⌶IXYS

X2-Class Power MOSFET™

IXTA20N65X2
IXTP20N65X2
IXTH20N65X2

V_{DSS} = 650V
I_{D25} = 20A
$R_{DS(on)}$ ≤ 185mΩ

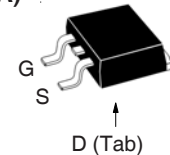N-Channel Enhancement Mode
Avalanche Rated

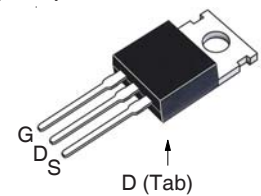**TO-263 (IXTA)**

D (Tab)

TO-220 (IXTP)

D (Tab)

TO-247 (IXTH)

D (Tab)

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

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	650	V
V_{DGR}	T_J = 25°C to 150°C, R_{GS} = 1MΩ	650	V
V_{GSS}	Continuous	±30	V
V_{GSM}	Transient	±40	V
I_{D25}	T_C = 25°C	20	A
I_{DM}	T_C = 25°C, Pulse Width Limited by T_{JM}	22	A
I_A	T_C = 25°C	5	A
E_{AS}	T_C = 25°C	400	mJ
dv/dt	I_S ≤ I_{DM}, V_{DD} ≤ V_{DSS}, T_J ≤ 150°C	15	V/ns
P_D	T_C = 25°C	290	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	650			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			50	µA
$R_{DS(on)}$	V_{GS} = 10V, I_D = 0.5 • I_{D25}, Note 1		155	185	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

Symbol	Test Conditions		Characteristic Values	
	(T_J = 25°C, Unless Otherwise Specified)	Min.	Typ.	Max
g_{fs}	V_{DS} = 10V, I_D = 0.5 • I_{D25}, Note 1	11	18	S
R_{Gi}	Gate Input Resistance		3.7	Ω
C_{iss}			1450	pF
C_{oss}	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz		1060	pF
C_{rss}			1.4	pF
	Effective Output Capacitance			
$C_{o(er)}$	Energy related V_{GS} = 0V		64	pF
$C_{o(tr)}$	Time related V_{DS} = 0.8 • V_{DSS}		250	pF
$t_{d(on)}$	**Resistive Switching Times**		19	ns
t_r			27	ns
$t_{d(off)}$	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		47	ns
t_f	R_G = 10Ω (External)		20	ns
$Q_{g(on)}$			27	nC
Q_{gs}	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		8	nC
Q_{gd}			11	nC
R_{thJC}				0.43 °C/W
R_{thCS}	TO-220		0.50	°C/W
	TO-247		0.21	°C/W

Source-Drain Diode

Symbol	Test Conditions		Characteristic Values	
	(T_J = 25°C, Unless Otherwise Specified)	Min.	Typ.	Max
I_S	V_{GS} = 0V			20 A
I_{SM}	Repetitive, pulse Width Limited by T_{JM}			80 A
V_{SD}	I_F = I_S, V_{GS} = 0V, Note 1			1.4 V
t_{rr}	I_F = 10A, -di/dt = 100A/μs		350	ns
Q_{RM}			4.3	μC
I_{RM}	V_R = 100V		24.6	A

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

Fig. 1. Output Characteristics @ T_J = 25°C

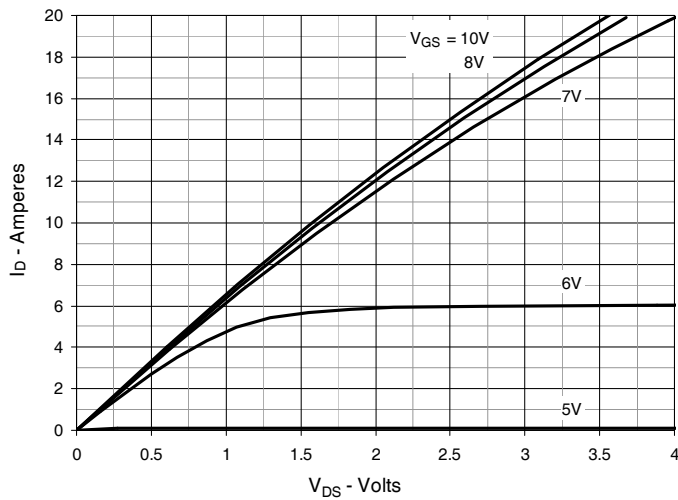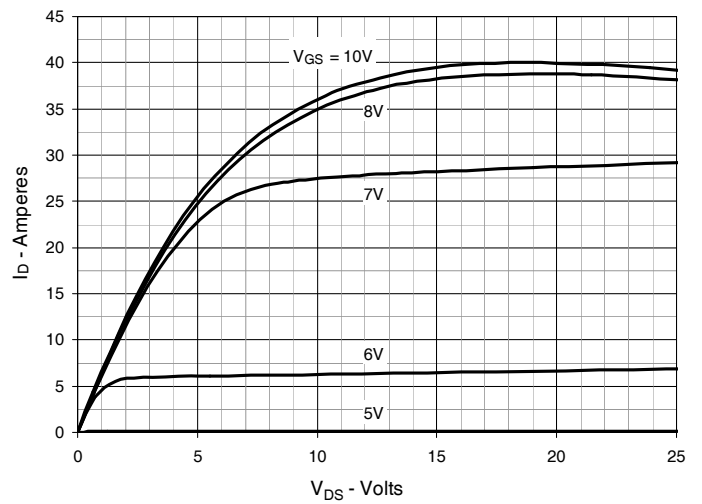**Fig. 2. Extended Output Characteristics @ T_J = 25°C**

Fig. 3. Output Characteristics @ T_J = 125°C

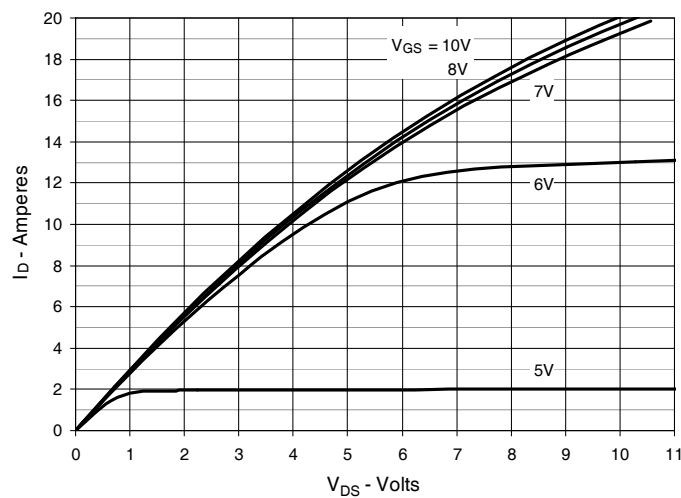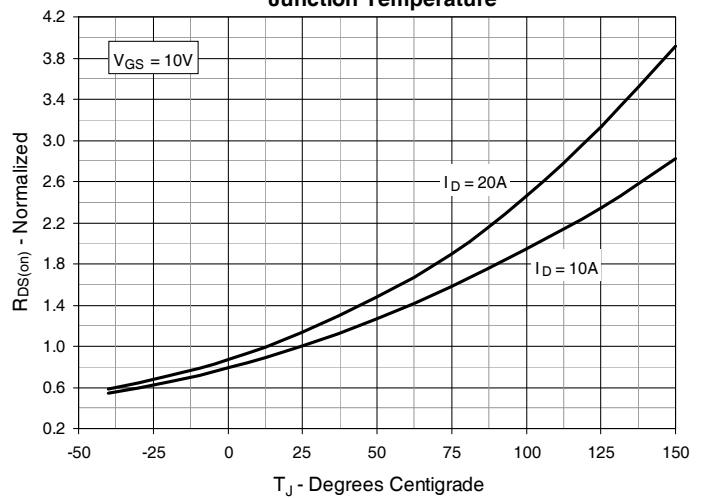**Fig. 4. $R_{DS(on)}$ Normalized to I_D = 10A Value vs. Junction Temperature**

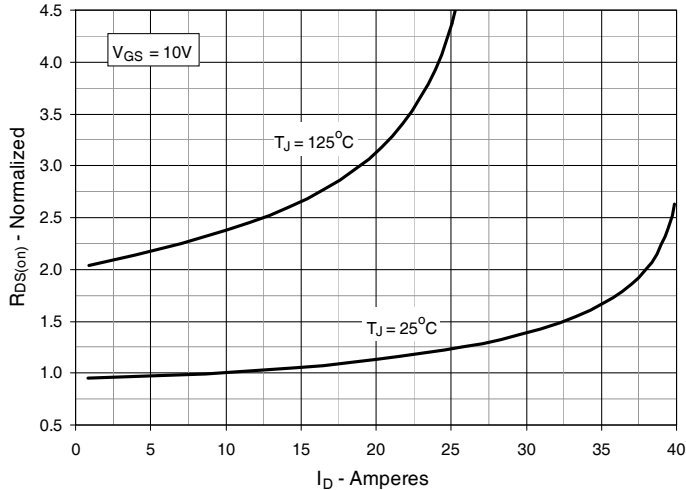**Fig. 5. $R_{DS(on)}$ Normalized to I_D = 10A Value vs. Drain Current**

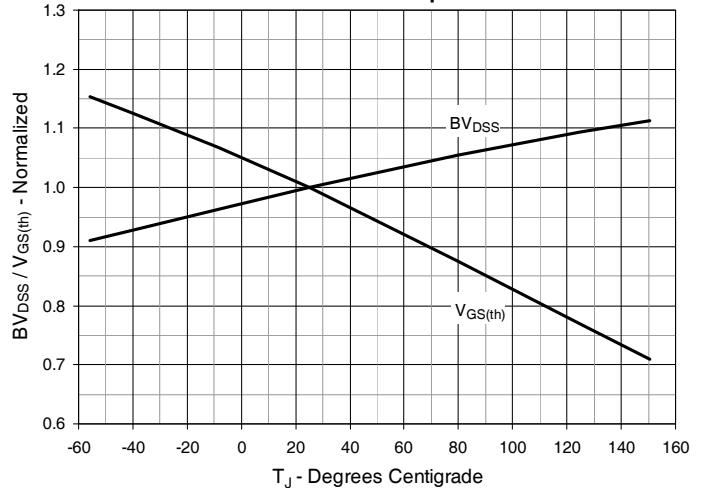**Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature**

![IXYS logo]

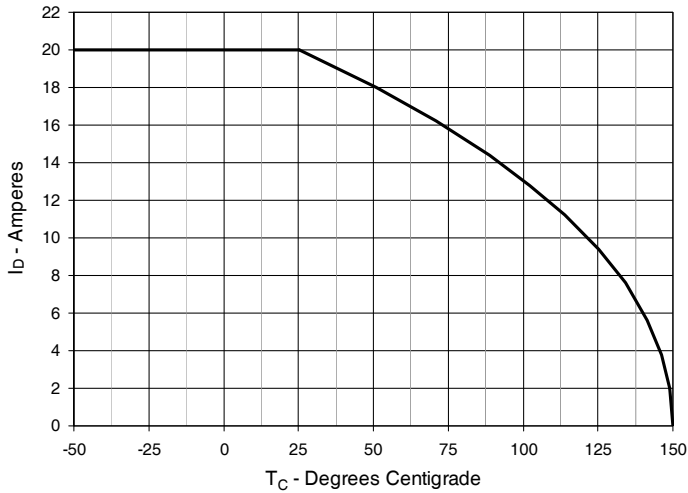**Fig. 7. Maximum Drain Current vs. Case Temperature**

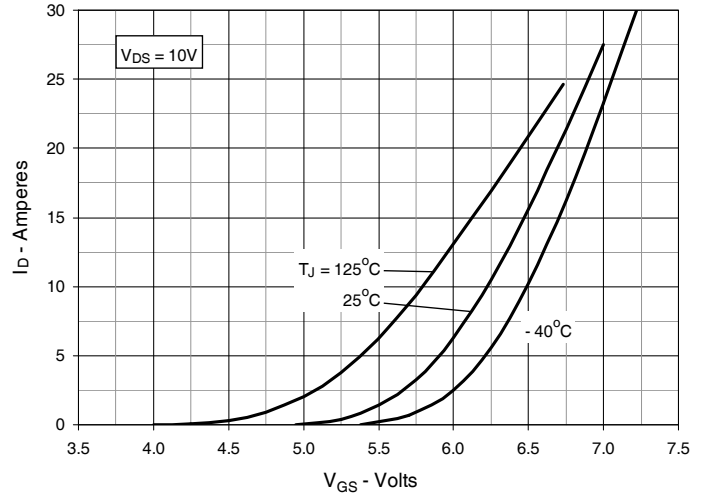**Fig. 8. Input Admittance**

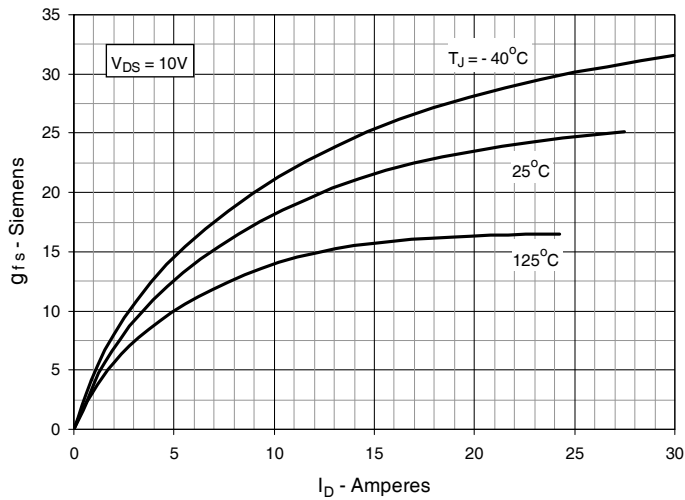
Fig. 9. Transconductance

Fig. 10. Forward Voltage Drop of Intrinsic Diode
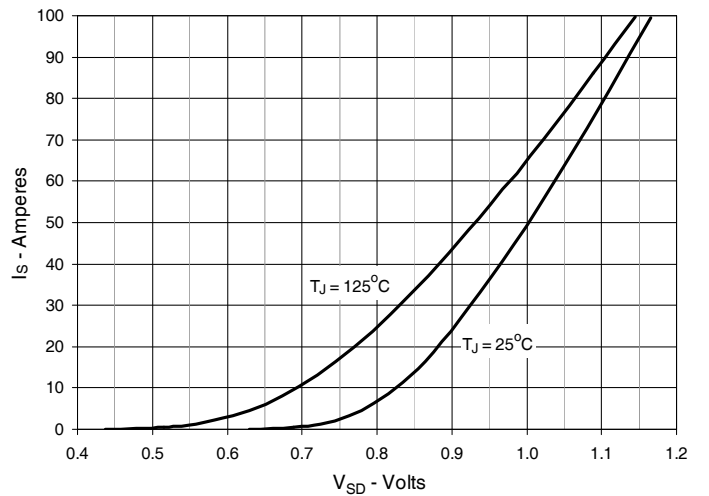
Fig. 11. Gate Charge

Fig. 12. Capacitance

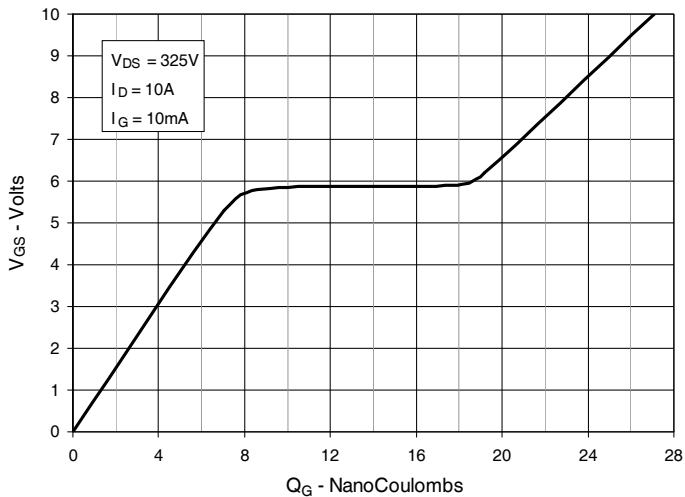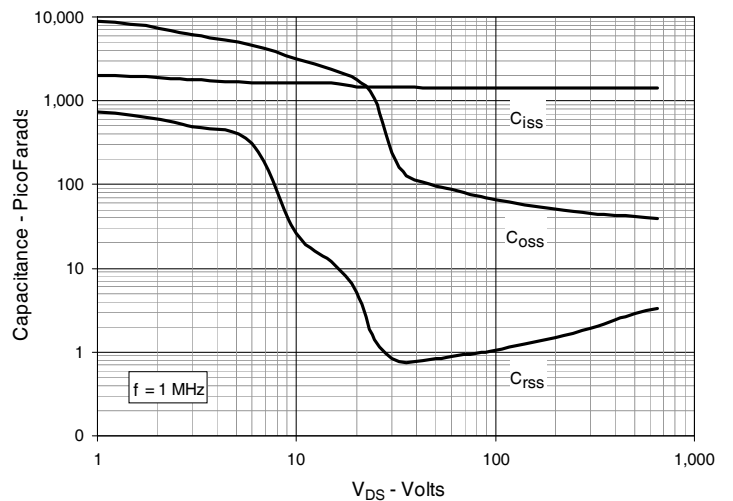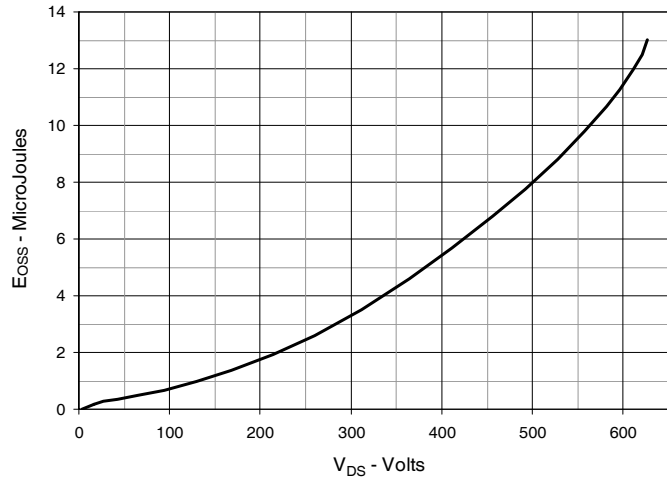IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

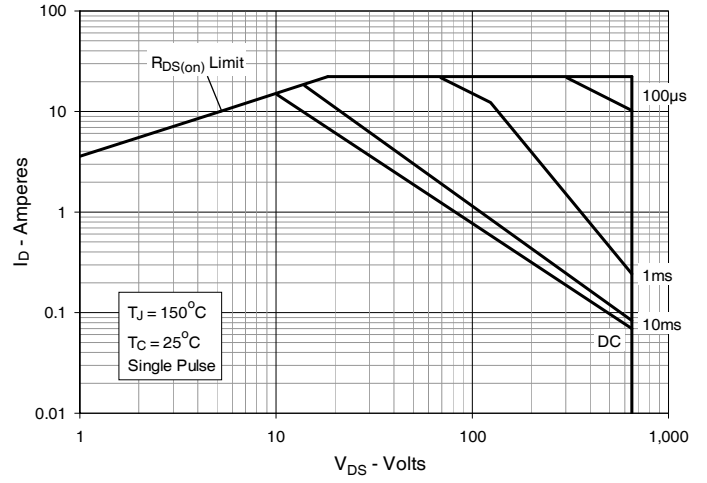**Fig. 13. Output Capacitance Stored Energy**

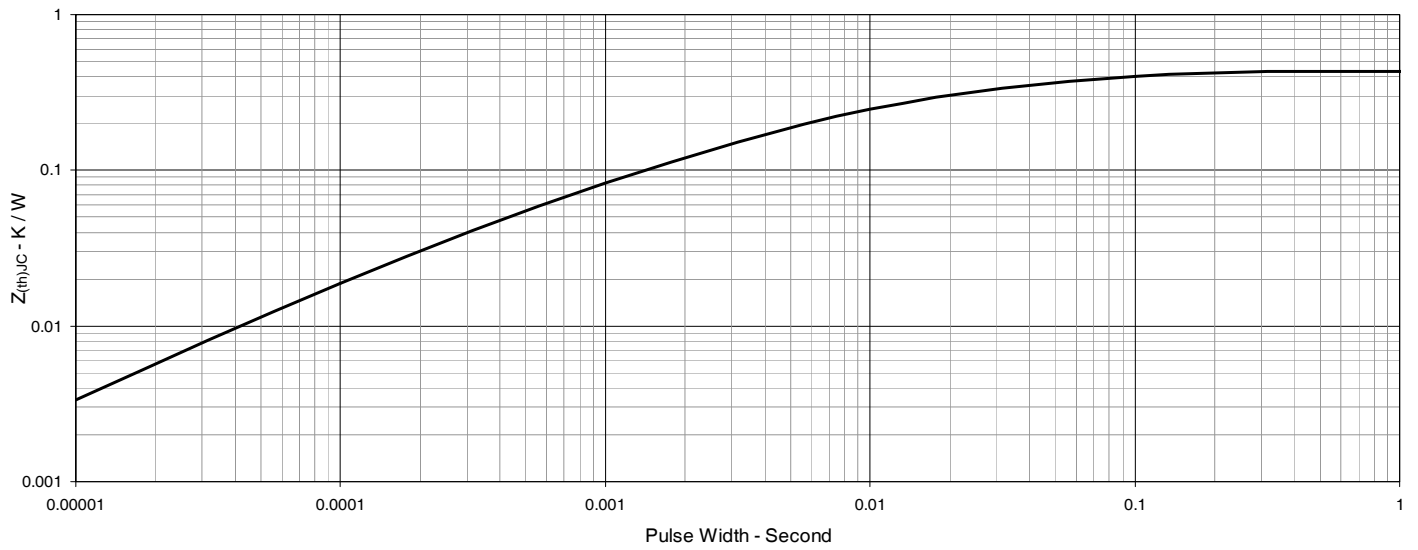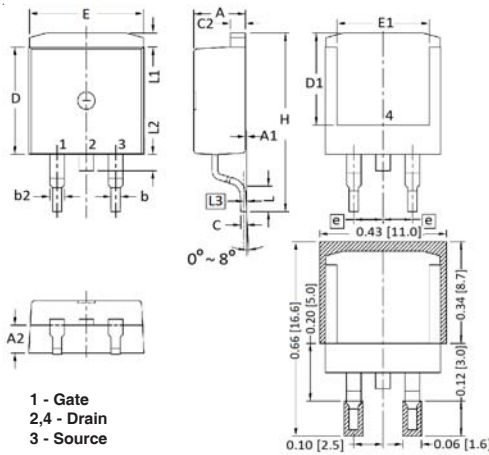**Fig. 14. Forward-Bias Safe Operating Area**

Fig. 15. Maximum Transient Thermal Impedance

TO-263 Outline

1 - Gate
2,4 - Drain
3 - Source

SYM	INCHES MIN	INCHES MAX	MILLIMETER MIN	MILLIMETER 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
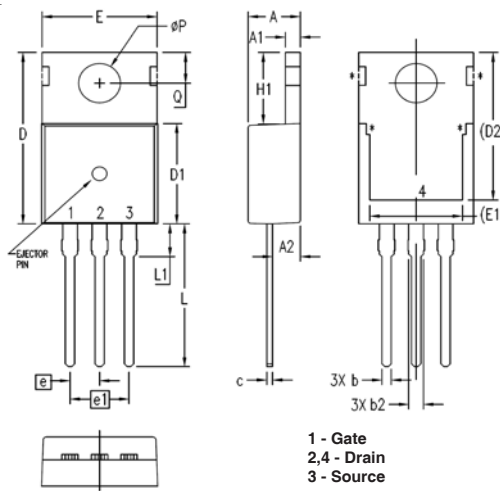
SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.169	.185	4.30	4.70
A1	.047	.055	1.20	1.40
A2	.079	.106	2.00	2.70
b	.024	.039	0.60	1.00
b2	.045	.057	1.15	1.45
c	.014	.026	0.35	0.65
D	.587	.626	14.90	15.90
D1	.335	.370	8.50	9.40
(D2)	.500	.531	12.70	13.50
E	.382	.406	9.70	10.30
(E1)	.283	.323	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
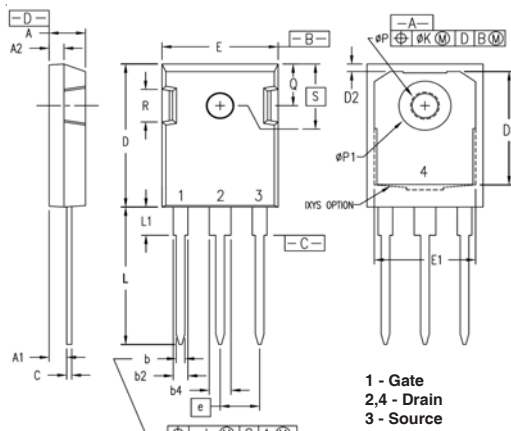
SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.087	1.91	2.20
b4	.115	.126	2.92	3.20
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
D1	.650	.690	16.51	17.53
D2	.035	.050	0.89	1.27
E	.620	.635	15.75	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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