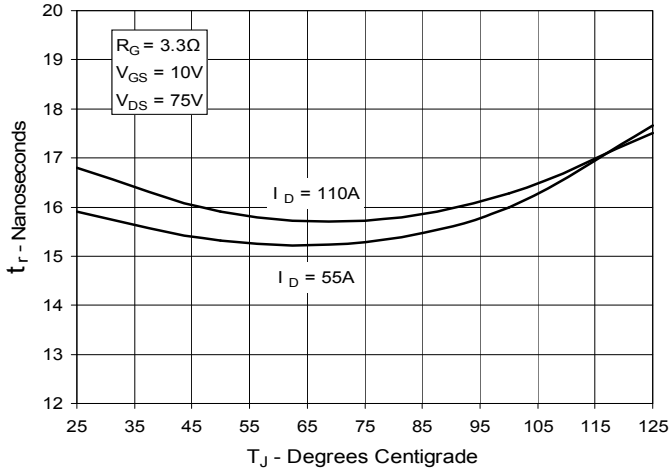
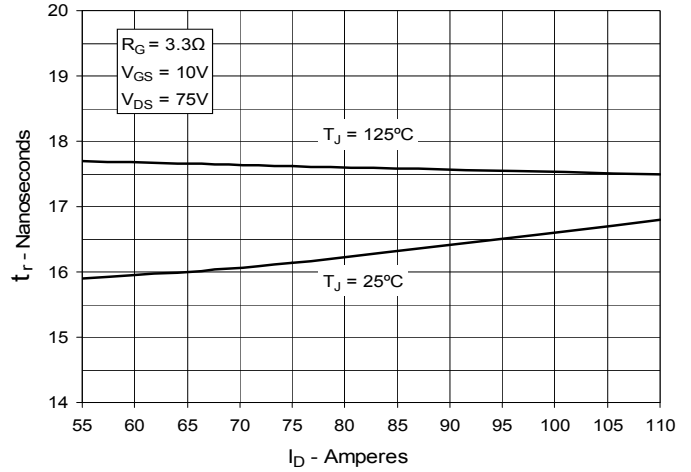
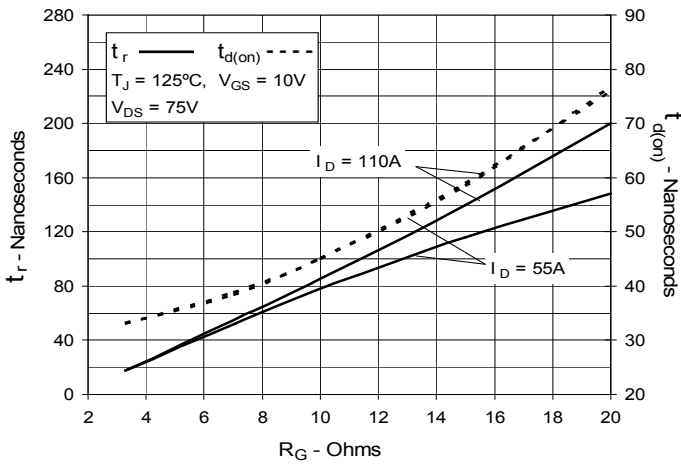
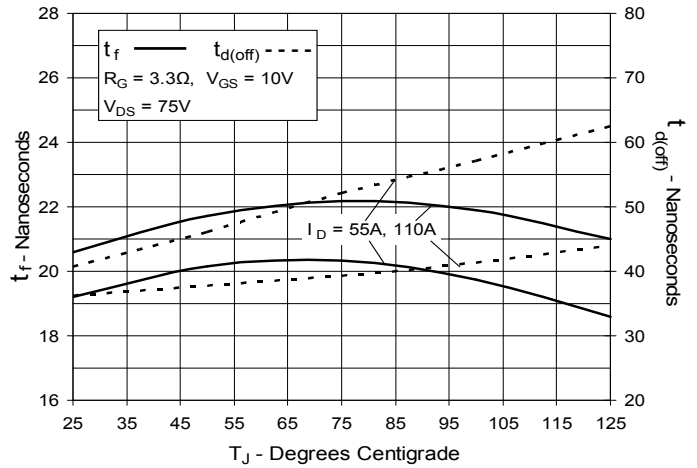
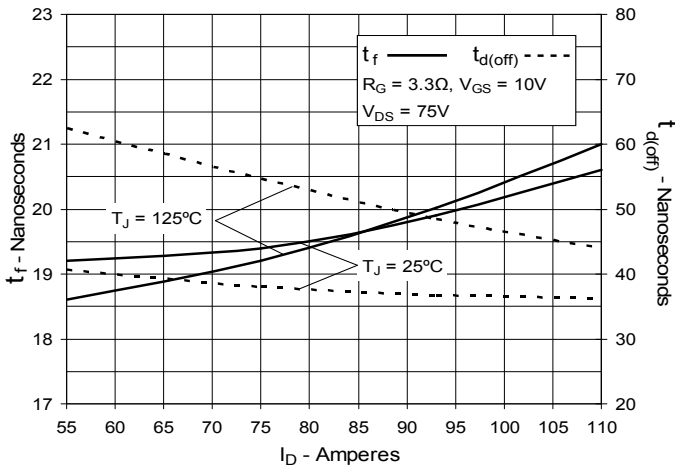
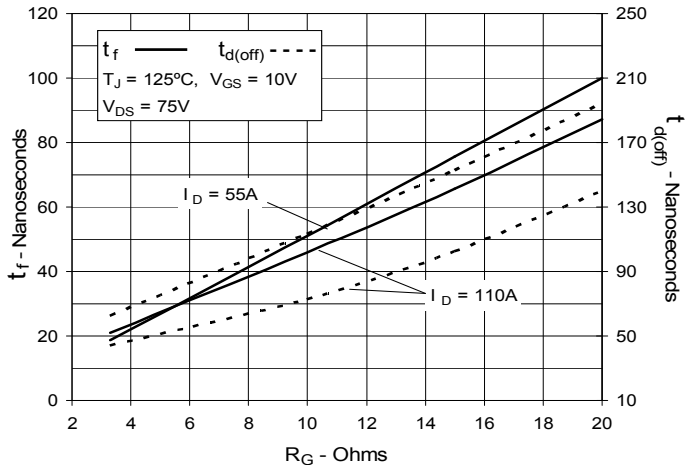
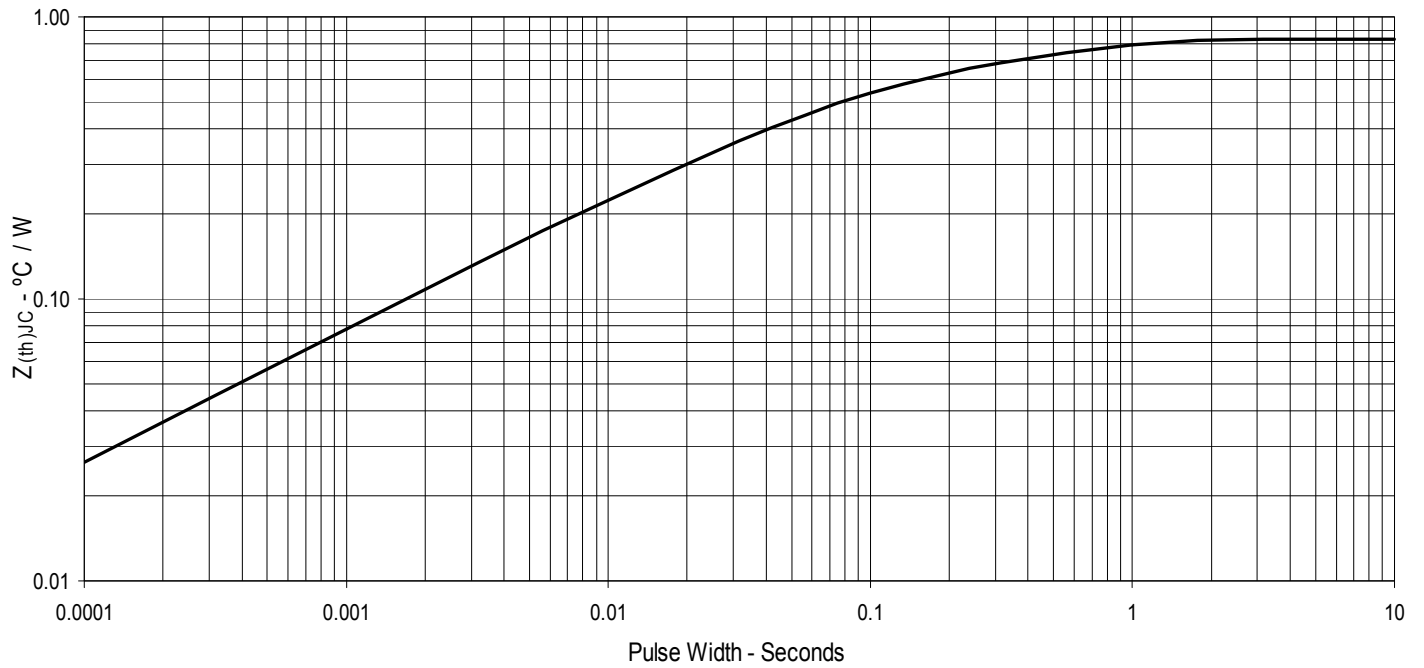
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**

**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**


Fig. 19. Maximum Transient Thermal Impedance



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