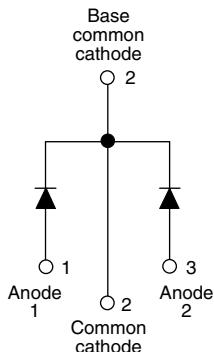


HEXFRED®

Ultrafast Soft Recovery Diode, 2 x 25


TO-247AC

FEATURES

- Ultrafast and ultrasoft recovery
- Very low I_{RRM} and Q_{rr}
- Compliant to RoHS Directive 2002/95/EC
- Designed and qualified according to JEDEC-JESD47
- Halogen-free according to IEC 61249-2-21 definition (-N3 only)



RoHS
COMPLIANT
HALOGEN
FREE
Available

BENEFITS

- Reduced RFI and EMI
- Reduced power loss in diode and switching transistor
- Higher frequency operation
- Reduced snubbing
- Reduced parts count

DESCRIPTION

VS-HFA50PA60C... is a state of the art center tap ultrafast recovery diode. Employing the latest in epitaxial construction and advanced processing techniques it features a superb combination of characteristics which result in performance which is unsurpassed by any rectifier previously available. With basic ratings of 600 V and 25 A per leg continuous current, the VS-HFA50PA60C... is especially well suited for use as the companion diode for IGBTs and MOSFETs. In addition to ultrafast recovery time, the HEXFRED® product line features extremely low values of peak recovery current (I_{RRM}) and does not exhibit any tendency to "snap-off" during the t_b portion of recovery. The HEXFRED features combine to offer designers a rectifier with lower noise and significantly lower switching losses in both the diode and the switching transistor. These HEXFRED advantages can help to significantly reduce snubbing, component count and heatsink sizes. The HEXFRED VS-HFA50PA60C... is ideally suited for applications in power supplies and power conversion systems (such as inverters), motor drives, and many other similar applications where high speed, high efficiency is needed.

PRODUCT SUMMARY	
Package	TO-247AC
$I_{F(AV)}$	2 x 25 A
V_R	600 V
V_F at I_F	1.7 V
t_{rr} typ.	23 ns
T_J max.	150 °C
Diode variation	Single die

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Cathode to anode voltage	V_R		600	V
Maximum continuous forward current	I_F	$T_C = 100$ °C	25	A
per leg			50	
per device				
Single pulse forward current	I_{FSM}		225	
Maximum repetitive forward current	I_{FRM}		100	
Maximum power dissipation	P_D	$T_C = 25$ °C	150	W
		$T_C = 100$ °C	60	
Operating junction and storage temperature range	T_J, T_{Stg}		- 55 to + 150	°C

ELECTRICAL SPECIFICATIONS PER LEG ($T_J = 25^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Cathode to anode breakdown voltage	V_{BR}	$I_R = 100 \mu\text{A}$		600	-	-	V
Maximum forward voltage	V_{FM}	$I_F = 25 \text{ A}$	See fig. 1	-	1.3	1.7	
		$I_F = 50 \text{ A}$		-	1.5	2.0	
		$I_F = 25 \text{ A}, T_J = 125^\circ\text{C}$		-	1.3	1.7	
Maximum reverse leakage current	I_{RM}	$V_R = V_R \text{ rated}$	See fig. 2	-	1.5	20	μA
		$T_J = 125^\circ\text{C}, V_R = 0.8 \times V_R \text{ rated}$		-	600	2000	
Junction capacitance	C_T	$V_R = 200 \text{ V}$	See fig. 3	-	55	100	pF
Series inductance	L_S	Measured lead to lead 5 mm from package body		-	12	-	nH

DYNAMIC RECOVERY CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Reverse recovery time See fig. 5, 10	t_{rr}	$I_F = 1.0 \text{ A}, dI_F/dt = 200 \text{ A}/\mu\text{s}, V_R = 30 \text{ V}$		-	23	-	ns
	t_{rr1}	$T_J = 25^\circ\text{C}$	$I_F = 25 \text{ A}$ $dI_F/dt = 200 \text{ A}/\mu\text{s}$ $V_R = 200 \text{ V}$	-	50	75	
	t_{rr2}	$T_J = 125^\circ\text{C}$		-	105	160	
Peak recovery current See fig. 6	I_{RRM1}	$T_J = 25^\circ\text{C}$		-	4.5	10	A
	I_{RRM2}	$T_J = 125^\circ\text{C}$		-	8.0	15	
Reverse recovery charge See fig. 7	Q_{rr1}	$T_J = 25^\circ\text{C}$	$V_R = 200 \text{ V}$	-	112	375	nC
	Q_{rr2}	$T_J = 125^\circ\text{C}$		-	420	1200	
Peak rate of fall of recovery current during t_b See fig. 8	$dl_{(rec)M}/dt1$	$T_J = 25^\circ\text{C}$		-	250	-	A/ μs
	$dl_{(rec)M}/dt2$	$T_J = 125^\circ\text{C}$		-	160	-	

THERMAL - MECHANICAL SPECIFICATIONS							
PARAMETER	SYMBOL	TEST CONDITIONS		MIN.	TYP.	MAX.	UNITS
Lead temperature	T_{lead}	0.063" from case (1.6 mm) for 10 s		-	-	300	$^\circ\text{C}$
Junction to case, single leg conducting	R_{thJC}			-	-	0.83	K/W
Junction to case, both legs conducting				-	-	0.42	
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount		-	-	40	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased		-	0.25	-	
Weight				-	6.0	-	g
				-	0.21	-	oz.
Mounting torque				6.0 (5.0)	-	12 (10)	$\text{kgf} \cdot \text{cm}$ (lbf · in)
Marking device		Case style TO-247AC		HFA50PA60C			

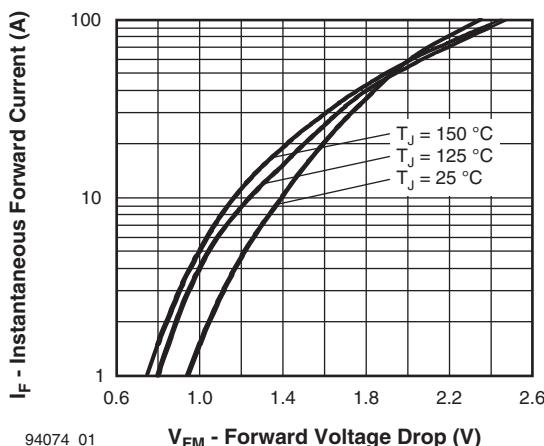


Fig. 1 - Maximum Forward Voltage Drop vs. Instantaneous Forward Current (Per Leg)

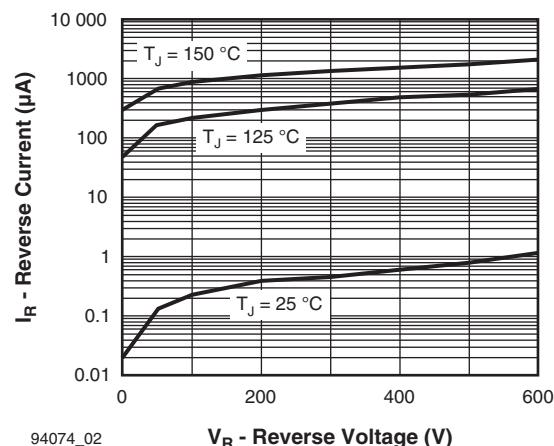


Fig. 2 - Typical Reverse Current vs. Reverse Voltage (Per Leg)

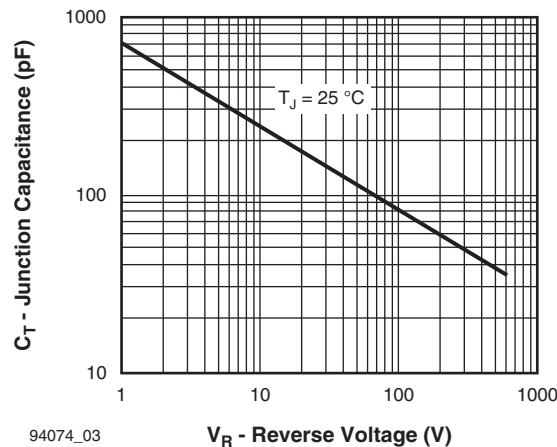


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

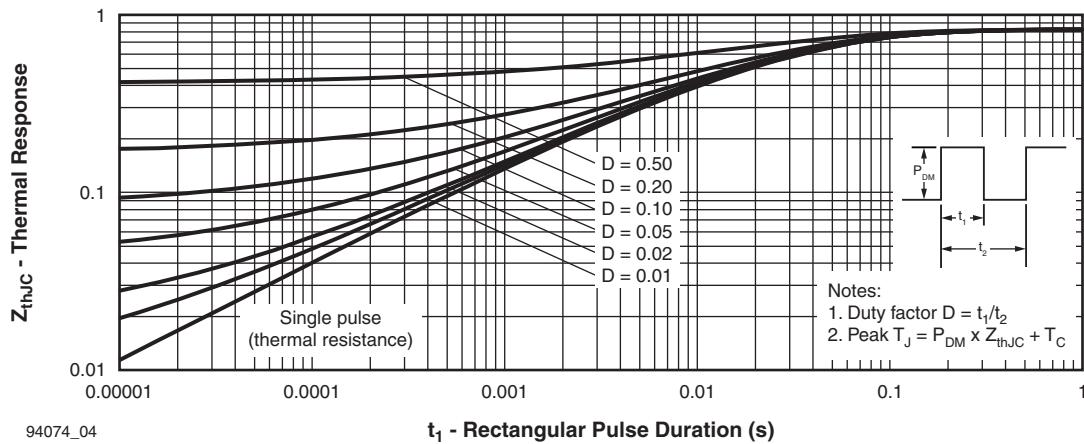
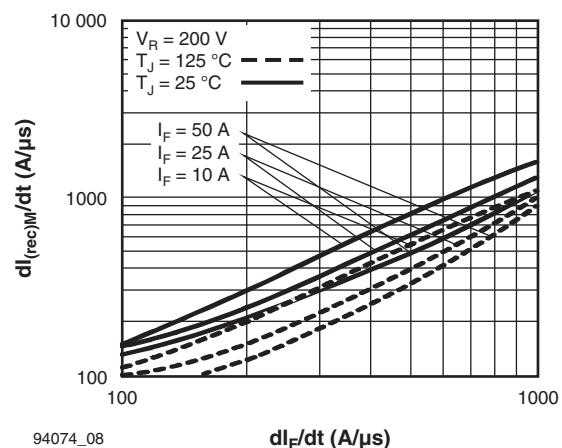
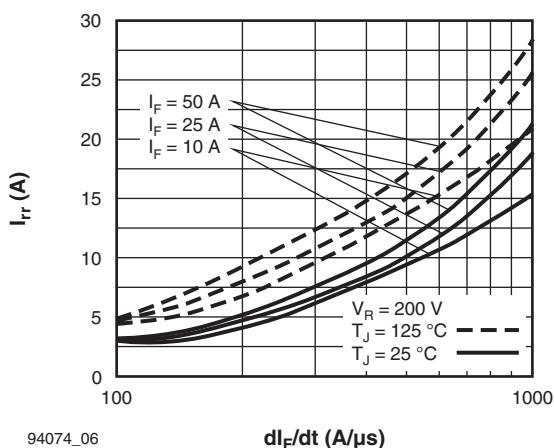
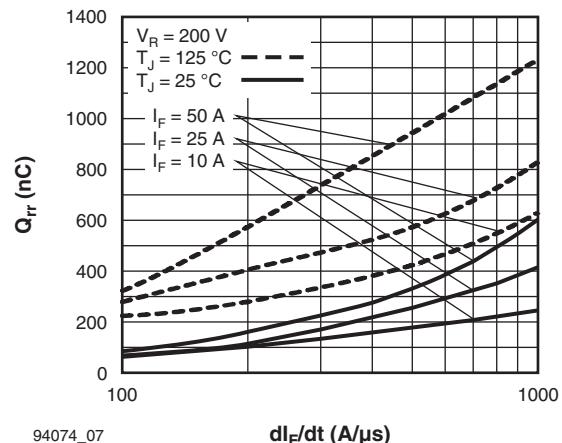
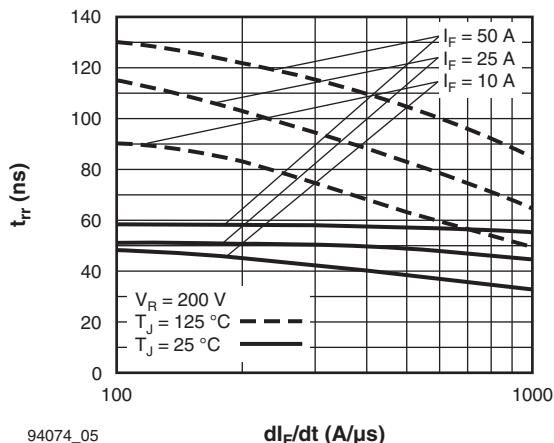


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics (Per Leg)



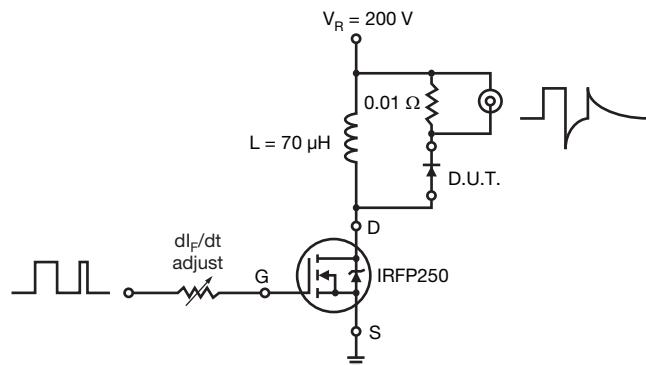


Fig. 9 - Reverse Recovery Parameter Test Circuit

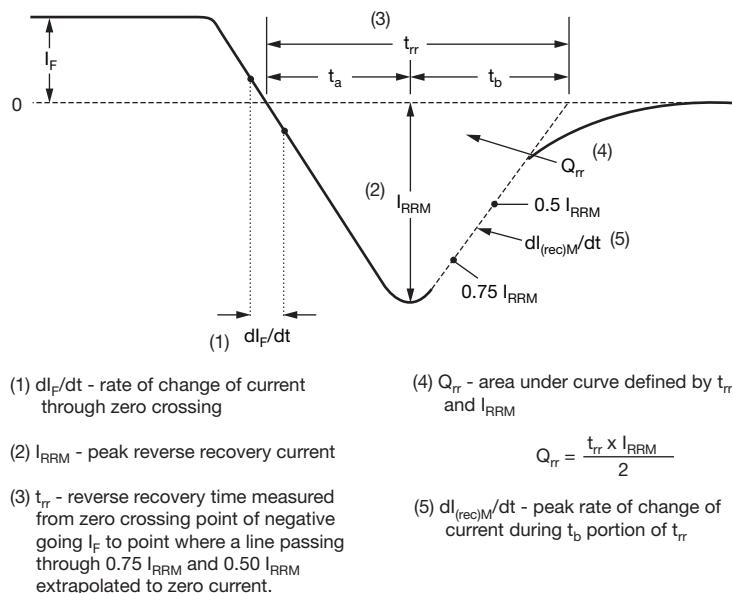


Fig. 10 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code	VS-	HF	A	50	PA	60	C	PbF
	1	2	3	4	5	6	7	8

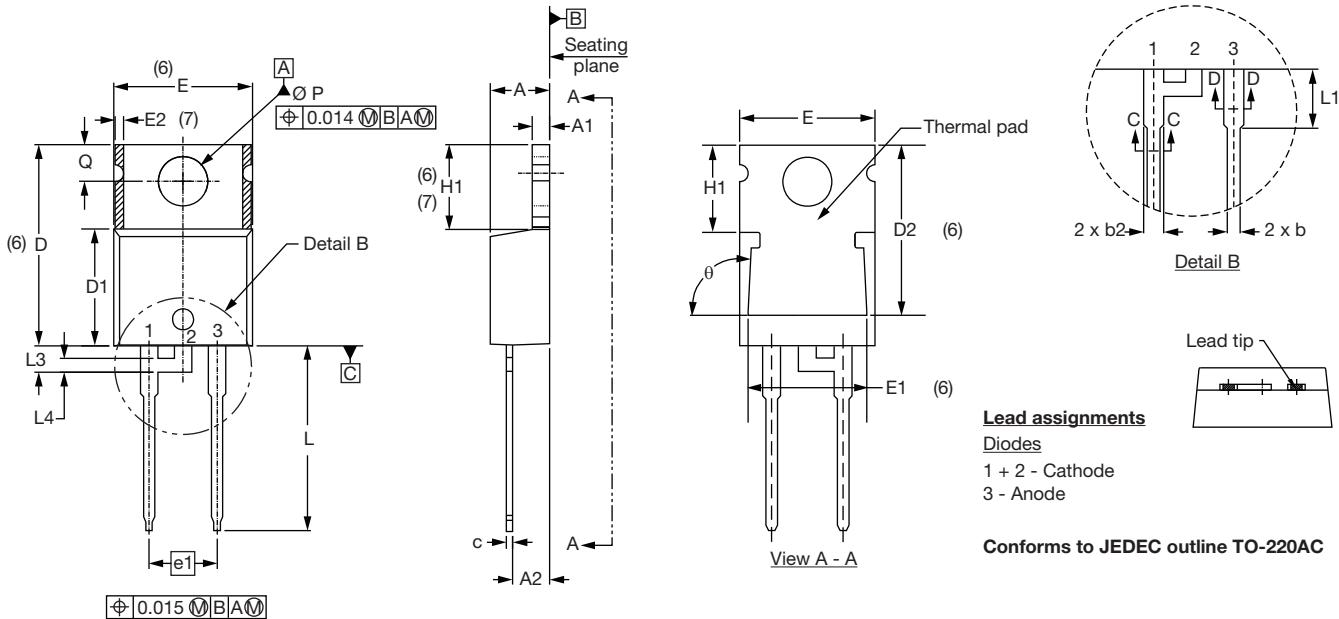
1	- Vishay Semiconductors product
2	- HEXFRED® family
3	- Electron irradiated
4	- Current rating (50 = 50 A)
5	- PA = TO-247AC
6	- Voltage rating: (60 = 600 V)
7	- Circuit configuration C = Common cathode
8	- Environmental digit: PbF = Lead (Pb)-free and RoHS compliant -N3 = Halogen-free, RoHS compliant and totally lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	QUANTITY PER T/R	MINIMUM ORDER QUANTITY	PACKAGING DESCRIPTION
VS-HFA50PA60CPbF	25	500	Antistatic plastic tube
VS-HFA50PA60C-N3	25	500	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95223
Part marking information	www.vishay.com/doc?95226
	www.vishay.com/doc?95007

TO-220AC

DIMENSIONS in millimeters and inches



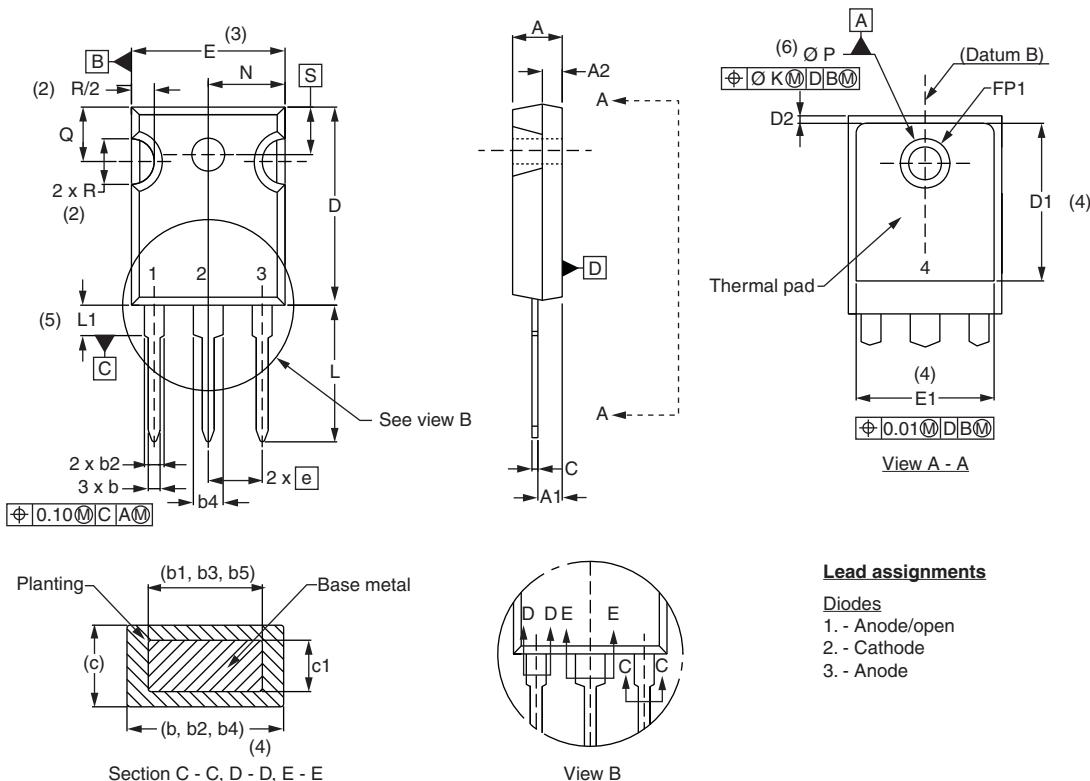
SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.56	2.92	0.101	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.97	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.14	1.73	0.045	0.068	4
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
D	14.85	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	
D2	11.68	12.88	0.460	0.507	6
E	10.11	10.51	0.398	0.414	3, 6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E1	6.86	8.89	0.270	0.350	6
E2	-	0.76	-	0.030	7
e	2.41	2.67	0.095	0.105	
e1	4.88	5.28	0.192	0.208	
H1	6.09	6.48	0.240	0.255	6, 7
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
L3	1.78	2.13	0.070	0.084	
L4	0.76	1.27	0.030	0.050	2
Ø P	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.118	
θ	90° to 93°		90° to 93°		

Notes

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC TO-220, D2 (minimum) where dimensions are derived from the actual package outline

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	13.72	-	0.540	-	
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			FK	2.54		0.010		
b2	1.65	2.39	0.065	0.094			L	14.20	16.10	0.559	0.634	
b3	1.65	2.37	0.065	0.094			L1	3.71	4.29	0.146	0.169	
b4	2.59	3.43	0.102	0.135			N	7.62 BSC		0.3		
b5	2.59	3.38	0.102	0.133			ΦP	3.56	3.66	0.14	0.144	
c	0.38	0.86	0.015	0.034			ΦP1	-	6.98	-	0.275	
c1	0.38	0.76	0.015	0.030			Q	5.31	5.69	0.209	0.224	
D	19.71	20.70	0.776	0.815	3		R	4.52	5.49	1.78	0.216	
D1	13.08	-	0.515	-	4		S	5.51 BSC		0.217 BSC		

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. Mold flash shall not exceed 0.127 mm (0.005") per side. 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 c

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