

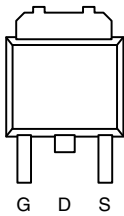
P-Channel 40-V (D-S) MOSFET

PRODUCT SUMMARY

V_{DS} (V)	$r_{DS(on)}$ (Ω)	I_D (A) ^a	Q_g (Typ.)
- 40	0.005 at $V_{GS} = - 10$ V	- 110	185 nC

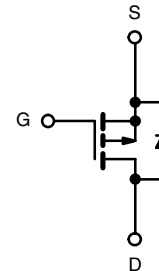
FEATURES

- TrenchFET[®] Power MOSFET


**RoHS
COMPLIANT**
TO-263


Top View

Drain Connected to Tab



P-Channel MOSFET

Ordering Information: SUM110P04-05-E3 (Lead (Pb)-free)

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

Parameter	Symbol	Limit	Unit	
Drain-Source Voltage	V_{DS}	- 40	V	
Gate-Source Voltage	V_{GS}	± 20		
Continuous Drain Current ($T_J = 175$ °C)	I_D	$T_C = 25$ °C	- 110 ^a	
		$T_C = 70$ °C	- 110 ^a	
		$T_A = 25$ °C	39 ^{b, c}	
		$T_A = 70$ °C	33 ^{b, c}	
Pulsed Drain Current	I_{DM}	240	A	
Continuous Source-Drain Diode Current	I_S	$T_C = 25$ °C		110
		$T_A = 25$ °C		10 ^{b, c}
Avalanche Current	I_{AS}	75		mJ
Single-Pulse Avalanche Energy	E_{AS}	281		
Maximum Power Dissipation	P_D	$T_C = 25$ °C	375	
		$T_C = 70$ °C	262	
		$T_A = 25$ °C	15 ^{b, c}	
		$T_A = 70$ °C	10.5 ^{b, c}	
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to 175	°C	
Soldering Recommendations (Peak Temperature) ^{d, e}		260		

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Typical	Maximum	Unit
Maximum Junction-to-Ambient ^{b, d}	R_{thJA}	8	10	°C/W
Maximum Junction-to-Case (Drain)	R_{thJC}	0.33	0.4	

Notes:

a. Package limited.

b. Surface Mounted on 1" x 1" FR4 board.

 c. $t = 10$ s.

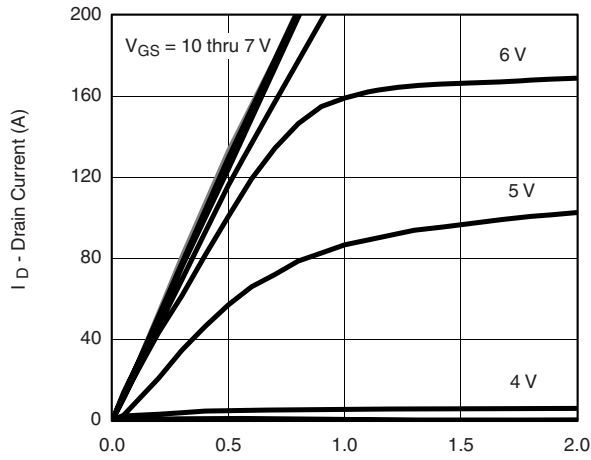
d. Maximum under Steady State conditions is 40 °C/W.

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}	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-40			V
V_{DS} Temperature Coefficient	$\Delta V_{DS}/T_J$	$I_D = -250\text{ }\mu\text{A}$		-40		mV/ $^\circ\text{C}$
$V_{GS(th)}$ Temperature Coefficient	$\Delta V_{GS(th)}/T_J$			-5.5		
Gate-Source Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-2	-3	-4	V
Gate-Source Leakage	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
		$V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}, T_J = 55\text{ }^\circ\text{C}$			-10	
On-State Drain Current ^a	$I_{D(on)}$	$V_{DS} \geq 5\text{ V}, V_{GS} = -10\text{ V}$	-120			A
Drain-Source On-State Resistance ^a	$r_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -20\text{ A}$		0.0041	0.005	Ω
Forward Transconductance ^a	g_{fs}	$V_{DS} = -15\text{ V}, I_D = -20\text{ A}$		75		S
Dynamic^b						
Input Capacitance	C_{iss}	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		11300		pF
Output Capacitance	C_{oss}			1510		
Reverse Transfer Capacitance	C_{rss}			1000		
Total Gate Charge	Q_g	$V_{DS} = -20\text{ V}, V_{GS} = -10\text{ V}, I_D = -110\text{ A}$		185	280	nC
Gate-Source Charge	Q_{gs}			48		
Gate-Drain Charge	Q_{gd}			42		
Gate Resistance	R_g	$f = 1\text{ MHz}$		4.0		Ω
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = -20\text{ V}, R_L = 0.18\text{ }\Omega$ $I_D \cong -110\text{ A}, V_{GEN} = -10\text{ V}, R_g = 1\text{ }\Omega$		25	40	ns
Rise Time	t_r			290	440	
Turn-Off Delay Time	$t_{d(off)}$			110	165	
Fall Time	t_f			35	55	
Drain-Source Body Diode Characteristics						
Continuous Source-Drain Diode Current	I_S	$T_C = 25\text{ }^\circ\text{C}$			-110	A
Pulse Diode Forward Current ^a	I_{SM}				-240	
Body Diode Voltage	V_{SD}	$I_S = -20\text{ A}$		-0.8	-1.5	V
Body Diode Reverse Recovery Time	t_{rr}	$I_F = -20\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, T_J = 25\text{ }^\circ\text{C}$		70	105	ns
Body Diode Reverse Recovery Charge	Q_{rr}			130	200	nC
Reverse Recovery Fall Time	t_a			37		ns
Reverse Recovery Rise Time	t_b			33		

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.

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.

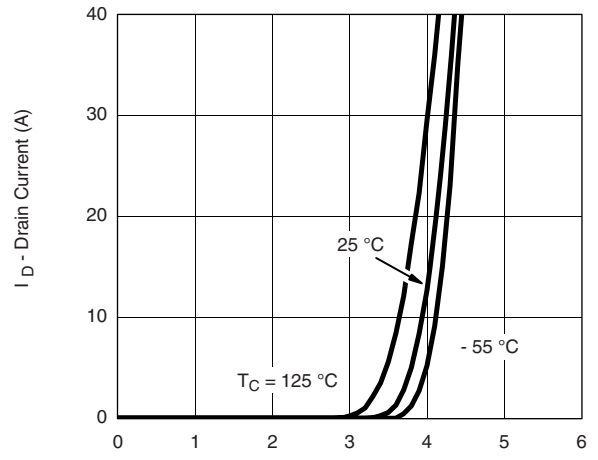
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted


$V_{GS} = 10$ thru 7 V

I_D - Drain Current (A)

V_{DS} - Drain-to-Source Voltage (V)

Output Characteristics



$T_C = 125\text{ }^\circ\text{C}$

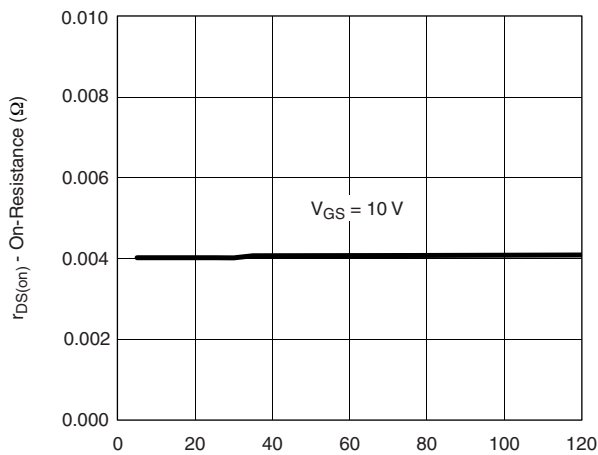
$25\text{ }^\circ\text{C}$

$-55\text{ }^\circ\text{C}$

I_D - Drain Current (A)

V_{GS} - Gate-to-Source Voltage (V)

Transfer Characteristics

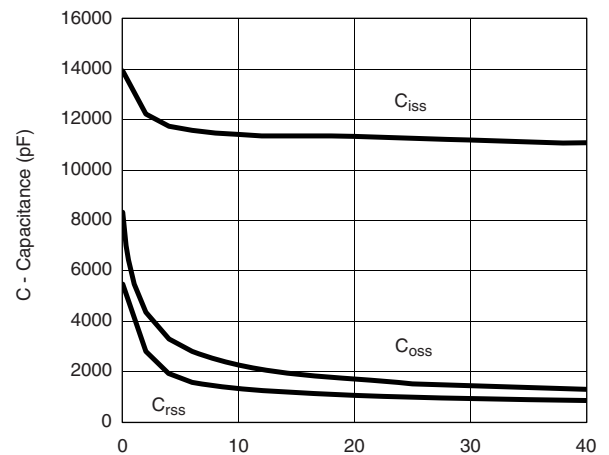


$V_{GS} = 10\text{ V}$

$r_{DS(on)}$ - On-Resistance (Ω)

I_D - Drain Current (A)

On-Resistance vs. Drain Current



C_{iss}

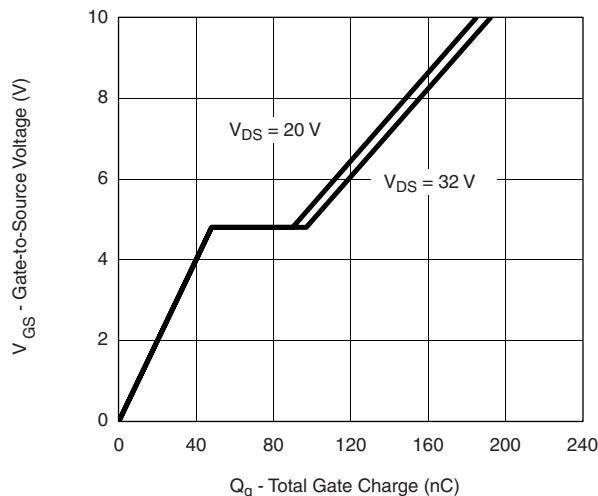
C_{oss}

C_{rss}

C - Capacitance (pF)

V_{DS} - Drain-to-Source Voltage (V)

Capacitance



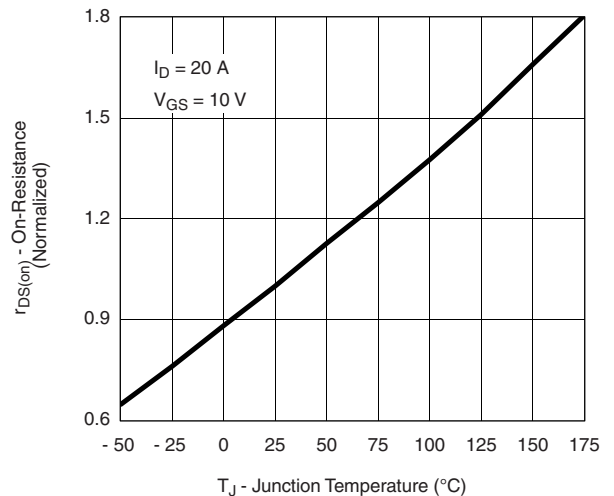
$V_{DS} = 20\text{ V}$

$V_{DS} = 32\text{ V}$

V_{GS} - Gate-to-Source Voltage (V)

Q_g - Total Gate Charge (nC)

Gate Charge



$I_D = 20\text{ A}$

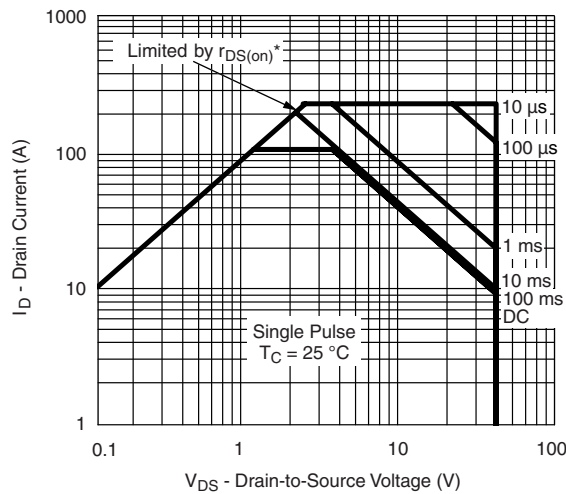
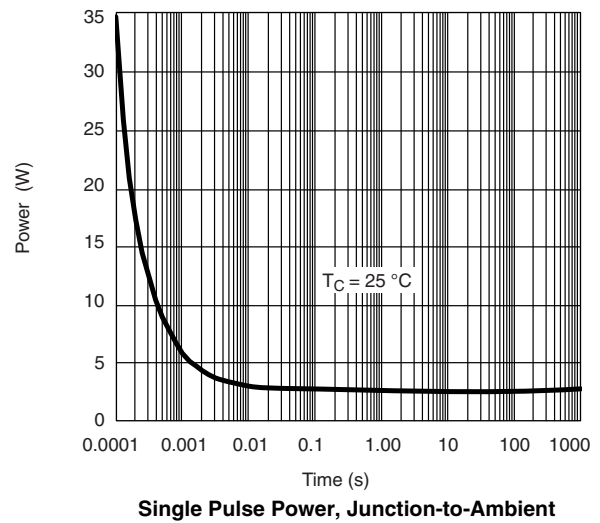
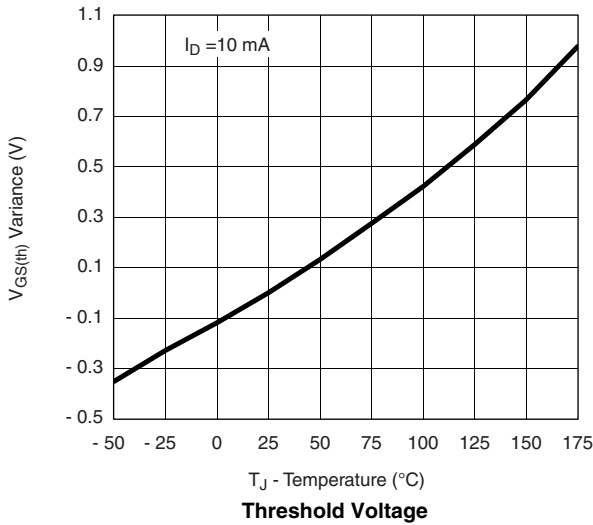
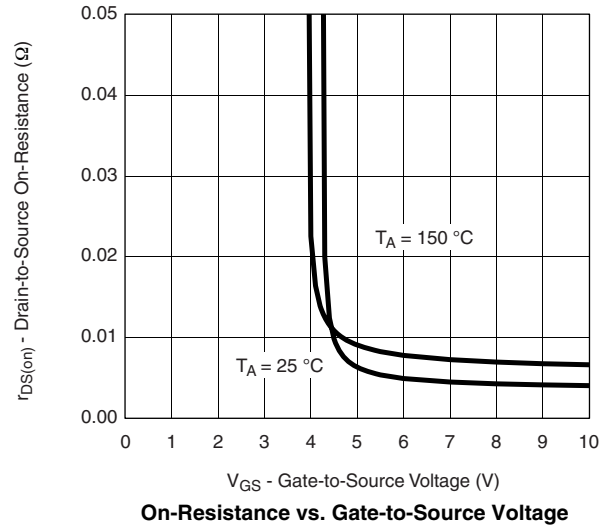
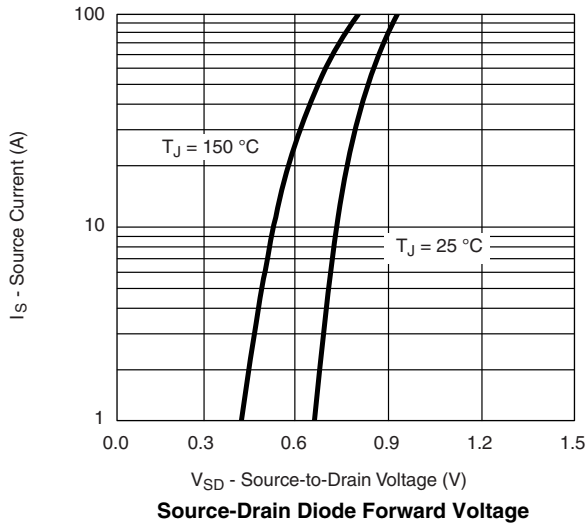
$V_{GS} = 10\text{ V}$

$r_{DS(on)}$ - On-Resistance (Normalized)

T_J - Junction Temperature ($^\circ\text{C}$)

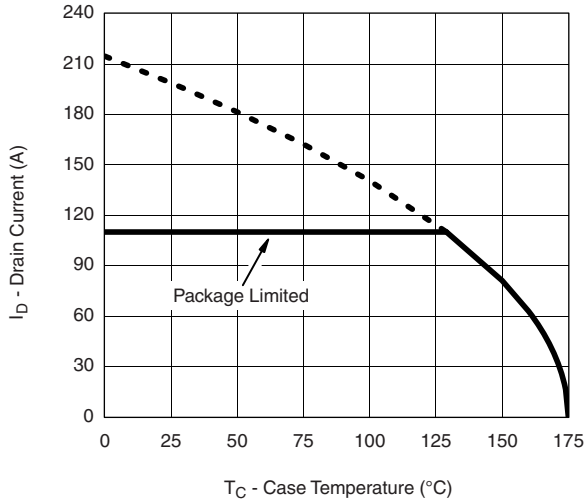
On-Resistance vs. Junction Temperature

TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted

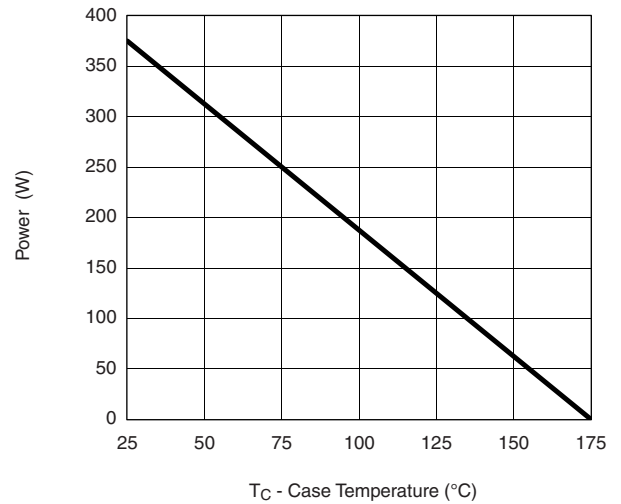


* $V_{GS} >$ minimum V_{GS} at which $r_{DS(on)}$ is specified

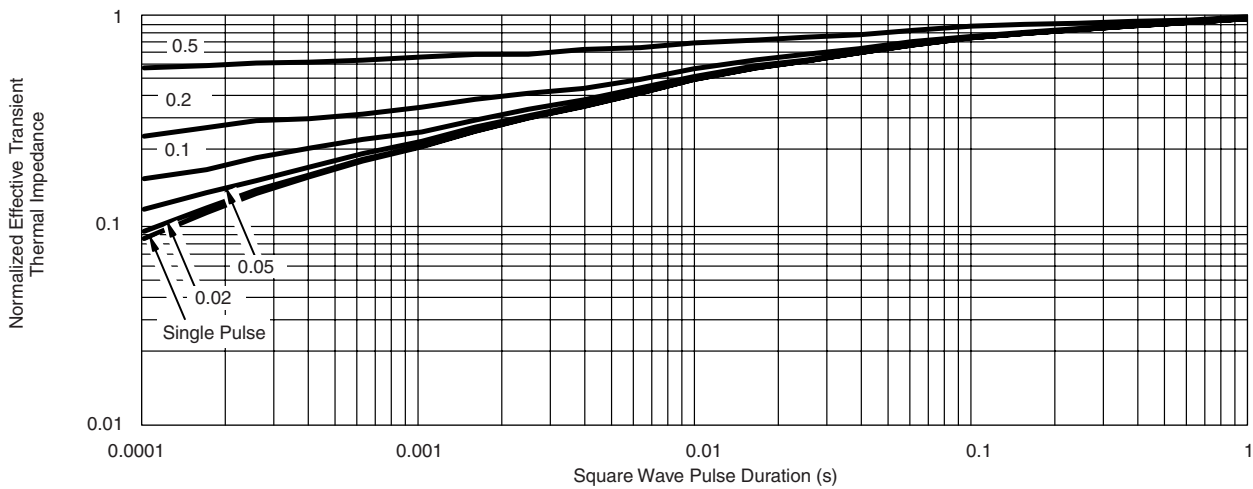
TYPICAL CHARACTERISTICS 25 °C, unless otherwise noted



Max. Avalanche and Drain Current vs. Case Temperature*



Power Derating, Junction-to-Case



Normalized Thermal Transient Impedance, Junction-to-Case

* The power dissipation P_D is based on $T_{J(max)} = 175\text{ °C}$, using junction-to-case thermal resistance, and is more useful in settling the upper power 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.

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see <http://www.vishay.com/ppg?73493>.

TO-263 (D²PAK): 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 D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

[Return to Index](#)



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.