

Power MOSFET

D²PAK (TO-263)


N-Channel MOSFET

PRODUCT SUMMARY

V_{DS} (V)	250	
$R_{DS(on)}$ (Ω)	$V_{GS} = 10\text{ V}$	0.45
Q_g max. (nC)	41	
Q_{gs} (nC)	6.5	
Q_{gd} (nC)	22	
Configuration	Single	

FEATURES

- Surface-mount
- Available in tape and reel
- Dynamic dv/dt rating
- Repetitive avalanche rated
- Fast switching
- Ease of paralleling
- Simple drive requirements
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Note

* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details



RoHS*
Available
HALOGEN
FREE
Available

DESCRIPTION

Third generation power MOSFETs from Vishay provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The D²PAK (TO-263) is a surface-mount power package capable of accommodating die size up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface-mount package. The D²PAK (TO-263) is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0 W in a typical surface-mount application.

ORDERING INFORMATION

Package	D ² PAK (TO-263)	D ² PAK (TO-263)	D ² PAK (TO-263)
Lead (Pb)-free and halogen-free	SiHF634S-GE3	-	SiHF634STRR-GE3 ^a
Lead (Pb)-free	-	IRF634STRLPbF ^a	IRF634STRRPbF ^a

Note

a. See device orientation

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

PARAMETER			SYMBOL	LIMIT	UNIT
Drain-source voltage			V _{DS}	250	V
Gate-source voltage			V _{GS}	± 20	
Continuous drain current	V _{GS} at 10 V	T _C = 25 °C	I _D	8.1	A
		T _C = 100 °C		5.1	
Pulsed drain current ^a			I _{DM}	32	
Linear derating factor				0.59	W/°C
Linear derating factor (PCB mount) ^e				0.025	
Single pulse avalanche energy ^b			E _{AS}	300	mJ
Avalanche current ^a			I _{AR}	8.1	A
Repetitive avalanche energy			E _{AR}	7.4	mJ
Maximum power dissipation	T _C = 25 °C		P _D	74	W
Maximum power dissipation (PCB mount) ^e	T _A = 25 °C			3.1	
Peak diode recovery dv/dt ^c			dv/dt	4.8	V/ns
Operating junction and storage temperature range			T _J , T _{stg}	-55 to +150	°C
Soldering recommendations (peak temperature) ^d	for 10 s			300	

Notes

a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)

b. $V_{DD} = 50\text{ V}$, starting $T_J = 25\text{ }^{\circ}\text{C}$, $L = 7.3\text{ mH}$, $R_g = 25\text{ }\Omega$, $I_{AS} = 8.1\text{ A}$ (see fig. 12)

c. $I_{SD} \leq 8.1\text{ A}$, $di/dt \leq 120\text{ A}/\mu\text{s}$, $V_{DD} \leq V_{DS}$, $T_J \leq 150\text{ }^{\circ}\text{C}$

d. 1.6 mm from case

e. When mounted on 1" square PCB (FR-4 or G-10 material)

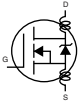

**THERMAL RESISTANCE RATINGS**

PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	62	°C/W
Maximum junction-to-ambient (PCB mount) ^a	R_{thJA}	-	40	
Maximum junction-to-case (drain)	R_{thJC}	-	1.7	

Note

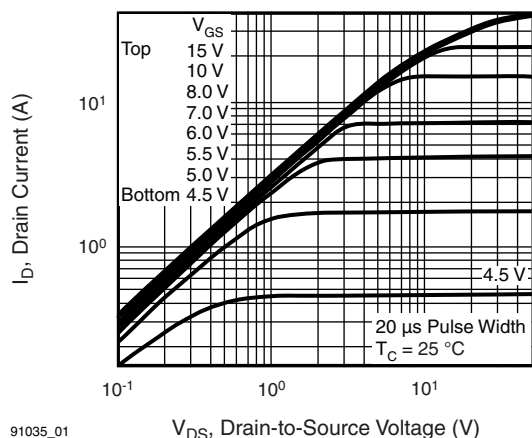
a. When mounted on 1" square PCB (FR-4 or G-10 material)

SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted)

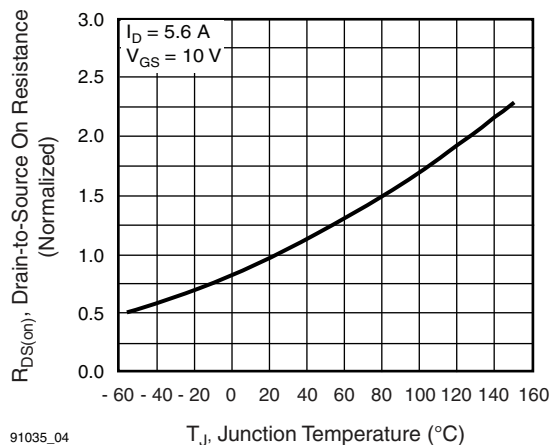
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Static							
Drain-source breakdown voltage	V_{DS}	$V_{GS} = 0$, $I_D = 250\text{ }\mu\text{A}$		250	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^{\circ}\text{C}$, $I_D = 1\text{ mA}$		-	0.37	-	V/ $^{\circ}\text{C}$
Gate-source threshold voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$		2.0	-	4.0	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 250\text{ V}$, $V_{GS} = 0\text{ V}$		-	-	25	μA
		$V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$		-	-	250	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 5.1\text{ A}^b$	-	-	0.45	Ω
Forward transconductance	g_{fs}	$V_{DS} = 50\text{ V}$, $I_D = 5.1\text{ A}^b$		1.6	-	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1.0\text{ MHz}$, see fig. 5		-	770	-	pF
Output capacitance	C_{oss}			-	190	-	
Reverse transfer capacitance	C_{rss}			-	52	-	
Total gate charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 5.6\text{ A}$, $V_{DS} = 200\text{ V}$, see fig. 6 and 13 ^b	-	-	41	nC
Gate-source charge	Q_{gs}			-	-	6.5	
Gate-drain charge	Q_{gd}			-	-	22	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 125\text{ V}$, $I_D = 5.6\text{ A}$, $R_g = 12\text{ }\Omega$, $R_D = 22\text{ }\Omega$, see fig. 10 ^b		-	9.6	-	ns
Rise time	t_r			-	21	-	
Turn-off delay time	$t_{d(off)}$			-	42	-	
Fall time	t_f			-	19	-	
Gate input resistance	R_g	$f = 1\text{ MHz}$, open drain		0.6	-	2.9	Ω
Internal drain inductance	L_D	Between lead, 6 mm (0.25") from package and center of die contact 		-	4.5	-	nH
Internal source inductance	L_S			-	7.5	-	
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	8.1	A
Pulsed diode forward current ^a	I_{SM}			-	-	32	
Body diode voltage	V_{SD}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_S = 8.1\text{ A}$, $V_{GS} = 0\text{ V}^b$		-	-	2.0	V
Body diode reverse recovery time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$, $I_F = 5.6\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}^b$		-	220	440	ns
Body diode reverse recovery charge	Q_{rr}			-	1.2	2.4	μC
Forward turn-on time	t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by L_S and L_D)					

Notes

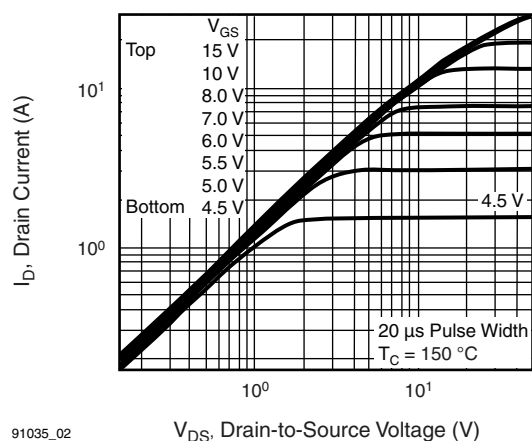
- a. Repetitive rating; pulse width limited by maximum junction temperature (see fig. 11)
b. Pulse width $\leq 300\text{ }\mu\text{s}$; duty cycle $\leq 2\%$

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)


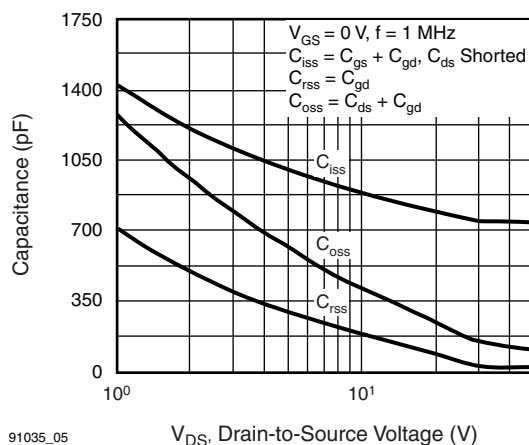
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Fig. 1 - Typical Output Characteristics, $T_C = 25^\circ\text{C}$


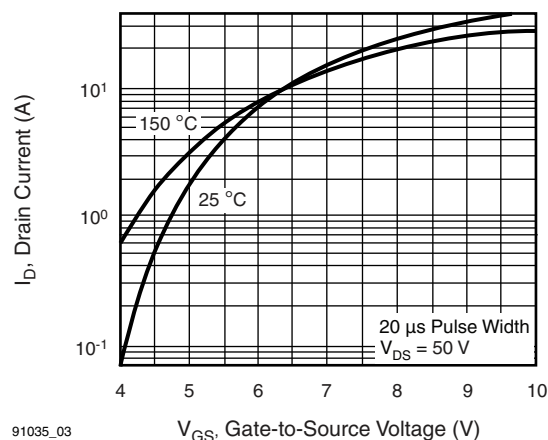
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Fig. 4 - Normalized On-Resistance vs. Temperature


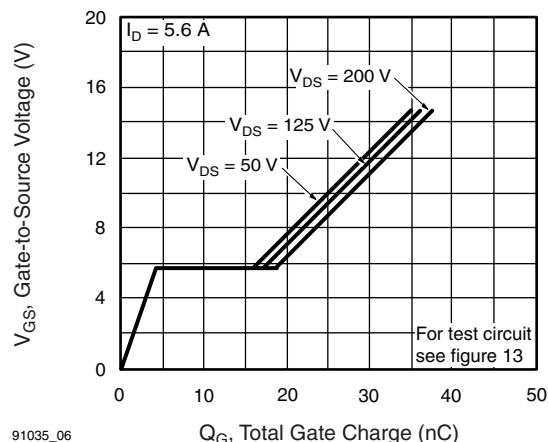
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Fig. 2 - Typical Output Characteristics, $T_C = 150^\circ\text{C}$


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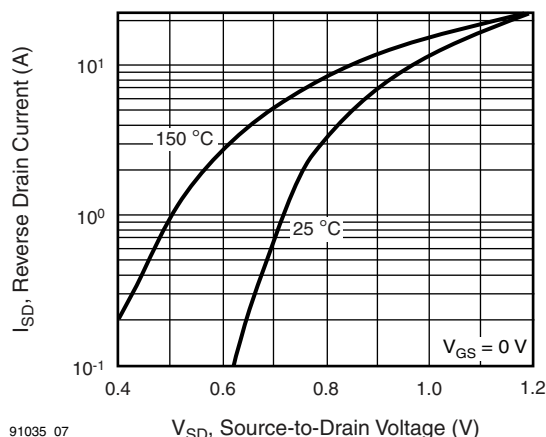
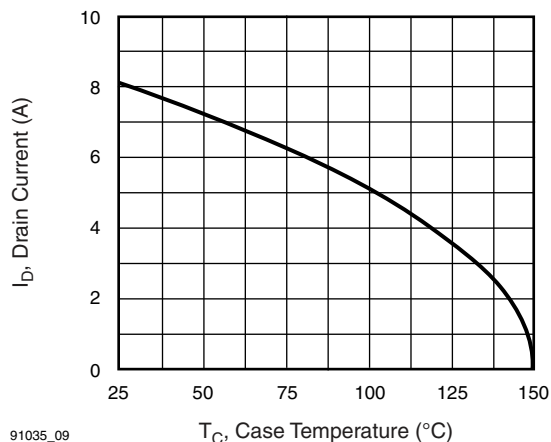
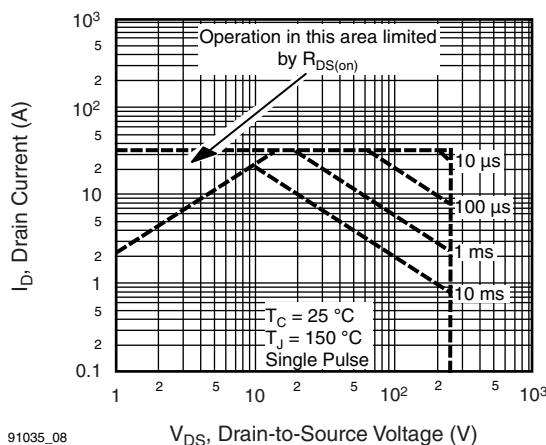
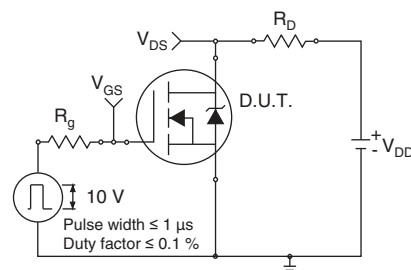
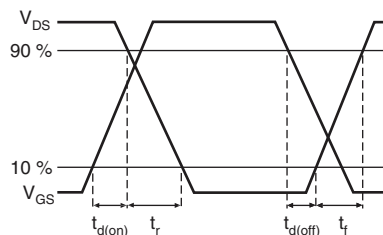
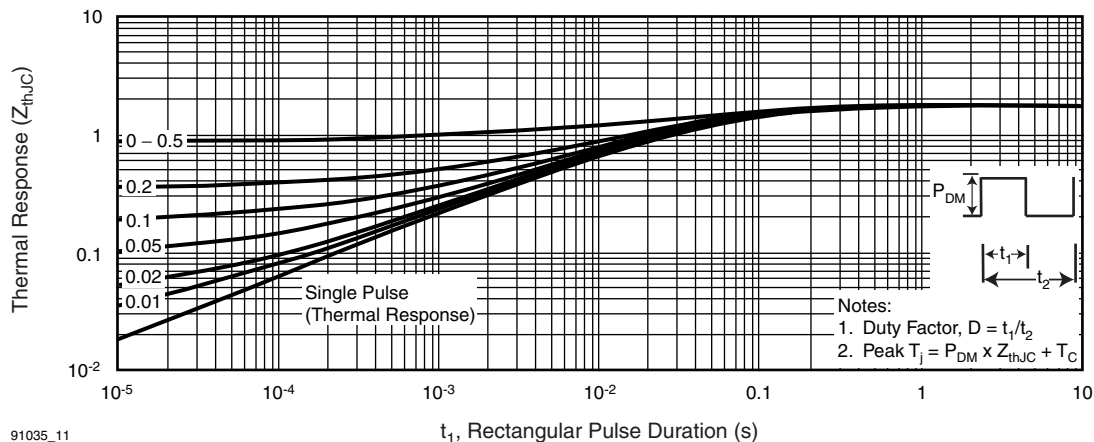
Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage


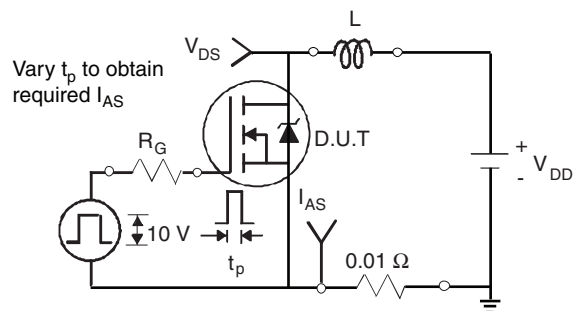
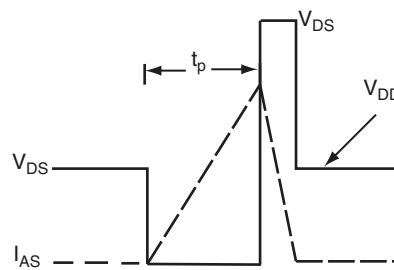
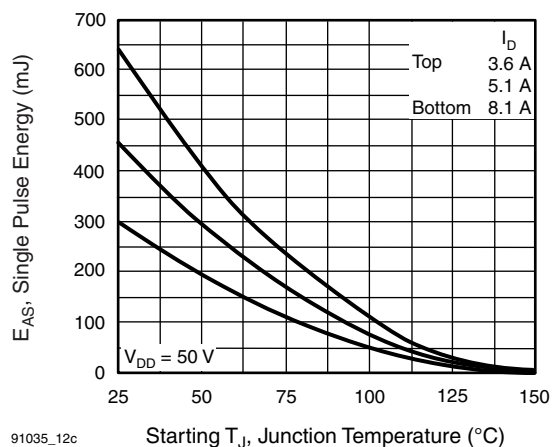
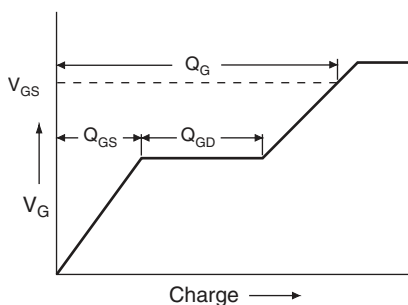
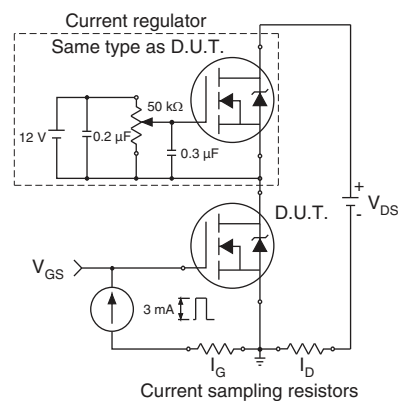
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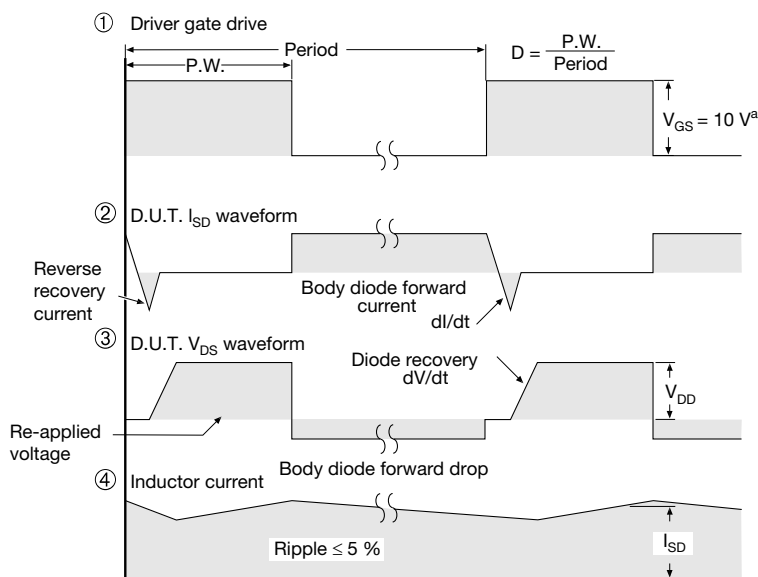
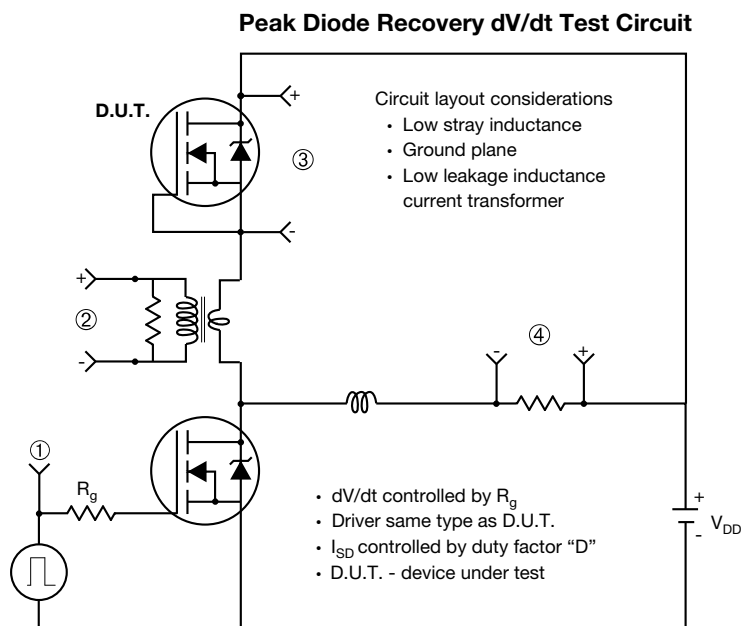
Fig. 3 - Typical Transfer Characteristics


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Fig. 6 - Typical Gate Charge vs. Gate-to-Source Voltage


Fig. 7 - Typical Source-Drain Diode Forward Voltage

Fig. 9 - Maximum Drain Current vs. Case Temperature

Fig. 8 - Maximum Safe Operating Area

Fig. 10a - Switching Time Test Circuit

Fig. 10b - Switching Time Waveforms

Fig. 11 - Maximum Effective Transient Thermal Impedance, Junction-to-Case


Fig. 12a - Unclamped Inductive Test Circuit

Fig. 12b - Unclamped Inductive Waveforms

Fig. 12c - Maximum Avalanche Energy vs. Drain Current

Fig. 13a - Basic Gate Charge Waveform

Fig. 13b - Gate Charge Test Circuit


Note

a. $V_{GS} = 5 V$ for logic level devices

Fig. 14 - For N-Channel

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	MILLIMETERS		INCHES	
DIM.	MIN.	MAX.	MIN.	MAX.
D1	6.86	-	0.270	-
E	9.65	10.67	0.380	0.420
E1	6.22	-	0.245	-
e	2.54 BSC		0.100 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	-	1.65	-	0.066
L2	-	1.78	-	0.070
L3	0.25 BSC		0.010 BSC	
L4	4.78	5.28	0.188	0.208

RECOMMENDED MINIMUM PADS FOR D²PAK: 3-Lead



Recommended Minimum Pads
Dimensions in Inches/(mm)

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