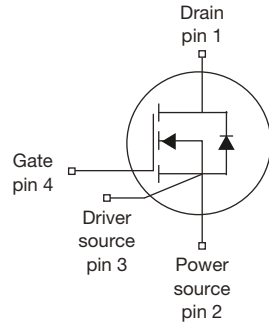
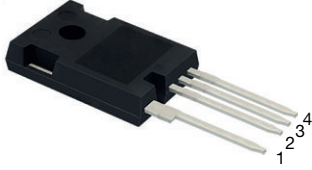


E Series Power MOSFET

TO-247AD 4L


FEATURES

- 4th generation E series technology
- Low figure-of-merit (FOM) $R_{on} \times Q_g$
- Low effective capacitance ($C_{o(er)}$)
- Reduced switching and conduction losses
- Avalanche energy rated (UIS)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT
HALOGEN
FREE

APPLICATIONS

- Server and telecom power supplies
- Switch mode power supplies (SMPS)
- Power factor correction power supplies (PFC)
- Lighting
 - High-intensity discharge (HID)
 - Fluorescent ballast lighting
- Industrial
 - Welding
 - Motor drives
 - Battery chargers
 - Solar (PV inverters)

PRODUCT SUMMARY

V_{DS} (V) at T_J max.	650	
$R_{DS(on)}$ typ. (Ω) at 25 °C	$V_{GS} = 10$ V	0.034
Q_g max. (nC)	123	
Q_{gs} (nC)	39	
Q_{gd} (nC)	16	
Configuration	Single	

ORDERING INFORMATION

Package	TO-247AD 4L
Lead (Pb)-free and halogen-free	SiHL039N60E-GE3

ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted)


PARAMETER	SYMBOL	LIMIT	UNIT
Drain-source voltage	V_{DS}	600	V
Gate-source voltage	V_{GS}	± 30	
Continuous drain current ($T_J = 150$ °C)	V_{GS} at 10 V	$T_C = 25$ °C	62
		$T_C = 100$ °C	39
Pulsed drain current ^a	I_{DM}	190	A
Linear derating factor		2.9	W/°C
Single pulse avalanche energy ^b	E_{AS}	633	mJ
Maximum power dissipation	P_D	357	W
Operating junction and storage temperature range	T_J, T_{stg}	-55 to +150	°C
Drain-source voltage slope	dv/dt	100	V/ns
Reverse diode dv/dt ^d		100	
Soldering recommendations (peak temperature) ^c	For 10 s	260	°C

Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{DD} = 120$ V, starting $T_J = 25$ °C, $L = 28.2$ mH, $R_g = 25$ Ω , $I_{AS} = 6.7$ A
- 1.6 mm from case
- $I_{SD} \leq I_D$, $di/dt = 100$ A/ μ s, starting $T_J = 25$ °C



THERMAL RESISTANCE RATINGS				
PARAMETER	SYMBOL	TYP.	MAX.	UNIT
Maximum junction-to-ambient	R_{thJA}	-	40	°C/W
Maximum junction-to-case (drain)	R_{thJC}	-	0.35	

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}	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$		600	-	-	V
V_{DS} temperature coefficient	$\Delta V_{DS}/T_J$	Reference to $25\text{ }^\circ\text{C}, I_D = 1\text{ mA}$		-	0.63	-	V/°C
Gate-source threshold voltage (N)	$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$		3	-	5	V
Gate-source leakage	I_{GSS}	$V_{GS} = \pm 20\text{ V}$		-	-	± 100	nA
		$V_{GS} = \pm 30\text{ V}$		-	-	± 1	μA
Zero gate voltage drain current	I_{DSS}	$V_{DS} = 600\text{ V}, V_{GS} = 0\text{ V}$		-	-	1	μA
		$V_{DS} = 480\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$		-	-	10	
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 32\text{ A}$	-	0.034	0.039	Ω
Forward transconductance	g_{fs}	$V_{DS} = 40\text{ V}, I_D = 32\text{ A}$		-	31	-	S
Dynamic							
Input capacitance	C_{iss}	$V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, f = 100\text{ KHz}$		-	5552	-	pF
Output capacitance	C_{oss}			-	170	-	
Reverse transfer capacitance	C_{rss}			-	2	-	
Effective output capacitance, energy related	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = 0\text{ V}$		-	211	-	
Effective output capacitance, time related	$C_{o(tr)}$			-	1308	-	
Total gate charge	Q_g	$V_{GS} = 10\text{ V}$	$I_D = 32\text{ A}, V_{DS} = 480\text{ V}$	-	82	123	nC
Gate-source charge	Q_{gs}			-	39	-	
Gate-drain charge	Q_{gd}			-	16	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 480\text{ V}, I_D = 32\text{ A}, V_{GS} = 10\text{ V}, R_g = 10.1\text{ }\Omega$		-	49	98	ns
Rise time	t_r			-	22	44	
Turn-off delay time	$t_{d(off)}$			-	85	128	
Fall time	t_f			-	3	6	
Gate input resistance	R_g	$f = 1\text{ MHz}, \text{open drain}$		0.4	0.9	1.8	Ω
Drain-Source Body Diode Characteristics							
Continuous source-drain diode current	I_S	MOSFET symbol showing the integral reverse p - n junction diode 		-	-	62	A
Pulsed diode forward current	I_{SM}			-	-	190	
Diode forward voltage	V_{SD}	$T_J = 25\text{ }^\circ\text{C}, I_S = 32\text{ A}, V_{GS} = 0\text{ V}$		-	-	1.2	V
Reverse recovery time	t_{rr}	$T_J = 25\text{ }^\circ\text{C}, I_F = I_S = 32\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_R = 400\text{ V}$		-	493	986	ns
Reverse recovery charge	Q_{rr}			-	7	14	μC
Reverse recovery current	I_{RRM}			-	23	-	A

TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

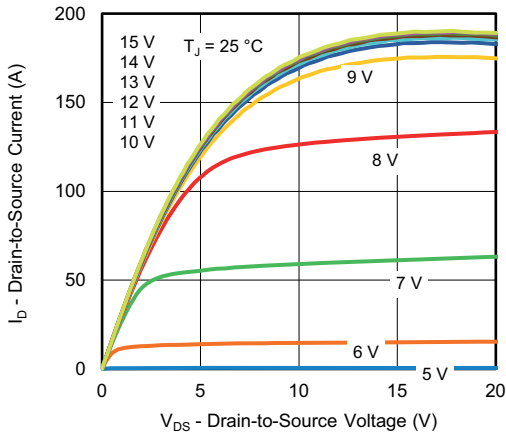


Fig. 1 - Typical Output Characteristics

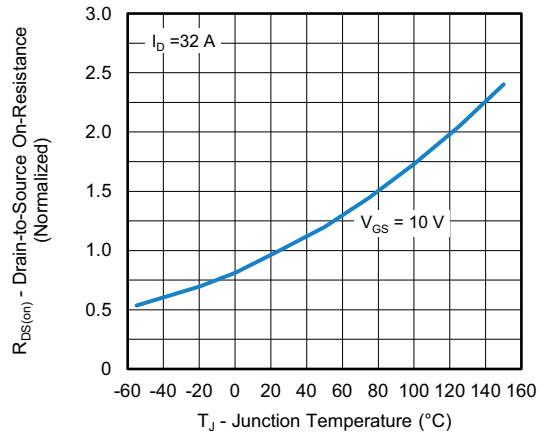


Fig. 4 - Normalized On-Resistance vs. Temperature

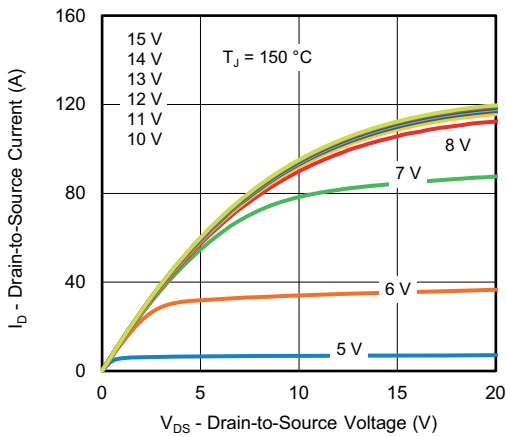


Fig. 2 - Typical Output Characteristics

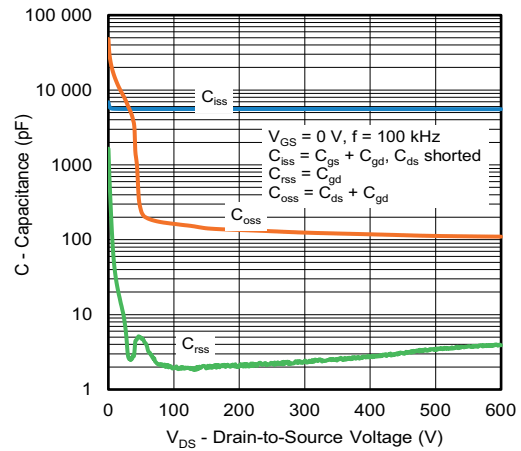


Fig. 5 - Typical Capacitance vs. Drain-to-Source Voltage

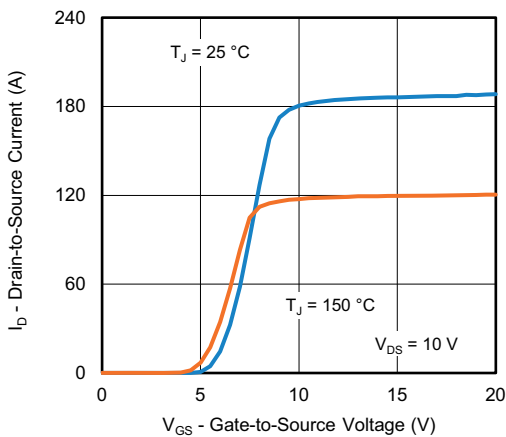


Fig. 3 - Typical Transfer Characteristics

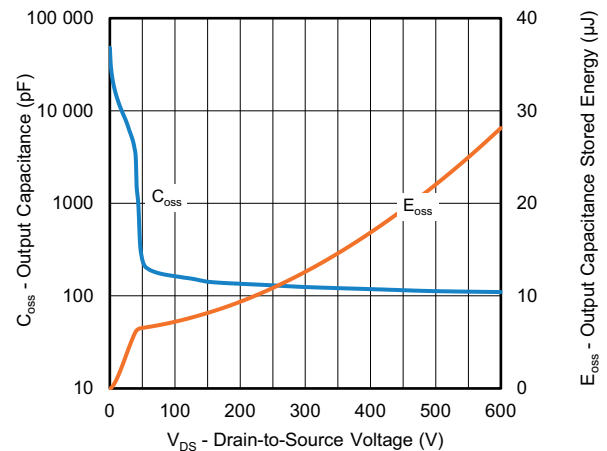


Fig. 6 - C_{oss} and E_{oss} vs. V_{DS}

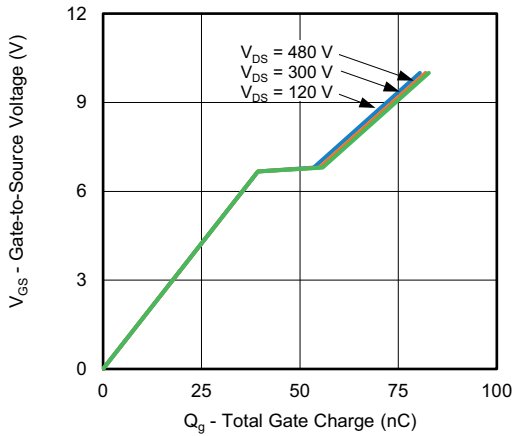


Fig. 7 - Typical Gate Charge vs. Gate-to-Source Voltage

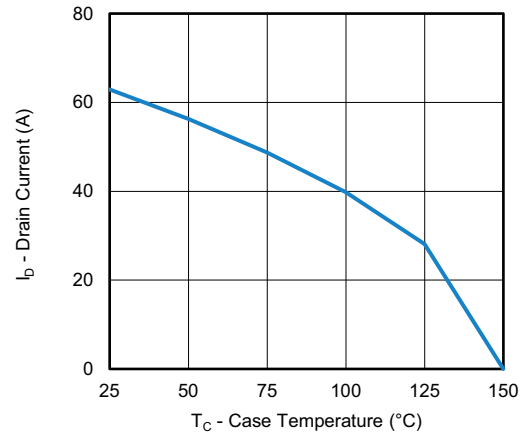


Fig. 10 - Maximum Drain Current vs. Case Temperature

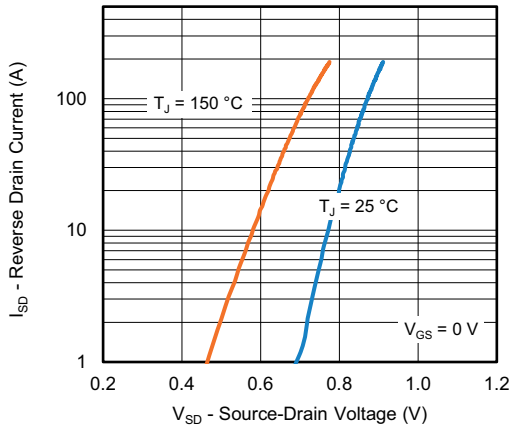


Fig. 8 - Typical Source-Drain Diode Forward Voltage

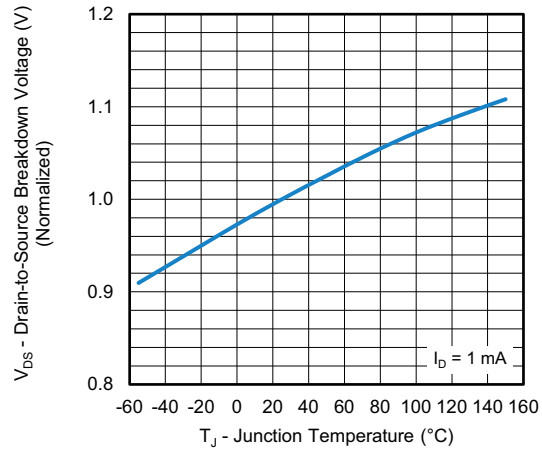


Fig. 11 - Temperature vs. Drain-to-Source Voltage

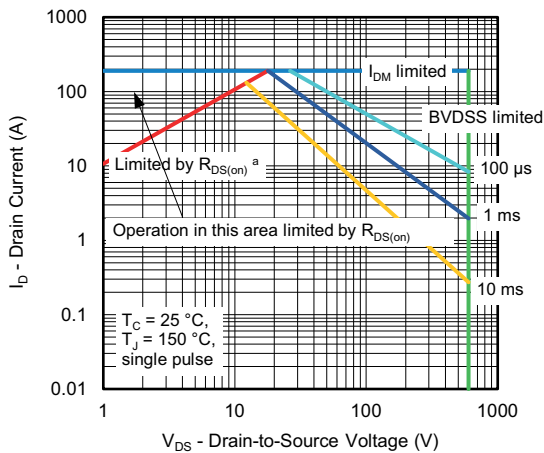


Fig. 9 - Maximum Safe Operating Area

Note

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

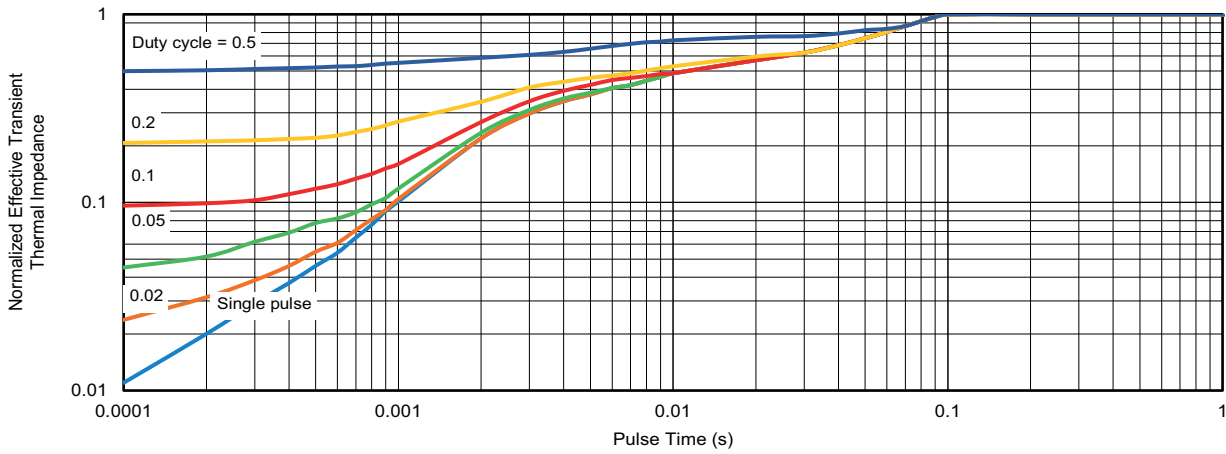


Fig. 12 - Normalized Thermal Transient Impedance, Junction-to-Case

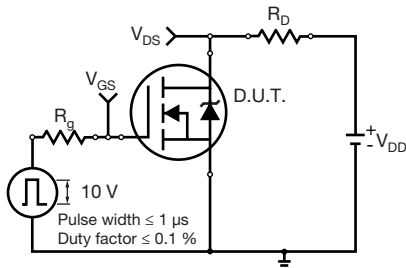


Fig. 13 - Switching Time Test Circuit

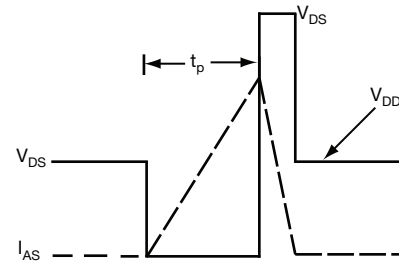


Fig. 16 - Unclamped Inductive Waveforms

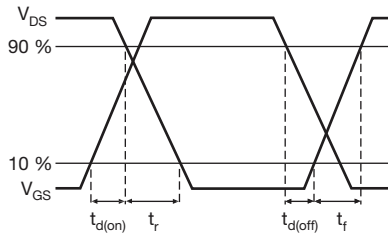


Fig. 14 - Switching Time Waveforms

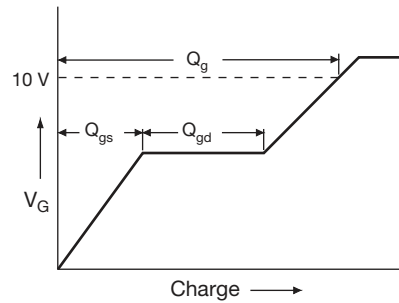


Fig. 17 - Basic Gate Charge Waveform

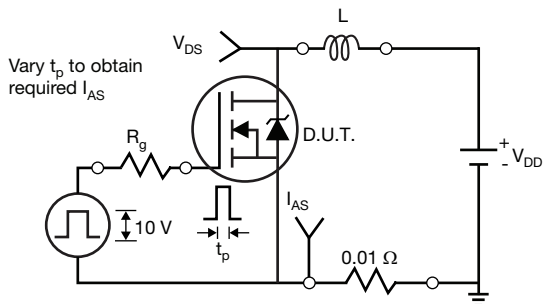


Fig. 15 - Unclamped Inductive Test Circuit

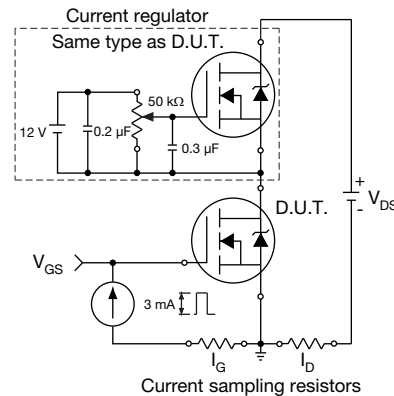


Fig. 18 - Gate Charge Test Circuit

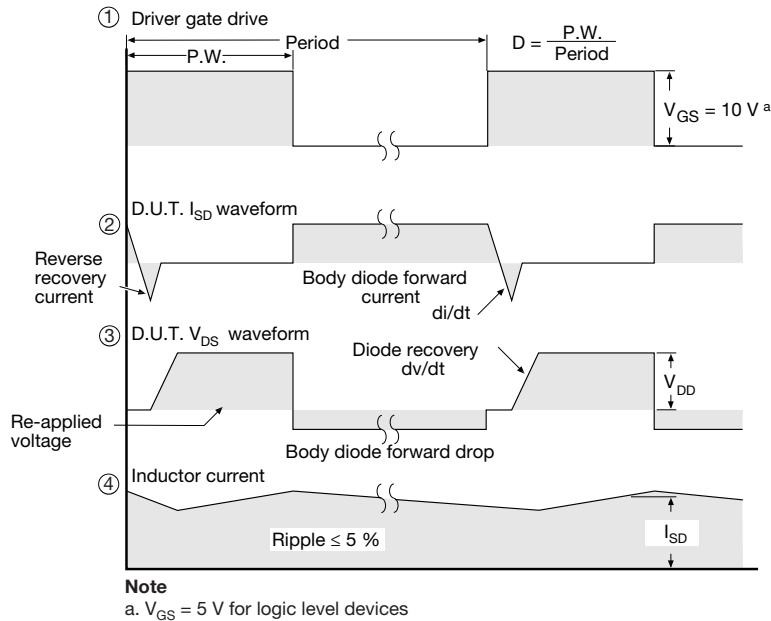
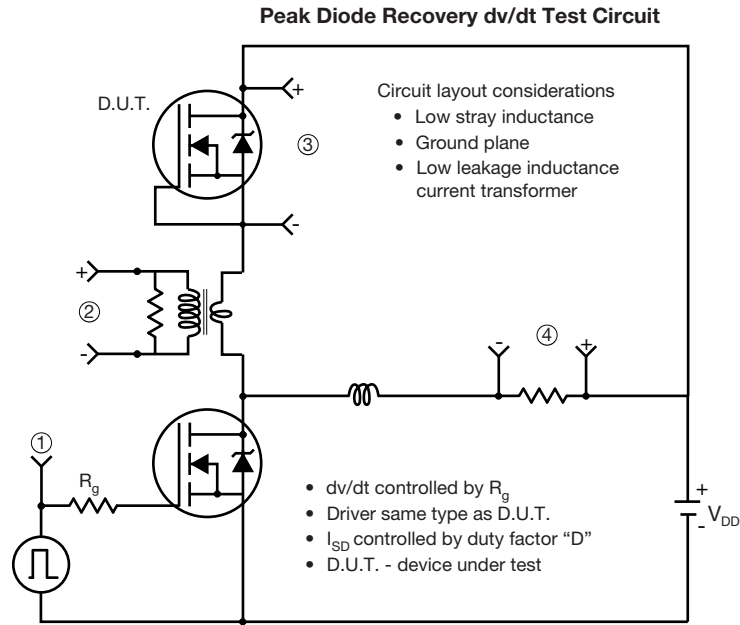


Fig. 19 - For N-Channel

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DIM.	MILLIMETERS	
	MIN.	MAX.
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.07	1.33
b1	2.39	2.94
b3	1.07	1.60
c	0.55	0.68
D	23.30	23.60
D1	16.25	17.65
D2	0.95	1.25
E	15.75	16.13
E1	13.10	14.15
E2	3.68	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	1.95	2.35
e	2.54 BSC.	
e1	5.08 BSC.	
L	17.31	17.82
L1	3.97	4.37
L2	2.35	2.65
ØP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30

Notes

- All dimensions are in mm. Angles are in degrees
- Dimension D and E do not include mold flash
- All metal surfaces: tin plated, except area of cut
- Dimensioning and toleranceing confirm to ASME Y14.5M-1994
- Creepage 1 is 8.58 mm (ref.) which is the distance alongside the surface between drain (pin 1) and trough the notch towards source (pin 2).
Creepage 2 is 7.95 mm (ref.) which is the distance from end of the copper slug on the backside of the package to either pin 2, pin 3 or pin 4



DIM.	MILLIMETERS		
	MIN.	NOM.	MAX.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b	1.07	1.20	1.33
b1	2.39	2.67	2.94
b2	1.07	1.30	1.60
b3	2.39	2.53	2.69
c	0.55	0.60	0.68
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
D3	5.55	5.71	6.01
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
E5	1.95	2.15	2.35
e	2.54 BSC.		
e1	5.08 BSC.		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ØP	3.51	3.61	3.65
ØP1	7.19 ref.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30
ECN: S25-0851-Rev. C, 18-Jul-2025 DWG: 6121			

Notes

- All dimensions are in mm
- Dimension D and E do not include mold flash.
- Creepage 1 is 8.40 mm (ref.) which is the distance alongside the surface between drain (pin 1) and trough the notch towards source (pin 2).
Creepage 2 is 7.70 mm (ref.) which is the distance from end of the copper slug on the backside of the package to either pin 2, pin 3 or pin 4



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