

# IRF520VL-VB Datasheet

## N-Channel 100-V (D-S) 175 °C MOSFET

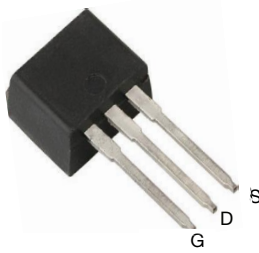
PRODUCT SUMMARY		
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ )	$I_D$ (A)
100	0.0085 at $V_{GS} = 10$ V	100
	0.010 at $V_{GS} = 6$ V	85

### FEATURES

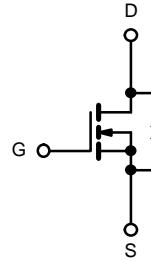
- Trench Power MOSFET
- 175 °C Maximum Junction Temperature
- Compliant to RoHS Directive 2002/95/EC


**RoHS**  
 COMPLIANT

TO-262



Top View



N-Channel MOSFET

### ABSOLUTE MAXIMUM RATINGS $T_A = 25$ °C, unless otherwise noted

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V <sub>DS</sub>	100	V
Gate-Source Voltage		V <sub>GS</sub>	± 20	
Continuous Drain Current (T <sub>J</sub> = 150 °C)	T <sub>C</sub> = 25 °C	I <sub>D</sub>	100	A
	T <sub>C</sub> = 125 °C		75 <sup>a</sup>	
Pulsed Drain Current		I <sub>DM</sub>	300	
Avalanche Current	L = 0.1 mH	I <sub>AS</sub>	75	
Single Pulse Avalanche Energy <sup>b</sup>		E <sub>AS</sub>	280	mJ
Maximum Power Dissipation <sup>b</sup>	T <sub>C</sub> = 25 °C (TO-220AB and TO-263)	P <sub>D</sub>	250 <sup>c</sup>	W
	T <sub>A</sub> = 25 °C (TO-263) <sup>d</sup>		3.75	
Operating Junction and Storage Temperature Range		T <sub>J</sub> , T <sub>stg</sub>	- 55 to 175	°C

### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Limit	Unit
Junction-to-Ambient	$R_{thJA}$	40	°C/W
		62.5	
Junction-to-Case	$R_{thJC}$	0.6	

Notes:

- Pulse test; pulse width  $\leq 300$   $\mu$ s, duty cycle  $\leq 2$  %.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

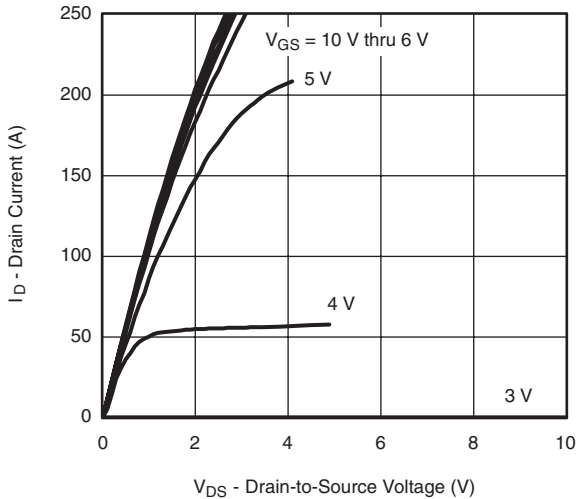
SPECIFICATIONS $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	1		3	
Gate-Body Leakage	$I_{GSS}$	$V_{DS} = 0\text{ V}$ , $V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
		$V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 125\text{ }^{\circ}\text{C}$			50	
		$V_{DS} = 100\text{ V}$ , $V_{GS} = 0\text{ V}$ , $T_J = 175\text{ }^{\circ}\text{C}$			250	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = \geq 5\text{ V}$ , $V_{GS} = 10\text{ V}$	120			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$ , $I_D = 30\text{ A}$		0.0085		$\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 20\text{ A}$		0.010		
		$V_{GS} = 10\text{ V}$ , $I_D = 30\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$		0.017		
		$V_{GS} = 10\text{ V}$ , $I_D = 30\text{ A}$ , $T_J = 175\text{ }^{\circ}\text{C}$		0.022		
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = 15\text{ V}$ , $I_D = 30\text{ A}$	25			S
Dynamic <sup>b</sup>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}$ , $V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$		6550		pF
Output Capacitance	$C_{oss}$			665		
Reverse Transfer Capacitance	$C_{rss}$			265		
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = 50\text{ V}$ , $V_{GS} = 10\text{ V}$ , $I_D = 85\text{ A}$		105	160	nC
Gate-Source Charge <sup>c</sup>	$Q_{gs}$			17		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$			23		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = 50\text{ V}$ , $R_L = 0.6\text{ }\Omega$ $I_D \cong 85\text{ A}$ , $V_{GEN} = 10\text{ V}$ , $R_g = 2.5\text{ }\Omega$		12	25	ns
Rise Time <sup>c</sup>	$t_r$			90	135	
Turn-Off DelayTime <sup>c</sup>	$t_{d(off)}$			55	85	
Fall Time <sup>c</sup>	$t_f$			130	195	
Source-Drain Diode Ratings and Characteristics $T_C = 25\text{ }^{\circ}\text{C}$ <sup>b</sup>						
Continuous Current	$I_S$				85	A
Pulsed Current	$I_{SM}$				240	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = 85\text{ A}$ , $V_{GS} = 0\text{ V}$		1.0	1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = 50\text{ A}$ , $dI/dt = 100\text{ A}/\mu\text{s}$		85	140	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$			4.5	7	A
Reverse Recovery Charge	$Q_{rr}$			0.17	0.35	$\mu\text{C}$

Notes:

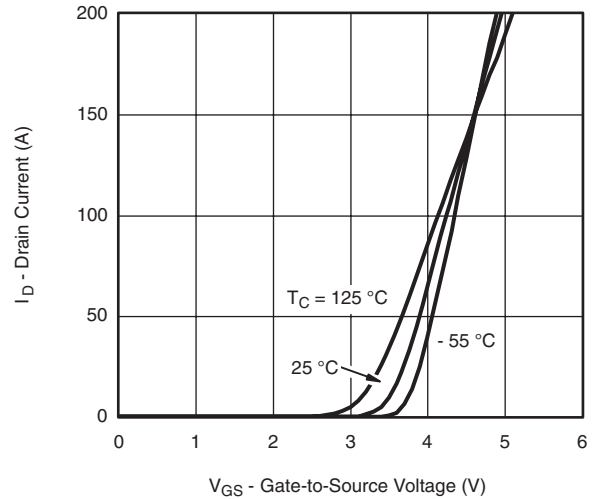
- a. Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .  
 b. Guaranteed by design, not subject to production testing.  
 c. Independent of operating temperature.

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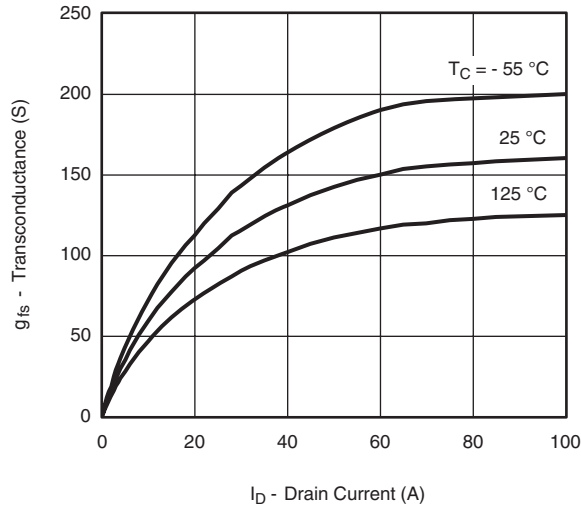
**TYPICAL CHARACTERISTICS**  $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise noted



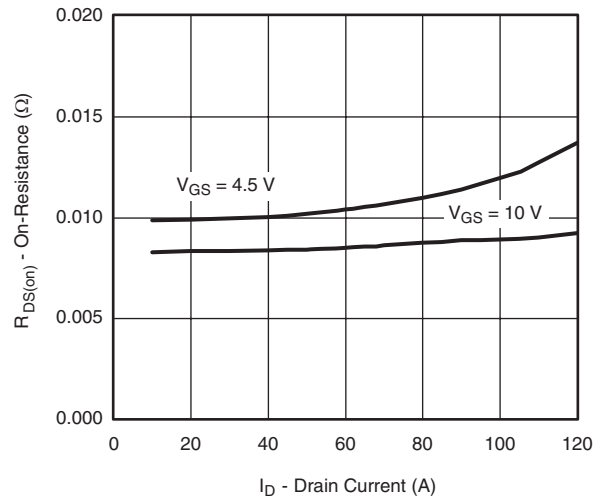
**Output Characteristics**



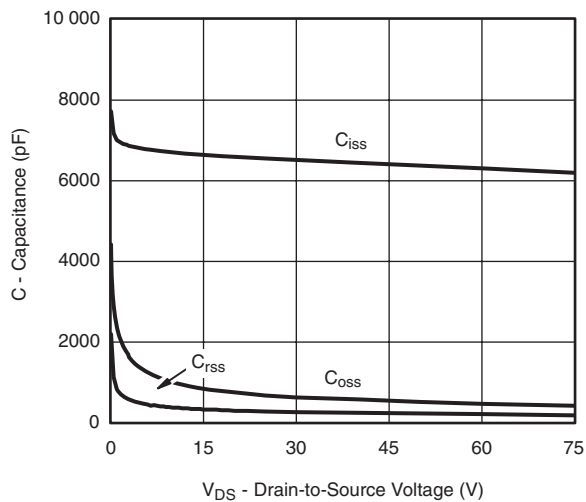
**Transfer Characteristics**



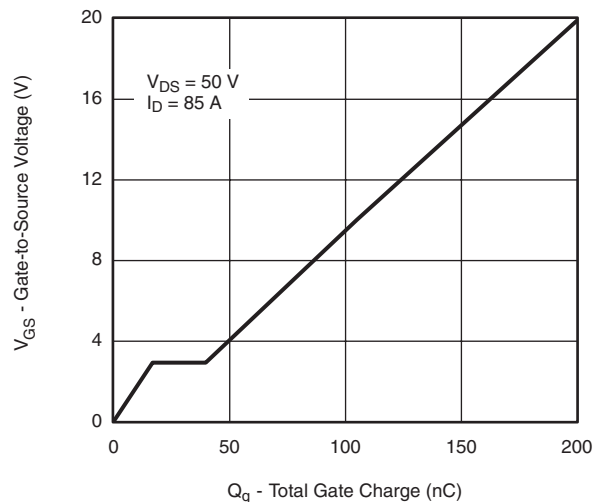
**Transconductance**



**On-Resistance vs. Drain Current**

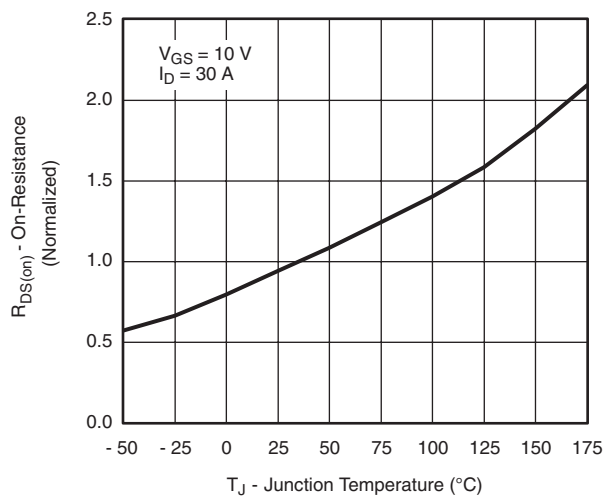


**Capacitance**

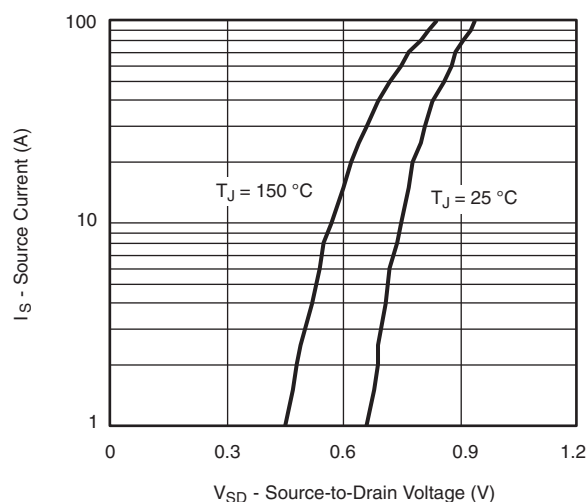


**Gate Charge**

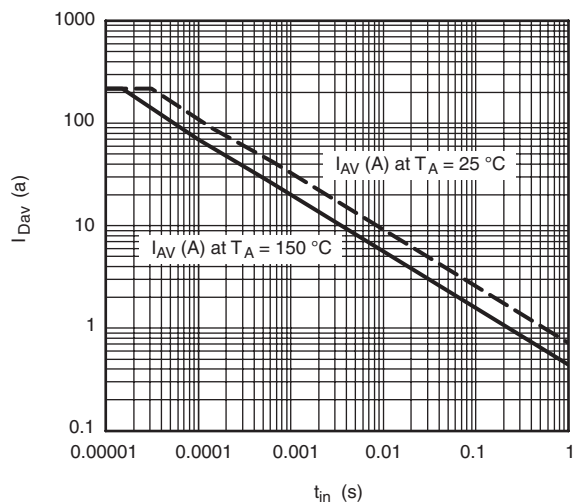
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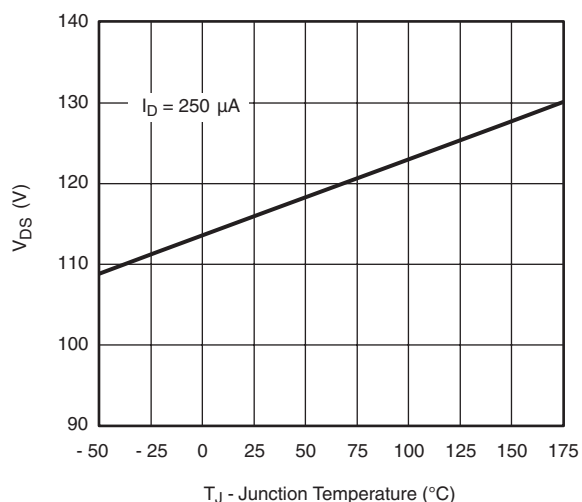
**On-Resistance vs. Junction Temperature**



**Source-Drain Diode Forward Voltage**

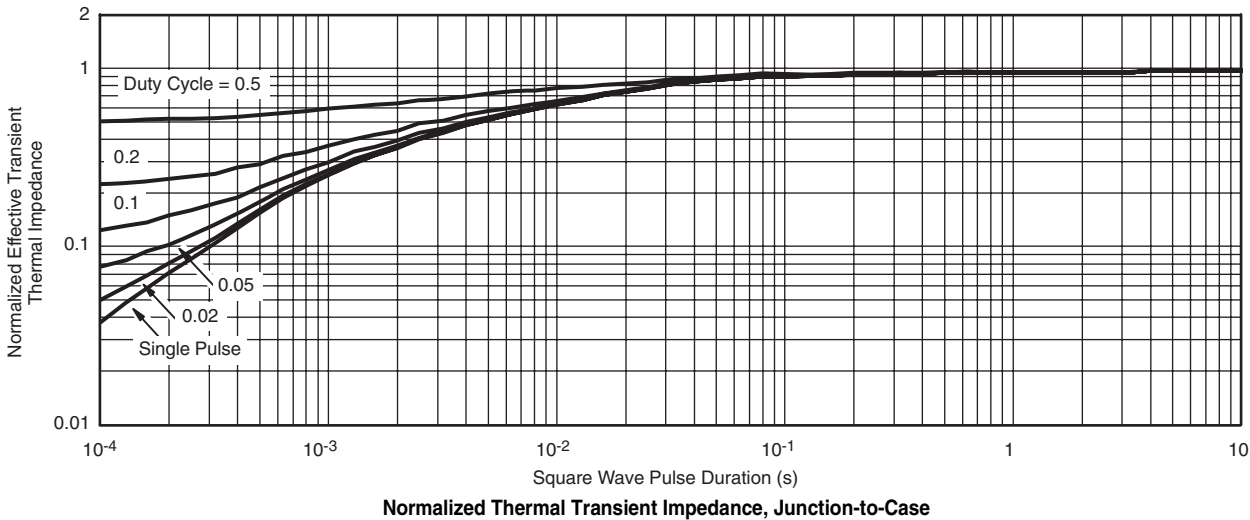
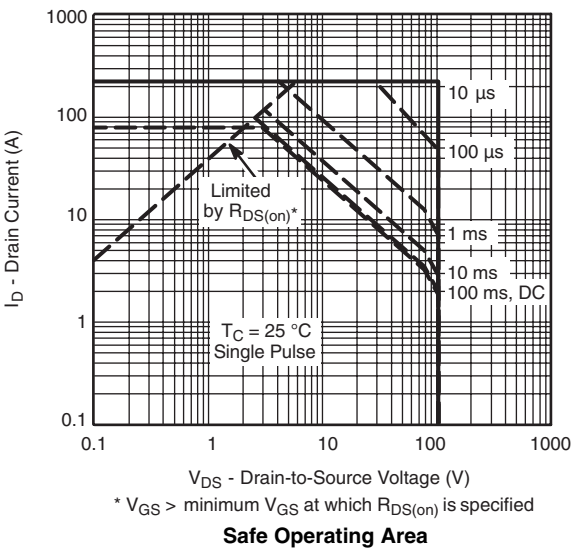
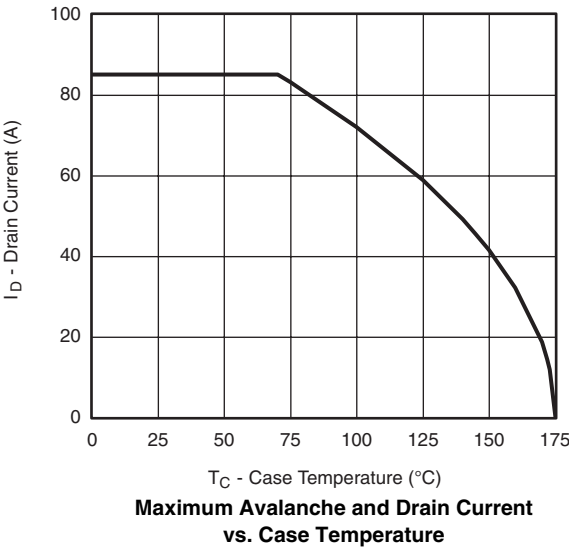


**Avalanche Current vs. Time**

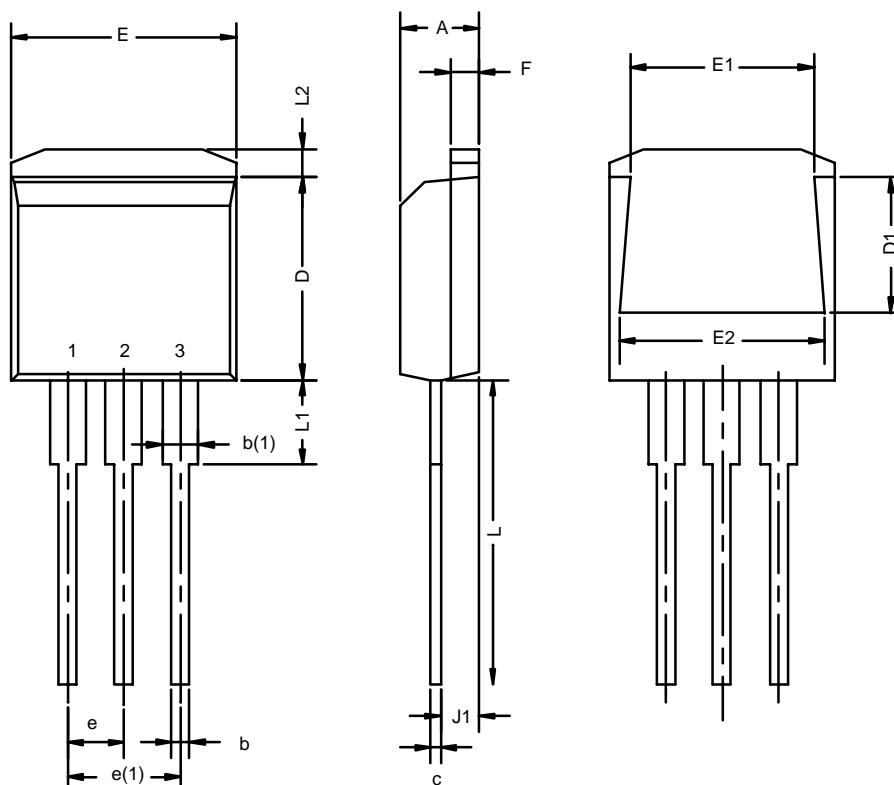


**$T_J$  - Drain-Source Breakdown vs. Junction-Temperature**

**THERMAL RATINGS**



**TO-262: 3-LEAD**



Dim	MILLIMETERS*		INCHES	
	Min	Max	Min	Max
<b>A</b>	4.32	4.70	0.170	0.185
<b>b</b>	0.64	1.00	0.025	0.039
<b>b(1)</b>	1.14	1.40	0.045	0.055
<b>c</b>	0.36	0.50	0.014	0.020
<b>D</b>	8.64	9.65	0.340	0.380
<b>D1</b>	5.59	6.10	0.220	0.240
<b>e</b>	2.41	2.67	0.095	0.105
<b>e(1)</b>	4.95	5.33	0.195	0.210
<b>E</b>	10.03	10.41	0.395	0.410
<b>E1</b>	7.87	8.64	0.310	0.340
<b>E2</b>	9.02	9.53	0.355	0.375
<b>F</b>	1.14	1.40	0.045	0.055
<b>J1</b>	2.41	2.79	0.095	0.110
<b>L</b>	13.08	14.22	0.515	0.560
<b>L1</b>	-	3.81	-	0.150
<b>L2</b>	1.02	1.40	0.040	0.055
ECN: T-02234—Rev. C, 14-Oct-02 DWG: 5855				

\*Use millimeters as the primary measurement

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