

## P-Channel 100 V (D-S) MOSFET

PRODUCT SUMMARY			
$V_{DS}$ (V)	$R_{DS(on)}$ ( $\Omega$ ) Max.	$I_D$ (A) <sup>c</sup>	$Q_g$ (Typ.)
- 100	0.138 at $V_{GS} = - 10$ V	- 16.3	24 nC
	0.141 at $V_{GS} = - 7.5$ V	- 16.1	
	0.142 at $V_{GS} = - 6$ V	- 16.1	

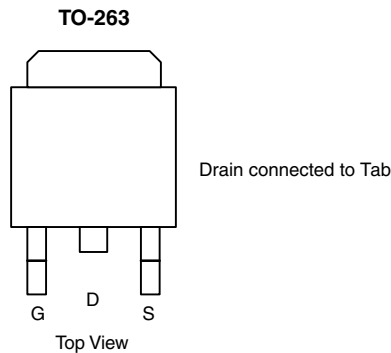
### FEATURES

- TrenchFET<sup>®</sup> Power MOSFET
- 100 %  $R_g$  and UIS Tested
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

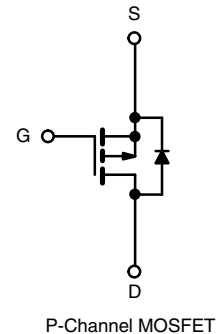


### APPLICATIONS

- DC/DC Converters
- Motor Control



**Ordering Information:**  
SUM25P10-138-E3 (Lead (Pb)-free)



ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted)			
Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	- 100	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	
Continuous Drain Current ( $T_J = 150$ °C)	$I_D$	$T_C = 25$ °C	- 16.7
		$T_C = 125$ °C	- 9.6
Pulsed Drain Current ( $t = 100$ $\mu$ s)	$I_{DM}$	- 40	A
Avalanche Current	$I_{AS}$	- 25	mJ
Single Pulse Avalanche Energy <sup>a</sup>			
Power Dissipation	$P_D$	$T_C = 25$ °C	88.2 <sup>b</sup>
		$T_A = 25$ °C	3.75
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	- 55 to 175	°C

THERMAL RESISTANCE RATINGS			
Parameter	Symbol	Limit	Unit
Junction-to-Ambient Free Air	$R_{thJA}$	40	°C/W
Junction-to-Case	$R_{thJC}$	1.7	

Notes:

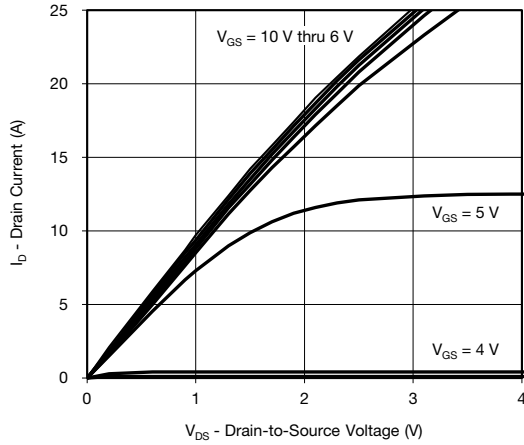
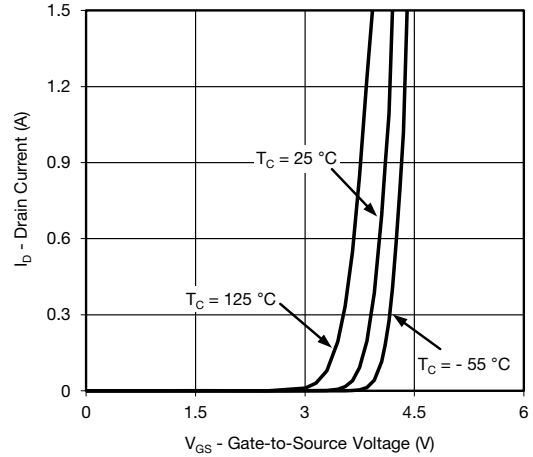
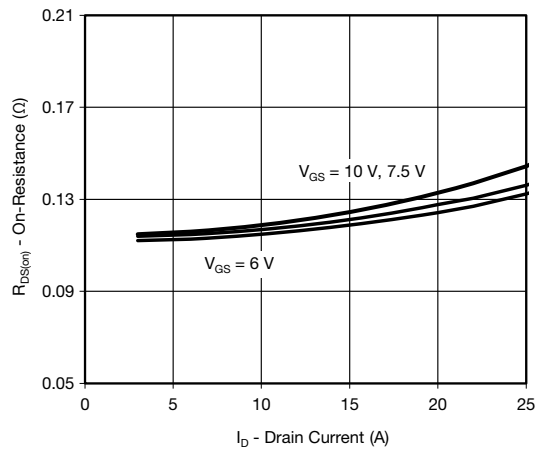
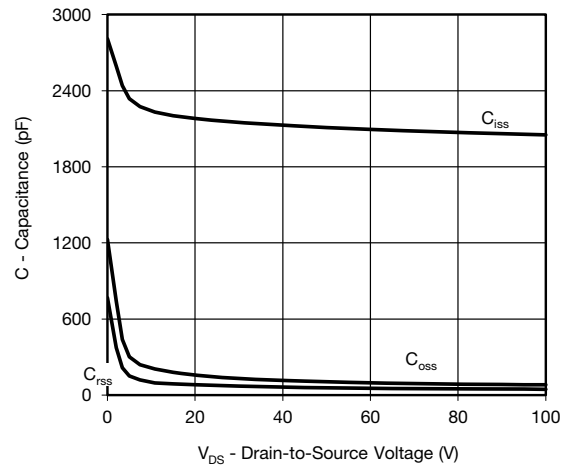
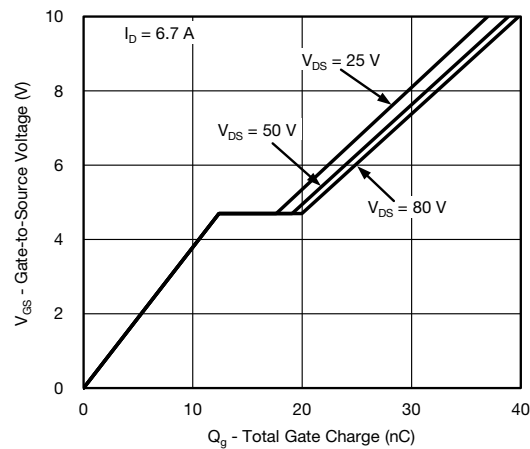
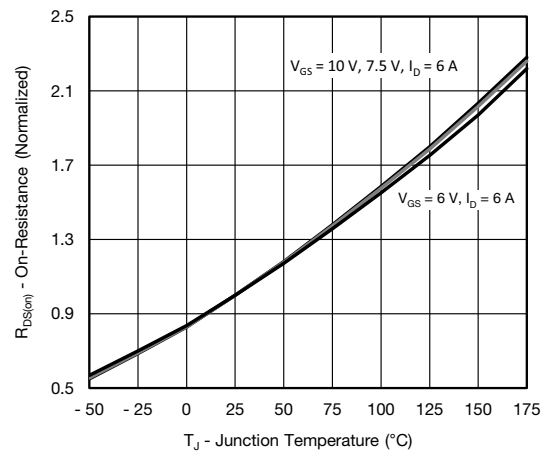
- Duty cycle  $\leq 1$  %.
- See SOA curve for voltage derating.
- $T_C = 25$  °C

<b>SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)						
Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Drain-Source Breakdown Voltage	$V_{DS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-100			V
Gate-Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-2		-4	
$V_{DS}$ Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-105		mV/°C
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$	$I_D = -250\text{ }\mu\text{A}$		6.6		
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	
		$V_{DS} = -100\text{ V}, V_{GS} = 0\text{ V}, T_J = 150\text{ }^\circ\text{C}$			-200	
On-State Drain Current <sup>a</sup>	$I_{D(on)}$	$V_{DS} = -5\text{ V}, V_{GS} = -10\text{ V}$	-20			A
Drain-Source On-State Resistance <sup>a</sup>	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -6\text{ A}$		0.115	0.138	$\Omega$
		$V_{GS} = -7.5\text{ V}, I_D = -6\text{ A}$		0.117	0.141	
		$V_{GS} = -6\text{ V}, I_D = -6\text{ A}$		0.118	0.142	
Forward Transconductance <sup>a</sup>	$g_{fs}$	$V_{DS} = -15\text{ V}, I_D = -6\text{ A}$		18		S
<b>Dynamic<sup>b</sup></b>						
Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = -50\text{ V}, f = 1\text{ MHz}$		2110		$\mu\text{F}$
Output Capacitance	$C_{oss}$		105			
Reverse Transfer Capacitance	$C_{rss}$		58			
Total Gate Charge <sup>c</sup>	$Q_g$	$V_{DS} = -50\text{ V}, V_{GS} = -10\text{ V}, I_D = -6.7\text{ A}$		40	60	nC
		$V_{DS} = -50\text{ V}, V_{GS} = -6\text{ V}, I_D = -6.7\text{ A}$		24	36	
Gate-Source Charge <sup>c</sup>	$Q_{gs}$	$V_{DS} = -50\text{ V}, V_{GS} = -6\text{ V}, I_D = -6.7\text{ A}$		12.5		
Gate-Drain Charge <sup>c</sup>	$Q_{gd}$	$V_{DS} = -50\text{ V}, V_{GS} = -6\text{ V}, I_D = -6.7\text{ A}$		6.7		
Gate Resistance	$R_g$	$f = 1\text{ MHz}$	2	8	16	$\Omega$
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = -50\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		7	14	ns
Rise Time <sup>c</sup>	$t_r$		12	20		
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$		46	70		
Fall Time <sup>c</sup>	$t_f$		40	60		
Turn-On Delay Time <sup>c</sup>	$t_{d(on)}$	$V_{DD} = -50\text{ V}, R_L = 10\text{ }\Omega$ $I_D \cong -5\text{ A}, V_{GEN} = -4.5\text{ V}, R_g = 1\text{ }\Omega$		12	20	
Rise Time <sup>c</sup>	$t_r$		105	160		
Turn-Off Delay Time <sup>c</sup>	$t_{d(off)}$		36	54		
Fall Time <sup>c</sup>	$t_f$		34	51		
<b>Source-Drain Diode Ratings and Characteristics</b> $T_C = 25\text{ }^\circ\text{C}^b$						
Continuous Current	$I_S$				-16.3	A
Pulsed Current ( $t = 100\text{ }\mu\text{s}$ )	$I_{SM}$				-40	
Forward Voltage <sup>a</sup>	$V_{SD}$	$I_F = -5\text{ A}, V_{GS} = 0\text{ V}$		-0.85	-1.5	V
Reverse Recovery Time	$t_{rr}$	$I_F = -5\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$		70	105	ns
Peak Reverse Recovery Current	$I_{RM(REC)}$		-7	-14	A	
Reverse Recovery Charge	$Q_{rr}$			220	330	nC

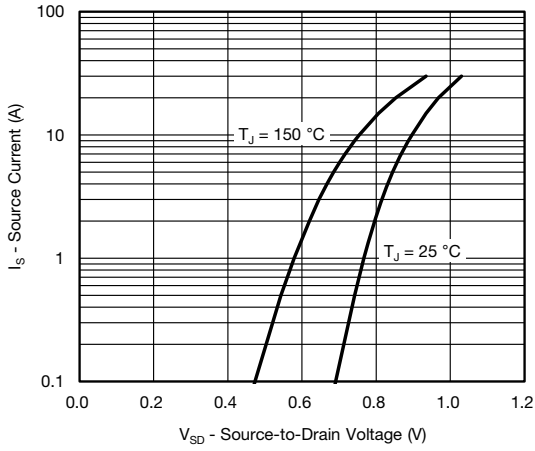
Notes:

- 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.

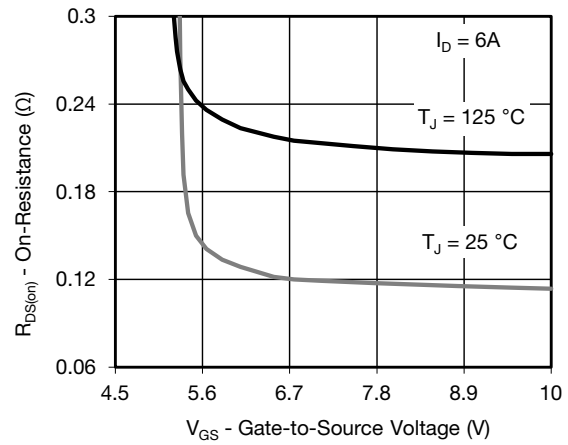
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

**Output Characteristics**

**Transfer Characteristics**

**On-Resistance vs. Drain Current and Gate Voltage**

**Capacitance**

**Gate Charge**

**On-Resistance vs. Junction Temperature**

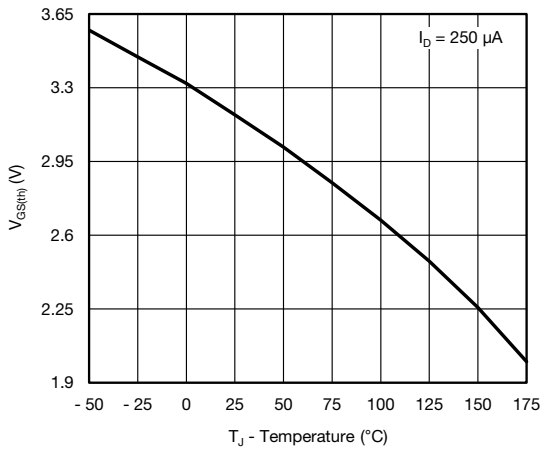
## TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



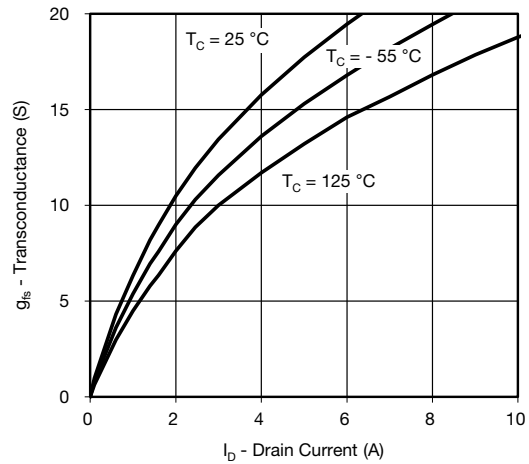
Source-Drain Diode Forward Voltage



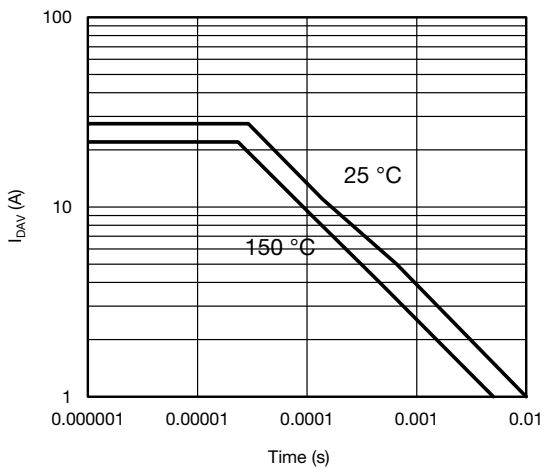
On-Resistance vs. Gate-to-Source Voltage



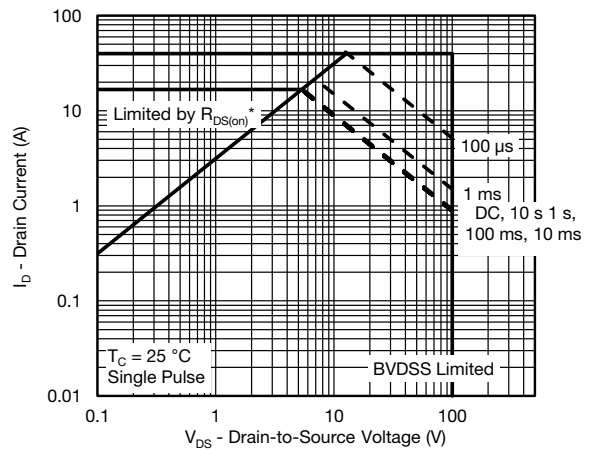
Threshold Voltage



Transconductance



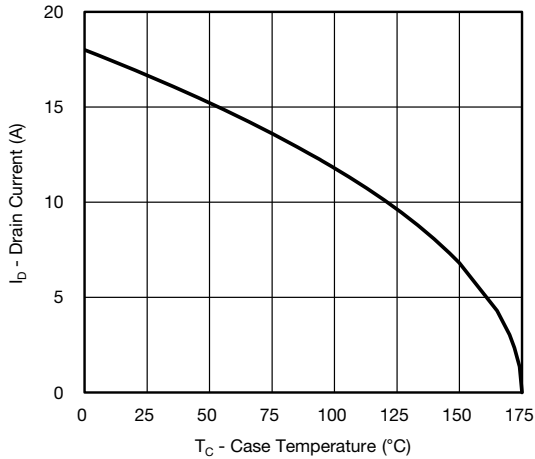
Single Pulse Avalanche Capability



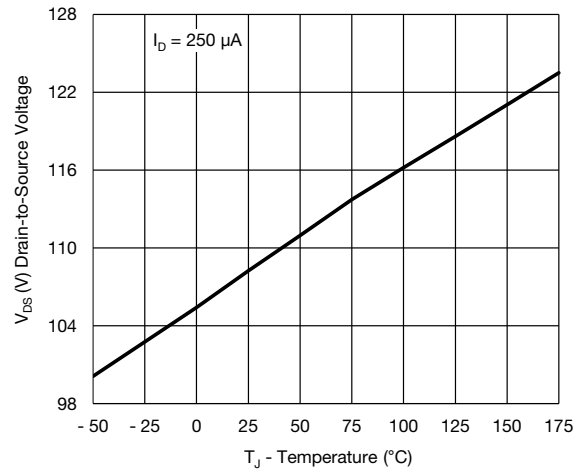
\*  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

Safe Operating Area, Junction-to-Case

**TYPICAL CHARACTERISTICS** (25 °C, unless otherwise noted)

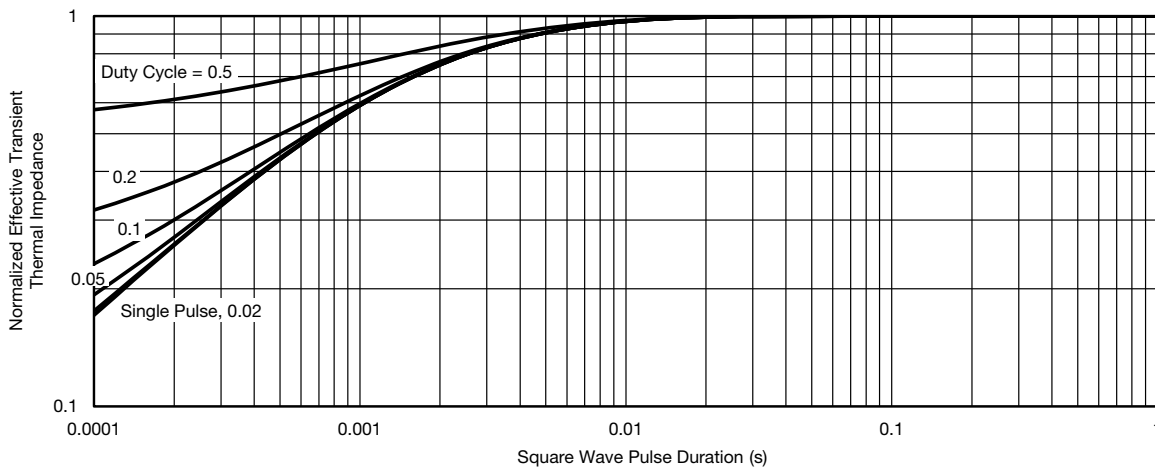


**Current Derating\***



**Drain Source Breakdown vs. Junction Temperature**

\* The power dissipation P<sub>D</sub> is based on T<sub>J(max.)</sub> = 150 °C, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



**Normalized Thermal Transient Impedance, Junction-to-Case**

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### TO-263 (D<sup>2</sup>PAK): 3-LEAD



DIM.	INCHES		MILLIMETERS		
	MIN.	MAX.	MIN.	MAX.	
A	0.160	0.190	4.064	4.826	
b	0.020	0.039	0.508	0.990	
b1	0.020	0.035	0.508	0.889	
b2	0.045	0.055	1.143	1.397	
c*	Thin lead	0.013	0.018	0.330	0.457
	Thick lead	0.023	0.028	0.584	0.711
c1	Thin lead	0.013	0.017	0.330	0.431
	Thick lead	0.023	0.027	0.584	0.685
c2	0.045	0.055	1.143	1.397	
D	0.340	0.380	8.636	9.652	
D1	0.220	0.240	5.588	6.096	
D2	0.038	0.042	0.965	1.067	
D3	0.045	0.055	1.143	1.397	
D4	0.044	0.052	1.118	1.321	
E	0.380	0.410	9.652	10.414	
E1	0.245	-	6.223	-	
E2	0.355	0.375	9.017	9.525	
E3	0.072	0.078	1.829	1.981	
e	0.100 BSC		2.54 BSC		
K	0.045	0.055	1.143	1.397	
L	0.575	0.625	14.605	15.875	
L1	0.090	0.110	2.286	2.794	
L2	0.040	0.055	1.016	1.397	
L3	0.050	0.070	1.270	1.778	
L4	0.010 BSC		0.254 BSC		
M	-	0.002	-	0.050	
ECN: T13-0707-Rev. K, 30-Sep-13					
DWG: 5843					

**Notes**

- Plane B includes maximum features of heat sink tab and plastic.
- No more than 25 % of L1 can fall above seating plane by max. 8 mils.
- Pin-to-pin coplanarity max. 4 mils.
- \*: Thin lead is for SUB, SYB.  
Thick lead is for SUM, SYM, SQM.
- Use inches as the primary measurement.
- This feature is for thick lead.

**RECOMMENDED MINIMUM PADS FOR D<sup>2</sup>PAK: 3-Lead**



Recommended Minimum Pads  
Dimensions in Inches/(mm)

[Return to Index](#)



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