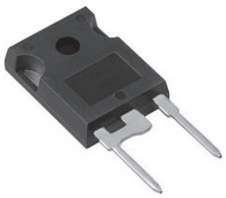
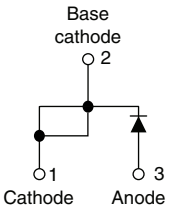
Fast Soft Recovery Rectifier Diode, 40 A



TO-247AC modified



FEATURES

- 150 °C max. operating junction temperature
- Low forward voltage drop and short reverse recovery time
- Designed and qualified according to JEDEC-JESD47
- Material categorization:
  For definitions of compliance please see www.vishay.com/doc?99912

Pb
e3
RoHS COMPLIANT
HALOGEN FREE Available

PRODUCT SUMMARY	
Package	TO-247AC modified (2 pins)
$I_{F(AV)}$	40 A
V_R	200 V, 400 V, 600 V
V_F at I_F	1.25 V
I_{FSM}	475 A
t_{rr}	60 ns
T_J max.	150 °C
Diode variation	Single die
Snap factor	0.5

APPLICATIONS

These devices are intended for use in output rectification and freewheeling in inverters, choppers and converters as well as in input rectification where severe restrictions on conducted EMI should be met.

DESCRIPTION

The VS-40EPF0... fast soft recovery rectifier series has been optimized for combined short reverse recovery time and low forward voltage drop.

The glass passivation ensures stable reliable operation in the most severe temperature and power cycling conditions.

MAJOR RATINGS AND CHARACTERISTICS			
SYMBOL	CHARACTERISTICS	VALUES	UNITS
$I_{F(AV)}$	Sinusoidal waveform	40	A
V_{RRM}		200 to 600	V
I_{FSM}		475	A
V_F	10 A, T_J = 25 °C	1	V
t_{rr}	1 A, - 100 A/µs	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-40EPF02PbF, VS-40EPF02-M3	200	300	8
VS-40EPF04PbF, VS-40EPF04-M3	400	500	
VS-40EPF06PbF, VS-40EPF06-M3	600	700	

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum average forward current	$I_{F(AV)}$	T_C = 105 °C, 180° conduction half sine wave	40	A
Maximum peak one cycle non-repetitive surge current	I_{FSM}	10 ms sine pulse, rated V_{RRM} applied	400	
		10 ms sine pulse, no voltage reapplied	475	
Maximum I^2t for fusing	I^2t	10 ms sine pulse, rated V_{RRM} applied	800	A^2s
		10 ms sine pulse, no voltage reapplied	1131	
Maximum $I^2\sqrt{t}$ for fusing	$I^2\sqrt{t}$	t = 0.1 ms to 10 ms, no voltage reapplied	11 310	$A^2\sqrt{s}$

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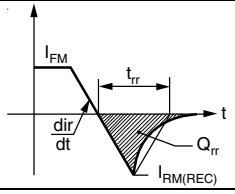
ELECTRICAL SPECIFICATIONS

PARAMETER	SYMBOL	TEST CONDITIONS		VALUES	UNITS
Maximum forward voltage drop	V_{FM}	40 A, T_J = 25 °C		1.25	V
Forward slope resistance	r_t	T_J = 150 °C		4.4	mΩ
Threshold voltage	$V_{F(TO)}$			1.1	V
Maximum reverse leakage current	I_{RM}	T_J = 25 °C	V_R = Rated V_{RRM}	0.1	mA
		T_J = 150 °C		8.0	

RECOVERY CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS	
Reverse recovery time	t_{rr}	I_F at 40 A_{pk} 25 A/µs 25 °C	180	ns	
Reverse recovery current	I_{rr}		3.2	A	
Reverse recovery charge	Q_{rr}		0.5	µC	
Snap factor	S		0.5		

THERMAL - MECHANICAL SPECIFICATIONS

PARAMETER		SYMBOL	TEST CONDITIONS	VALUES	UNITS
Maximum junction and storage temperature range		T_J, T_{Stg}		- 40 to 150	°C
Maximum thermal resistance, junction to case		R_{thJC}	DC operation	0.6	°C/W
Maximum thermal resistance, junction to ambient		R_{thJA}		40	
Typical thermal resistance, case to heatsink		R_{thCS}	Mounting surface, smooth and greased	0.2	
Approximate weight				6	g
				0.21	oz.
Mounting torque	minimum			6 (5)	kgf · cm (lbf · in)
	maximum			12 (10)	
Marking device			Case style TO-247AC modified (JEDEC)	40EPF02	
				40EPF04	
				40EPF06	

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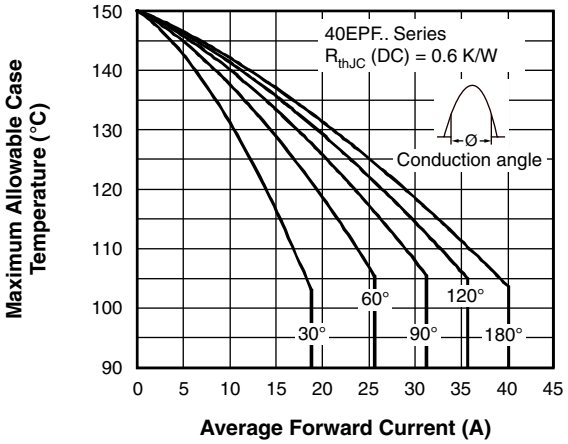

Fig. 1 - Current Rating Characteristics

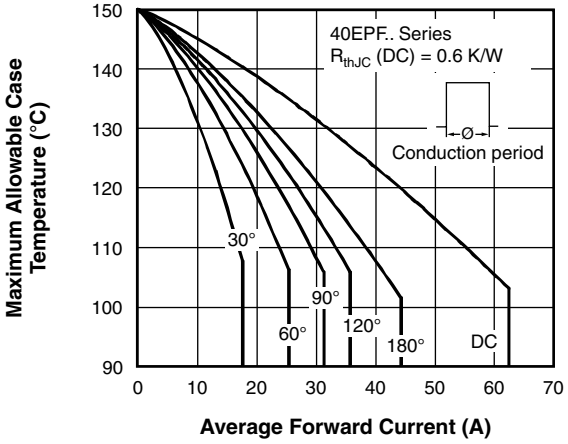

Fig. 2 - Current Rating Characteristics

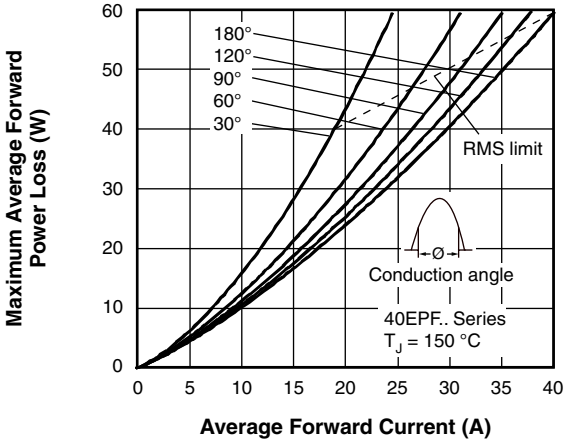

Fig. 3 - Forward Power Loss Characteristics

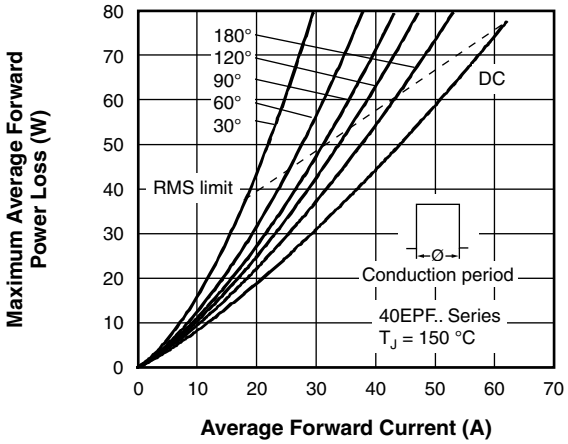

Fig. 4 - Forward Power Loss Characteristics

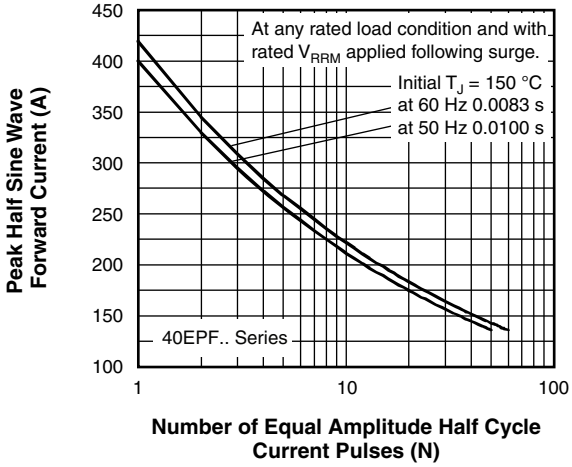

Fig. 5 - Maximum Non-Repetitive Surge Current

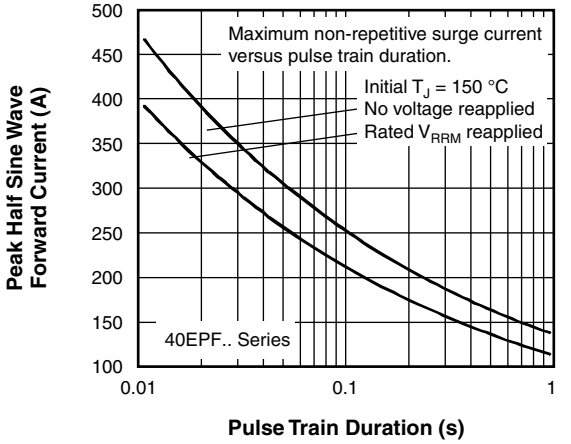

Fig. 6 - Maximum Non-Repetitive Surge Current

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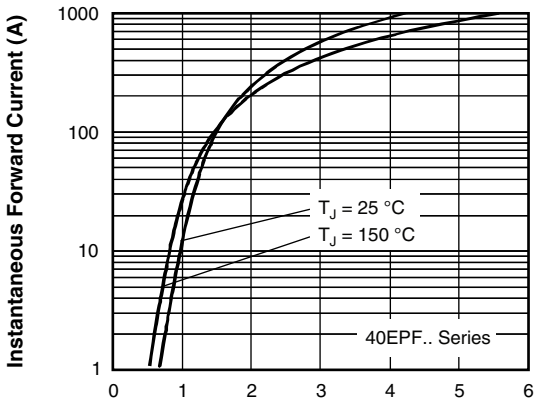

Fig. 7 - Forward Voltage Drop Characteristics

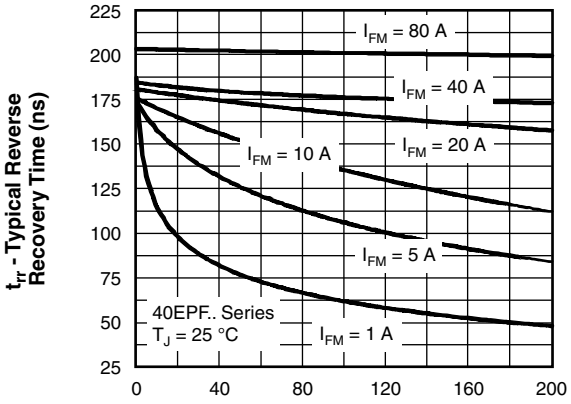

Fig. 8 - Recovery Time Characteristics, T_J = 25 °C

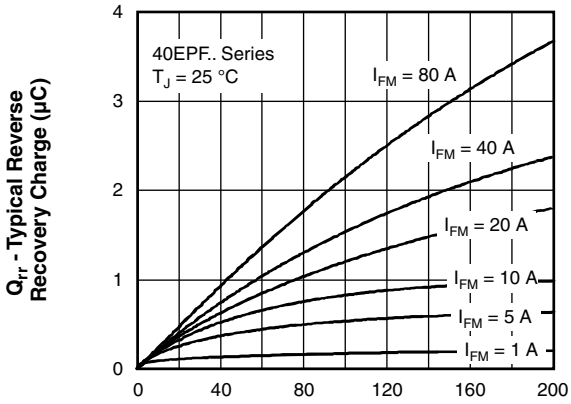

Fig. 10 - Recovery Charge Characteristics, T_J = 25 °C

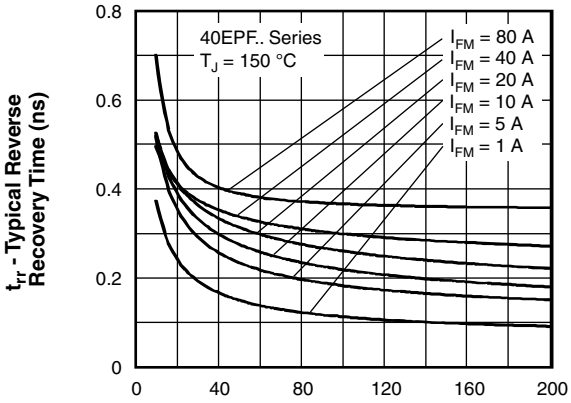

Fig. 9 - Recovery Time Characteristics, T_J = 150 °C

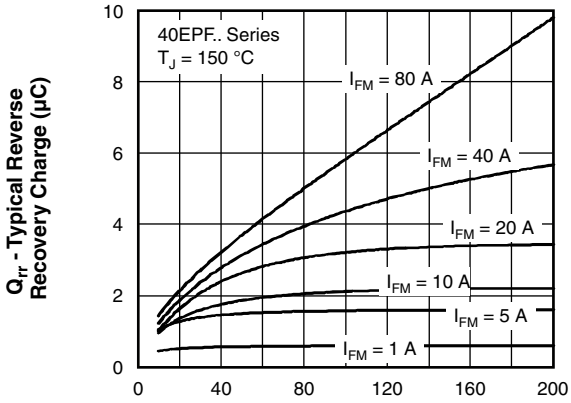

Fig. 11 - Recovery Charge Characteristics, T_J = 150 °C

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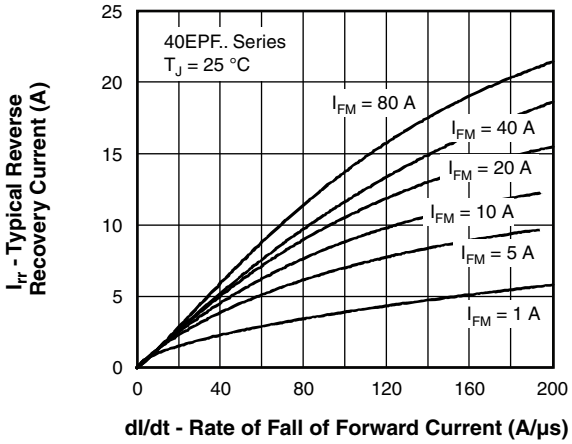

Fig. 12 - Recovery Current Characteristics, T_J = 25 °C

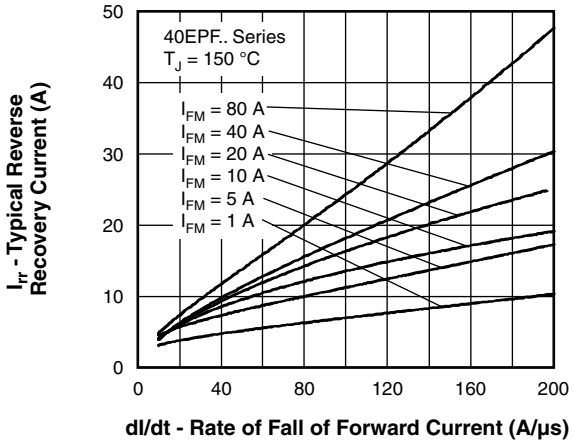

Fig. 13 - Recovery Current Characteristics, T_J = 150 °C

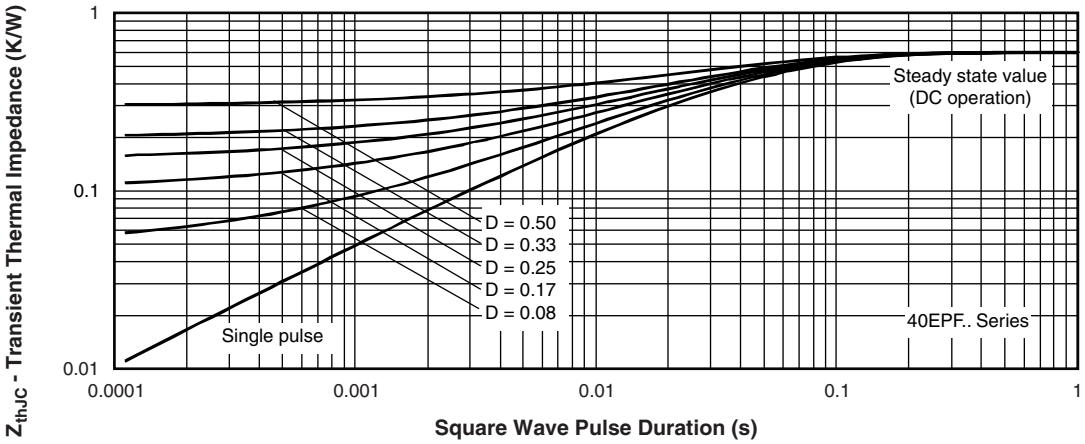

Fig. 14 - Thermal Impedance Z_{thJC} Characteristics

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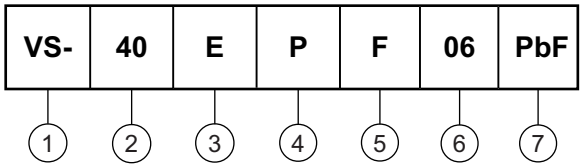
ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product

2 - Current rating (40 = 40 A)

3 - Circuit configuration:
E = Single diode

4 - Package:
P = TO-247AC modified

5 - Type of silicon:
F = Fast diode

6 - Voltage code x 100 = V_{RRM}
02 = 200 V
04 = 400 V
06 = 600 V

7 - Environmental digit:
- PbF = Lead (Pb)-free and RoHS compliant
- -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-40EPF02PbF	25	500	Antistatic plastic tubes
VS-40EPF02-M3	25	500	Antistatic plastic tubes
VS-40EPF04PbF	25	500	Antistatic plastic tubes
VS-40EPF04-M3	25	500	Antistatic plastic tubes
VS-40EPF06PbF	25	500	Antistatic plastic tubes
VS-40EPF06-M3	25	500	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS		
Dimensions		www.vishay.com/doc?95253
Part marking information	TO-247AC modified PbF	www.vishay.com/doc?95255
	TO-247AC modified -M3	www.vishay.com/doc?95442
SPICE model		www.vishay.com/doc?95274

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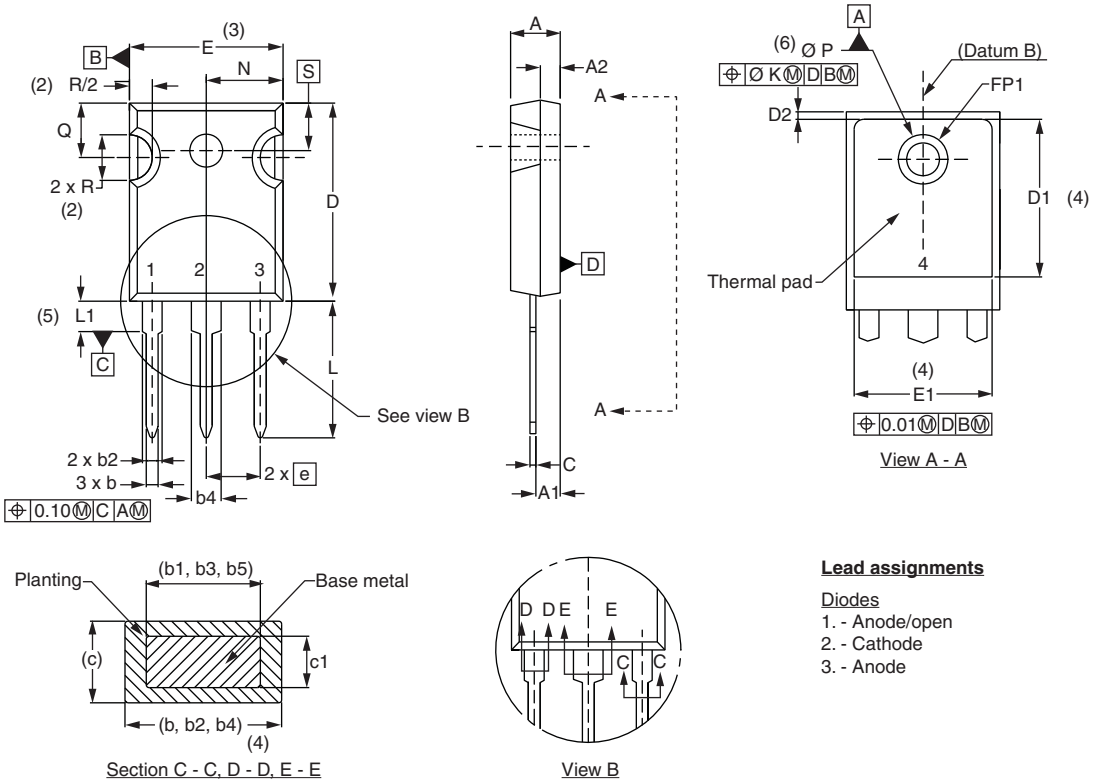
DIMENSIONS in millimeters and inches



Lead assignments

Diodes
1. - Anode/open
2. - Cathode
3. - Anode

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	2.37	0.065	0.094	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
c	0.38	0.86	0.015	0.034	
c1	0.38	0.76	0.015	0.030	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	0.51	1.30	0.020	0.051	
E	15.29	15.87	0.602	0.625	3
E1	13.72	-	0.540	-	
e	5.46 BSC		0.215 BSC		
FK	2.54		0.010		
L	14.20	16.10	0.559	0.634	
L1	3.71	4.29	0.146	0.169	
N	7.62 BSC		0.3		
ΦP	3.56	3.66	0.14	0.144	
ΦP1	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	1.78	0.216	
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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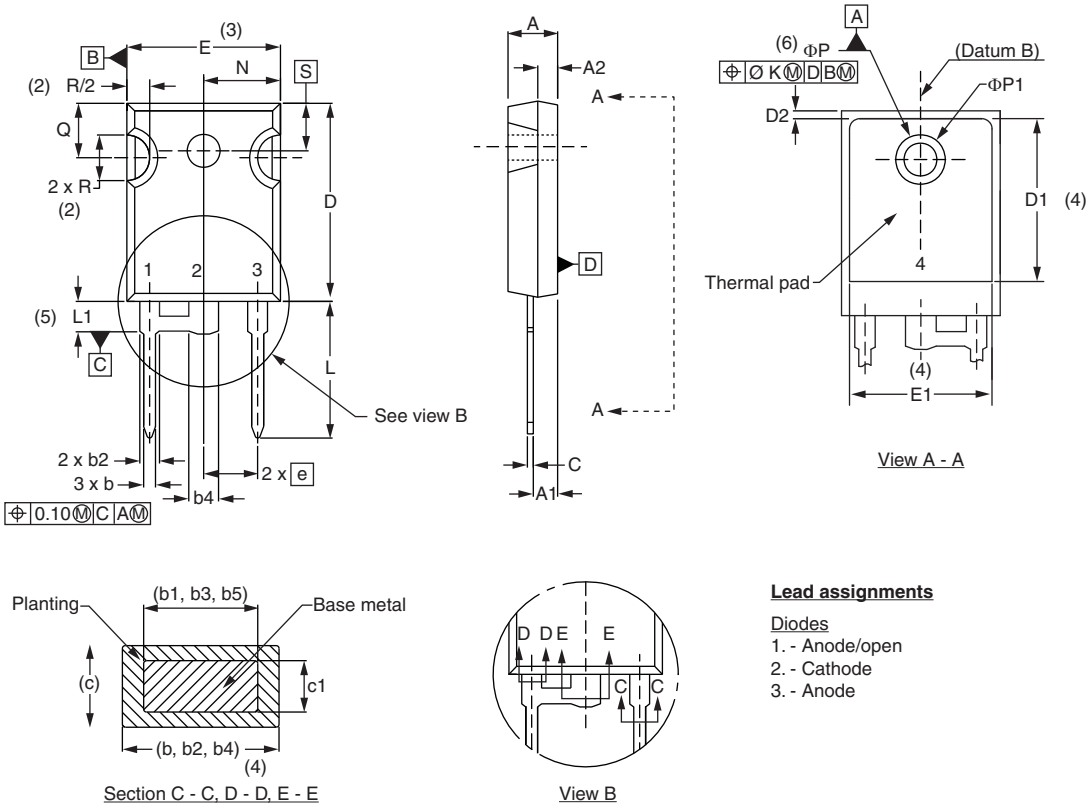
DIMENSIONS in millimeters and inches



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b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.37	0.065	0.094	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
c	0.38	0.86	0.015	0.034	
c1	0.38	0.76	0.015	0.030	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	0.51	1.30	0.020	0.051	
E	15.29	15.87	0.602	0.625	3
E1	13.72	-	0.540	-	
e	5.46 BSC		0.215 BSC		
ΦK	2.54		0.010		
L	14.20	16.10	0.559	0.634	
L1	3.71	4.29	0.146	0.169	
N	7.62 BSC		0.3		
ΦP	3.56	3.66	0.14	0.144	
ΦP1	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
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Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.