

X2-Class Power MOSFET

IXTY4N65X2
IXTA4N65X2
IXTP4N65X2

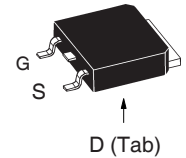
$V_{DSS} = 650V$
 $I_{D25} = 4A$
 $R_{DS(on)} \leq 850m\Omega$

N-Channel Enhancement Mode

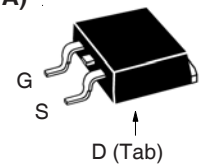


Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	$T_J = 25^\circ C$ to $150^\circ C$	650	V
V_{DGR}	$T_J = 25^\circ C$ to $150^\circ C$, $R_{GS} = 1M\Omega$	650	V
V_{GSS}	Continuous	± 30	V
V_{GSM}	Transient	± 40	V
I_{D25}	$T_C = 25^\circ C$	4	A
I_{DM}	$T_C = 25^\circ C$, Pulse Width Limited by T_{JM}	8	A
I_A	$T_C = 25^\circ C$	2	A
E_{AS}	$T_C = 25^\circ C$	150	mJ
dv/dt	$I_S \leq I_{DM}$, $V_{DD} \leq V_{DSS}$, $T_J \leq 150^\circ C$	15	V/ns
P_D	$T_C = 25^\circ C$	80	W
T_J		-55 ... +150	$^\circ C$
T_{JM}		150	$^\circ C$
T_{stg}		-55 ... +150	$^\circ C$
T_L	Maximum Lead Temperature for Soldering	300	$^\circ C$
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	$^\circ C$
F_C	Mounting Force (TO-263)	10..65 / 2.2..14.6	N/lb
M_d	Mounting Torque (TO-220)	1.13 / 10	Nm/lb.in
Weight	TO-252	0.35	g
	TO-263	2.50	g
	TO-220	3.00	g

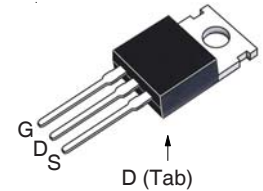
TO-252 (IXTY)



TO-263 (IXTA)



TO-220 (IXTP)



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

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 ($T_J = 25^\circ C$, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
BV_{DSS}	$V_{GS} = 0V$, $I_D = 250\mu A$	650		V
$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\mu A$	3.0		5.0 V
I_{GSS}	$V_{GS} = \pm 30V$, $V_{DS} = 0V$			± 100 nA
I_{DSS}	$V_{DS} = V_{DSS}$, $V_{GS} = 0V$ $T_J = 125^\circ C$			5 μA 100 μA
$R_{DS(on)}$	$V_{GS} = 10V$, $I_D = 0.5 \cdot I_{D25}$, Note 1			850 m Ω

Symbol	Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
g_{fs}	$V_{DS} = 10\text{V}$, $I_D = 0.5 \cdot I_{D25}$, Note 1	2.5	4.2	S
R_{Gi}	Gate Input Resistance		13	Ω
C_{iss}	} $V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$		455	pF
C_{oss}			294	pF
C_{rss}			0.8	pF
Effective Output Capacitance				
$C_{o(er)}$	Energy related	} $V_{GS} = 0\text{V}$ $V_{DS} = 0.8 \cdot V_{DSS}$	32	pF
$C_{o(tr)}$	Time related		82	pF
Resistive Switching Times				
$t_{d(on)}$	} $V_{GS} = 10\text{V}$, $V_{DS} = 0.5 \cdot V_{DSS}$, $I_D = 0.5 \cdot I_{D25}$ $R_G = 50\Omega$ (External)		22	ns
t_r			28	ns
$t_{d(off)}$			57	ns
t_f			25	ns
$Q_{g(on)}$	} $V_{GS} = 10\text{V}$, $V_{DS} = 0.5 \cdot V_{DSS}$, $I_D = 0.5 \cdot I_{D25}$		8.3	nC
Q_{gs}			2.0	nC
Q_{gd}			3.0	nC
R_{thJC}	TO-220			1.56 $^\circ\text{C/W}$
R_{thCS}			0.50	$^\circ\text{C/W}$

Source-Drain Diode

Symbol	Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max
I_S	$V_{GS} = 0\text{V}$			4 A
I_{SM}	Repetitive, pulse Width Limited by T_{JM}			16 A
V_{SD}	$I_F = I_S$, $V_{GS} = 0\text{V}$, Note 1			1.4 V
t_{rr}	} $I_F = 2\text{A}$, $-di/dt = 100\text{A}/\mu\text{s}$ $V_R = 100\text{V}$		160	ns
Q_{RM}			890	nC
I_{RM}			11.4	A

Note 1. Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$.

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

Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

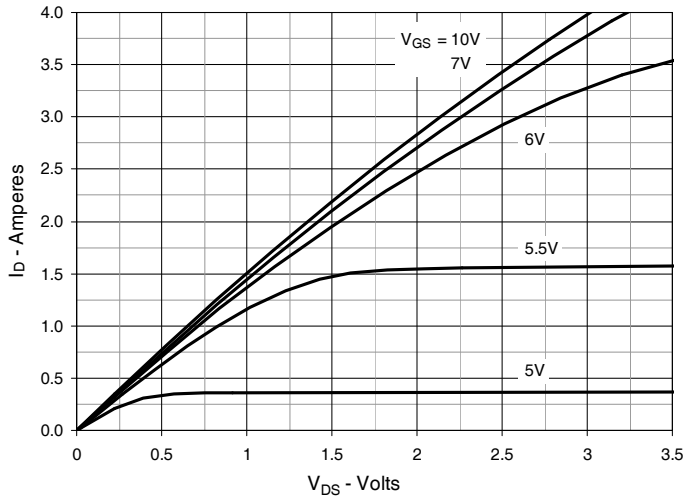


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

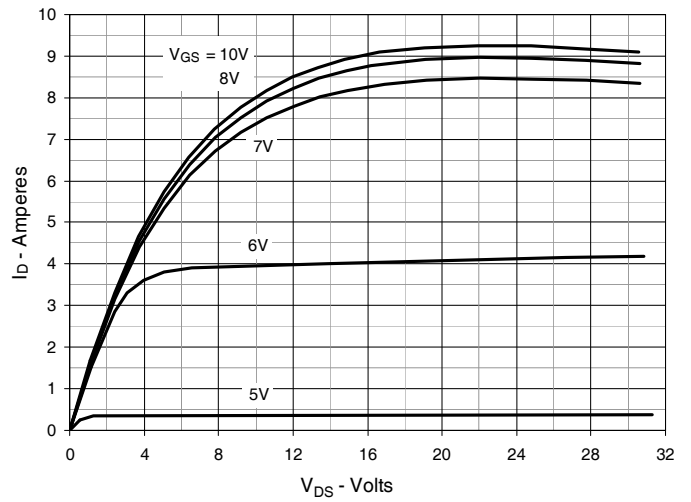


Fig. 3. Output Characteristics @ $T_J = 125^\circ\text{C}$

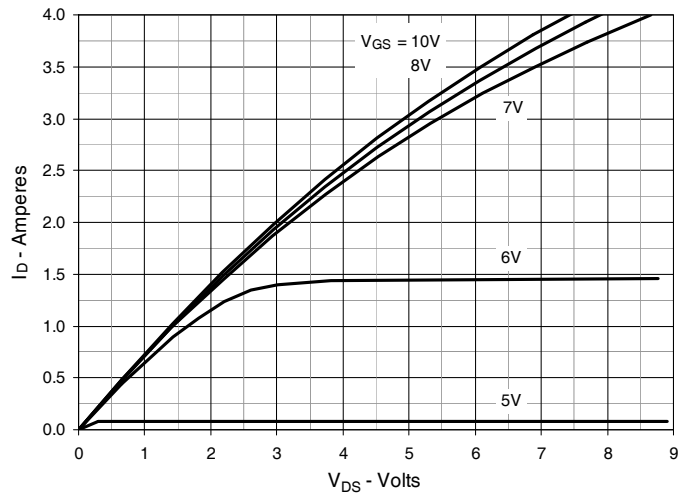


Fig. 4. $R_{DS(on)}$ Normalized to $I_D = 2\text{A}$ Value vs. Junction Temperature

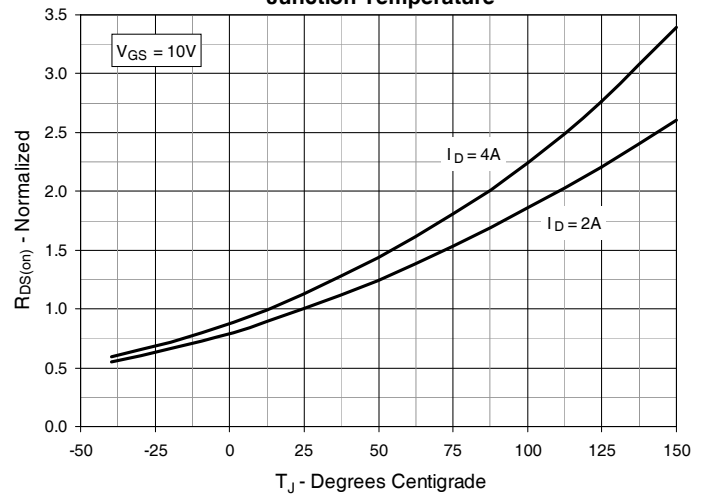


Fig. 5. $R_{DS(on)}$ Normalized to $I_D = 2\text{A}$ Value vs. Drain Current

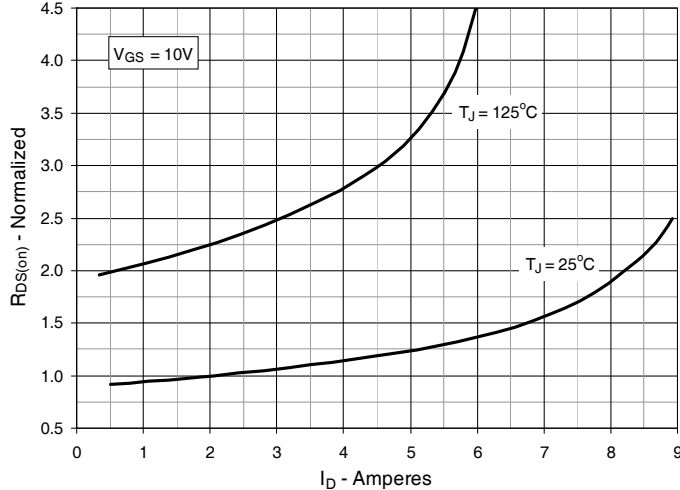


Fig. 6. Maximum Drain Current vs. Case Temperature

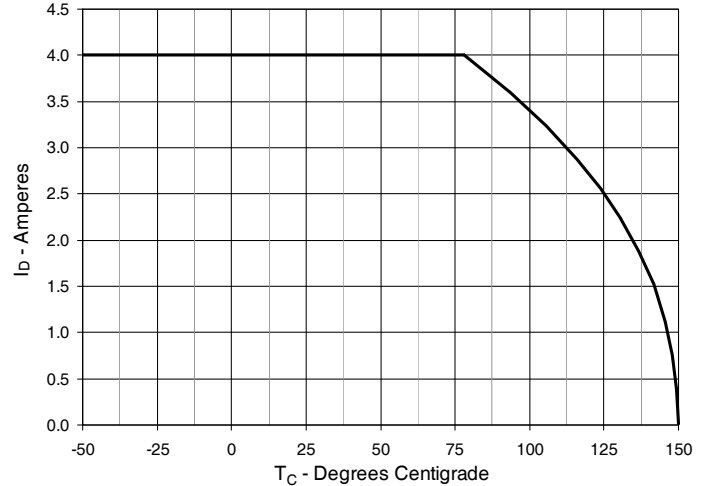


Fig. 7. Input Admittance

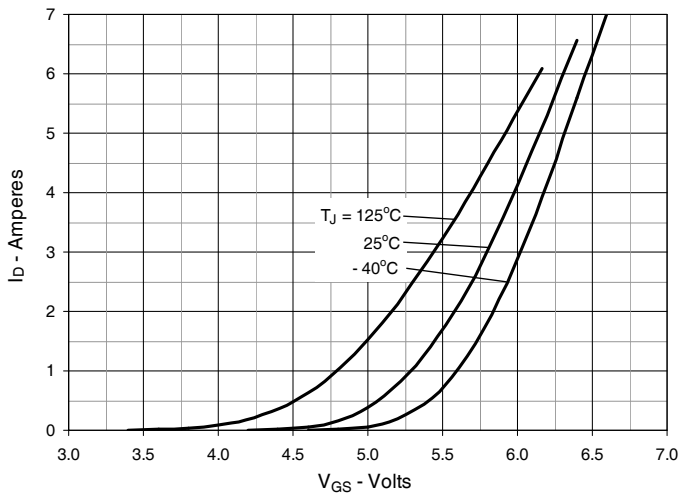


Fig. 8. Transconductance

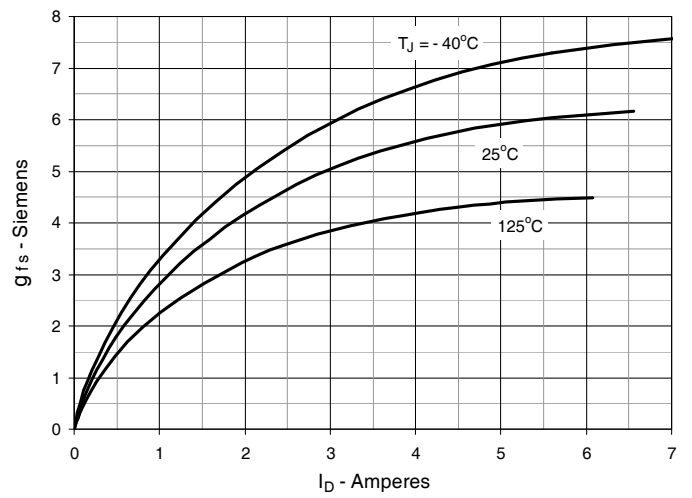


Fig. 9. Forward Voltage Drop of Intrinsic Diode

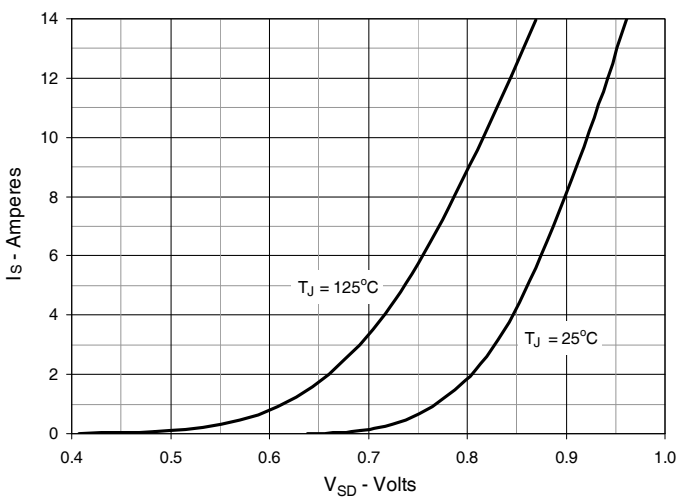


Fig. 10. Gate Charge

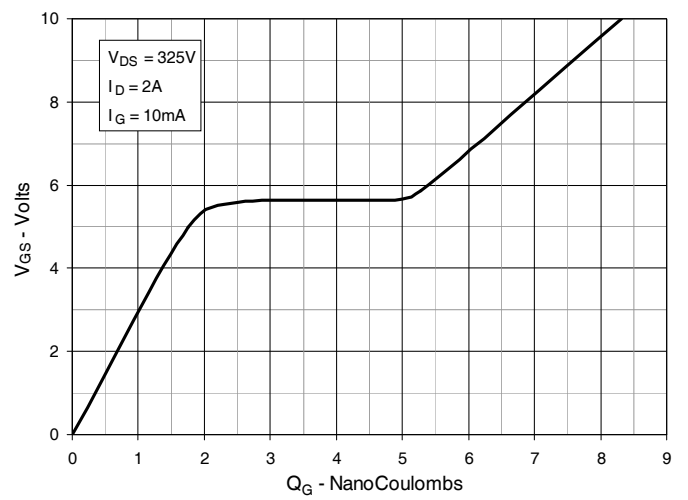


Fig. 11. Capacitance

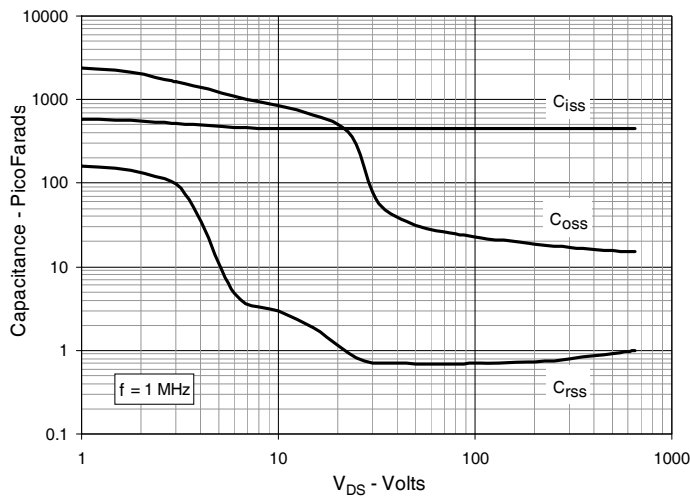


Fig. 12. Output Capacitance Stored Energy

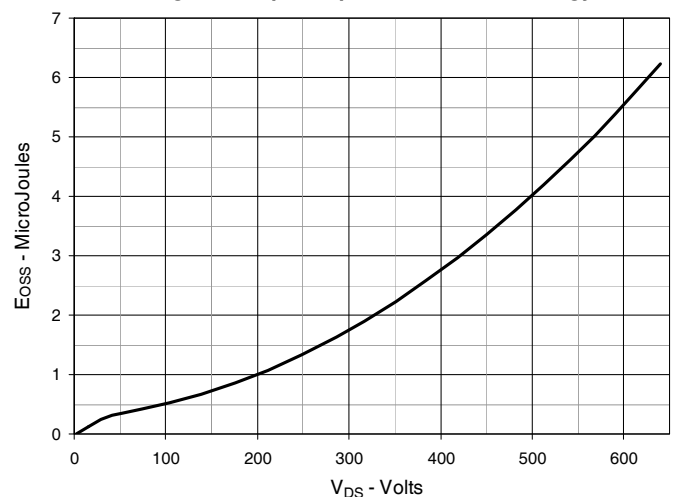


Fig. 13. Forward-Bias Safe Operating Area

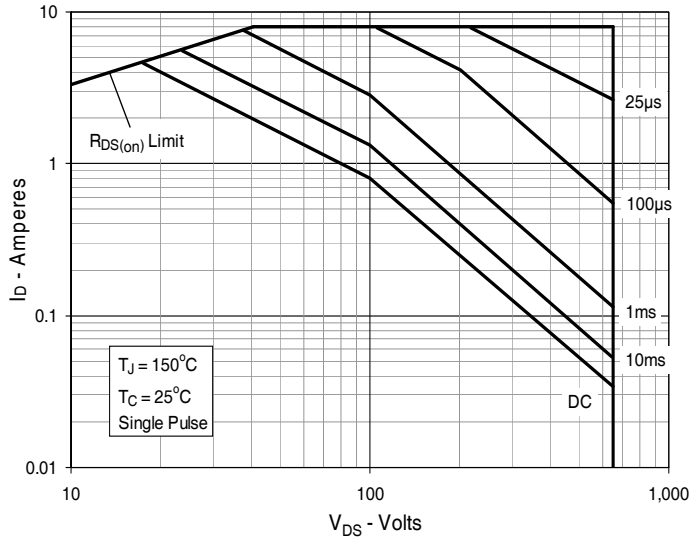
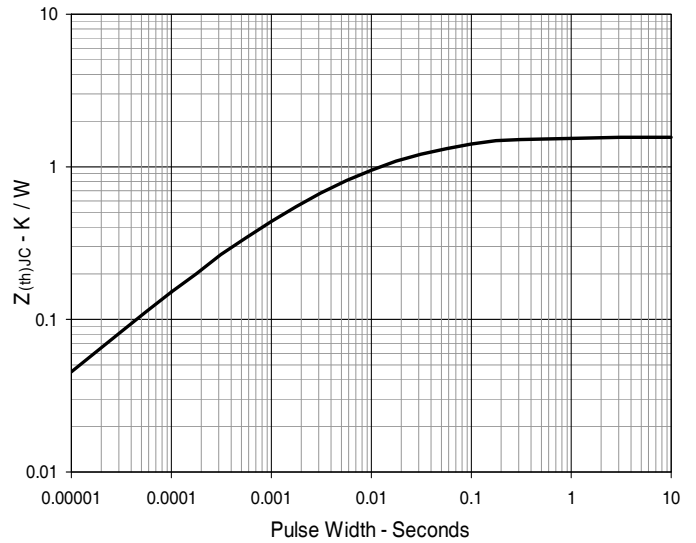
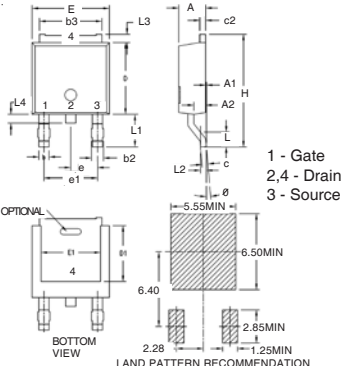


Fig. 14. Maximum Transient Thermal Impedance

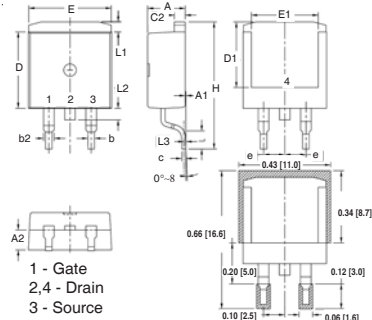


TO-252 AA Outline



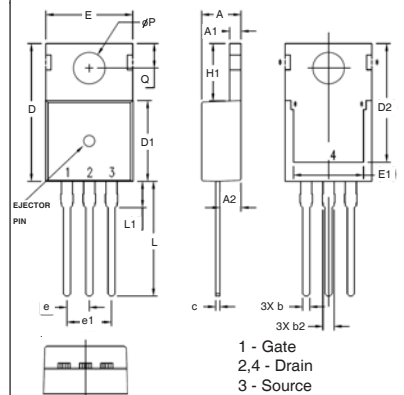
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.086	.094	2.19	2.38
A1	0	.005	0	0.12
A2	.038	.046	0.97	1.17
b	.025	.035	0.64	0.89
b2	.030	.045	0.76	1.14
b3	.200	.215	5.08	5.46
c	.018	.024	0.46	0.61
c2	.018	.023	0.46	0.58
D	.235	.245	5.97	6.22
D1	.180	.205	4.57	5.21
E	.250	.265	6.35	6.73
E1	.170	.205	4.32	5.21
e	.090 BSC		2.28 BSC	
e1	.180 BSC		4.57 BSC	
H	.370	.410	9.40	10.42
L	.055	.070	1.40	1.78
L1	.100	.115	2.54	2.92
L2	.020 BSC		0.50 BSC	
L3	.025	.040	0.64	1.02
L4	.025	.040	0.64	1.02
θ	0°	10°	0°	10°

TO-263 Outline



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



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	
H	.244	.268	6.20	6.80
L	.492	.547	12.50	13.90
L1	.110	.154	2.80	3.90
∅P	.134	.150	3.40	3.80
Q	.106	.126	2.70	3.20



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