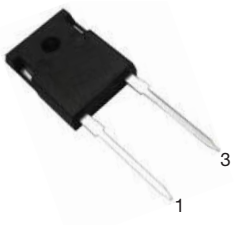
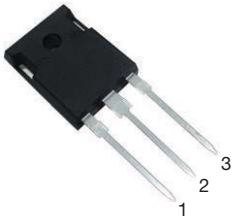
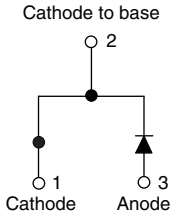
Ultrafast Soft Recovery Diode, 60 A FRED Pt®



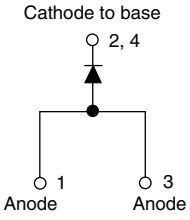
TO-247 long lead 2-pins



TO-247 long lead 3-pins



VS-EPU6006L-M3



VS-APU6006L-M3

FEATURES

- Ultrafast recovery time
- Low forward voltage drop
- 175 °C operating junction temperature
- Designed and qualified according to commercial qualification
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb e3 RoHS COMPLIANT HALOGEN FREE

DESCRIPTION / APPLICATIONS

VS-EPU60/VS-APU60... series are the state of the art ultrafast recovery rectifiers designed with optimized performance of forward voltage drop and ultrafast recovery time.

The planar structure and the platinum doped life time control guarantee the best overall performance, ruggedness and reliability characteristics.

These devices are intended for use in the output rectification stage of SMPS, welding, UPS, DC/DC converters as well as freewheeling diodes in low voltage inverters and chopper motor drives.

Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

PRODUCT SUMMARY	
Package	TO-247 long lead 2 pins, TO-247 long lead 3 pins
$I_{F(AV)}$	60 A
V_R	600 V
V_F at I_F	1.05 V
t_{rr} typ.	32 ns
T_J max.	175 °C
Diode variation	Single die

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Repetitive peak reverse voltage	V_{RRM}		600	V
Average rectified forward current in DC	$I_{F(AV)}$	T_C = 116 °C	60	A
Single pulse forward current	I_{FSM}	T_C = 25 °C	600	
Operating junction and storage temperatures	T_J, T_{Stg}		-55 to +175	°C

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Breakdown voltage, blocking voltage	V_{BR}, V_R	I_R = 100 µA	600	-	-	V
Forward voltage	V_F	I_F = 60 A	-	1.2	1.5	
		I_F = 60 A, T_J = 125 °C	-	1.1	1.3	
		I_F = 60 A, T_J = 175 °C	-	1.05	1.2	
Reverse leakage current	I_R	V_R = V_R rated	-	0.2	30	µA
		T_J = 150 °C, V_R = V_R rated	-	-	200	
Junction capacitance	C_T	V_R = 600 V	-	38	-	pF

DYNAMIC RECOVERY CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Reverse recovery time	t_{rr}	I_F = 1 A, dI_F/dt = 200 A/µs, V_R = 30 V		-	32	-	ns
		T_J = 25 °C	I_F = 60 A dI_F/dt = 200 A/µs V_R = 200 V	-	110	-	
		T_J = 125 °C		-	200	-	
Peak recovery current	I_{RRM}	T_J = 25 °C		-	10	-	A
		T_J = 125 °C		-	19	-	
Reverse recovery charge	Q_{rr}	T_J = 25 °C		-	530	-	nC
		T_J = 125 °C		-	1900	-	

THERMAL - MECHANICAL SPECIFICATIONS						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Maximum junction and storage temperature range	T_J, T_{Stg}		-65	-	175	°C
Thermal resistance, junction to case	R_{thJC}		-	-	0.65	°C/W
Thermal resistance, junction to ambient	R_{thJA}	Typical socket mount	-	-	70	
Thermal resistance, case to heatsink	R_{thCS}	Mounting surface, flat, smooth and greased	-	0.5	-	
Weight			-	6	-	g
			-	0.21	-	oz.
Mounting torque			6 (5)	-	1.2 (10)	kgf. cm (lbf · in)
Marking device		Case style TO-247 long lead 2 pins	EPU6006L			
		Case style TO-247 long lead 3 pins	APU6006L			

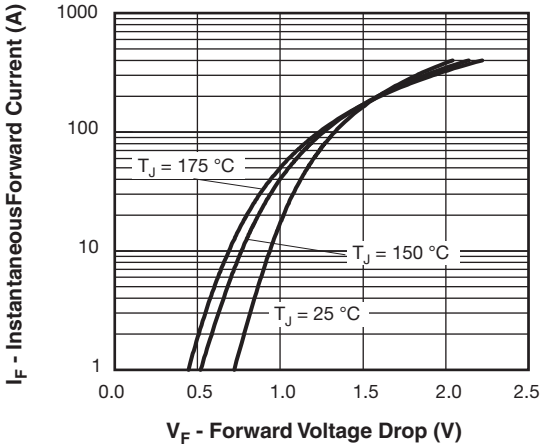


Fig. 1 - Typical Forward Voltage Drop Characteristics

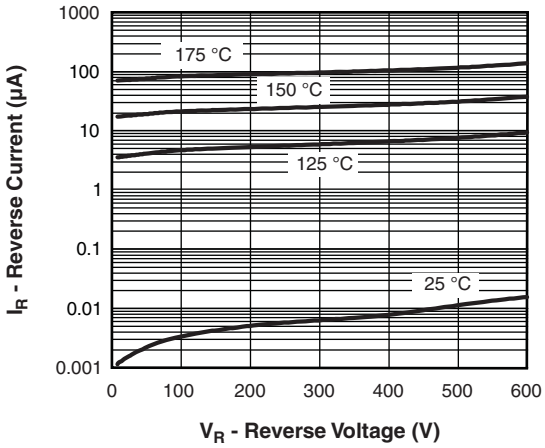


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

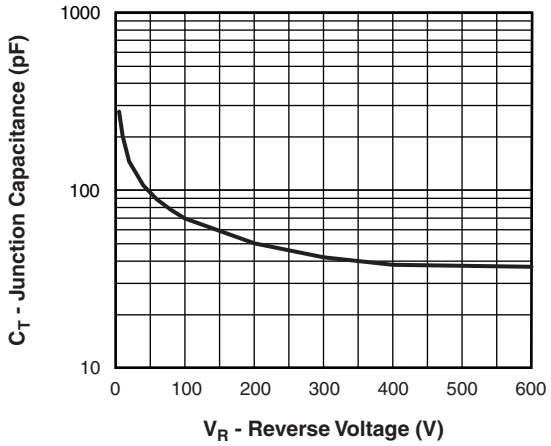


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

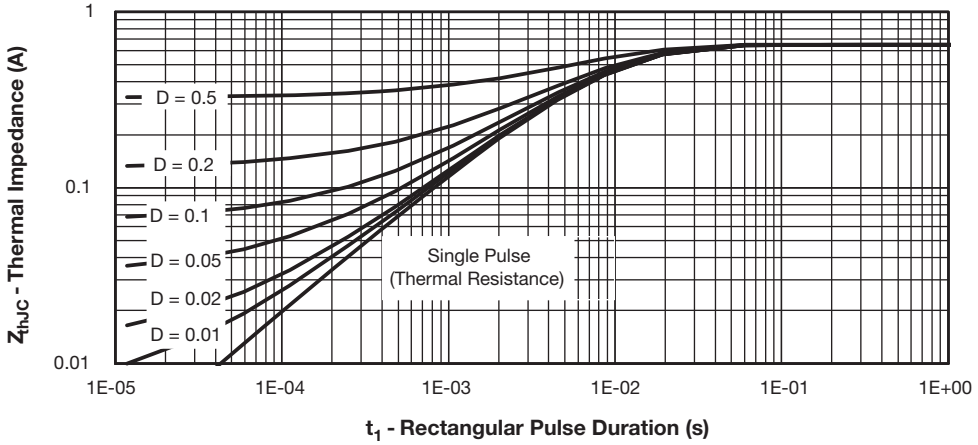


Fig. 4 - Maximum Thermal Impedance Z_{thJC} Characteristics

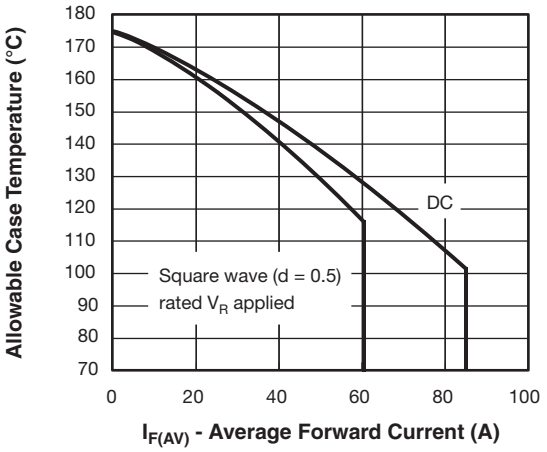


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current

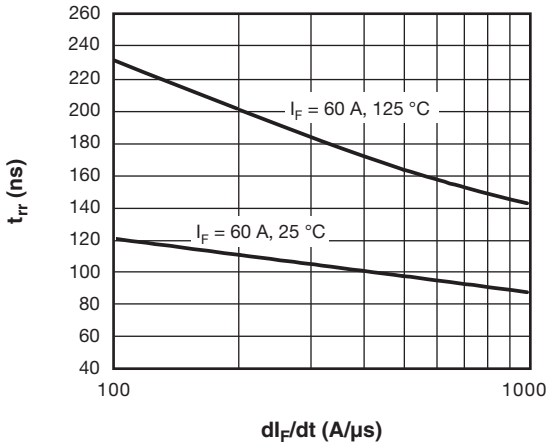


Fig. 7 - Typical Reverse Recovery Time vs. dI_F/dt

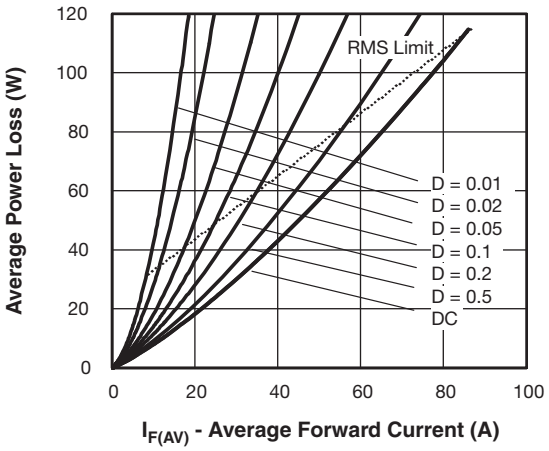


Fig. 6 - Forward Power Loss Characteristics

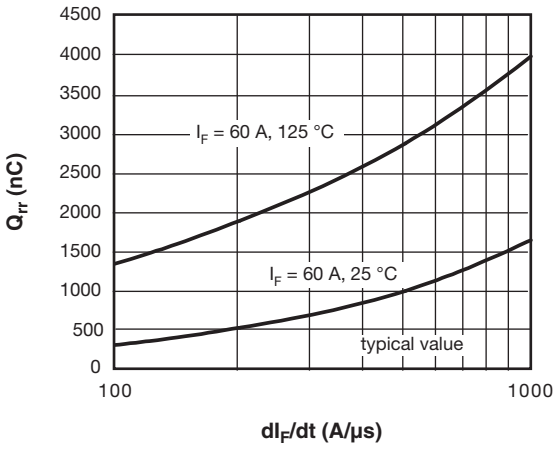
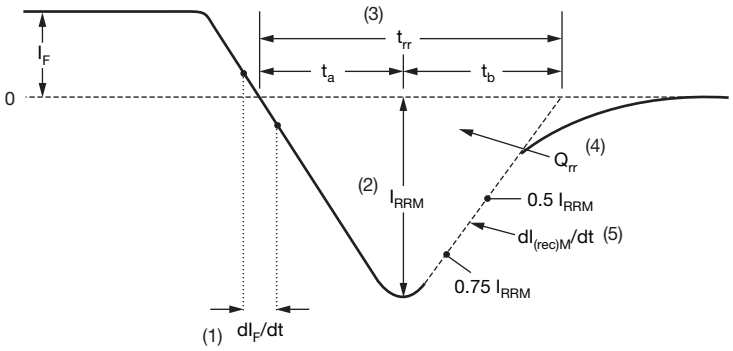


Fig. 8 - Typical Stored Charge vs. dI_F/dt

Note

(1) Formula used: $T_C = T_J - (Pd + Pd_{REV}) \times R_{thJC}$;
Pd = Forward power loss = $I_{F(AV)} \times V_{FM}$ at ($I_{F(AV)}$/D) (see fig. 6);
Pd_{REV} = Inverse power loss = $V_{R1} \times I_R (1 - D)$; I_R at V_{R1} = 80 % rated V_R



(1) dI_F/dt - rate of change of current through zero crossing

(2) I_{RRM} - peak reverse recovery current

(3) t_{rr} - reverse recovery time measured from zero crossing point of negative going I_F to point where a line passing through 0.75 I_{RRM} and 0.50 I_{RRM} extrapolated to zero current.

(4) Q_{rr} - area under curve defined by t_{rr} and I_{RRM}

$$Q_{rr} = \frac{t_{rr} \times I_{RRM}}{2}$$

(5) $dI_{(rec)M}/dt$ - peak rate of change of current during t_b portion of t_{rr}

Fig. 9 - Reverse Recovery Waveform and Definitions

ORDERING INFORMATION TABLE

Device code

VS-	E	P	U	60	06	L	-M3
1	2	3	4	5	6	7	8

1 - Vishay Semiconductors product

2 - Circuit configuration:
- A = single diode 3-pin
- E = single diode 2-pin

3 - P = TO-247

4 - U = ultrafast recovery time

5 - Current code (60 = 60 A)

6 - Voltage code (06 = 600 V)

7 - L = long lead

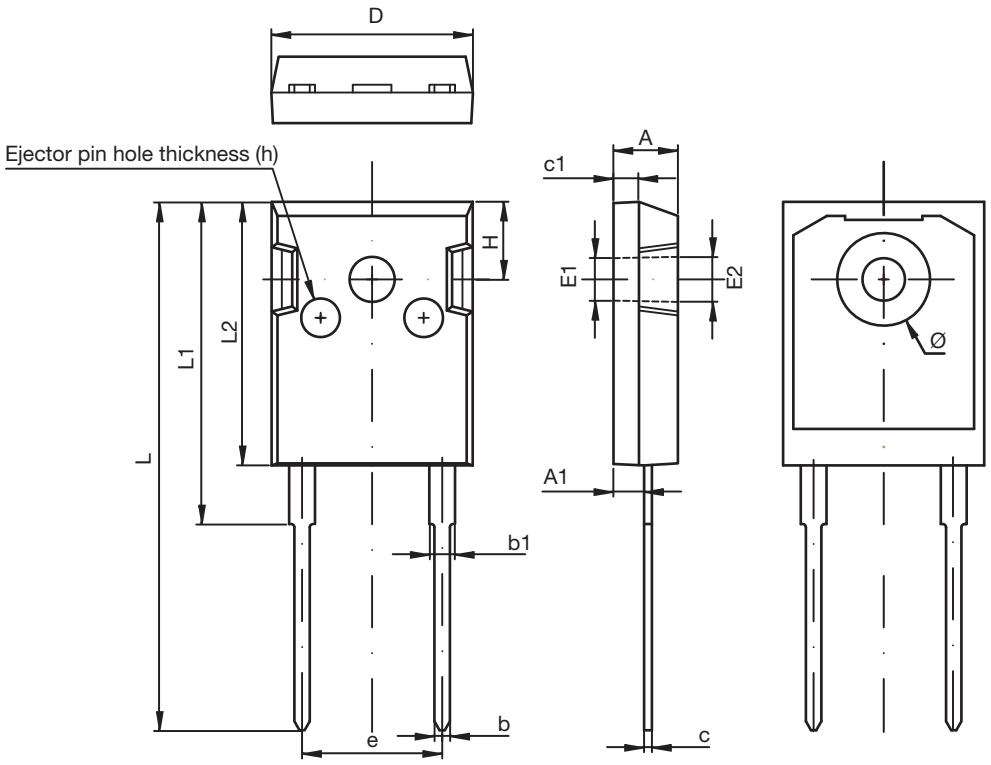
8 - Environmental digit:
-M3 = halogen-free, RoHS-compliant and termination lead (Pb)-free

ORDERING INFORMATION (Example)			
PREFERRED P/N	**QUANTITY PER TUBE**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-EPU6006L-M3	30	300	Antistatic plastic tube
VS-APU6006L-M3	30	300	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS		
Dimensions	TO-247 3-pin LL	www.vishay.com/doc?95599
	TO-247AC 2-pin LL	www.vishay.com/doc?95598
Part marking information	TO-247 3-pin LL	www.vishay.com/doc?95593
	TO-247 2-pin LL	www.vishay.com/doc?95592

TO-247 2 Pin Long Lead

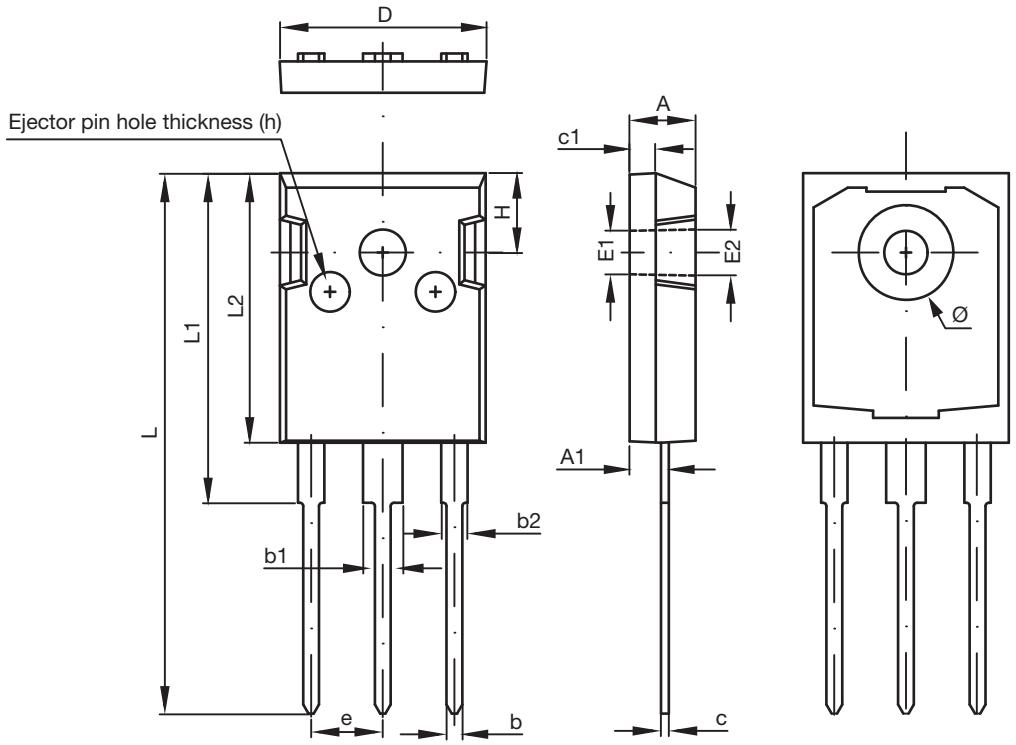
DIMENSIONS in millimeters



SYMBOL	DIMENSIONS IN MILLIMETERS		DIMENSIONS IN INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 Ref.		0.138 Ref.	
E2	3.600 Ref.		0.142 Ref.	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Ø	7.100	7.300	0.280	0.287
e	10.900 Typ.		0.429 Typ.	
H	5.980 Typ.		0.235 Typ.	
h	0.000	0.300	0.000	0.012

TO-247 3 Pin Long Lead

DIMENSIONS in millimeters



SYMBOL	DIMENSIONS IN MILLIMETERS		DIMENSIONS IN INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
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