

NTL4502N

Quad Power MOSFET

24 V, 15 A, N-Channel, PInPAK™ Package



ON Semiconductor®

<http://onsemi.com>

Features

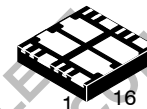
- Four N-Channel MOSFETs in a Single Package
- High Drain Current (Up to 80A per Device, Single Pulse $t_p < 10 \mu\text{s}$, $R_{\theta JC} = 1.5 \text{ }^\circ\text{C/W}$)
- High Input Impedance for Ease of Drive
- Ultra Low On-resistance ($R_{DS(on)}$) Provides Low Conduction Losses
- Very Fast Switching Times Provides Low Switching Losses
- Low Parasitic Inductance
- Low Stored Charge for Efficient Switching
- Very Low V_{SD} Ideal for Synchronous Rectification
- 200% Footprint Reduction Compared to Similar DPAK Solution for the Same Power
- Advanced Leadless Power Integrated Package (PInPAK)

Applications

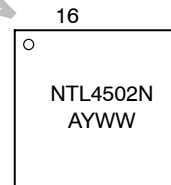
- DC-DC Converters
- Motherboard/Server Voltage Regulator
- Telecomm/Industrial Power Supply
- H-Bridge Circuits
- Low Voltage Motor Control

$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX (Note 1)
24 V	8.0 m Ω @ 4.5 V	15 A
	11.2 m Ω @ 10 V	

MARKING DIAGRAM



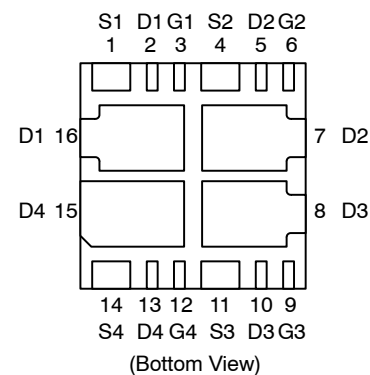
CASE 495
PInPAK
STYLE 1



xx = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Units	
Drain-to-Source Voltage	V_{DSS}	24	V	
Gate-to-Source Voltage	V_{GS}	± 20	V	
Continuous Drain Current (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	15	A
		$T_A = 85^\circ\text{C}$	10.9	
	$t \leq 10 \text{ s}$	$T_A = 25^\circ\text{C}$	18.8	
Power Dissipation (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	2.9	W
		$t \leq 10 \text{ s}$	4.5	
Continuous Drain Current (Note 2)	Steady State	$T_A = 25^\circ\text{C}$	11.4	A
		$T_A = 85^\circ\text{C}$	8.2	
Power Dissipation (Note 2)		$T_A = 25^\circ\text{C}$	1.7	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	I_{DM}	32	A
Operating Junction and Storage Temperature	T_J, T_{STG}	-55 to 150	$^\circ\text{C}$	
Source Current (Body Diode)	I_S	15	A	
Single Pulse Drain-to-Source Avalanche Energy – ($V_{DD} = 25 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_{PK} = 60 \text{ A}$, $L = 0.1 \text{ mH}$, $R_G = 1.0 \text{ k}\Omega$)	EAS	80	mJ	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$	



Pinout Diagram

ORDERING INFORMATION

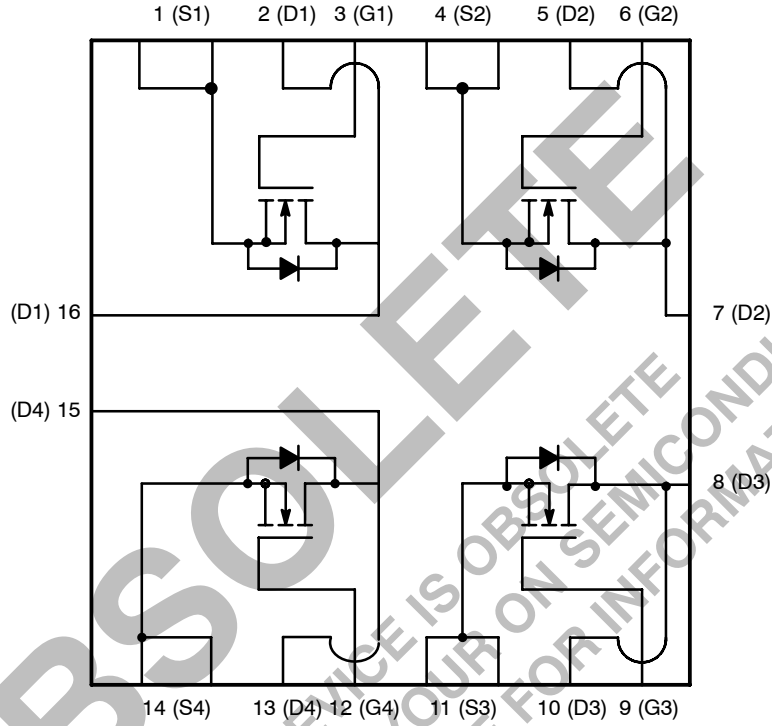
Device	Package	Shipping
NTL4502NT1	PInPAK	1500 / Reel

NTL4502N

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Units
Junction-to-Case (Drain)	$R_{\theta JC}$	1.5	°C/W
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	43	
Junction-to-Ambient – $t_{\leq 10}$ s (Note 1)	$R_{\theta JA}$	27.5	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	75	

1. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surface-mounted on FR4 board using minimum recommended pad size (Cu area = 0.440 in sq).



SCHEMATIC (TOP VIEW)

NTL4502N

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA	24	27.5		V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V _{(BR)DSS} /T _J			25.5		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 20 V, V _{GS} = 0 V	T _J =25°C		1.5	μA
			T _J =125°C		10	
Gate-to-Source Leakage Current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V			±100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	1.0	1.5	2.0	V
Gate Threshold Voltage Temperature Coefficient	V _{GS(th)} /T _J			-4.1		mV/°C
Drain-to-Source On-Resistance	R _{DS(on)}	V _{GS} = 4.5 V, I _D = 15 A		11.2	13	mΩ
		V _{GS} = 10 V, I _D = 15 A		8.0	11	
Forward Transconductance	g _{FS}	V _{DS} = 10 V, I _D = 15 A		27		S

CHARGES AND CAPACITANCES

Input Capacitance	C _{iss}	V _{DS} = 20 V, V _{GS} = 0 V, f = 1.0 MHz		1070	1605	pF
Output Capacitance	C _{oss}			408	612	
Reverse Transfer Capacitance	C _{rss}			142	213	
Total Gate Charge	Q _{G(TOT)}	V _{GS} = 4.5 V, I _D = 15 A, V _{DS} = 24 V		13		nC
Threshold Gate Charge	Q _{G(TH)}			1.6		
Gate-to-Source Charge	Q _{GS}			3.3		
Gate-to-Drain Charge	Q _{GD}			7.0		

SWITCHING CHARACTERISTICS, V_{GS} = 10 V (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 10 V, V _{DD} = 12 V, I _D = 15 A, R _G = 3.0 Ω		5.0	8.5	ns
Rise Time	t _r			28	47	
Turn-Off Delay Time	t _{d(OFF)}			22	37	
Fall Time	t _f			6.0	10	

SWITCHING CHARACTERISTICS, V_{GS} = 4.5 V (Note 4)

Turn-On Delay Time	t _{d(ON)}	V _{GS} = 4.5 V, V _{DD} = 12 V, I _D = 15 A, R _G = 3.0 Ω		9.5	16	ns
Rise Time	t _r			33	55	
Turn-Off Delay Time	t _{d(OFF)}			14	23.5	
Fall Time	t _f			7.5	12.5	

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 15 A	T _J =25°C	0.8	1.2	V
			T _J =125°C	0.7		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, di _S /dt = 100 A/μs, I _S = 15 A		31		ns
Charge Time	t _a			17		
Discharge Time	t _b			14		
Reverse Recovery Charge	Q _{RR}			20		nC

3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

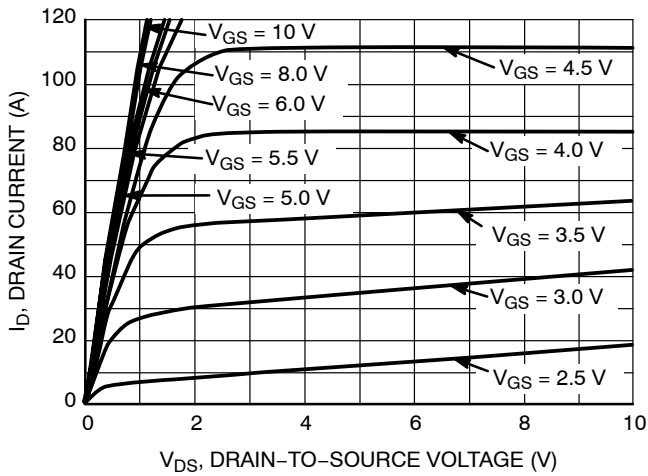


Figure 1. On-Region Characteristics

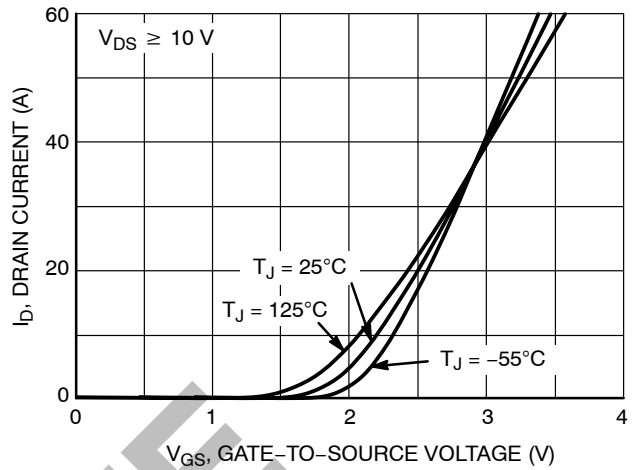


Figure 2. Transfer Characteristics

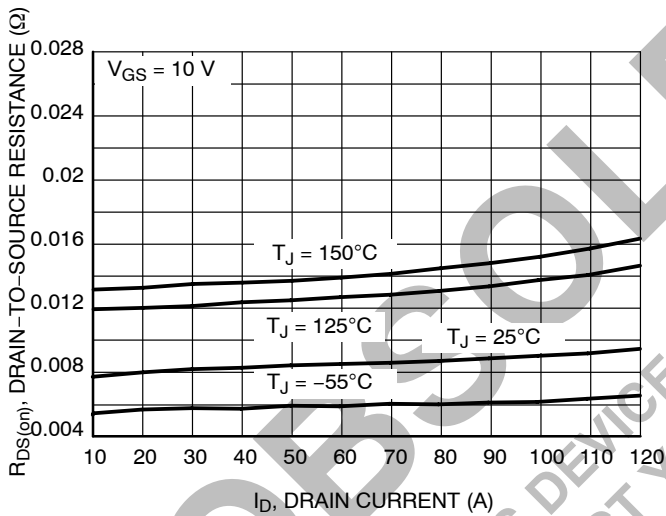


Figure 3. On-Resistance versus Drain Current and Temperature

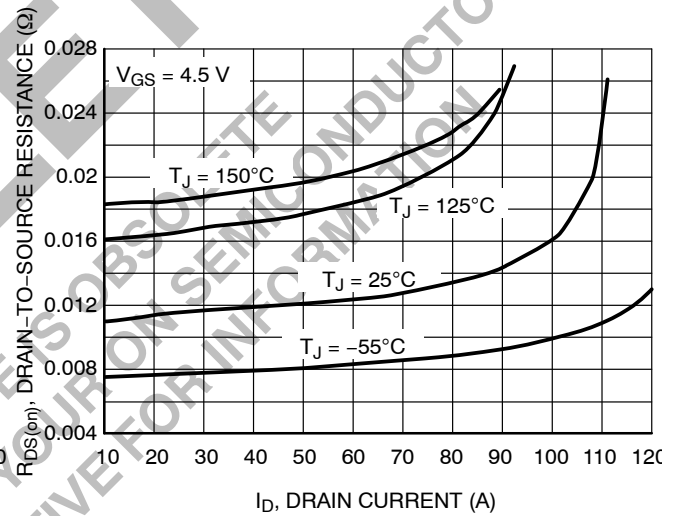


Figure 4. On-Resistance versus Drain Current and Temperature

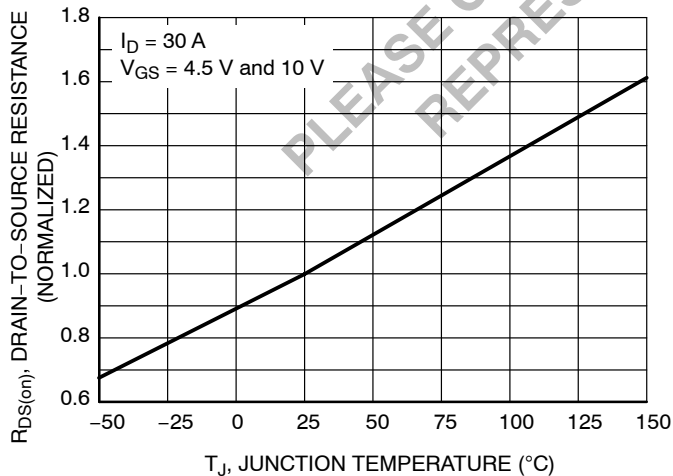


Figure 5. On-Resistance Variation with Temperature

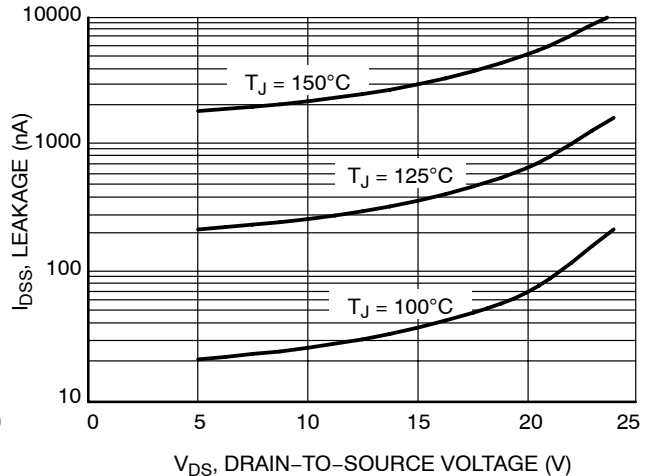


Figure 6. Drain-to-Source Leakage Current versus Voltage

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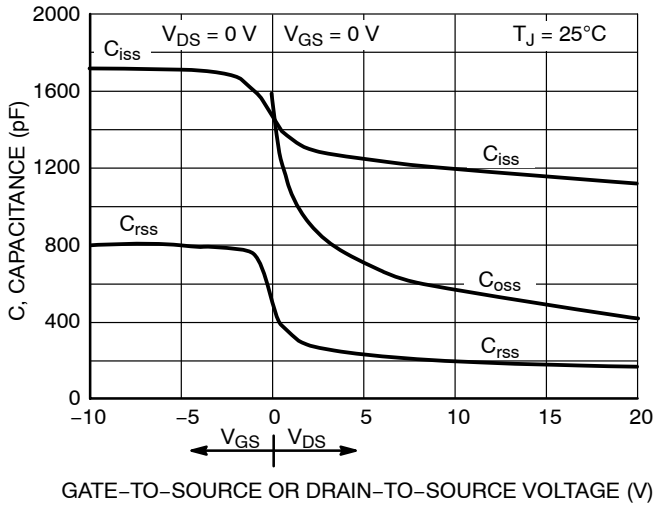


Figure 7. Capacitance Variation

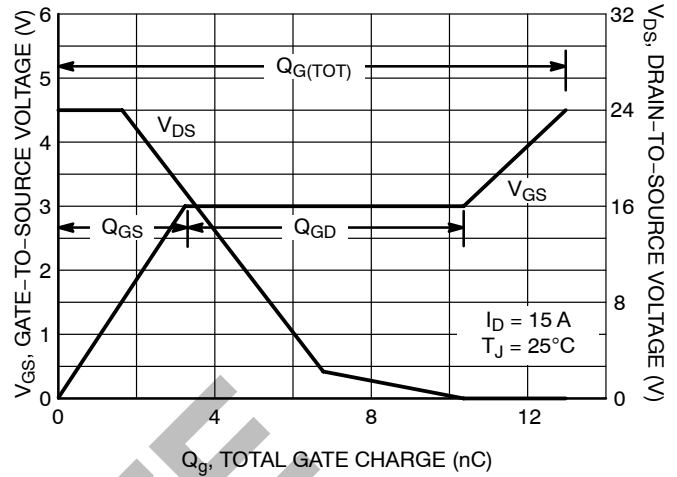


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

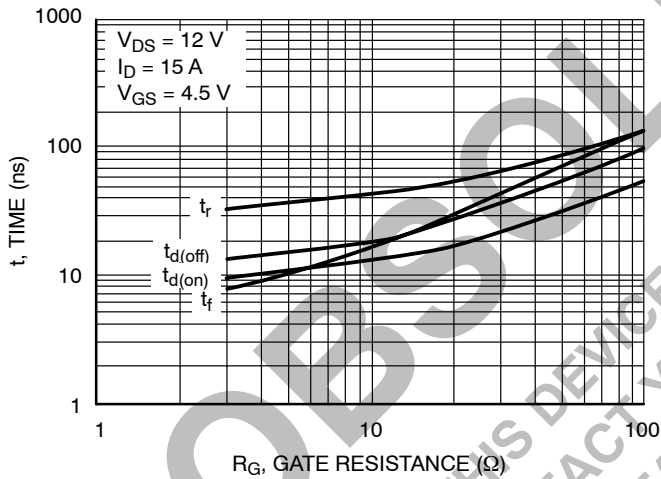


Figure 9. Resistive Switching Time Variation versus Gate Resistance

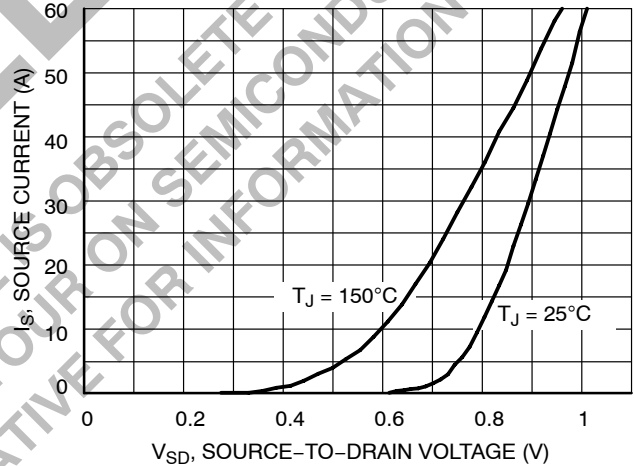


Figure 10. Diode Forward Voltage versus Current

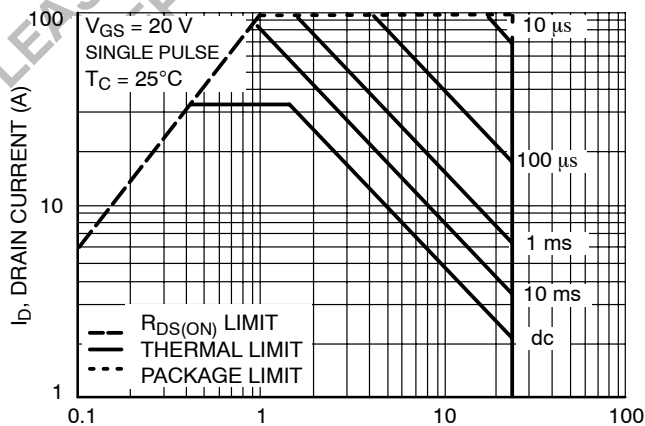
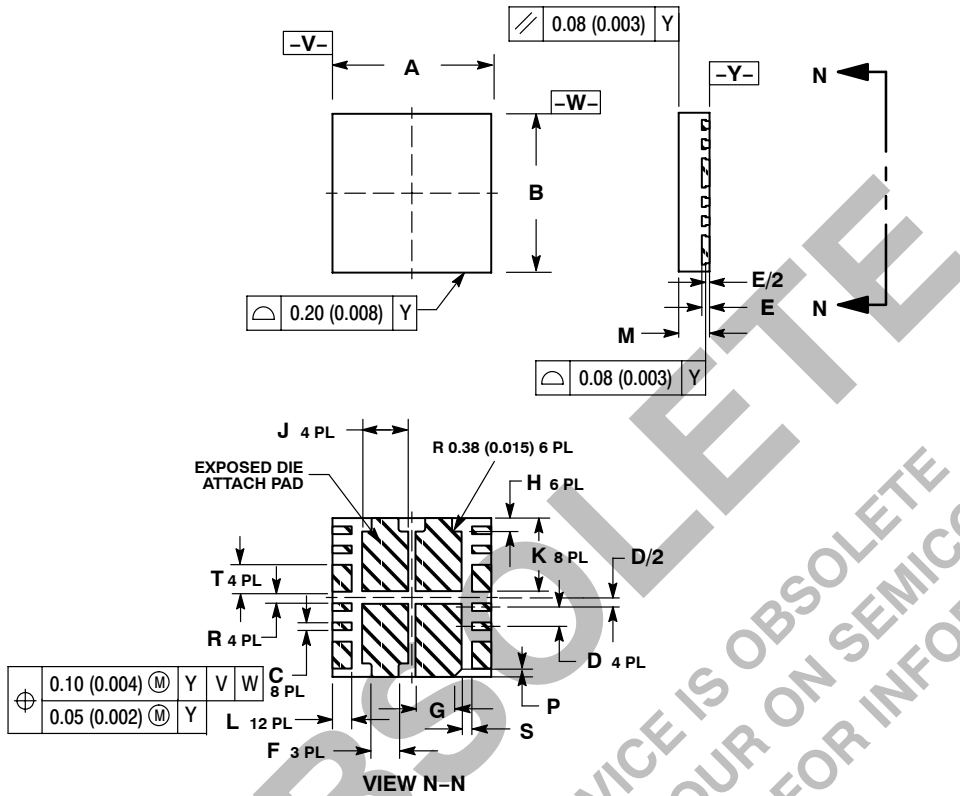


Figure 11. Maximum Rated Forward Biased Safe Operating Area

NTL4502N

PACKAGE DIMENSIONS

PlnPAK
CASE 495-01
ISSUE 0



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. COPLANARITY APPLIES TO LEAD, DIE ATTACHED PAD.
4. OPTIONAL FEATURES ARE FOR REFERENCE ONLY.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.40	10.60	0.409	0.417
B	10.40	10.60	0.409	0.417
C	0.40	0.50	0.016	0.020
D	1.27 BSC		0.050 BSC	
E	0.50	0.52	0.020	0.020
F	1.70	1.90	0.067	0.075
G	2.45	2.55	0.096	0.100
H	0.80	1.00	0.031	0.039
J	2.90	3.10	0.114	0.122
K	4.75	4.95	0.187	0.195
L	1.10	1.30	0.043	0.051
M	2.00	2.20	0.079	0.087
P	0.30	0.50	0.012	0.020
R	0.70	0.90	0.028	0.035
S	0.58	0.78	0.023	0.031
T	1.68	1.78	0.066	0.070

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