IXYS

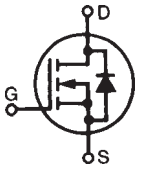
Advance Technical Information

TrenchT3™ HiperFET™ Power MOSFET

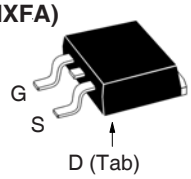
IXFA220N06T3
IXFP220N06T3
IXFH220N06T3

V_{DSS} = 60V
I_{D25} = 220A
$R_{DS(on)}$ ≤ 4mΩ

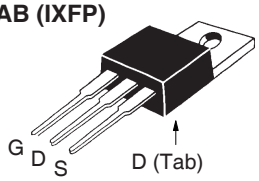
N-Channel Enhancement Mode
Avalanche Rated
Fast Intrnsic Rectifier



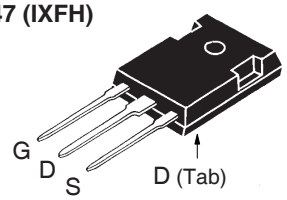
TO-263 AA (IXFA)



TO-220AB (IXFP)



TO-247 (IXFH)



G = Gate D = Drain
S = Source Tab = Drain

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 175°C	60	V
V_{DGR}	T_J = 25°C to 175°C, R_{GS} = 1MΩ	60	V
V_{GSM}	Transient	± 20	V
I_{D25}	T_C = 25°C	220	A
I_{LRMS}	Lead Current Limit, RMS	160	A
I_{DM}	T_C = 25°C, Pulse Width Limited by T_{JM}	500	A
I_A	T_C = 25°C	110	A
E_{AS}	T_C = 25°C	900	mJ
P_D	T_C = 25°C	440	W
T_J		-55 ... +175	°C
T_{JM}		175	°C
T_{stg}		-55 ... +175	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
F_C	Mounting Force (TO-263)	10..65 / 2.2..14.6	N/lb
M_d	Mounting Torque (TO-220 & TO-247)	1.13 / 10	m/lb.in
Weight	TO-263	2.5	g
	TO-220	3.0	g
	TO-247	6.0	g

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{DSS}	V_{GS} = 0V, I_D = 250μA	60			V
$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250μA	2.0		4.0	V
I_{GSS}	V_{GS} = ± 20V, V_{DS} = 0V			±200	nA
I_{DSS}	$V_{DS} = V_{DSS}$, V_{GS} = 0V			10	μA
	T_J = 150°C			1	mA
$R_{DS(on)}$	V_{GS} = 10V, I_D = 100A, Notes 1, 2			4	mΩ

Features

- International Standard Packages
- 175°C Operating Temperature
- High Current Handling Capability
- Avalanche Rated
- Fast Intrinsic Rectifier
- Low $R_{DS(on)}$

Advantages

- Easy to Mount
- Space Savings
- High Power Density

Applications

- DC-DC Converters & Off-Line UPS
- Primary-Side Switch
- High Current Switching Applications

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Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	V_{DS} = 10V, I_D = 60A, Note 1	87	145		S
C_{iss}	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz		8500		pF
C_{oss}			970		pF
C_{rss}			50		pF
R_{Gi}	Gate Input Resistance		1.7		Ω
$t_{d(on)}$	**Resistive Switching Times**		24		ns
t_r	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		20		ns
$t_{d(off)}$	R_G = 5Ω (External)		46		ns
t_f			17		ns
$Q_{g(on)}$	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		136		nC
Q_{gs}			44		nC
Q_{gd}			30		nC
R_{thJC}				0.34	°C/W
R_{thCS}	TO-220		0.50		°C/W
	TO-247		0.21		°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			220	A
I_{SM}	Repetitive, Pulse Width Limited by T_{JM}			880	A
V_{SD}	I_F = 100A, V_{GS} = 0V, Note 1			1.4	V
t_{rr}	I_F = 110A, V_{GS} = 0V		38		ns
I_{RM}	-di/dt = 100A/μs		1.9		A
Q_{RM}	V_R = 40V		37		nC

Notes: 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. On through-hole packages, $R_{DS(on)}$ Kelvin test contact location must be 5mm or less from the package body.

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 by one or more of the following U.S. patents: 4,835,592 4,860,072 4,881,106 4,931,844 5,017,508 5,034,796 5,049,961 5,063,307 5,187,117 5,237,481 5,381,025 5,486,715 6,162,665 6,259,123 B1 6,306,728 B1 6,404,065 B1 6,534,343 6,583,505 6,683,344 6,710,405 B2 6,710,463 6,727,585 6,759,692 6,771,478 B2 7,005,734 B2 7,063,975 B2 7,071,537 7,157,338B2

Fig. 1. Output Characteristics @ T_J = 25ºC

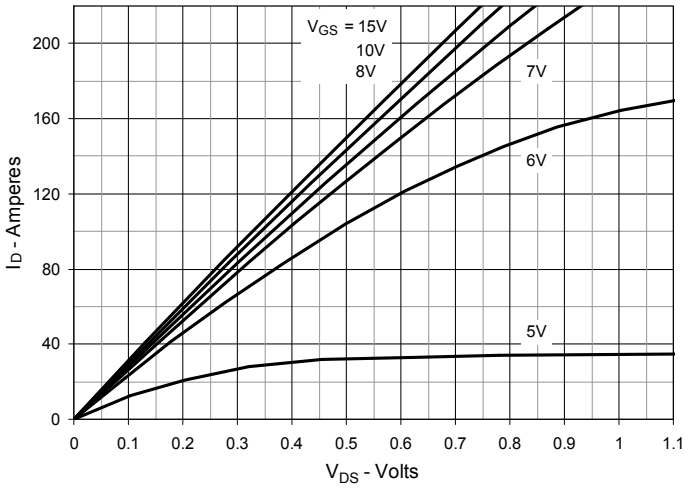


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

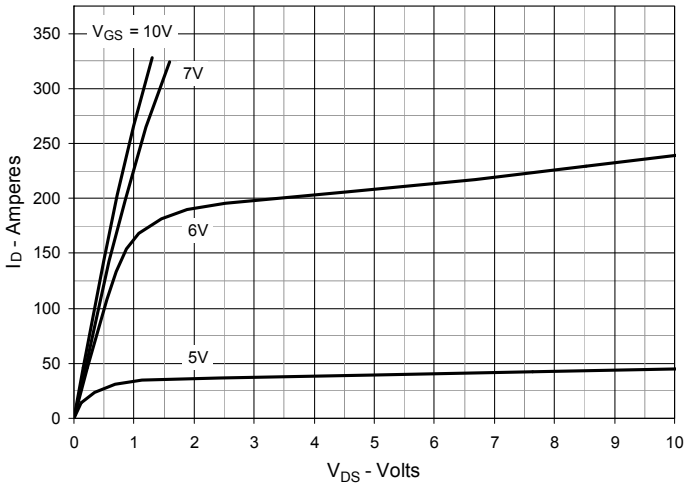


Fig. 3. Output Characteristics @ T_J = 150ºC

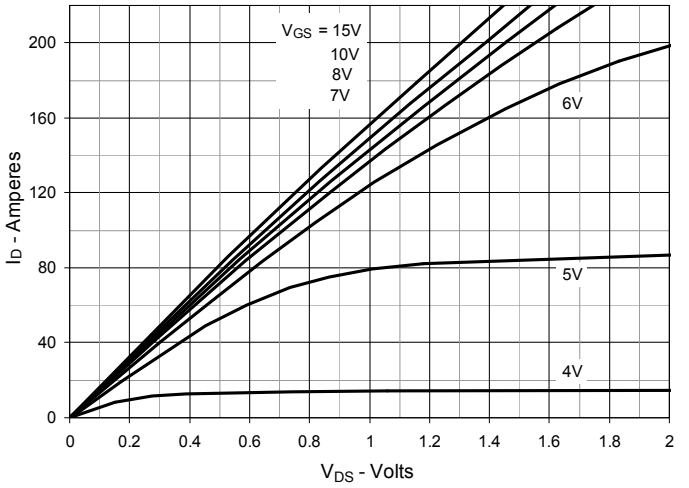


Fig. 4. Normalized $R_{DS(on)}$ to I_D = 110A Value vs. Junction Temperature

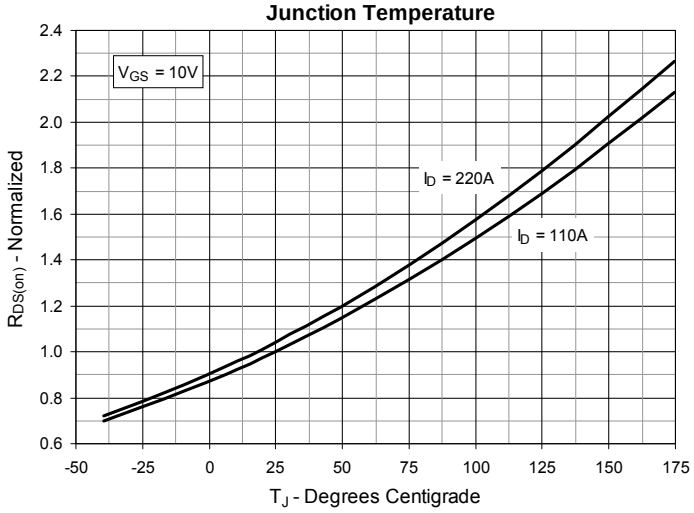


Fig. 5. Normalized $R_{DS(on)}$ to I_D = 110A vs. Drain Current

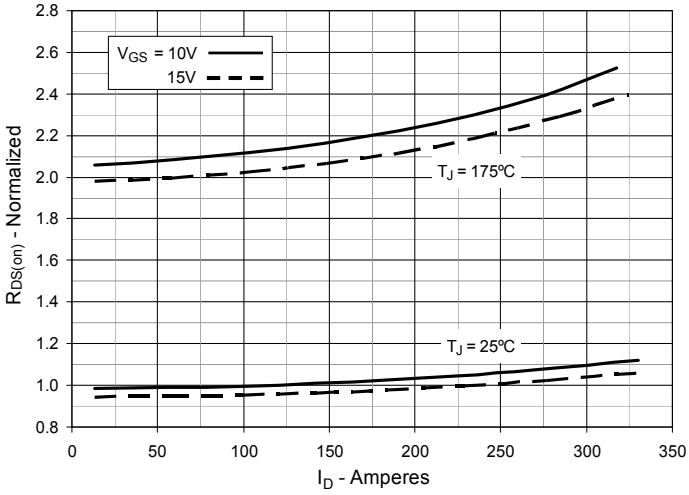
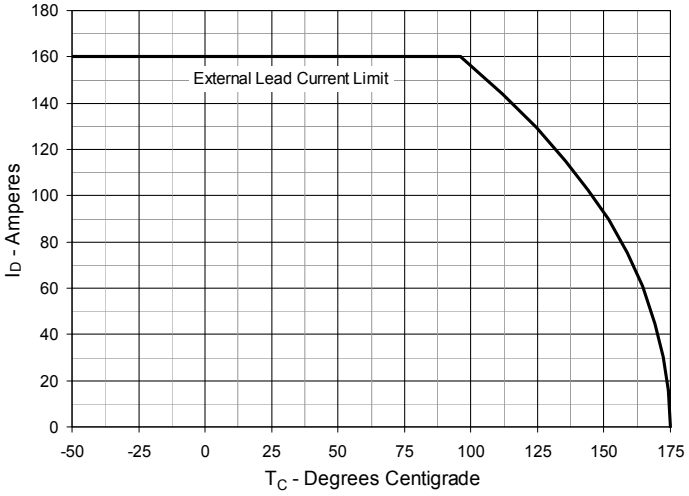


Fig. 6. Drain Current vs. Case Temperature



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Fig. 7. Input Admittance

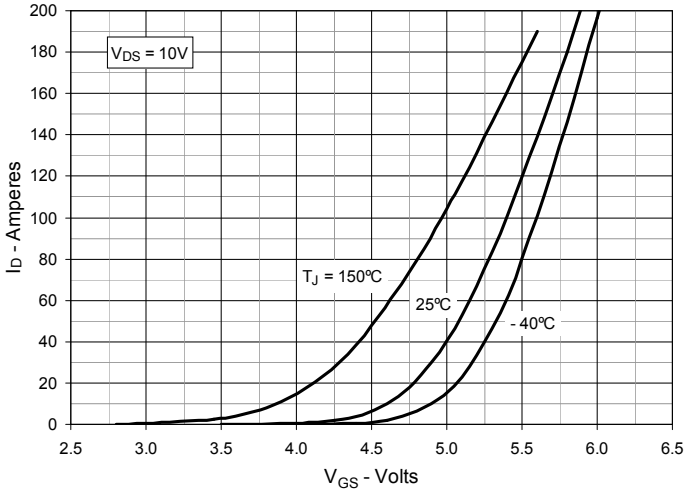


Fig. 8. Transconductance

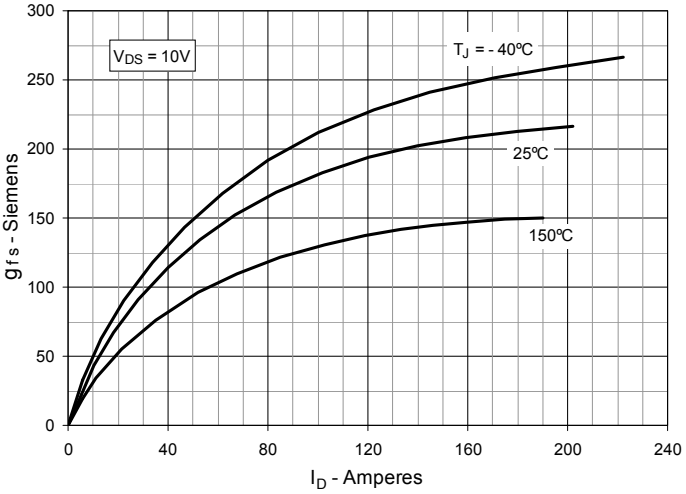


Fig. 9. Forward Voltage Drop of Intrinsic Diode

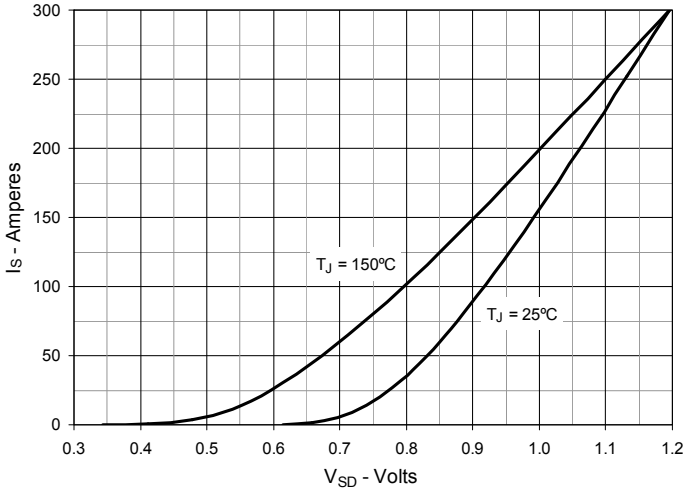


Fig. 10. Gate Charge

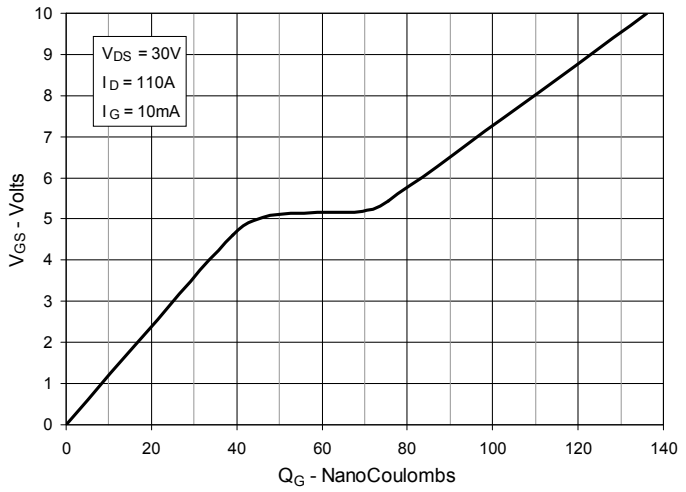


Fig. 11. Capacitance

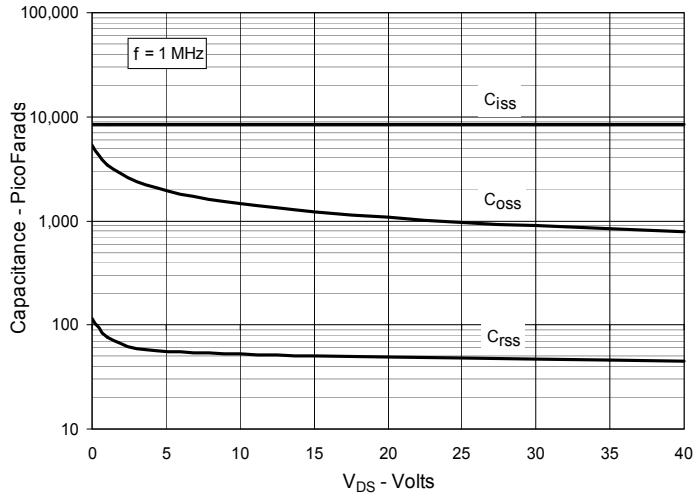
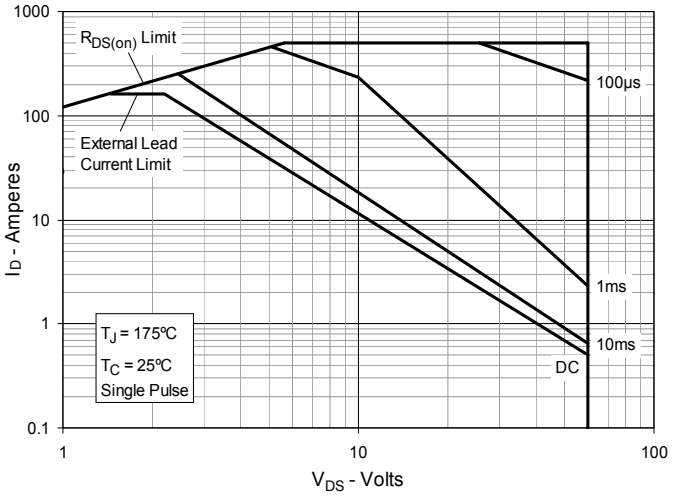


Fig. 12. Forward-Bias Safe Operating Area



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

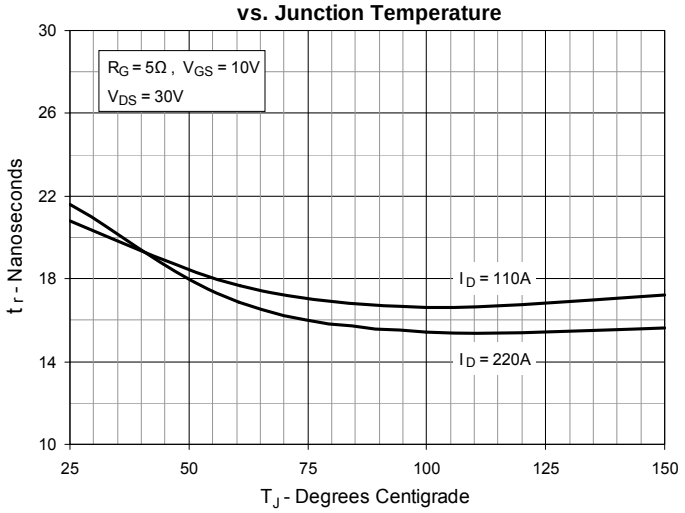


Fig. 14. Resistive Turn-on Rise Time vs. Drain Current

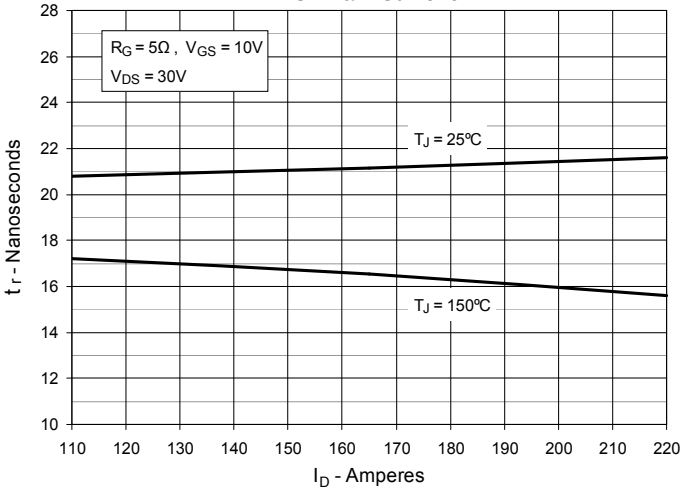


Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance

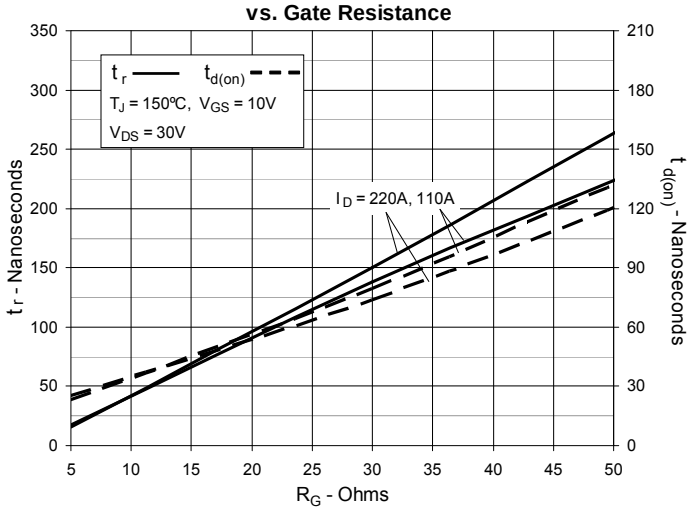


Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature

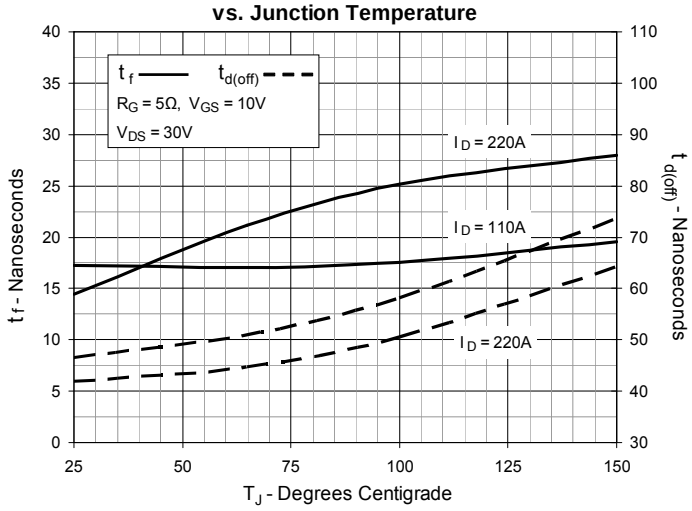


Fig. 17. Resistive Turn-off Switching Times vs. Drain Current

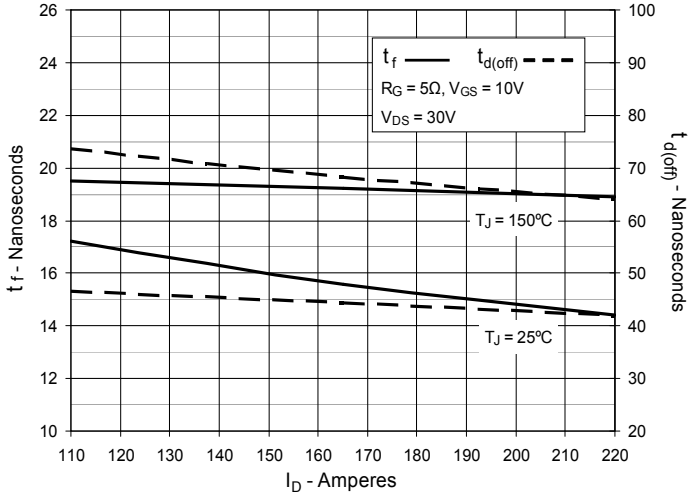
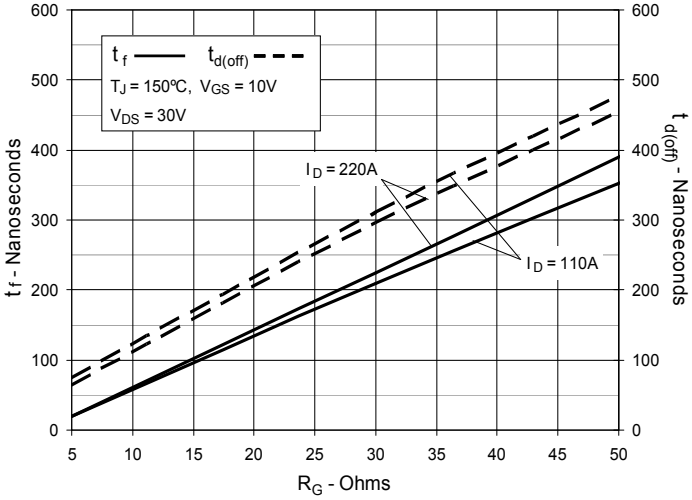
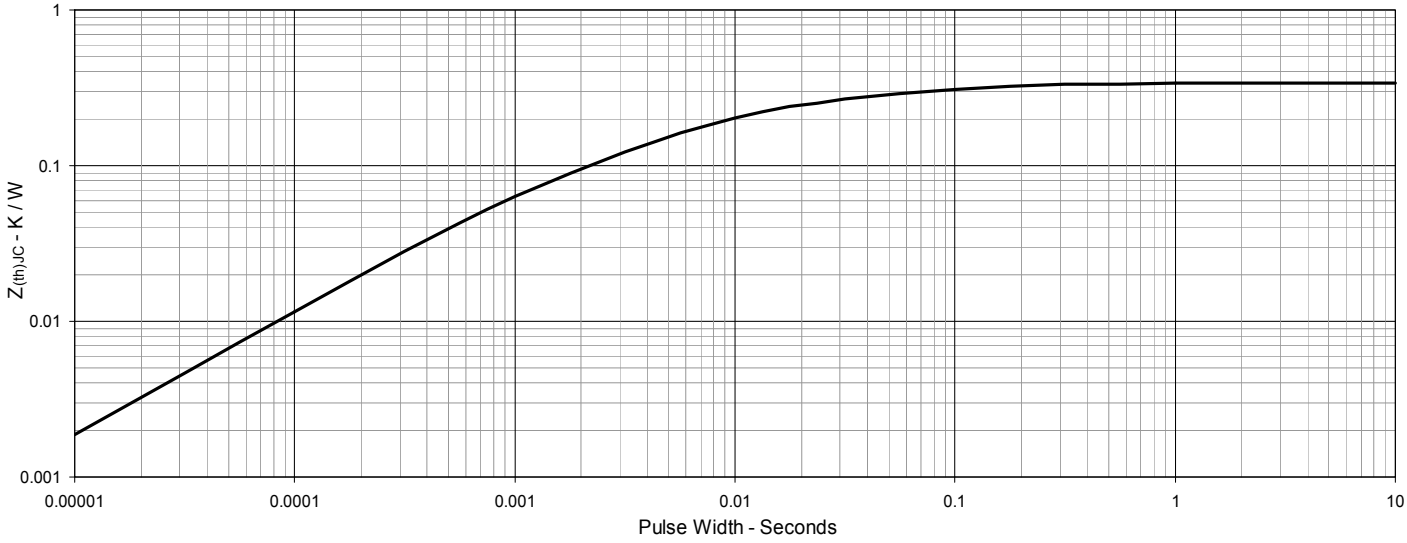


Fig. 18. Resistive Turn-off Switching Times vs. Gate Resistance

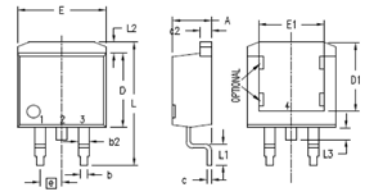


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Fig. 19. Maximum Transient Thermal Impedance



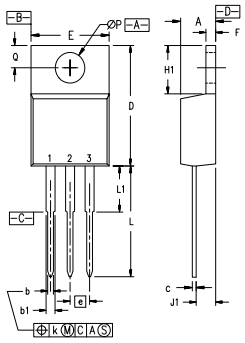
TO-263 Outline



1 = Gate
2 = Drain
3 = Source
4 = Drain

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.160	.190	4.06	4.83
A1	.080	.110	2.03	2.79
b	.020	.039	0.51	0.99
b2	.045	.055	1.14	1.40
c	.016	.029	0.40	0.74
c2	.045	.055	1.14	1.40
D	.340	.380	8.64	9.65
D1	.315	.350	8.00	8.89
E	.380	.410	9.65	10.41
E1	.245	.320	6.22	8.13
e	.100 BSC		2.54 BSC	
L	.575	.625	14.61	15.88
L1	.090	.110	2.29	2.79
L2	.040	.055	1.02	1.40
L3	.050	.070	1.27	1.78
L4	0	.005	0	0.13

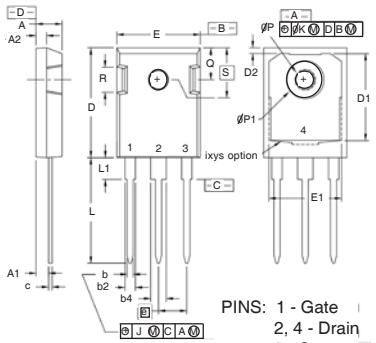
TO-220 Outline



Pins: 1 - Gate 2 - Drain
3 - Source

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b1	.045	.065	1.15	1.65
c	.014	.022	0.35	0.56
D	.580	.630	14.73	16.00
E	.390	.420	9.91	10.66
e	.100 BSC		2.54 BSC	
F	.045	.055	1.14	1.40
H1	.230	.270	5.85	6.85
J1	.090	.110	2.29	2.79
k	0	.015	0	0.38
L	.500	.550	12.70	13.97
L1	.110	.230	2.79	5.84
ØP	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

TO-247 Outline



PINS: 1 - Gate
2, 4 - Drain
3 - Source

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.087	1.91	2.20
b4	.115	.126	2.92	3.20
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
D1	.650	.690	16.51	17.53
D2	.035	.050	0.89	1.27
E	.620	.635	15.75	16.13
E1	.545	.565	13.84	14.35
e	.215 BSC		5.45 BSC	
J	--	.010	--	0.25
K	--	.025	--	0.64
L	.780	.810	19.81	20.57
L1	.150	.170	3.81	4.32
øP	.140	.144	3.55	3.65
øP1	.275	.290	6.99	7.37
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.242 BSC		6.15 BSC	

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