IXYS

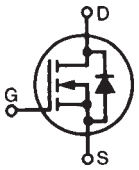
Preliminary Technical Information

X2-Class Power MOSFET

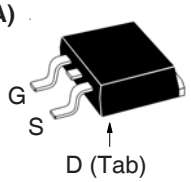
IXTA12N70X2
IXTP12N70X2
IXTH12N70X2

V_{DSS} = 700V
I_{D25} = 12A
$R_{DS(on)}$ ≤ 300mΩ

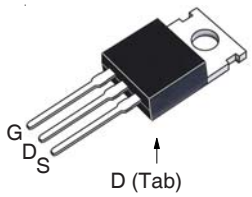
N-Channel Enhancement Mode



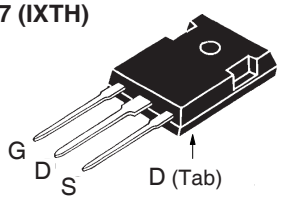
TO-263 (IXTA)



TO-220 (IXTP)



TO-247 (IXTH)



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

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	700	V
V_{DGR}	T_J = 25°C to 150°C, R_{GS} = 1MΩ	700	V
V_{GSS}	Continuous	±30	V
V_{GSM}	Transient	±40	V
I_{D25}	T_C = 25°C	12	A
I_{DM}	T_C = 25°C, Pulse Width Limited by T_{JM}	24	A
I_A	T_C = 25°C	6	A
E_{AS}	T_C = 25°C	300	mJ
dv/dt	$I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_J \le 150°C$	50	V/ns
P_D	T_C = 25°C	180	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}	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	Nm/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	700			V
$V_{GS(th)}$	$V_{DS} = V_{GS}$, I_D = 250μA	2.5		4.5	V
I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V			±100	nA
I_{DSS}	$V_{DS} = V_{DSS}$, V_{GS} = 0V			5	μA
	T_J = 125°C			75	μA
$R_{DS(on)}$	V_{GS} = 10V, $I_D = 0.5 \bullet I_{D25}$, Note 1			300	mΩ

Features

- International Standard Packages
- Low $R_{DS(ON)}$ and Q_G
- Avalanche Rated
- Low Package Inductance

Advantages

- High Power Density
- Easy to Mount
- Space Savings

Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- PFC Circuits
- AC and DC Motor Drives
- Robotics and Servo Controls

© 2018 IXYS CORPORATION, All Rights Reserved

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max	
g_{fs}	V_{DS} = 10V, I_D = 0.5 • I_{D25}, Note 1	7	12		S
R_{Gi}	Gate Input Resistance		3.7		Ω
C_{iss}	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz		960		pF
C_{oss}			920		pF
C_{rss}			2		pF
	Effective Output Capacitance				
$C_{o(er)}$	Energy related; V_{GS} = 0V, V_{DS} = 0.8 • V_{DSS}		58		pF
$C_{o(tr)}$	Time related; V_{GS} = 0V, V_{DS} = 0.8 • V_{DSS}		200		pF
$t_{d(on)}$	**Resistive Switching Times**		24		ns
t_r	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		30		ns
$t_{d(off)}$	R_G = 30Ω (External)		78		ns
t_f			27		ns
$Q_{g(on)}$	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		19		nC
Q_{gs}			5		nC
Q_{gd}			8		nC
R_{thJC}				0.69	°C/W
R_{thCS}	TO-220		0.50		°C/W
	TO-247		0.25		°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			12	A
I_{SM}	Repetitive, pulse Width Limited by T_{JM}			48	A
V_{SD}	I_F = I_S, V_{GS} = 0V, Note 1			1.4	V
t_{rr}	I_F = 6A, -di/dt = 100A/μs		270		ns
Q_{RM}	V_R = 100V		2.8		μC
I_{RM}			21		A

Note 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

PRELIMINARY 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 6,259,123B1 6,306,728B1 6,404,065B1 6,534,343 6,583,505 6,683,344 6,710,405B2 6,710,463 6,727,585 6,759,692 6,771,478B2 7,005,734B2 7,063,975B2 7,071,537 7,157,338B2

Fig. 1. Output Characteristics @ T_J = 25ºC

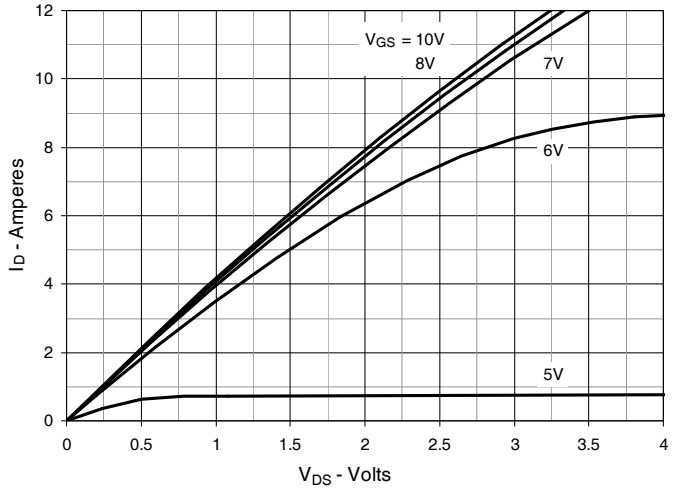


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

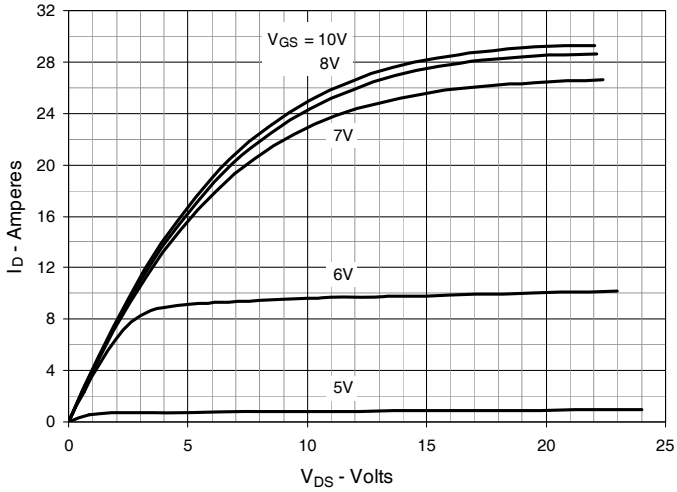


Fig. 3. Output Characteristics @ T_J = 125ºC

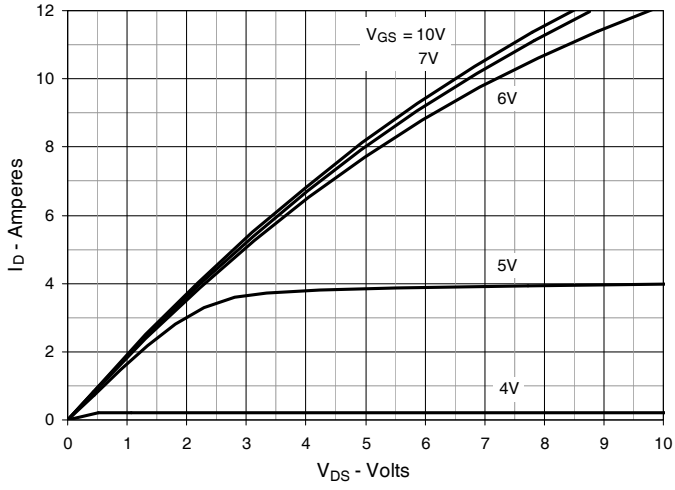


Fig. 4. $R_{DS(on)}$ Normalized to I_D = 6A Value vs. Junction Temperature

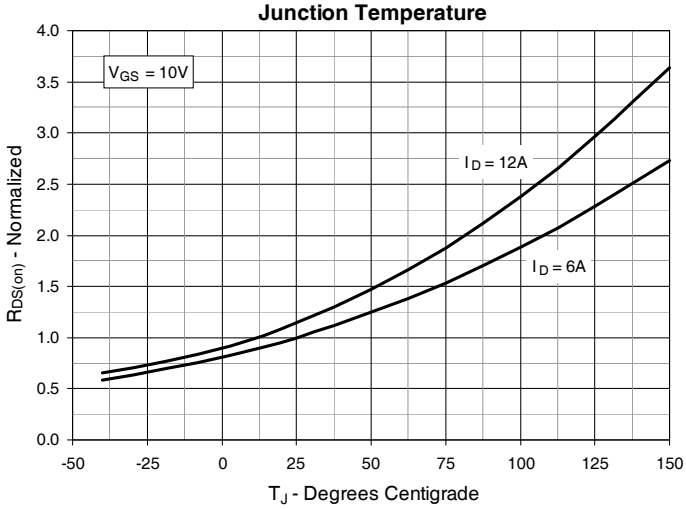


Fig. 5. $R_{DS(on)}$ Normalized to I_D = 6A Value vs. Drain Current

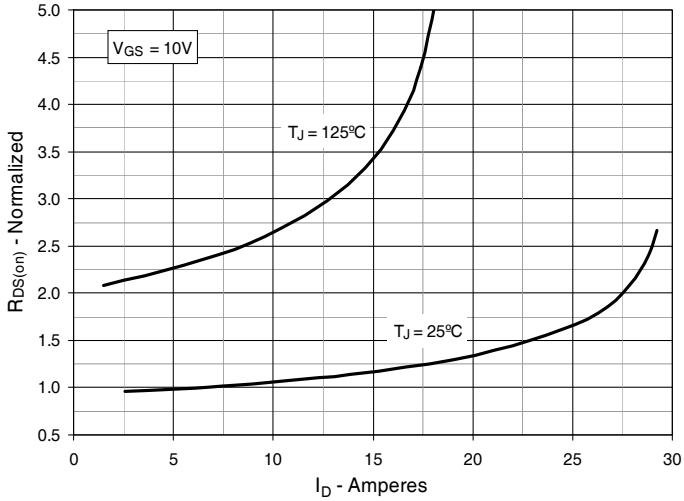
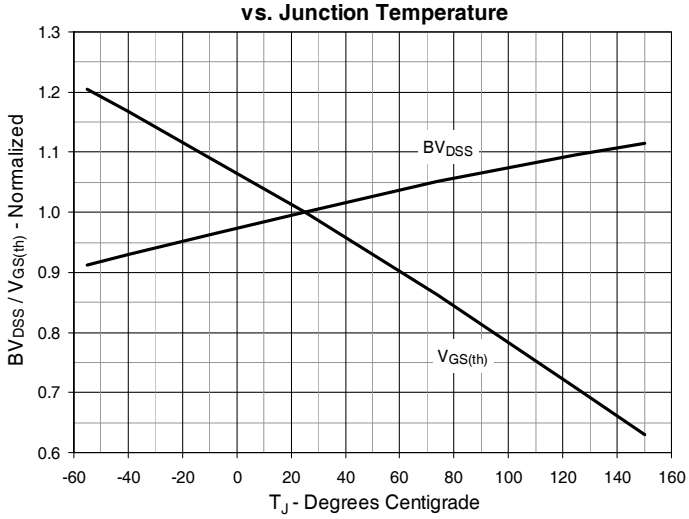


Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature



© 2018 IXYS CORPORATION, All Rights Reserved

Fig. 7. Maximum Drain Current vs. Case Temperature

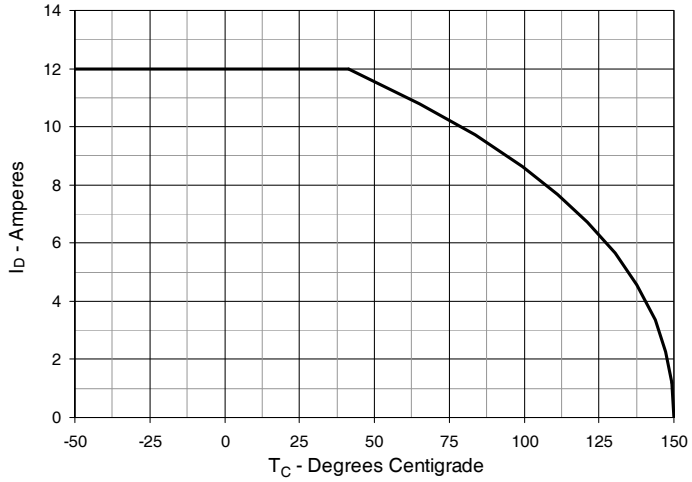


Fig. 8. Input Admittance

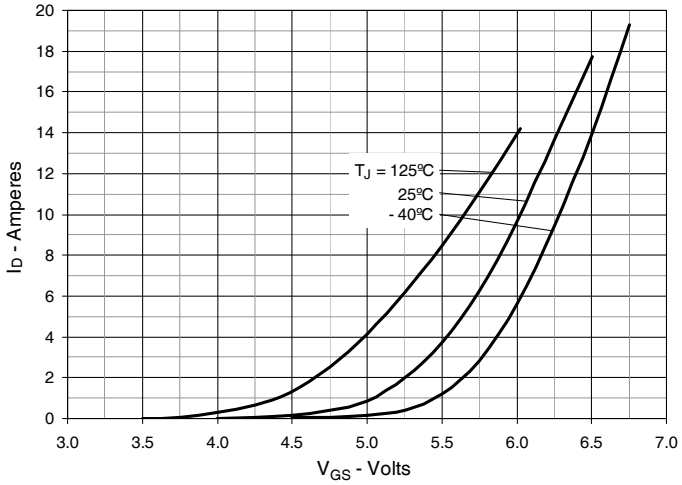


Fig. 9. Transconductance

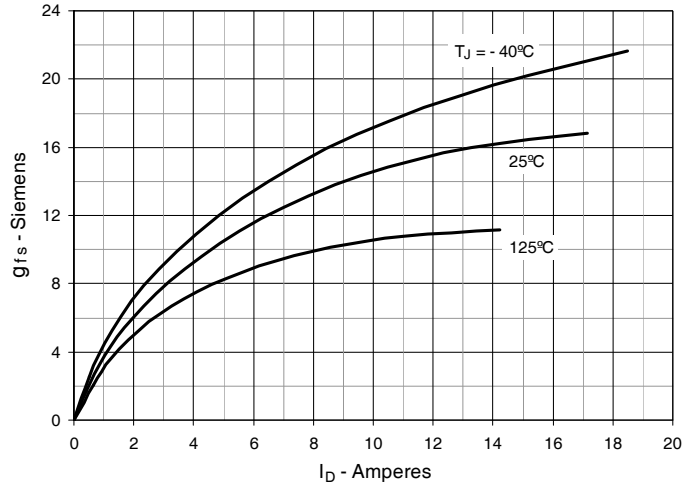


Fig. 10. Forward Voltage Drop of Intrinsic Diode

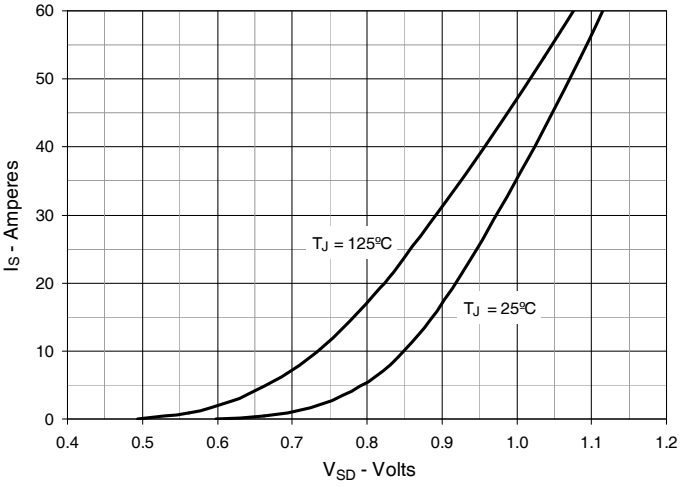


Fig. 11. Gate Charge

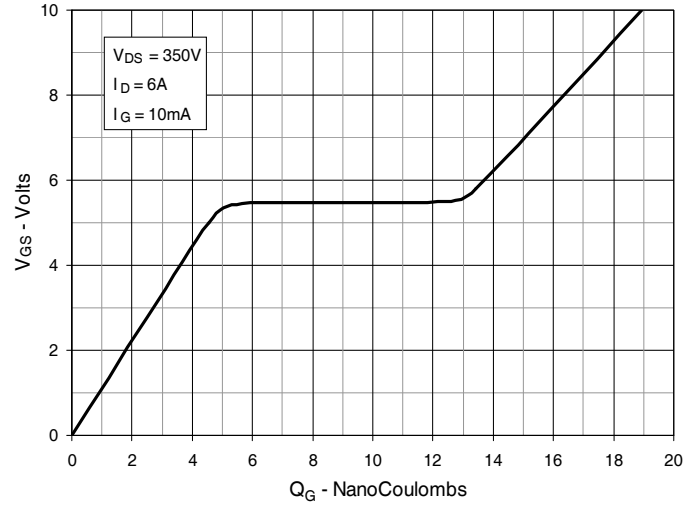
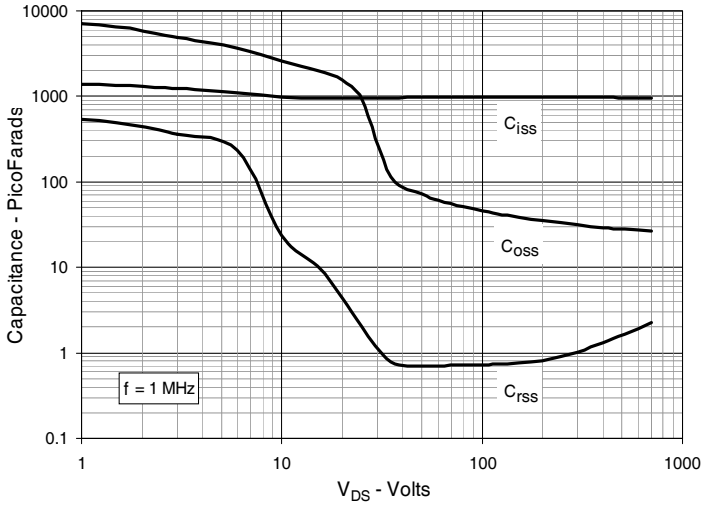


Fig. 12. Capacitance



IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

Fig. 13. Output Capacitance Stored Energy

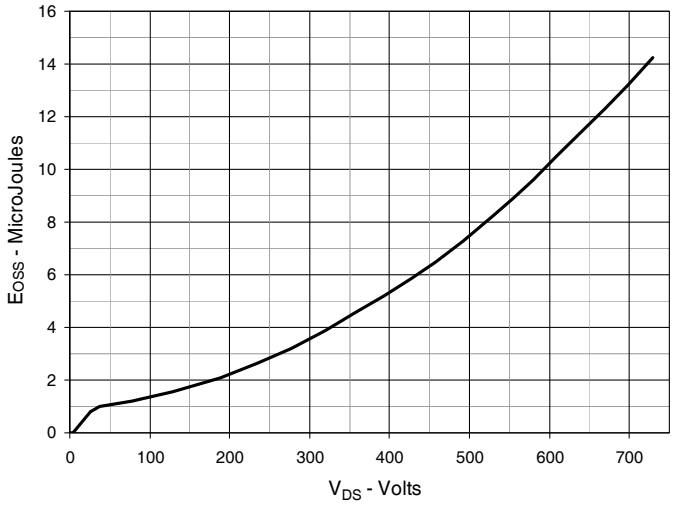


Fig. 14. Forward-Bias Safe Operating Area

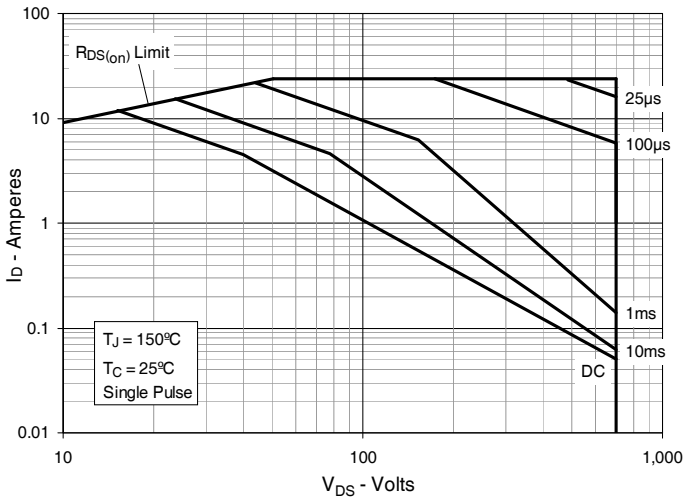
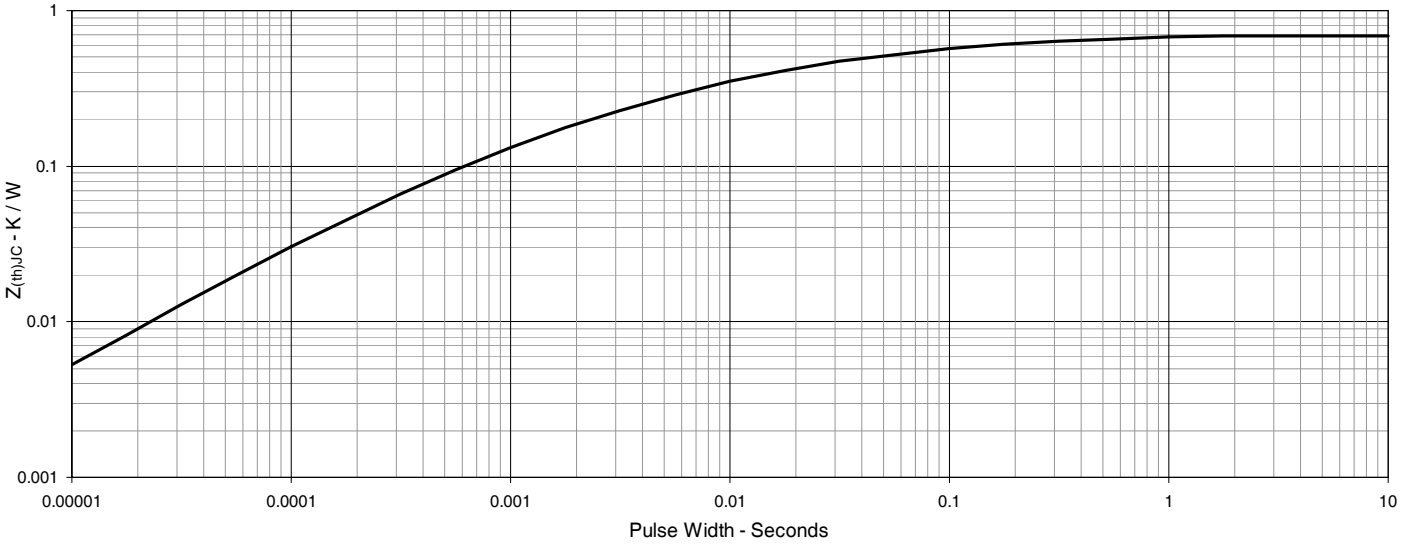
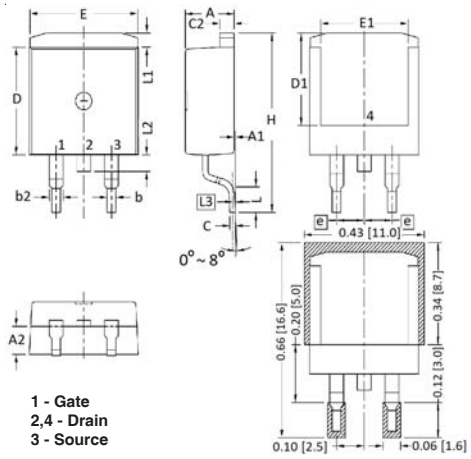


Fig. 15. Maximum Transient Thermal Impedance



© 2018 IXYS CORPORATION, All Rights Reserved

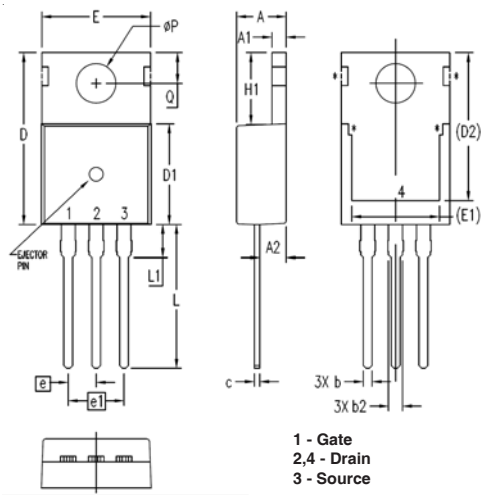
TO-263 Outline



1 - Gate
2,4 - Drain
3 - Source

SYM	INCHES		MILLIMETER	
	MIN	MAX	MIN	MAX
A	.170	.185	4.30	4.70
A1	.000	.008	0.00	0.20
A2	.091	.098	2.30	2.50
b	.028	.035	0.70	0.90
b2	.046	.060	1.18	1.52
C	.018	.024	0.45	0.60
C2	.049	.060	1.25	1.52
D	.340	.370	8.63	9.40
D1	.300	.327	7.62	8.30
E	.380	.410	9.65	10.41
E1	.270	.330	6.86	8.38
e	.100 BSC		2.54 BSC	
H	.580	.620	14.73	15.75
L	.075	.105	1.91	2.67
L1	.039	.060	1.00	1.52
L2	—	.070	—	1.77
L3	.010 BSC		0.254 BSC	

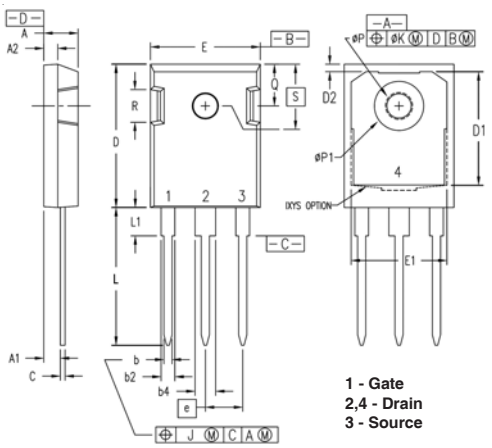
TO-220 Outline



1 - Gate
2,4 - Drain
3 - Source

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.169	.185	4.30	4.70
A1	.047	.055	1.20	1.40
A2	.079	.106	2.00	2.70
b	.024	.039	0.60	1.00
b2	.045	.057	1.15	1.45
c	.014	.026	0.35	0.65
D	.587	.626	14.90	15.90
D1	.335	.370	8.50	9.40
(D2)	.500	.531	12.70	13.50
E	.382	.406	9.70	10.30
(E1)	.283	.323	7.20	8.20
e	.100 BSC		2.54 BSC	
e1	.200 BSC		5.08 BSC	
H1	.244	.268	6.20	6.80
L	.492	.547	12.50	13.90
L1	.110	.154	2.80	3.90
ØP	.134	.150	3.40	3.80
Q	.106	.126	2.70	3.20

TO-247 Outline



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	

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.



Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.