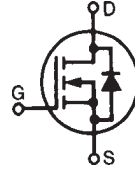# IXYS

LinearL2™ Power MOSFET w/Extended FBSOA

IXTT40N50L2
IXTQ40N50L2
IXTH40N50L2

V_{DSS} = 500V
I_{D25} = 40A
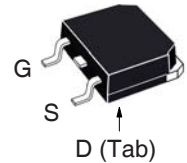$R_{DS(on)}$ ≤ 170mΩ
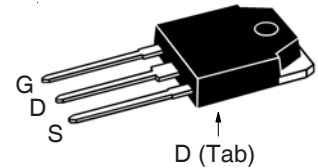
N-Channel Enhancement Mode
Avalanche rated

TO-268 (IXTT)

G
S
D (Tab)

TO-3P (IXTQ)

G
D
S
D (Tab)

TO-247 (IXTH)

G
D
S
D (Tab)

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

Symbol	Test Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	500	V
V_{DGR}	T_J = 25°C to 150°C, R_{GS} = 1MΩ	500	V
V_{GSS}	Continuous	±20	V
V_{GSM}	Transient	±30	V
I_{D25}	T_C = 25°C	40	A
I_{DM}	T_C = 25°C, Pulse Width Limited by T_{JM}	80	A
I_A	T_C = 25°C	40	A
E_{AS}	T_C = 25°C	2	J
P_D	T_C = 25°C	540	W
T_J		-55 to +150	°C
T_{JM}		+150	°C
T_{stg}		-55 to +150	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
M_d	Mounting Torque (TO-247&TO-3P)	1.13/10	Nm/lb.in
Weight	TO-268	4.0	g
	TO-3P	5.5	g
	TO-247	6.0	g

Features

- Designed for Linear Operation
- International Standard Packages
- Avalanche Rated
- Molding Epoxies Meet UL 94 V-0 Flammability Classification
- Guaranteed FBSOA at 75°C

Applications

- Solid State Circuit Breakers
- Soft Start Controls
- Linear Amplifiers
- Programmable Loads
- Current Regulators

Symbol	Test Conditions	Characteristic Values		
(T_J = 25°C, Unless Otherwise Specified)		Min.	Typ.	Max.
BV_{DSS}	V_{GS} = 0V, I_D = 1mA	500		V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250µA	2.5		4.5 V
I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V			±100 nA
I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0V			50 µA
	T_J = 125°C			300 µA
$R_{DS(on)}$	V_{GS} = 10V, I_D = 0.5 • I_{D25}, Note 1			170 mΩ

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	15	19	S
C_{iss}			10.4		nF
C_{oss}	V_{GS} = 0V, V_{DS} = 25V, f = 1MHz		655		pF
C_{rss}			155		pF
$t_{d(on)}$	**Resistive Switching Times**		50		ns
t_r	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		133		ns
$t_{d(off)}$	R_G = 2Ω (External)		127		ns
t_f			44		ns
$Q_{g(on)}$			320		nC
Q_{gs}	V_{GS} = 10V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		64		nC
Q_{gd}			198		nC
R_{thJC}				0.23	°C/W
R_{thCS}	(TO-247&TO-3P)		0.25		°C/W

Safe Operating Area Specification

Symbol	Test Conditions	Min.	Typ.	Max.	
SOA	V_{DS} = 400V, I_D = 0.8A, T_C = 75°C, tp = 3s	320			W

Source-Drain Diode

Symbol	Test Conditions	Characteristic Values			
(T_J = 25°C, Unless Otherwise Specified)		Min.	Typ.	Max.	
I_S	V_{GS} = 0V			40	A
I_{SM}	Repetitive, Pulse Width Limited by T_{JM}			160	A
V_{SD}	I_F = I_S, V_{GS} = 0V, Note 1			1.5	V
t_{rr}	I_F = I_S, -di/dt = 100A/μs, V_R = 100V		500		ns

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

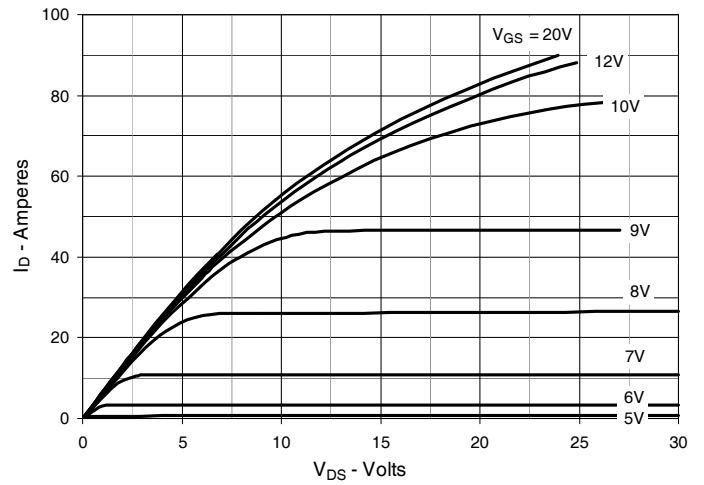**Fig. 3. Output Characteristics @ T_J = 125°C**

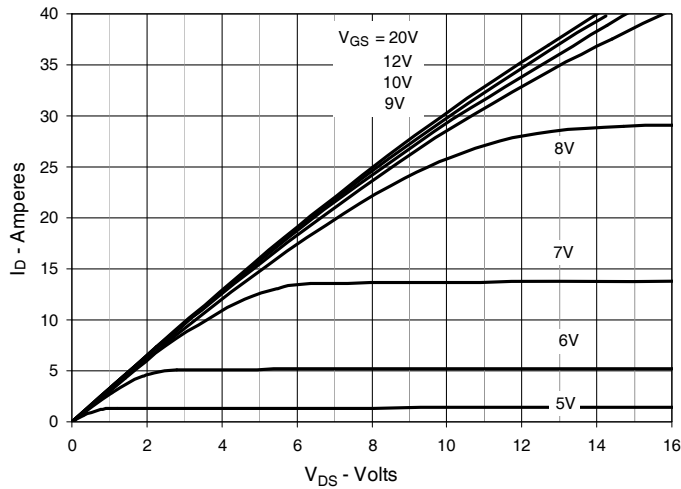**Fig. 4. R_DS(on) Normalized to I_D = 20A Value vs. Junction Temperature**

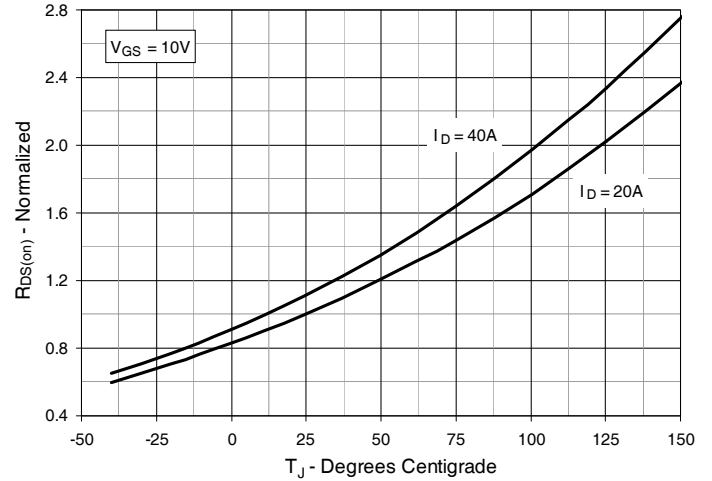**Fig. 5. R_DS(on) Normalized to I_D = 20A Value vs. Drain Current**

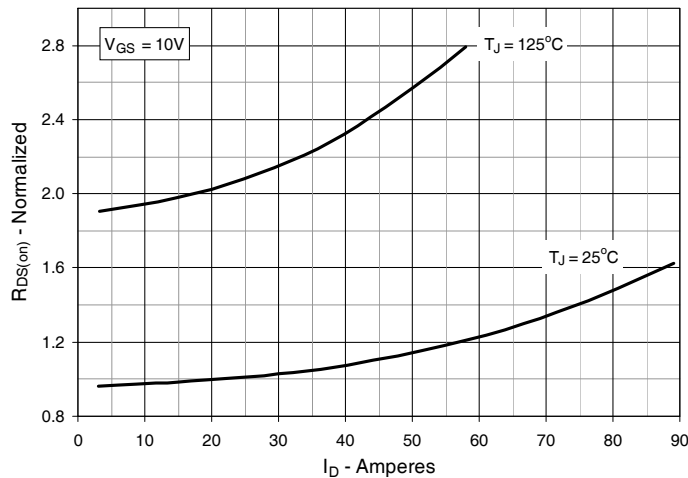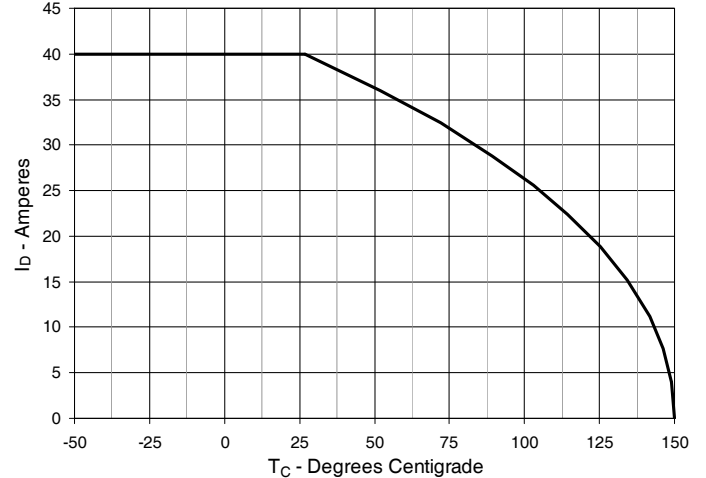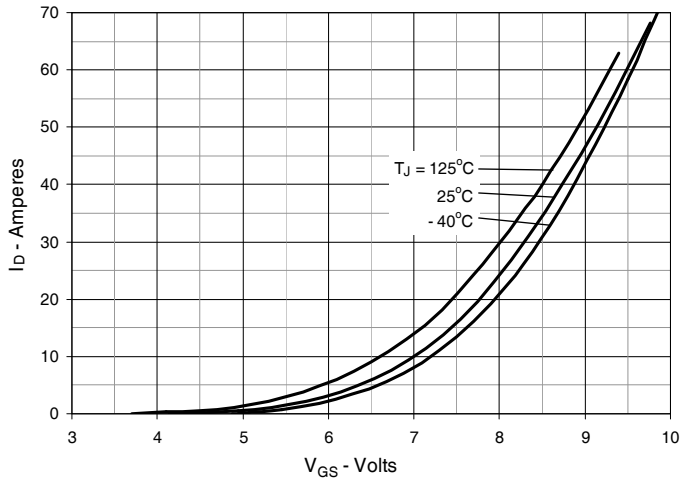**Fig. 6. Maximum Drain Current vs. Case Temperature**

Fig. 7. Input Admittance

Plot of I_D - Amperes (0 to 70) versus V_{GS} - Volts (3 to 10), with curves for $T_J = 125°C$, $25°C$, $-40°C$.

Fig. 8. Transconductance

Plot of g_{fs} - Siemens (0 to 36) versus I_D - Amperes (0 to 70), with curves for $T_J = -40°C$, $25°C$, $125°C$.
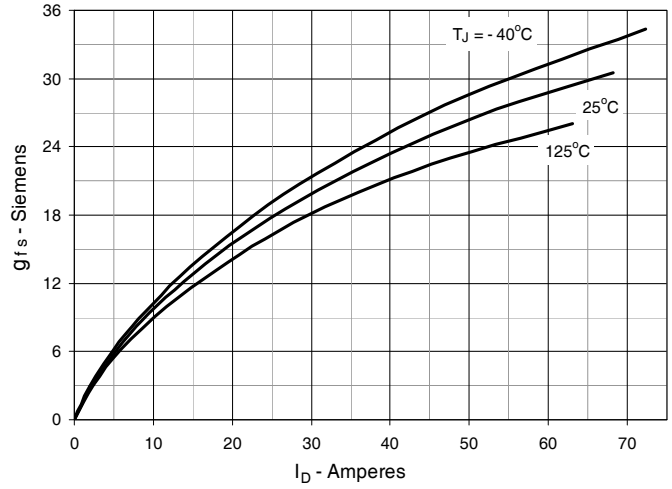
Fig. 9. Forward Voltage Drop of Intrinsic Diode

Plot of I_S - Amperes (0 to 120) versus V_{SD} - Volts (0.4 to 1.1), with curves for $T_J = 125°C$ and $T_J = 25°C$.

Fig. 10. Gate Charge

Plot of V_{GS} - Volts (0 to 16) versus Q_G - NanoCoulombs (0 to 450).
$V_{DS} = 250V$
$I_D = 20A$
$I_G = 10mA$

Fig. 11. Capacitance

Plot of Capacitance - PicoFarads (100 to 100,000) versus V_{DS} - Volts (0 to 40).
$f = 1$ MHz
C_{iss}, C_{oss}, C_{rss}
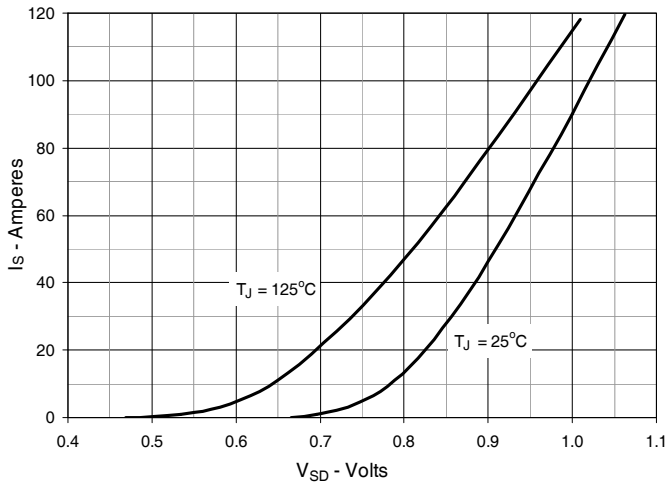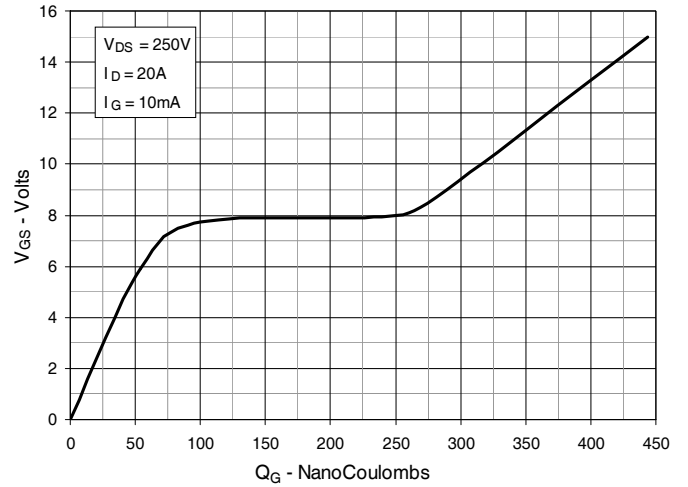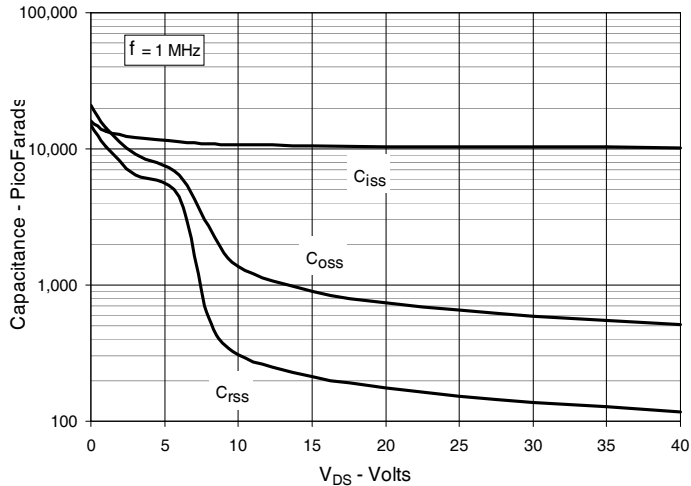
Fig. 12. Maximum Transient Thermal Impedance

Plot of $Z_{(th)JC}$ - K / W (0.001 to 1) versus Pulse Width - Seconds (0.00001 to 10).

IXYS reserves the right to change limits, test conditions, and dimensions.
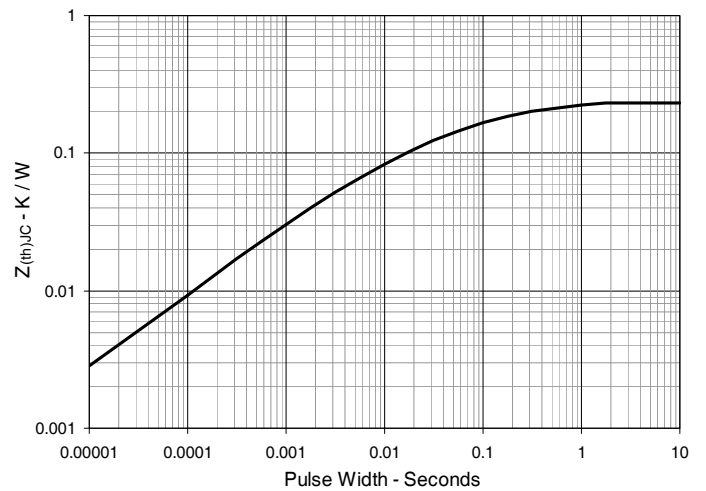
Fig. 13. Forward-Bias Safe Operating Area
@ T$_C$ = 25°C
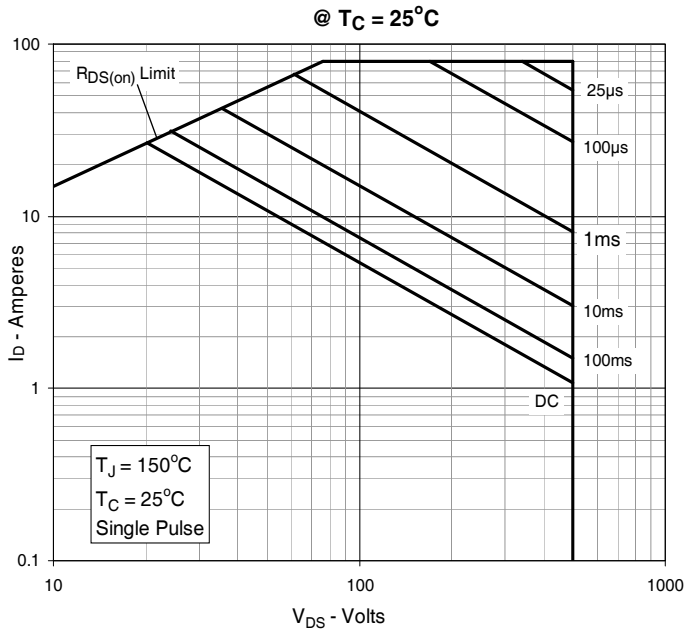
Fig. 14. Forward-Bias Safe Operating Area
@ T$_C$ = 75°C
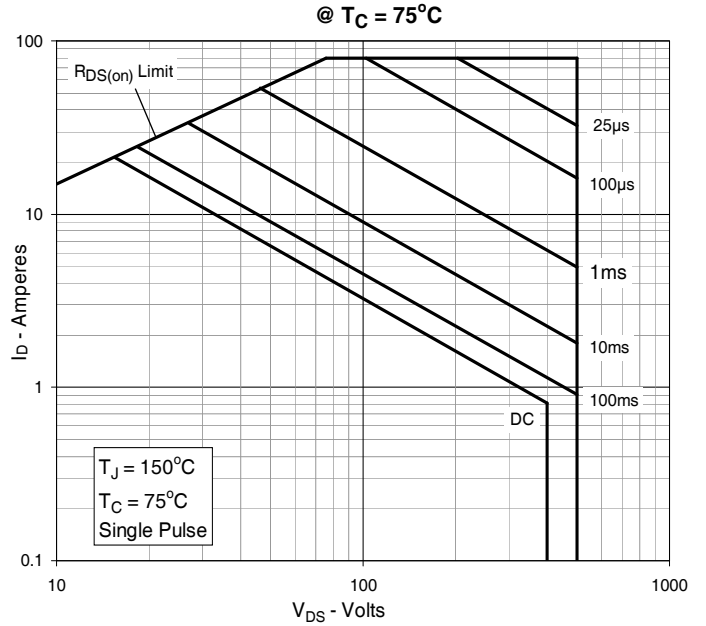
TO-268 Outline
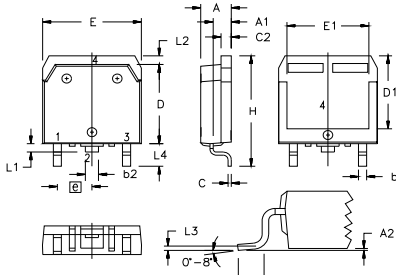
Terminals: 1 - Gate   2,4 - Drain
            3 - Source

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
H	.736	.752	18.70	19.10
L	.094	.106	2.40	2.70
L1	.047	.055	1.20	1.40
L2	.039	.045	1.00	1.15
L3	.010 BSC		0.25 BSC	
L4	.150	.161	3.80	4.10

TO-3P Outline
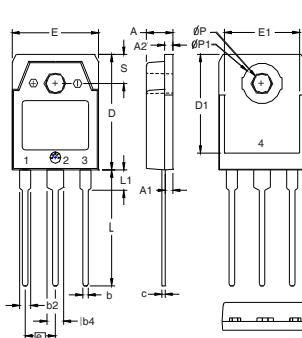
PINS: 1 - Gate
       2, 4 - Drain
       3 - Source

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.185	.193	4.70	4.90
A1	.051	.059	1.30	1.50
A2	.057	.065	1.45	1.65
b	.035	.045	0.90	1.15
b2	.075	.087	1.90	2.20
b4	.114	.126	2.90	3.20
c	.022	.031	0.55	0.80
D	.780	.799	19.80	20.30
D1	.665	.677	16.90	17.20
E	.610	.622	15.50	15.80
E1	.531	.539	13.50	13.70
e	.215 BSC		5.45 BSC	
L	.779	.795	19.80	20.20
L1	.134	.142	3.40	3.60
øP	.126	.134	3.20	3.40
øP1	.272	.280	6.90	7.10
S	.193	.201	4.90	5.10

TO-247 Outline
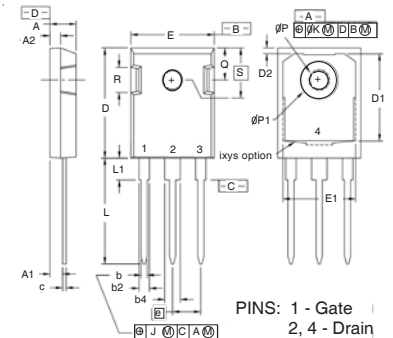
PINS: 1 - Gate
       2, 4 - Drain
       3 - Source

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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