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NTL4502N

Quad Power MOSFET

24 V, 15 A, N-Channel



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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

Applications

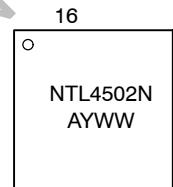
- DC-DC Converters
- Motherboard/Server Voltage Regulator
- Telecomm/Industrial Power Supply
- H-Bridge Circuits
- Low Voltage Motor Control

$V_{(BR)DSS}$	$R_{DS(ON)}$ 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



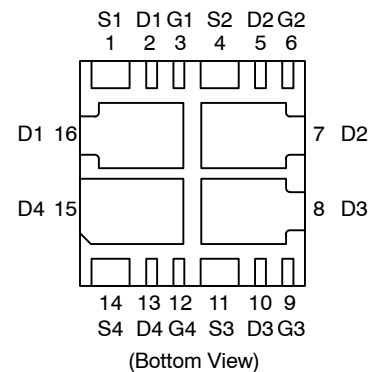
CASE 495
QFN16 FBIP
STYLE 1



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)	I_D	$T_A=25^\circ\text{C}$	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)	P_D	Steady State, $T_A=25^\circ\text{C}$	2.9	W
		$t \leq 10 \text{ s}$	4.5	
Continuous Drain Current (Note 2)	I_D	$T_A=25^\circ\text{C}$	11.4	A
		$T_A=85^\circ\text{C}$	8.2	
Power Dissipation (Note 2)	P_D	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 – ($V_{DD}=25 \text{ V}$, $V_G=10 \text{ V}$, $I_{PK}=60 \text{ A}$, $L=0.1 \text{ mH}$, $R_G=1.0 \text{ k}\Omega$)	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

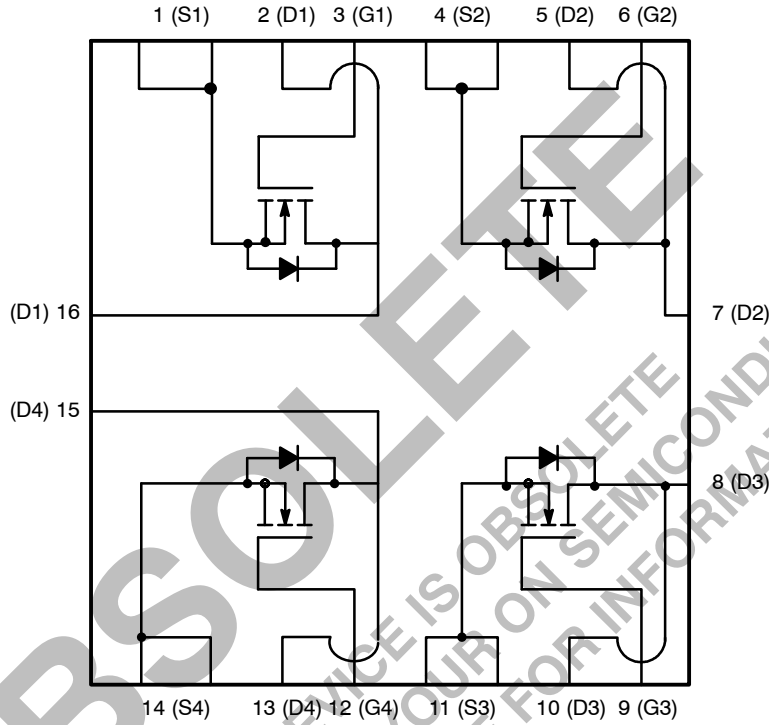
Device	Package	Shipping
NTL4502NT1	QFN16 FBIP	1500 / Tape & Reel

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

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	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}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	$T_J = 25^\circ\text{C}$		1.5	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$	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	$R_{DS(on)}$	$V_{GS} = 4.5\text{ V}, I_D = 15\text{ A}$		11.2	13	m Ω
		$V_{GS} = 10\text{ V}, I_D = 15\text{ A}$		8.0	11	
Forward Transconductance	g_{FS}	$V_{DS} = 10\text{ V}, I_D = 15\text{ A}$		27		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{iss}	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$		1070	1605	pF
Output Capacitance	C_{oss}			408	612	
Reverse Transfer Capacitance	C_{rss}			142	213	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, I_D = 15\text{ A}, V_{DS} = 24\text{ V}$		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, $V_{GS} = 10\text{ V}$ (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DD} = 12\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		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, $V_{GS} = 4.5\text{ V}$ (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 12\text{ V}, I_D = 15\text{ A}, R_G = 3.0\ \Omega$		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}	$V_{GS} = 0\text{ V}, I_S = 15\text{ A}$	$T_J = 25^\circ\text{C}$	0.8	1.2	V
			$T_J = 125^\circ\text{C}$	0.7		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 15\text{ A}$		31		ns
Charge Time	t_a			17		
Discharge Time	t_b			14		
Reverse Recovery Charge	Q_{RR}			20		nC

- Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.

NTL4502N

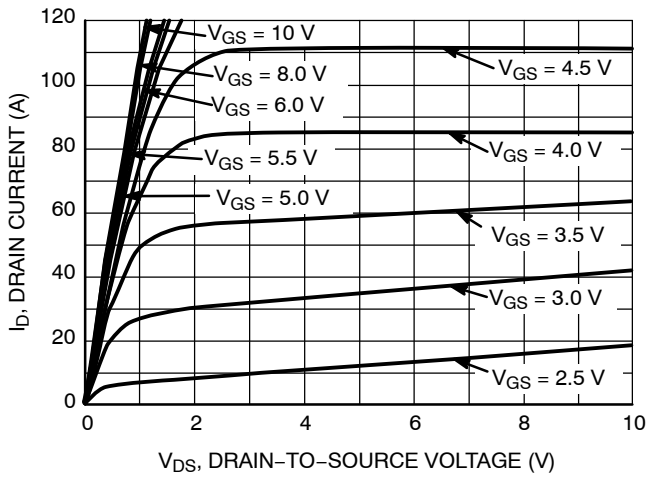


Figure 1. On-Region Characteristics

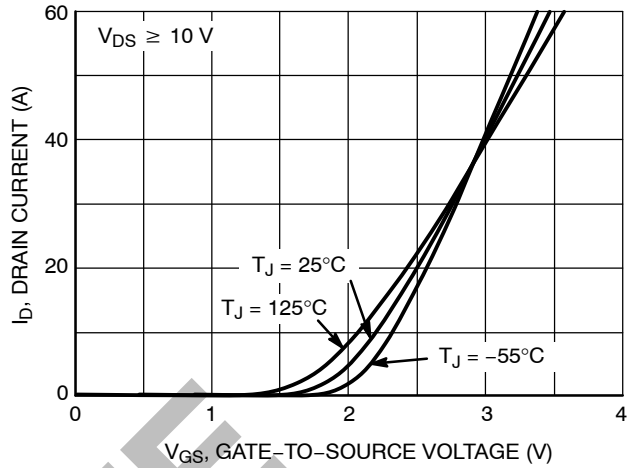


Figure 2. Transfer Characteristics

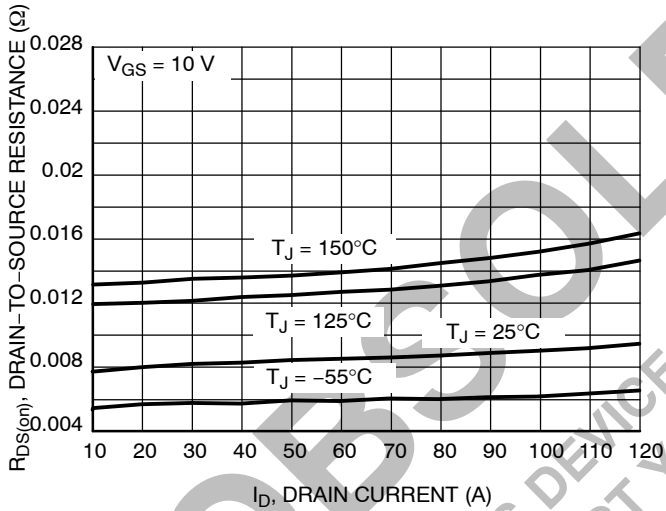


Figure 3. On-Resistance versus Drain Current and Temperature

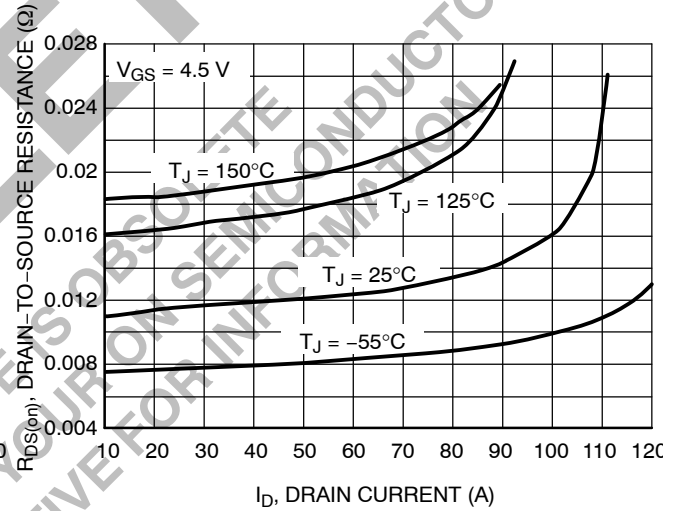


Figure 4. On-Resistance versus Drain Current and Temperature

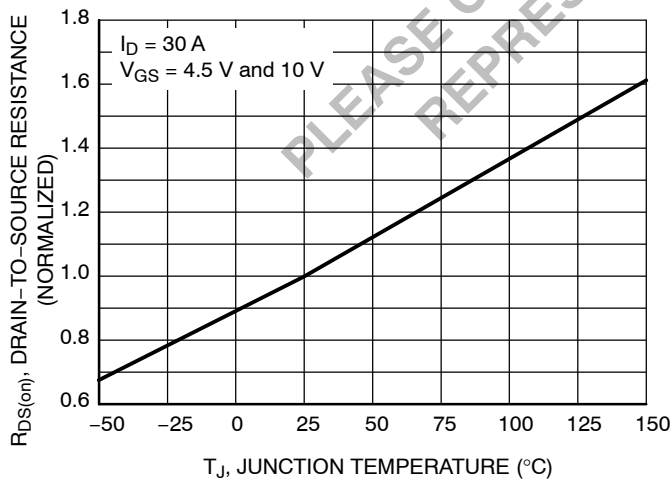


Figure 5. On-Resistance Variation with Temperature

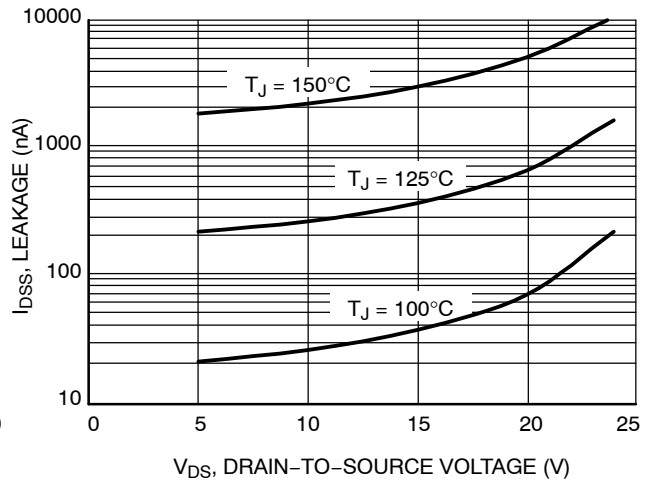


Figure 6. Drain-to-Source Leakage Current versus Voltage

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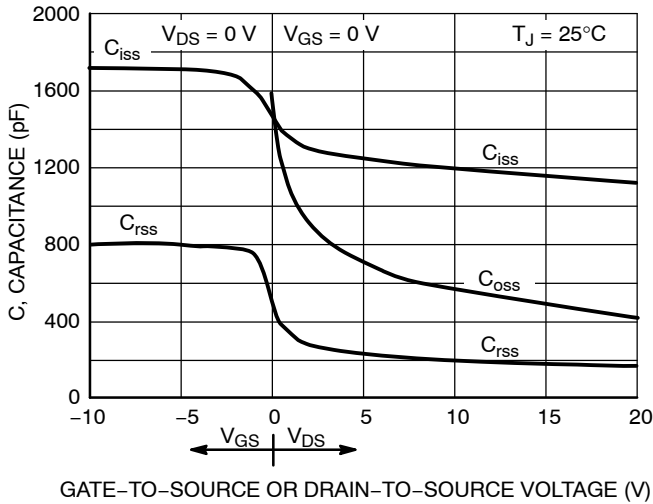


Figure 7. Capacitance Variation

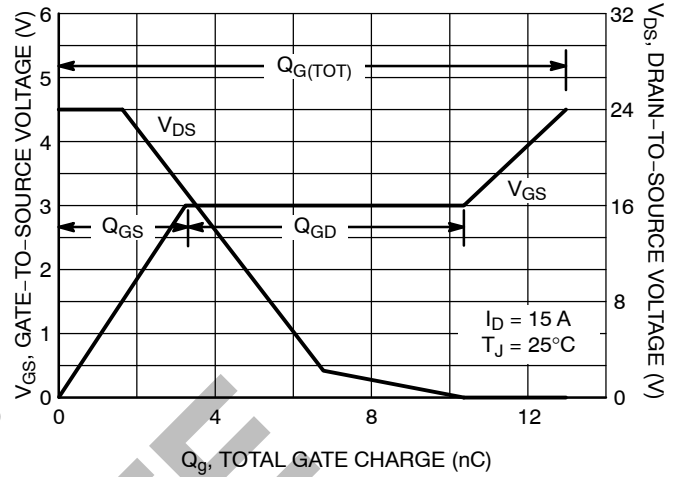


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

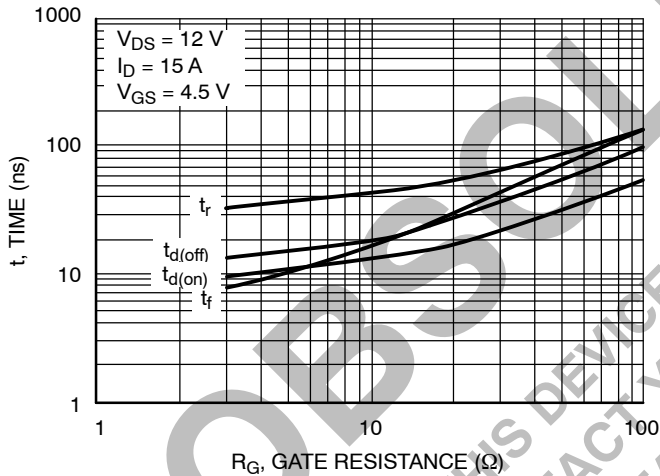


Figure 9. Resistive Switching Time Variation versus Gate Resistance

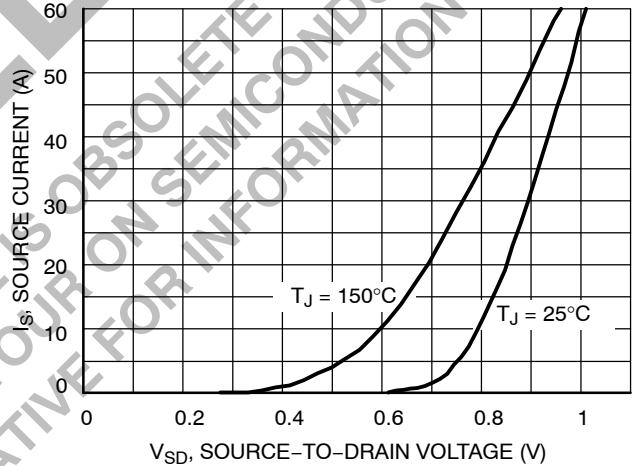


Figure 10. Diode Forward Voltage versus Current

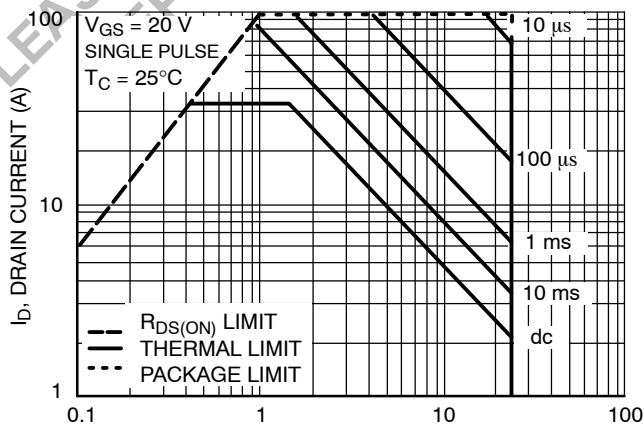
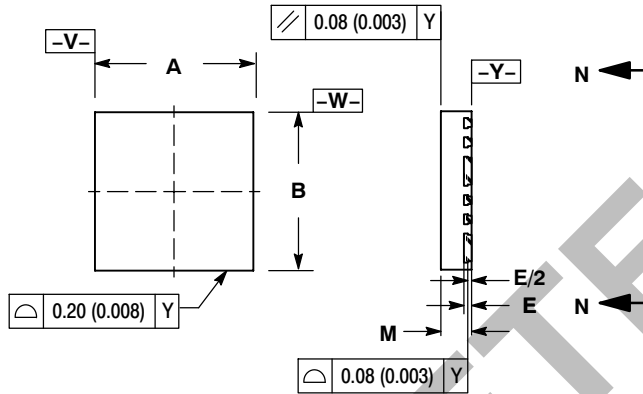


Figure 11. Maximum Rated Forward Biased Safe Operating Area

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PACKAGE DIMENSIONS

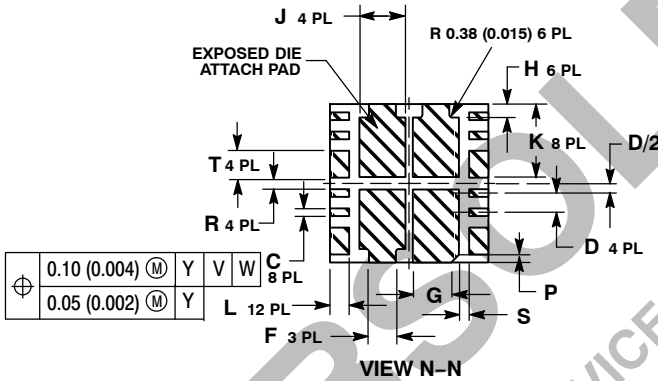
QFN16 FBIP
CASE 495-01
ISSUE A



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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