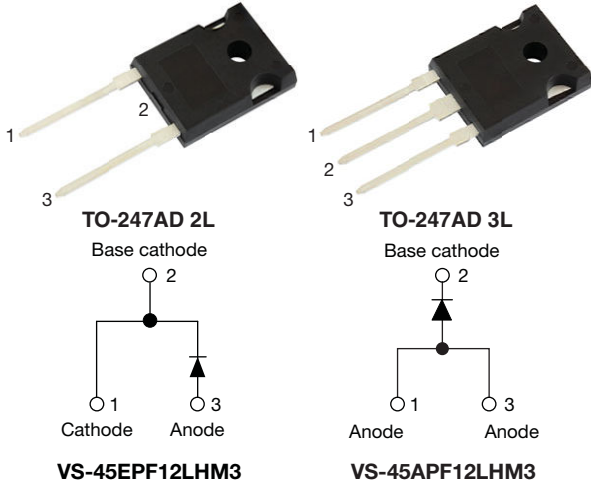


## Fast Soft Recovery Rectifier Diode, 45 A



### 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
$V_R$	1200 V
$V_F$ at $I_F$	1.44 V
$I_{FSM}$	550 A
$t_{rr}$	95 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
$V_{RRM}$		1200	V
$I_{FSM}$		550	A
$V_F$	20 A, $T_J = 25$ °C	1.22	V
$t_{rr}$	1 A, 100 A/ $\mu$ s	95	ns
$T_J$		-40 to +150	°C

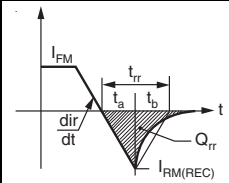
VOLTAGE RATINGS			
PART NUMBER	$V_{RRM}$ , MAXIMUM PEAK REVERSE VOLTAGE V	$V_{RSM}$ , MAXIMUM NON-REPETITIVE PEAK REVERSE VOLTAGE V	$I_{RRM}$ AT 150 °C mA
VS-45EPF12LHM3	1200	1300	10
VS-45APF12LHM3	1200	1300	



ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	$T_C = 97\text{ }^\circ\text{C}$ , 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	$A^2s$
		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	$A^2\sqrt{s}$

ELECTRICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum forward voltage drop	$V_{FM}$	45 A, $T_J = 25\text{ }^\circ\text{C}$	1.44	V
Forward slope resistance	$r_t$	$T_J = 150\text{ }^\circ\text{C}$	6.82	$m\Omega$
Threshold voltage	$V_{F(TO)}$		0.94	V
Maximum reverse leakage current	$I_{RM}$	$T_J = 25\text{ }^\circ\text{C}$	0.1	mA
		$T_J = 150\text{ }^\circ\text{C}$	10	

RECOVERY CHARACTERISTICS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Reverse recovery time	$t_{rr}$	$I_F$ at 40 A <sub>pk</sub> 25 A/ $\mu$ s 25 °C	450	ns
Reverse recovery current	$I_{rr}$		6	A
Reverse recovery charge	$Q_{rr}$		1.8	$\mu$ C
Snap factor	S		Typical	0.5



THERMAL - MECHANICAL SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range	$T_J, T_{Stg}$		-40 to +150	$^\circ\text{C}$
Maximum thermal resistance, junction to case	$R_{thJC}$	DC operation	0.4	$^\circ\text{C/W}$
Maximum thermal resistance, junction to ambient	$R_{thJA}$		40	
Typical thermal resistance, case to heatsink	$R_{thCS}$	Mounting surface, smooth, and greased	0.25	
Approximate weight			6	g
			0.21	oz.
Mounting torque	minimum		6 (5)	$\text{kgf} \cdot \text{cm}$ ( $\text{lbf} \cdot \text{in}$ )
	maximum		12 (10)	
Marking device		Case style TO-247AD 2L	45EPF12LH	
		Case style TO-247AD 3L	45APF12LH	

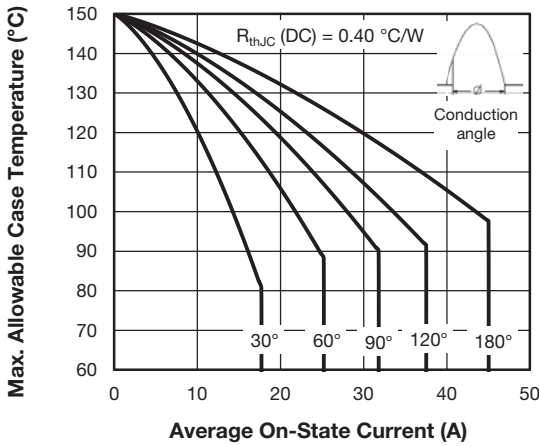


Fig. 1 - Current Rating Characteristics

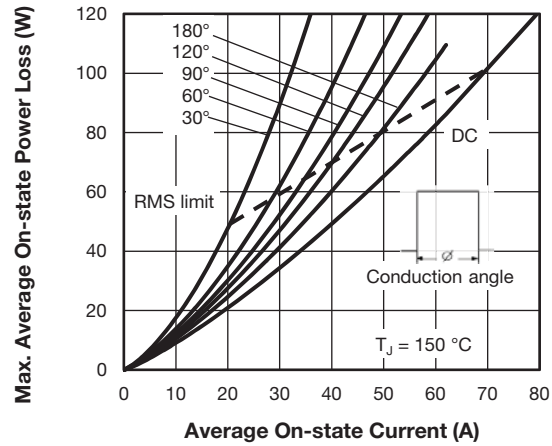


Fig. 4 - Forward Power Loss Characteristics

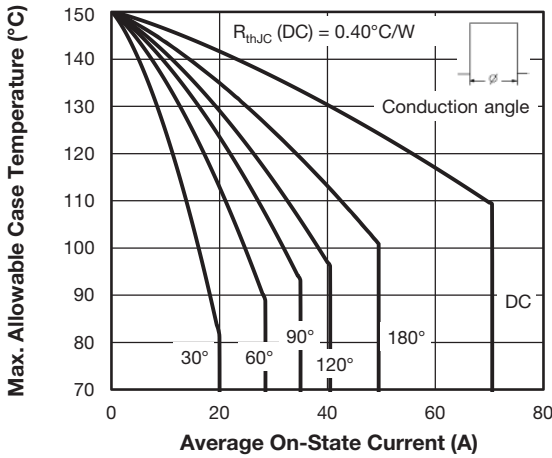


Fig. 2 - Current Rating Characteristics

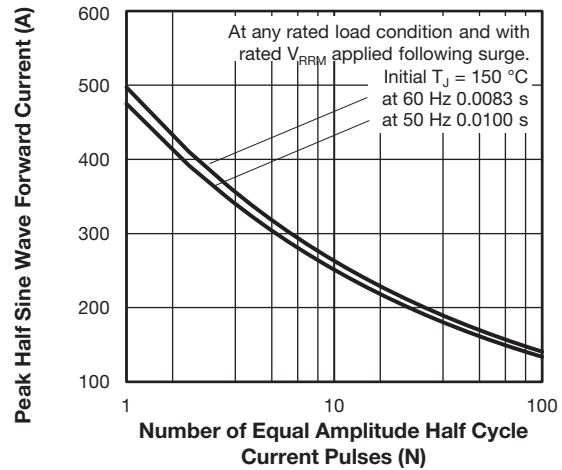


Fig. 5 - Maximum Non-Repetitive Surge Current

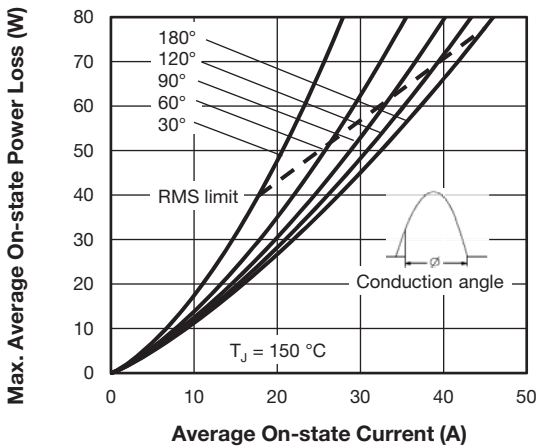


Fig. 3 - Forward Power Loss Characteristics

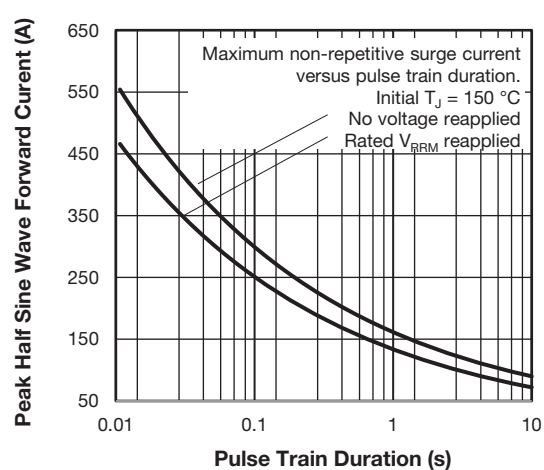


Fig. 6 - Maximum Non-Repetitive Surge Current

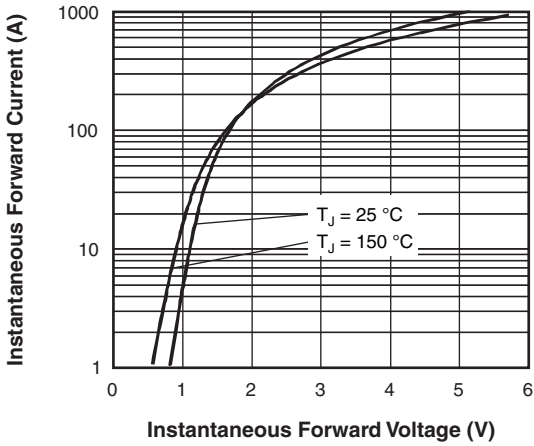


Fig. 7 - Forward Voltage Drop Characteristics

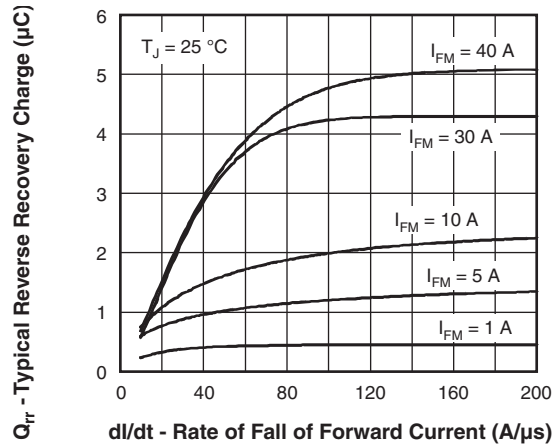


Fig. 10 - Recovery Charge Characteristics,  $T_J = 25\text{ }^\circ\text{C}$

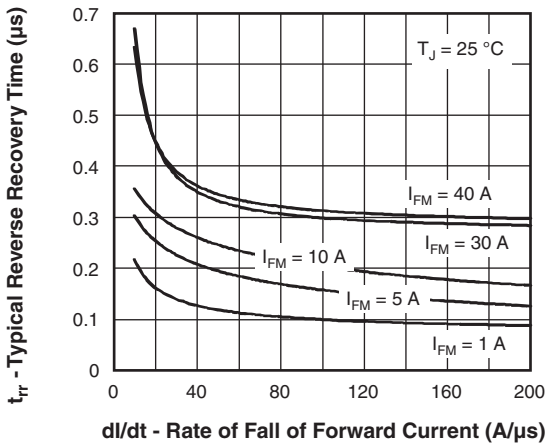


Fig. 8 - Thermal Impedance  $Z_{thJC}$  Characteristics

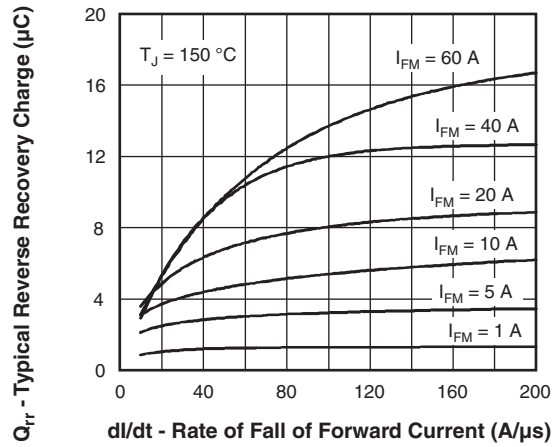


Fig. 11 - Recovery Charge Characteristics,  $T_J = 150\text{ }^\circ\text{C}$

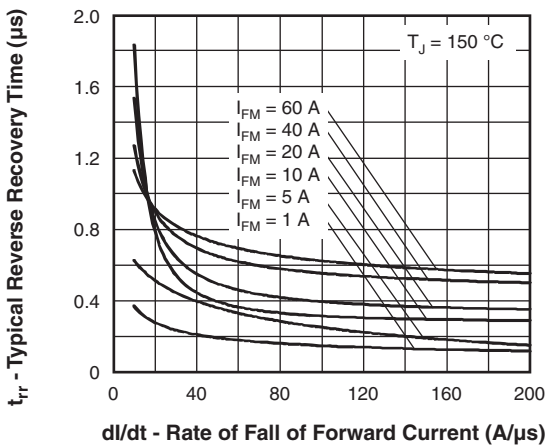


Fig. 9 - Recovery Time Characteristics,  $T_J = 150\text{ }^\circ\text{C}$

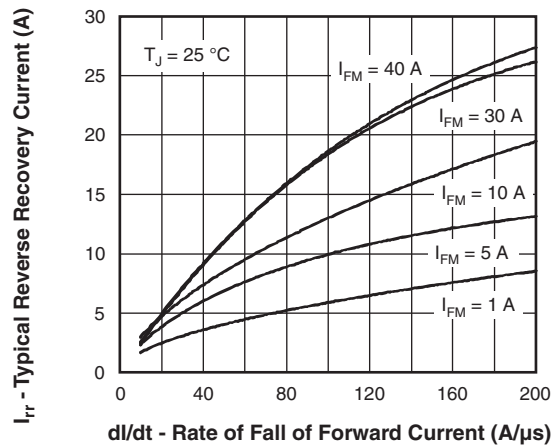


Fig. 12 - Recovery Current Characteristics,  $T_J = 25\text{ }^\circ\text{C}$

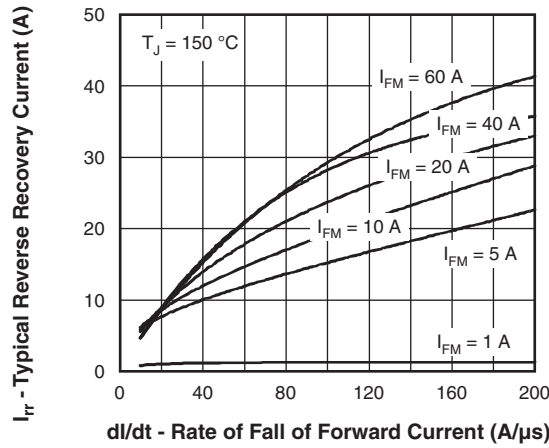


Fig. 13 - Recovery Current Characteristics,  $T_J = 150\text{ }^\circ\text{C}$

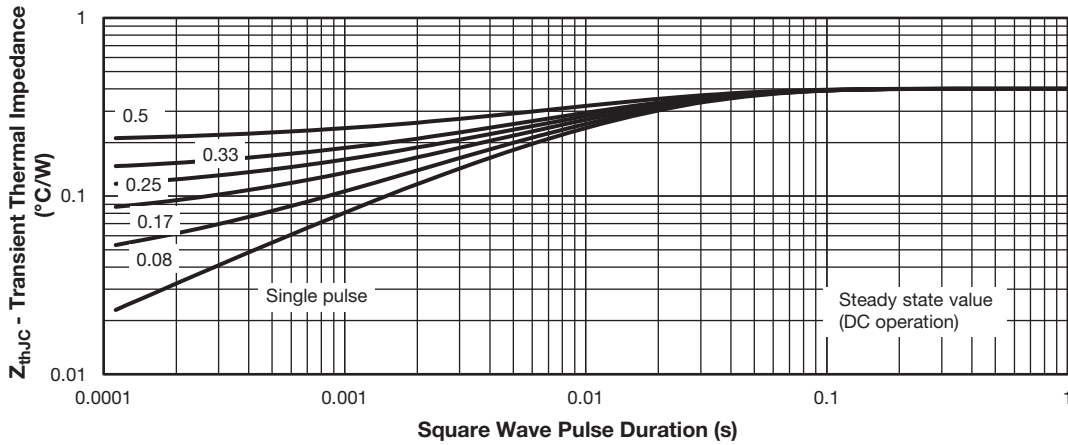
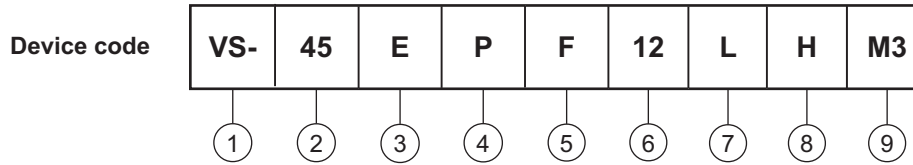


Fig. 14 - Thermal Impedance  $Z_{thJC}$  Characteristics



## ORDERING INFORMATION TABLE



- 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 =  $V_{RRM}$  12 = 1200 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-45EPF12LHM3	25	500	Antistatic plastic tubes
VS-45APF12LHM3	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



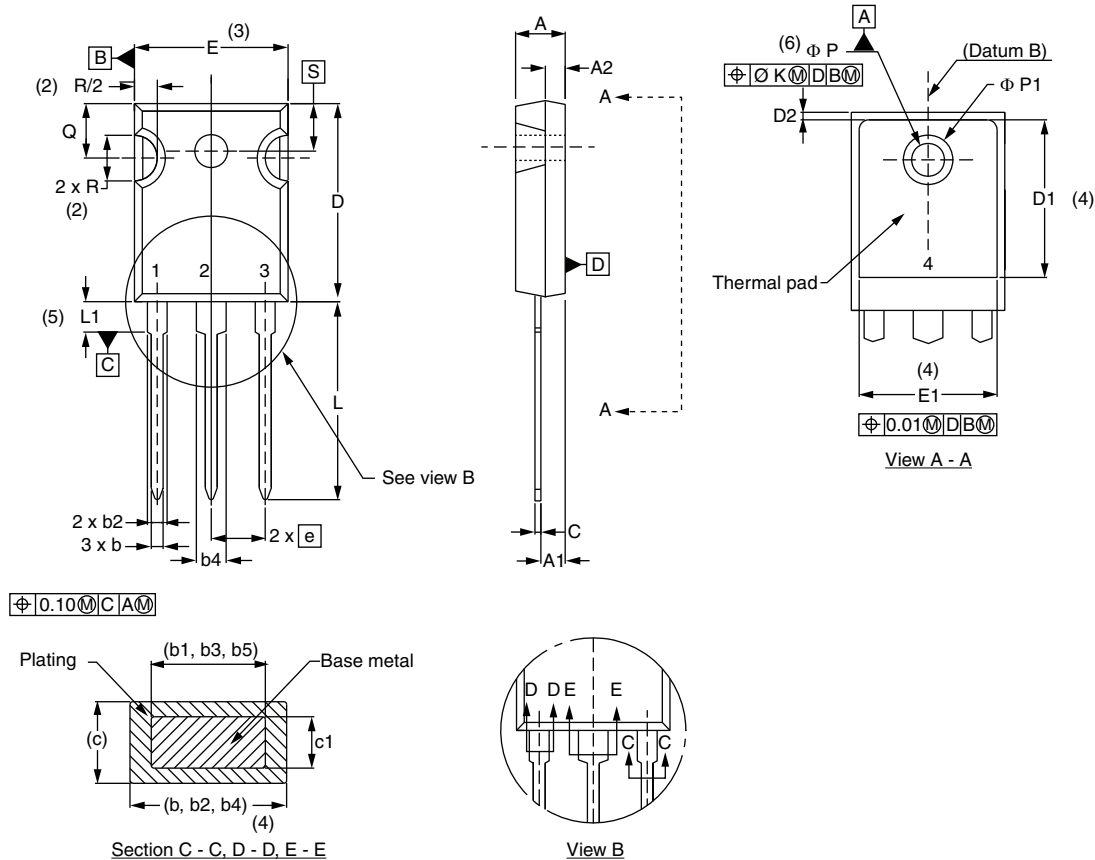
SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209		E	15.29	15.87	0.602	0.625	3
A1	2.21	2.59	0.087	0.102		E1	13.46	-	0.53	-	
A2	1.50	2.49	0.059	0.098		e	5.46 BSC		0.215 BSC		
b	0.99	1.40	0.039	0.055		Ø K	0.254		0.010		
b1	0.99	1.35	0.039	0.053		L	19.81	20.32	0.780	0.800	
b2	1.65	2.39	0.065	0.094		L1	3.71	4.29	0.146	0.169	
b3	1.65	2.34	0.065	0.092		Ø P	3.56	3.66	0.14	0.144	
c	0.38	0.89	0.015	0.035		Ø P1	-	6.98	-	0.275	
c1	0.38	0.84	0.015	0.033		Q	5.31	5.69	0.209	0.224	
D	19.71	20.70	0.776	0.815	3	R	4.52	5.49	0.178	0.216	
D1	13.08	-	0.515	-	4	S	5.51 BSC		0.217 BSC		
D2	0.51	1.35	0.020	0.053							

**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
- (4) Thermal pad contour optional with dimensions D1 and E1
- (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

### TO-247AD 3L

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209		D2	0.51	1.30	0.020	0.051	
A1	2.21	2.59	0.087	0.102		E	15.29	15.87	0.602	0.625	3
A2	1.50	2.49	0.059	0.098		E1	13.46	-	0.53	-	
b	0.99	1.40	0.039	0.055		e	5.46 BSC		0.215 BSC		
b1	0.99	1.35	0.039	0.053		Ø K	0.254		0.010		
b2	1.65	2.39	0.065	0.094		L	19.81	20.32	0.780	0.800	
b3	1.65	2.34	0.065	0.092		L1	3.71	4.29	0.146	0.169	
b4	2.59	3.43	0.102	0.135		Ø P	3.56	3.66	0.14	0.144	
b5	2.59	3.38	0.102	0.133		Ø P1	-	6.98	-	0.275	
c	0.38	0.89	0.015	0.035		Q	5.31	5.69	0.209	0.224	
c1	0.38	0.84	0.015	0.033		R	4.52	5.49	0.178	0.216	
D	19.71	20.70	0.776	0.815	3	S	5.51 BSC		0.217 BSC		
D1	13.08	-	0.515	-	4						

**Notes**

- (1) Dimensioning and tolerancing per ASME Y14.5M-1994
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