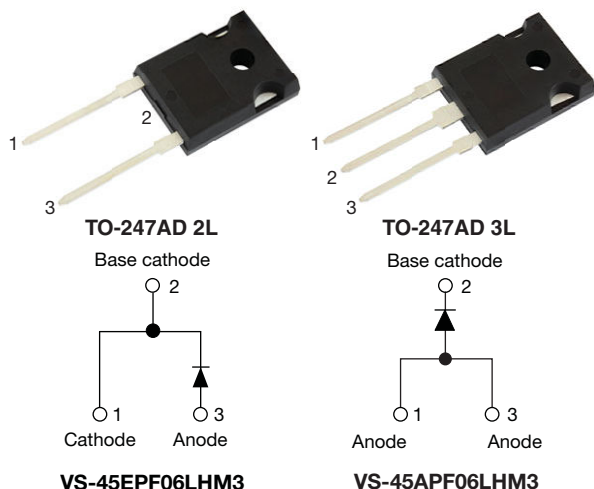


## Fast Soft Recovery Rectifier Diode, 45 A



### FEATURES

- Very low forward voltage drop
- Glass passivated pellet chip junction
- AEC-Q101 qualified meets JESD 201 class 1A whisker test
- Flexible solution for reliable AC power rectification
- High surge, low  $V_F$  rugged blocking diode for DC charging stations
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- On-board and off-board EV / HEV battery chargers
- Renewable energy inverters

### DESCRIPTION

High voltage rectifiers optimized for very low forward voltage drop with moderate leakage, and short reverse recovery time.

These devices are intended for use in main rectification (single or three phase bridge)

### PRIMARY CHARACTERISTICS

$I_{F(AV)}$	45 A
$V_R$	600 V
$V_F$ at $I_F$	1.31 V
$I_{FSM}$	550 A
$t_{rr}$	60 ns
$T_J$ max.	150 °C
Package	TO-247AD 2L, TO-247AD 3L
Circuit configuration	Single
Snap factor	0.5

### MAJOR RATINGS AND CHARACTERISTICS

SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Sinusoidal waveform	45	A
$V_{RRM}$		600	V
$I_{FSM}$		550	A
$V_F$	20 A, $T_J = 25$ °C	1.09	V
$t_{rr}$	1 A, 100 A / $\mu$ s	60	ns
$T_J$		-40 to +150	°C

### VOLTAGE RATINGS

PART NUMBER	$V_{RRM}$ , MAXIMUM PEAK REVERSE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}$ AT 150 °C mA
VS-45EPF06LHM3	600	700	8
VS-45APF06LHM3	600	700	

**ABSOLUTE MAXIMUM RATINGS**

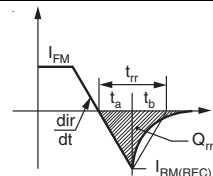
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	$T_C = 108\text{ }^\circ\text{C}$ , 180° conduction half sine wave	45	A
Maximum peak one cycle non-repetitive surge current	$I_{FSM}$	10 ms sine pulse, rated $V_{RRM}$ applied	462	
		10 ms sine pulse, no voltage reapplied	550	
Maximum $I^2t$ for fusing	$I^2t$	10 ms sine pulse, rated $V_{RRM}$ applied	1069	$\text{A}^2\text{s}$
		10 ms sine pulse, no voltage reapplied	1513	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	$t = 0.1\text{ ms to } 10\text{ ms}$ , no voltage reapplied	15 125	$\text{A}^2\sqrt{\text{s}}$

**ELECTRICAL SPECIFICATIONS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum forward voltage drop	$V_{FM}$	45 A, $T_J = 25\text{ }^\circ\text{C}$	1.31	V
Forward slope resistance	$r_t$	$T_J = 150\text{ }^\circ\text{C}$	4.4	$\text{m}\Omega$
Threshold voltage	$V_{F(TO)}$		1.1	V
Maximum reverse leakage current	$I_{RM}$	$T_J = 25\text{ }^\circ\text{C}$	0.1	mA
		$T_J = 150\text{ }^\circ\text{C}$	8	

**RECOVERY CHARACTERISTICS**

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Reverse recovery time	$t_{rr}$	$I_F$ at 40 A <sub>pk</sub> 25 A/ $\mu\text{s}$ 25 °C	180	ns
Reverse recovery current	$I_{rr}$		3.2	A
Reverse recovery charge	$Q_{rr}$		0.5	$\mu\text{C}$
Snap factor	S	Typical	0.5	

**THERMAL - MECHANICAL SPECIFICATIONS**

THERMAL MECHANICAL CHARACTERISTICS					
PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range		T <sub>J</sub> , T <sub>Stg</sub>		-40 to +150	°C
Maximum thermal resistance, junction to case		R <sub>thJC</sub>	DC operation	0.4	°C/W
Maximum thermal resistance, junction to ambient		R <sub>thJA</sub>		40	
Typical thermal resistance, case to heatsink		R <sub>thCS</sub>	Mounting surface, smooth, and greased	0.25	
Approximate weight				6	g
				0.21	oz.
Mounting torque	minimum			6 (5)	kgf · cm (lbf · in)
	maximum			12 (10)	
Marking device			Case style TO-247AD 2L	45EPF06LH	
			Case style TO-247AD 3L	45APF06LH	

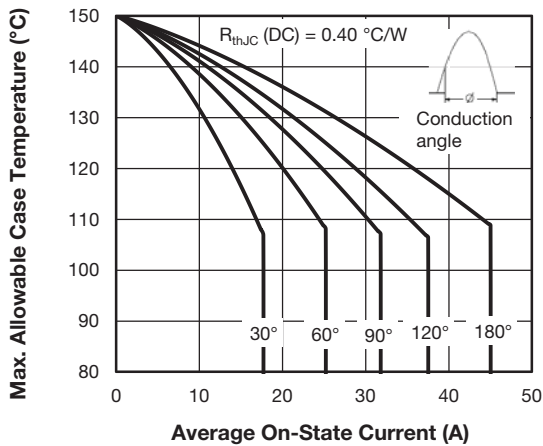


Fig. 1 - Current Rating Characteristics

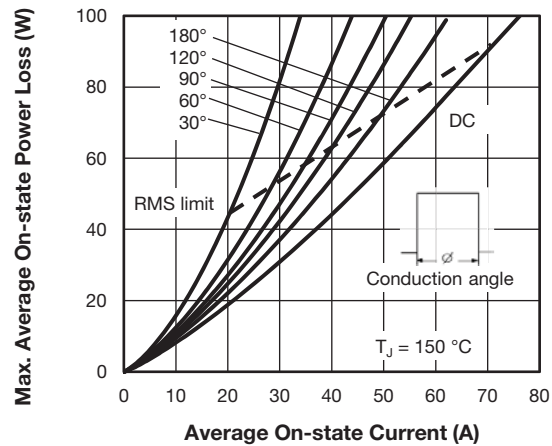


Fig. 4 - Forward Power Loss Characteristics

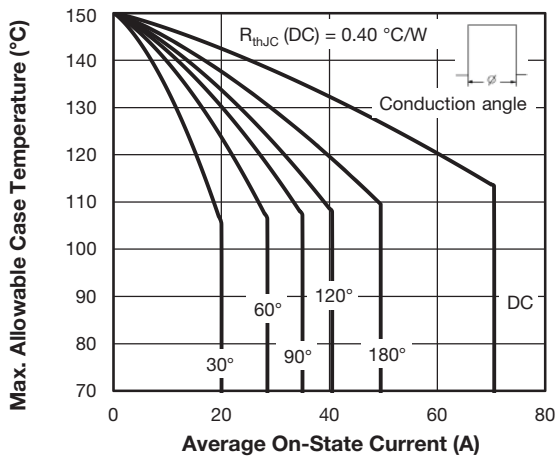


Fig. 2 - Current Rating Characteristics

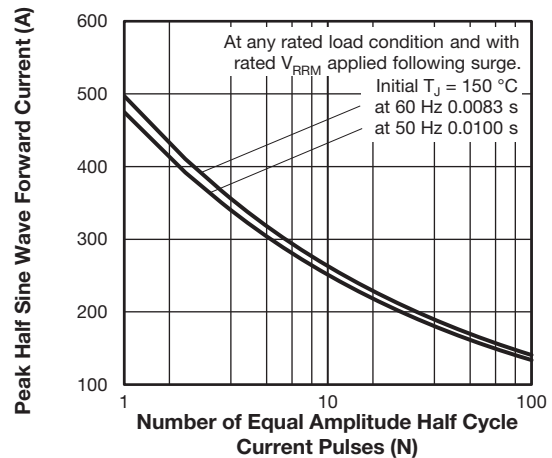


Fig. 5 - Maximum Non-Repetitive Surge Current

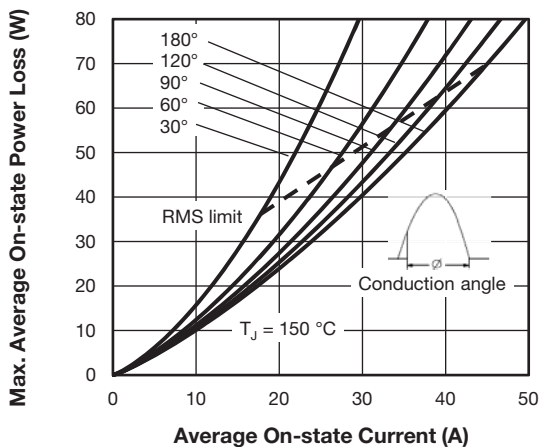


Fig. 3 - Forward Power Loss Characteristics

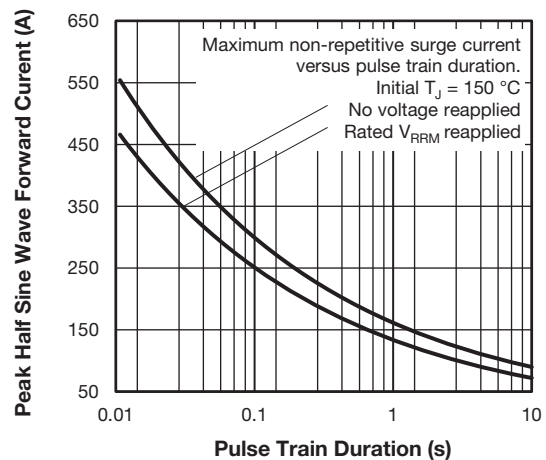


Fig. 6 - Maximum Non-Repetitive Surge Current

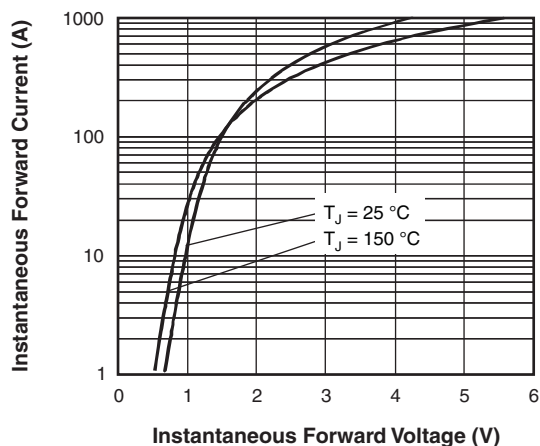


Fig. 7 - Forward Voltage Drop Characteristics

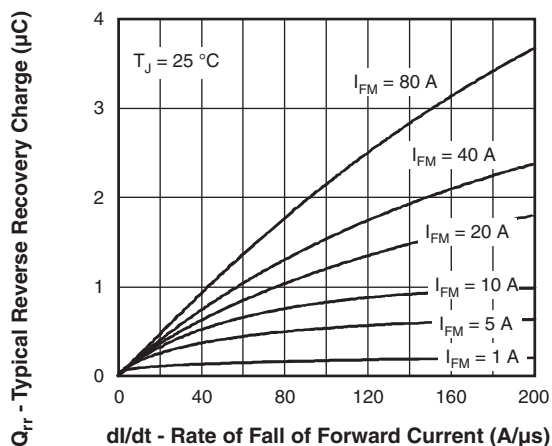


Fig. 10 - Recovery Charge Characteristics,  $T_J = 25\text{ }^{\circ}\text{C}$

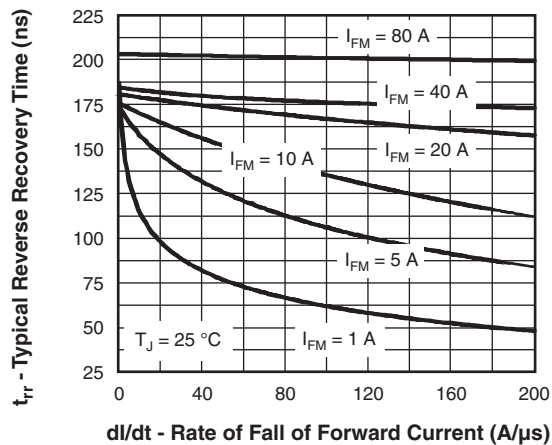


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

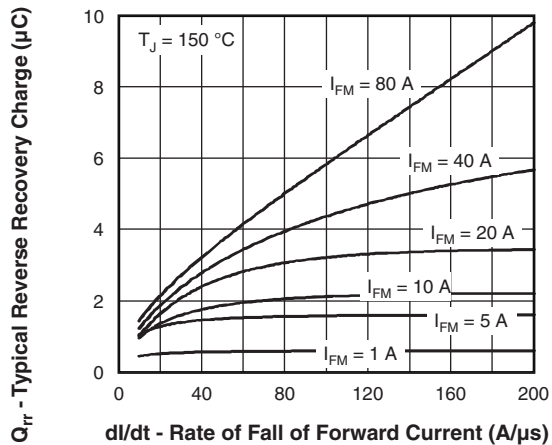


Fig. 11 - Recovery Charge Characteristics,  $T_J = 150\text{ }^{\circ}\text{C}$

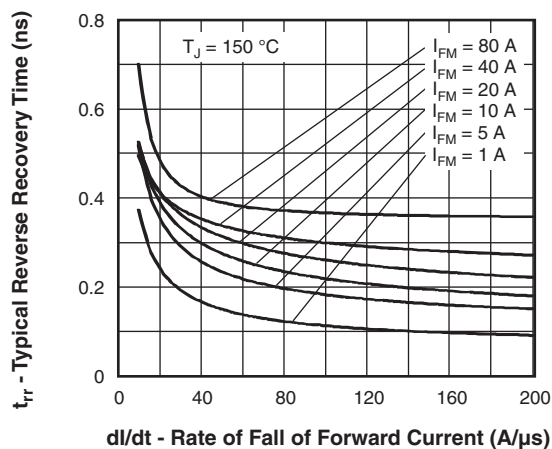


Fig. 9 - Recovery Time Characteristics,  $T_J = 150\text{ }^{\circ}\text{C}$

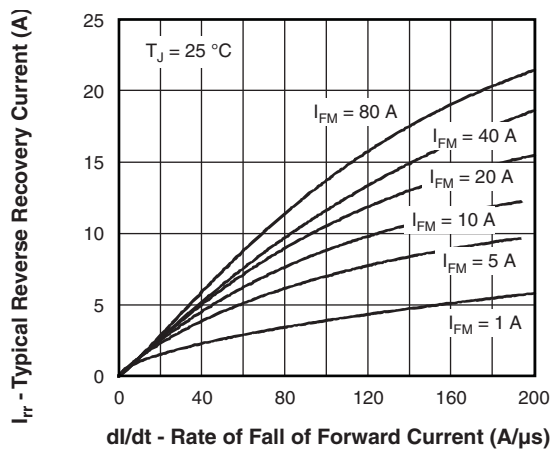


Fig. 12 - Recovery Current Characteristics,  $T_J = 25\text{ }^{\circ}\text{C}$

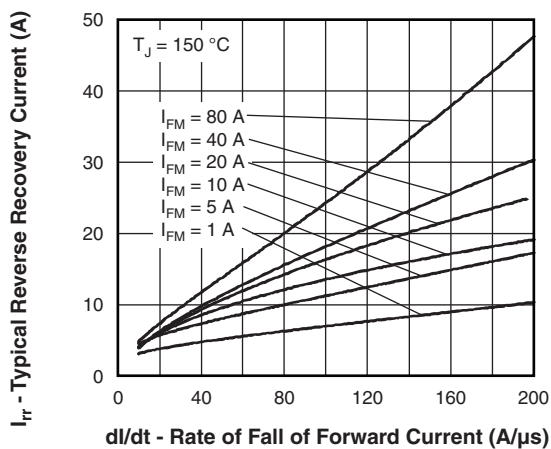


Fig. 13 - Recovery Current Characteristics,  $T_J = 150\text{ }^{\circ}C$

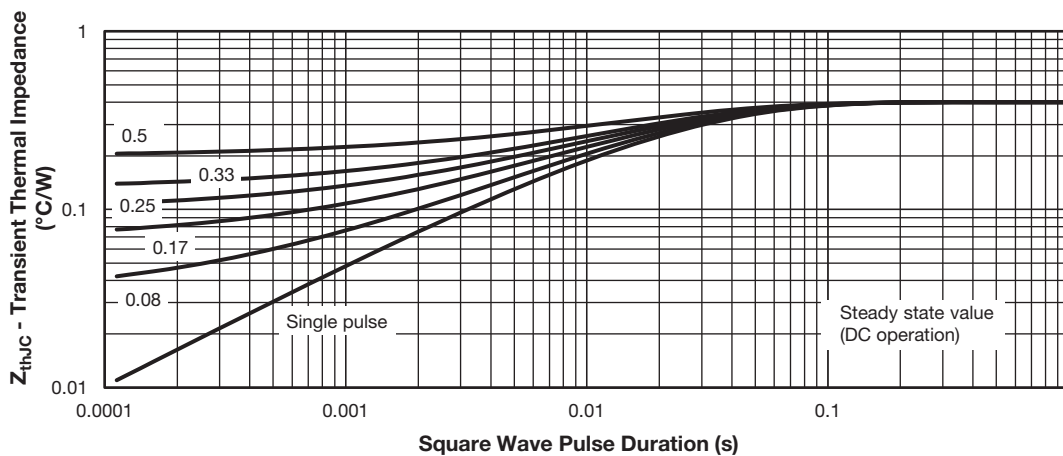


Fig. 14 - Thermal Impedance  $Z_{thJC}$  Characteristics

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>45</b>	<b>E</b>	<b>P</b>	<b>F</b>	<b>06</b>	<b>L</b>	<b>H</b>	<b>M3</b>
	1	2	3	4	5	6	7	8	9

- 1** - Vishay Semiconductors product
- 2** - Current rating (45 = 45 A)
- 3** - Circuit configuration:
  - E = single, 2 pins
  - A = single, 3 pins
- 4** - Package:
  - P = TO-247AD
- 5** - Type of silicon:
  - F = fast recovery rectifier
- 6** - Voltage code x 100 =  $V_{RRM}$  ————— **06 = 600 V**
- 7** - L = long leads
- 8** - H = AEC-Q101 qualified
- 9** - Environmental digit:
  - M3 = halogen-free, RoHS-compliant, and terminations lead (Pb)-free

**ORDERING INFORMATION** (Example)

PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-45EPF06LHM3	25	500	Antistatic plastic tubes
VS-45APF06LHM3	25	500	Antistatic plastic tubes

**LINKS TO RELATED DOCUMENTS**

Dimensions	TO-247AD 2L	<a href="http://www.vishay.com/doc?95536">www.vishay.com/doc?95536</a>
	TO-247AD 3L	<a href="http://www.vishay.com/doc?95626">www.vishay.com/doc?95626</a>
Part marking information	TO-247AD 2L	<a href="http://www.vishay.com/doc?95648">www.vishay.com/doc?95648</a>
	TO-247AD 3L	<a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a>



### TO-247AD 2L

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.50	2.49	0.059	0.098	
b	0.99	1.40	0.039	0.055	
b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.34	0.065	0.092	
c	0.38	0.89	0.015	0.035	
c1	0.38	0.84	0.015	0.033	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4
D2	0.51	1.35	0.020	0.053	

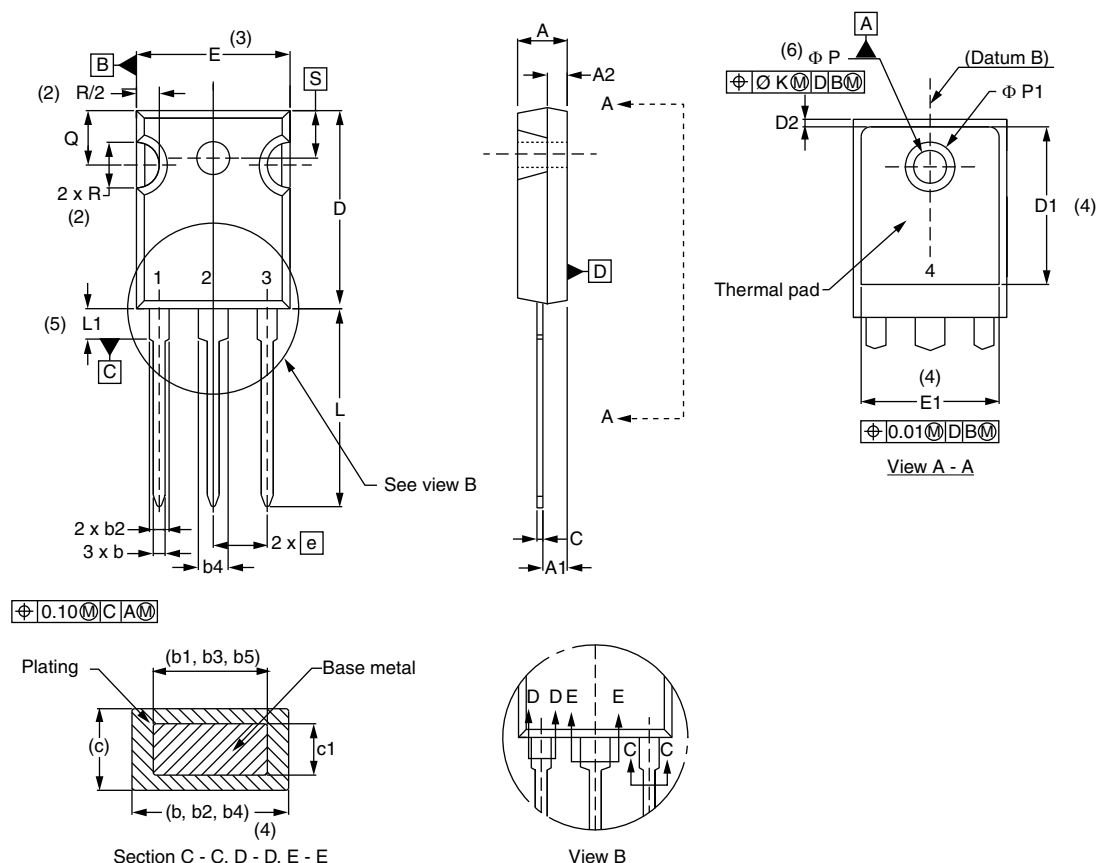
SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E	15.29	15.87	0.602	0.625	3
E1	13.46	-	0.53	-	
e	5.46 BSC		0.215 BSC		
$\phi K$	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
$\phi P$	3.56	3.66	0.14	0.144	
$\phi P1$	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	0.178	0.216	
S	5.51 BSC		0.217 BSC		

#### Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Contour of slot optional
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions D1 and E1
- Lead finish uncontrolled in L1
- $\phi P$  to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4

# TO-247AD 3L

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.50	2.49	0.059	0.098	
b	0.99	1.40	0.039	0.055	
b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.34	0.065	0.092	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
c	0.38	0.89	0.015	0.035	
c1	0.38	0.84	0.015	0.033	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4

## Notes

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
- (2) Contour of slot optional
- (3) Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
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- (5) Lead finish uncontrolled in L1
- (6) Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- (7) Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4





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