Powermite High Efficiency 2 and 2.5 Amp Ultrafast Rectifiers

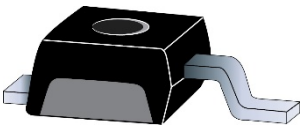
UPR5–UPR60e3

Product Overview

The Microchip UPR5–UPR60e3 Powermite high efficiency rectifiers offer optimized forward voltage characteristics with reverse blocking capabilities from 50–600 volts. They are ideal for surface mount applications that operate at high frequencies.

In addition to its size advantages, Powermite package features include a full metallic bottom that eliminates possibility of solder flux entrapment during assembly and a unique locking tab acts as an efficient heat path from die to mounting plane for external heat sinking with very low thermal resistance junction to case (bottom). Its innovative design makes this device ideal for use with automatic insertion equipment. RoHS compliant versions are available.

Figure 1. DO-216AA Package



Features

- Low thermal resistance DO-216AA package for higher current operation
- Ultrafast recovery time of:
  - 25 ns for UPR5–UPR15e3
  - 50 ns for UPR20–UPR40e3
  - 30 ns for UPR60(e3)
- Efficient heat path with Integral locking bottom metal tab
- Low forward voltage
- Full metallic bottom eliminates flux entrapment
- Compatible with automatic insertion equipment
- Low profile-maximum height of 1.14 mm
- RoHS compliant versions available

Applications/Benefits

- Switching and regulating power supplies
- Charge pump circuits
- Reduces reverse recovery loss with low I_{RM}
- Small foot print (See Mounting Pad Dimensions details)

Table of Contents

1. Maximum Ratings

Table 1-1. Maximum Ratings

Parameters/Test Conditions		Symbol	Value	Unit
Junction and Storage Temperature		T_J and T_{STG}	–55 to +150	°C
Thermal Resistance Junction-to-Tab		—	30	°C/W
Thermal Resistance Junction-to-Bottom		—	10	°C/W
Non-Repetitive Peak Forward Surge Current (At 8.3 ms single half-sine wave)	UPR5–UPR15 UPR20–UPR60	I_{FSM}	25 20	A
Average Rectified Output Current [1] (At rated V_{RWM}, T_C = 75 °C)	UPR5–UPR15 UPR20–UPR60	I_O	2.5 2.0	A
Solder Temperature at 10 seconds		—	260	°C

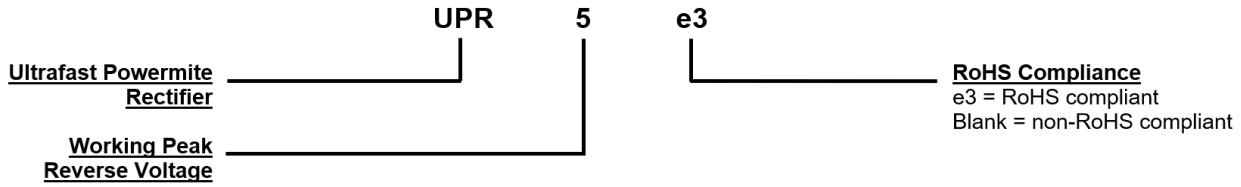
Note:
1. When mounted on FR-4 PC board using 1 oz copper with recommended minimum footprint.

1.1. Mechanical Packaging

- Case: Void-free transfer molded thermosetting epoxy compound meeting UL94V-0
- Terminals: Tin-lead or RoHS compliant annealed matte-tin plating. Solderable per MIL-STD-750, method 2026
- Marking: Date code, see electrical characteristics: device marking
- Polarity: Cathode designated by TAB 1
- Tape and Reel Option: 12 mm tape per standard EIA-481-B. Consult factory for quantities.
- Weight: Approximately 0.016 gram
- See Package Dimensions

1.2. Part Nomenclature

Figure 1-1. Part Nomenclature



2. Symbols and Definitions

Table 2-1. Symbols and Definitions

Symbol	Definition
I_F	Forward Current: The dc current flowing from the external circuit into the anode terminal.
I_{FSM}	Surge Peak Forward Current: The forward current including all nonrepetitive transient currents but excluding all repetitive transients (ref JESD282-B).
I_O	Average Rectified Output Current: The output current averaged over a full cycle with a 50 Hz or 60 Hz sine-wave input and a 180 degree conduction angle.
I_R	Reverse Current: The dc current flowing from the external circuit into the cathode terminal at the specified voltage V_R.
$I_{R(REC)}$	Reverse Recovery Current: The transient reverse current associated with a change from forward current to a reverse condition.
trr	Reverse Recovery Time: The time interval between the instant the current passes through zero when changing from the forward direction to the reverse direction and a specified decay point after a peak reverse current occurs.
V_F	Forward Voltage: A positive dc anode-cathode voltage the device will exhibit at a specified forward current.
V_R	Reverse Voltage: A positive dc cathode-anode voltage below the breakdown region.
V_{RWM}	Working Peak Reverse Voltage: The peak voltage excluding all transient voltages (ref JESD282-B). Also sometimes known historically as PIV.

2.1. Electrical Characteristics

Table 2-2. Electrical Characteristics at T_A = +25 °C Unless Otherwise Stated

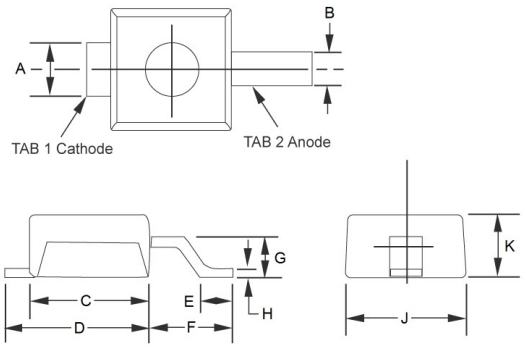
Part Number	Device Marking [1]	Working Peak Reverse Voltage V_{RWM}	Reverse Current I_R at V_{RWM}	Reverse Current I_R at V_{RWM} (T_J = 100 °C)	Forward Current I_F	Forward Voltage [3] V_F at I_F	Forward Voltage [3] V_F at I_F (T_J = 100 °C)	Reverse Recovery Time t_{rr} at I_F = 0.5A at I_R = 1.0A at $I_{R(REC)}$ = 0.25A
		V	µA	µA	A	V	V	ns
UPR5	R05	50	2	50	2	0.975	0.895	25
UPR10	R10	100	2	50	2	0.975	0.895	25
UPR15	R15	150	2	50	2	0.975	0.895	25
UPR20	R20	200	10	100	1	1.25	1.15	50
UPR30	R30	300	10	100	1	1.25	1.15	50
UPR40	R40	400	10	100	1	1.25	1.15	50
UPR60	R60	600	1	100 [2]	2	1.6	1.4 [4]	30

Notes:

1. Include • in marking for e3 parts (for example, UPR5e3 & R05•)
2. At T_J = 125 °C
3. Short duration test pulse used to minimize self – heating effect.
4. At T_J = 25 °C , I_F = 1.2A

3. Package Dimensions

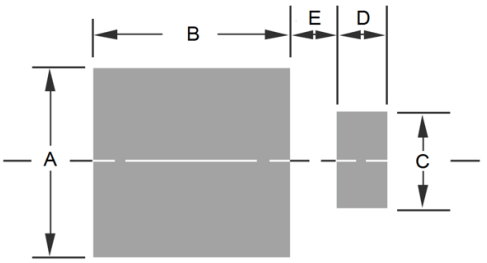
Figure 3-1. Package Dimensions



Ltr	Dimensions			
	Inch		Millimeters	
	Min.	Max.	Min.	Max.
A	0.029	0.039	0.73	0.99
B	0.016	0.026	0.40	0.66
C	0.070	0.080	1.77	2.03
D	0.087	0.097	2.21	2.46
E	0.020	0.030	0.50	0.76
F	0.051	0.061	1.29	1.54
G	0.021	0.031	0.53	0.78
H	0.004	0.008	0.10	0.20
J	0.070	0.080	1.77	2.03
K	0.035	0.045	0.89	1.14

3.1. Mounting Pad Dimensions

Figure 3-2. Pad Layout



Ltr	Dimensions	
	Inch	Millimeters
A	0.100	2.54
B	0.105	2.67
C	0.050	1.27
D	0.030	0.76
E	0.025	0.64

4. Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Revision	Date	Description
A	04/2025	Document was converted to Microchip template and assigned literature number DS00005917.
Rev. A	10/2024	Initial Microsemi document was created and assigned literature number RF01312.

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