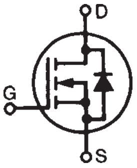
IXYS

Polar3 ™ HiPerFET™ Power MOSFET

IXFY4N60P3
IXFA4N60P3
IXFP4N60P3

V_{DSS} = 600V
I_{D25} = 4A
$R_{DS(on)}$ ≤ 2.4Ω

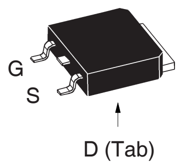
N-Channel Enhancement Mode
Avalanche Rated
Fast Intrinsic Rectifier



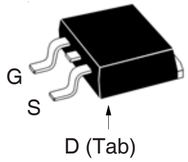
Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	600	V
V_{DGR}	T_J = 25°C to 150°C, R_{GS} = 1MΩ	600	V
V_{GSS}	Continuous	±30	V
V_{GSM}	Transient	±40	V
I_{D25}	T_C = 25°C	4	A
I_{DM}	T_C = 25°C, Pulse Width Limited by T_{JM}	8	A
I_A	T_C = 25°C	2	A
E_{AS}	T_C = 25°C	200	mJ
dv/dt	I_S ≤ I_{DM}, V_{DD} ≤ V_{DSS}, T_J ≤ 150°C	35	V/ns
P_D	T_C = 25°C	114	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}	Plastic Body for 10s	260	°C
M_d	Mounting Torque (TO-220)	1.13 / 10	Nm/lb.in.
Weight	TO-252 TO-263 TO-220	0.35 2.50 3.00	g g g

Symbol (T_J = 25°C, Unless Otherwise Specified)	Test Conditions	Characteristic Values Min.	 Typ.	 Max.	
BV_{DSS}	V_{GS} = 0V, I_D = 1mA	600			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250μA	3.0		5.0	V
I_{GSS}	V_{GS} = ±30V, V_{DS} = 0V			±100	nA
I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0V T_J = 125°C			10 100	μA μA
$R_{DS(on)}$	V_{GS} = 10V, I_D = 0.5 • I_{D25}, Note 1			2.4	Ω

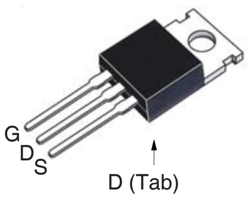
TO-252 (IXFY)



TO-263 (IXFA)



TO-220 (IXFP)



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

Features

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

Advantages

- High Power Density
- Easy to Mount
- Space Savings

Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- Laser Drivers
- AC and DC Motor Drives
- Robotics and Servo Controls

Symbol	**Test Conditions** ($T_J = 25°C$, Unless Otherwise Specified)	**Characteristic Values** **Min.**	 **Typ.**	 **Max**	
g_{fs}	$V_{DS} = 20V$, $I_D = 0.5 \bullet I_{D25}$, Note 1	2.2	3.7		S
R_{Gi}	Gate Input Resistance		6.0		Ω
C_{iss}	$V_{GS} = 0V$, $V_{DS} = 25V$, f = 1MHz		365		pF
C_{oss}			46		pF
C_{rss}			3		pF
$t_{d(on)}$	**Resistive Switching Times** $V_{GS} = 10V$, $V_{DS} = 0.5 \bullet V_{DSS}$, $I_D = 0.5 \bullet I_{D25}$ $R_G = 30\Omega$ (External)		15		ns
t_r			24		ns
$t_{d(off)}$			24		ns
t_f			23		ns
$Q_{g(on)}$	$V_{GS} = 10V$, $V_{DS} = 0.5 \bullet V_{DSS}$, $I_D = 0.5 \bullet I_{D25}$		6.9		nC
Q_{gs}			1.7		nC
Q_{gd}			2.8		nC
R_{thJC}				1.10	°C/W
R_{thCS}	TO-220		0.50		°C/W

Source-Drain Diode

Symbol	**Test Conditions** ($T_J = 25°C$, Unless Otherwise Specified)	**Characteristic Values** **Min.**	 **Typ.**	 **Max**	
I_S	$V_{GS} = 0V$, Note1			4	A
I_{SM}	Repetitive, Pulse Width Limited by T_{JM}			16	A
V_{SD}	$I_F = I_S$, $V_{GS} = 0V$, Note 1			1.4	V
t_{rr}	$I_F = 4A$, -di/dt = 25A/µs $V_R = 100V$			250	ns
Q_{RM}			0.35		µC
I_{RM}			2.15		A

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

Fig. 1. Output Characteristics @ $T_J = 25^oC$

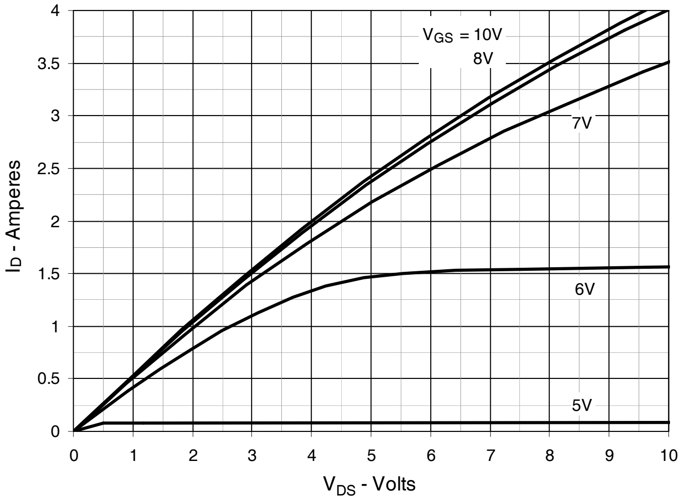


Fig. 2. Extended Output Characteristics @ $T_J = 25^oC$

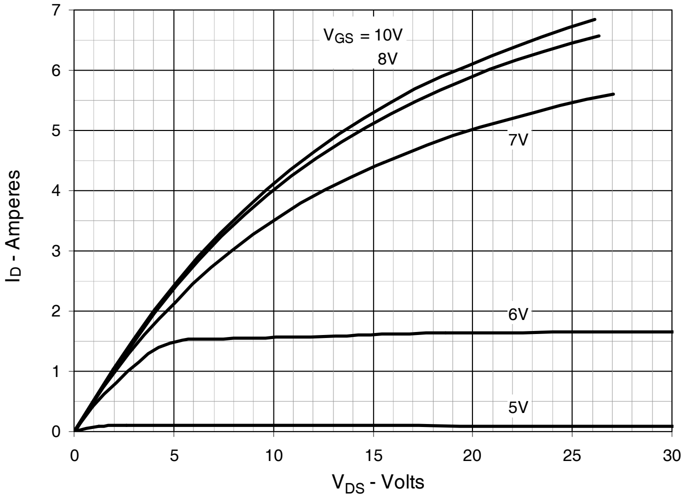


Fig. 3. Output Characteristics @ $T_J = 125^oC$

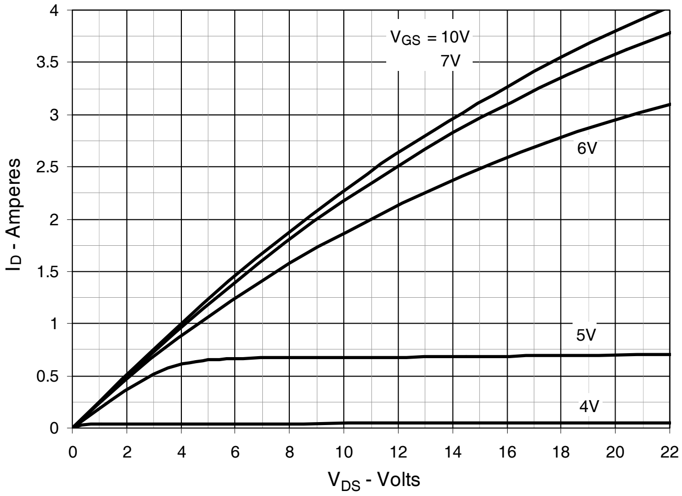


Fig. 4. $R_{DS(on)}$ Normalized to $I_D = 2A$ Value vs. Junction Temperature

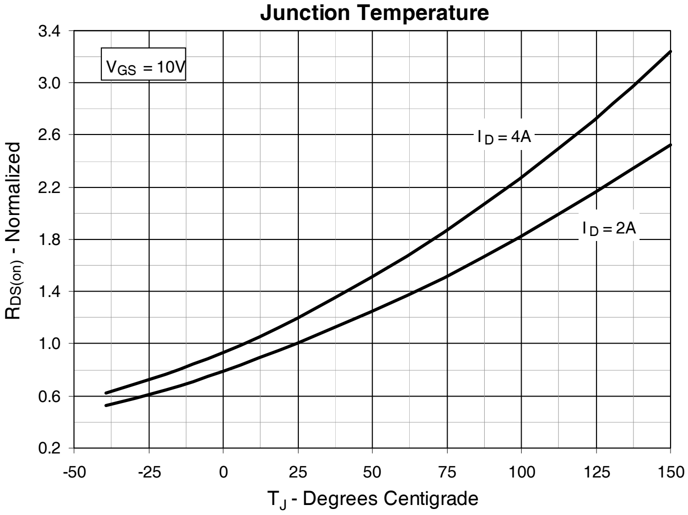


Fig. 5. $R_{DS(on)}$ Normalized to $I_D = 2A$ Value vs. Drain Current

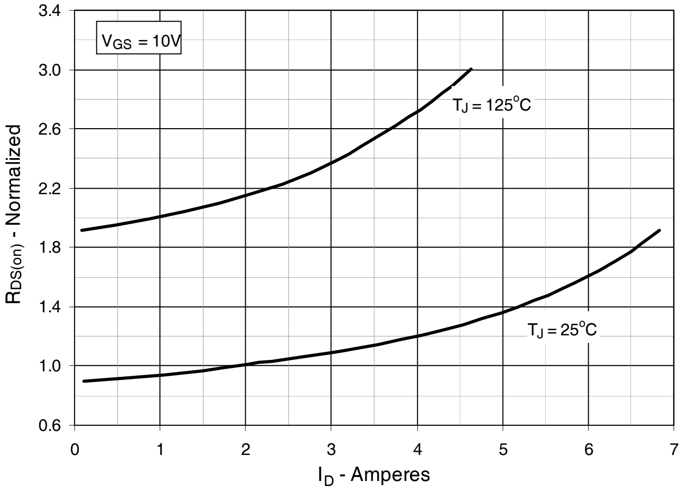


Fig. 6. Maximum Drain Current vs. Case Temperature

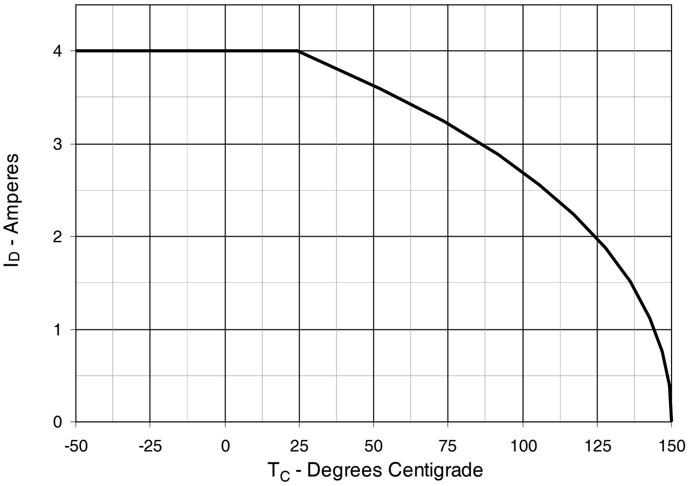


Fig. 7. Input Admittance

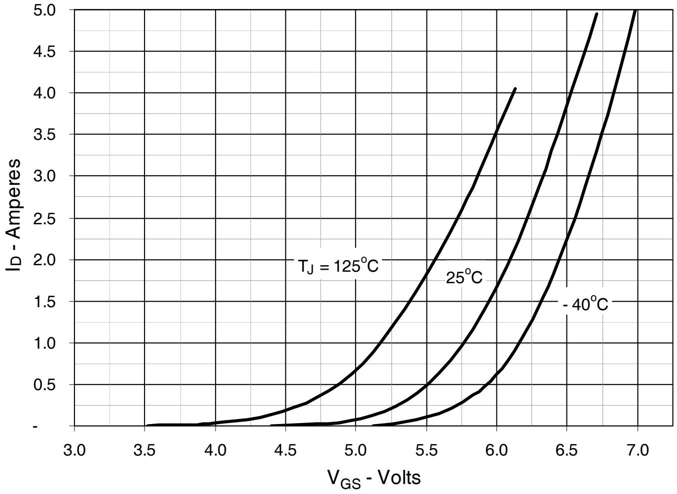


Fig. 8. Transconductance

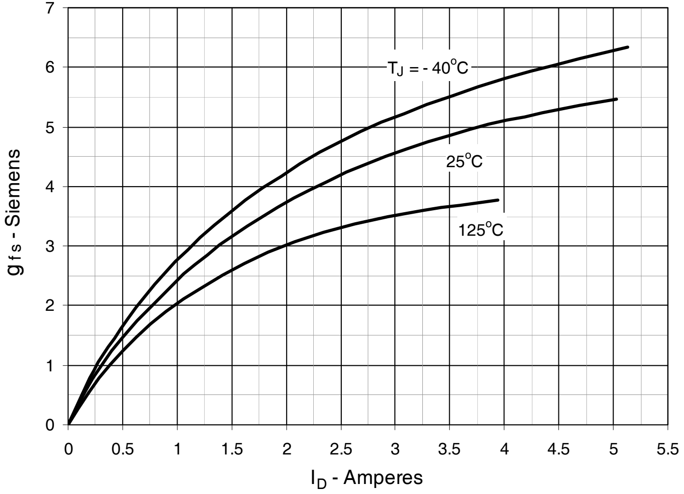


Fig. 9. Forward Voltage Drop of Intrinsic Diode

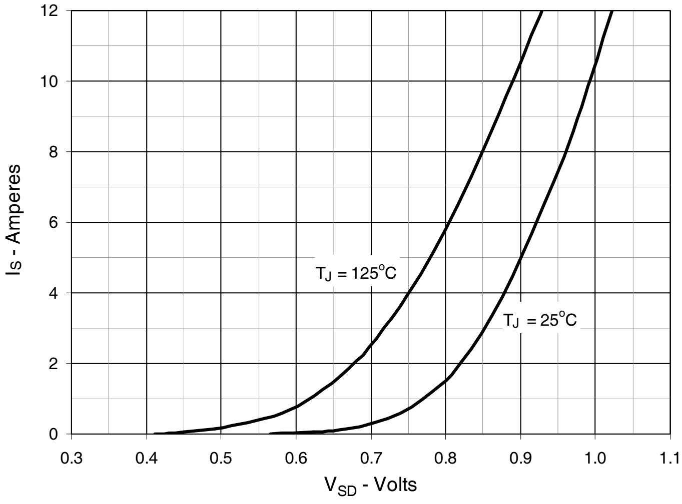


Fig. 10. Gate Charge

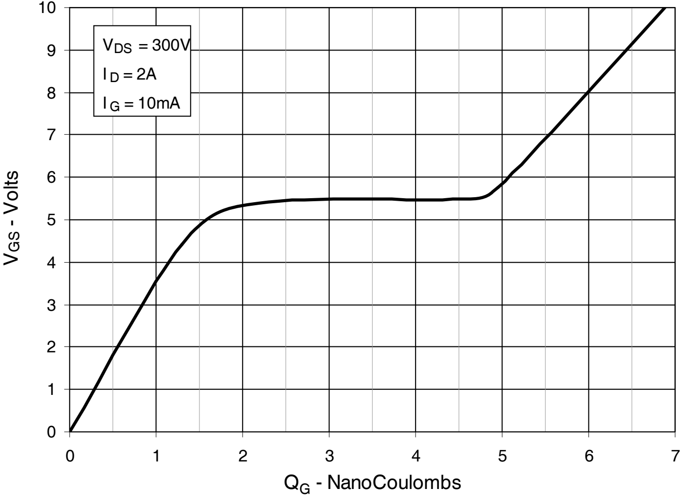


Fig. 11. Capacitance

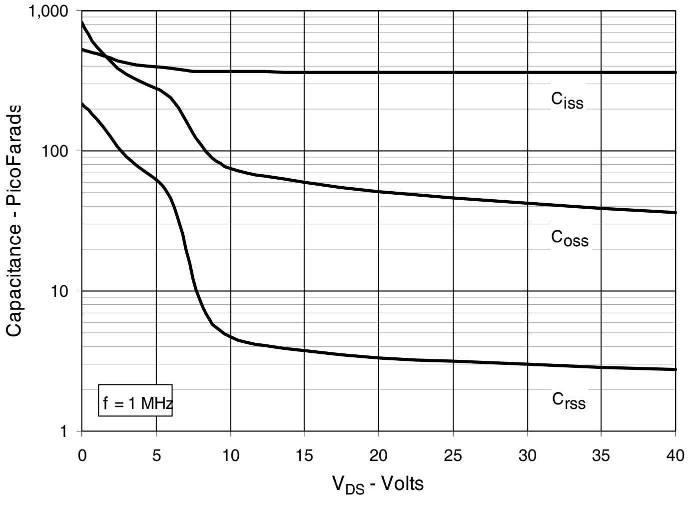
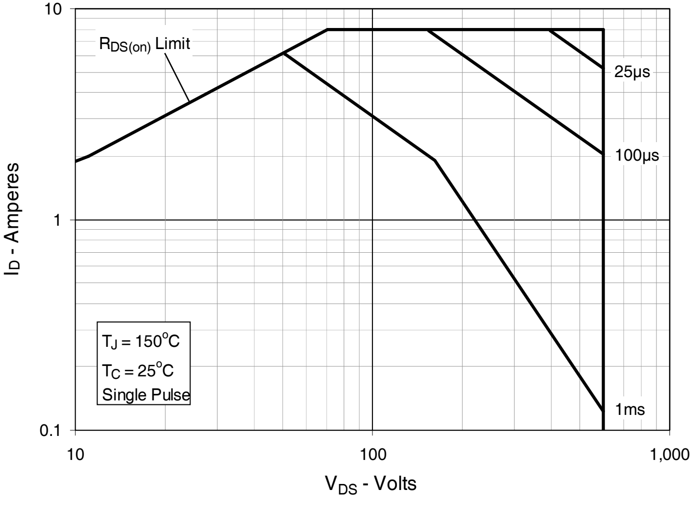
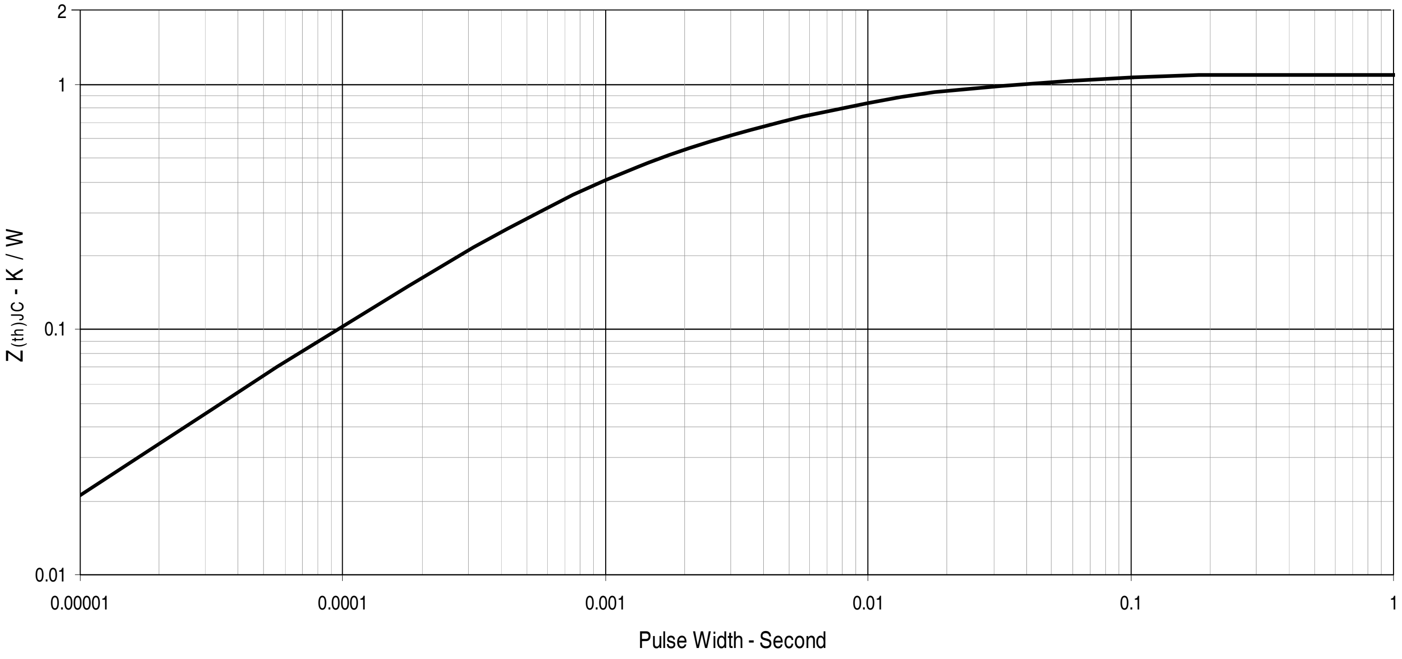


Fig. 12. Forward-Bias Safe Operating Area



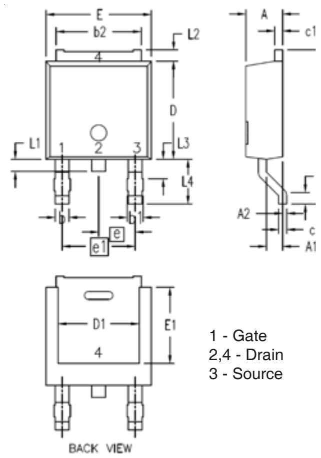
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

Fig. 13. Maximum Transient Thermal Impedance



IXYS REF: F_4N60P3(K2)12-07-11

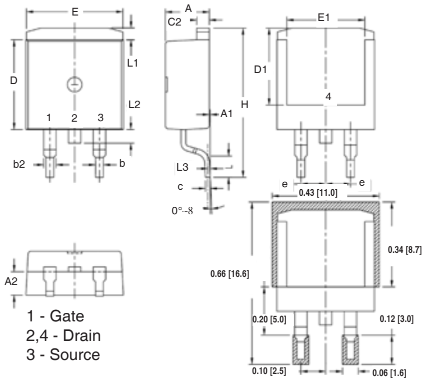
TO-252 Outline



1 - Gate
2,4 - Drain
3 - Source

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.086	.094	2.19	2.38
A1	.035	.045	0.89	1.14
A2	0	.004	0	0.10
b	.025	.035	0.64	0.89
b1	.030	.045	0.76	1.14
b2	.205	.215	5.21	5.46
c	.018	.023	0.46	0.58
c1	.018	.023	0.46	0.58
D	.235	.245	5.97	6.22
D1	.170	.205	4.32	5.21
E	.250	.265	6.35	6.73
E1	.170	.205	4.32	5.21
e	.090 BSC		2.28 BSC	
e1	.180 BSC		4.57 BSC	
H	.370	.410	9.40	10.42
L	.020	.040	0.51	1.02
L1	.025	.040	0.64	1.02
L2	.024	.036	0.60	0.90
L3	.045	.060	1.15	1.52
L4	.100	.115	2.54	2.92

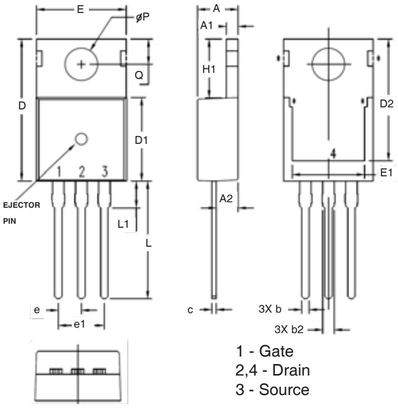
TO-263 Outline



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

IXYS

A **Littelfuse** Technology