

Description

The VPE2033 three terminal positive regulator is available with 3.3V or 5V fixed output voltage, making it useful in a wide range of applications. Used as a Zener-diode and resistor combination replacement, the VPE2033 usually provides an effective output impedance improvement of two orders of magnitude and lower quiescent current. These regulators can provide local, on-card regulation, eliminating distribution problems associated with single-point regulation. The available voltages allow the VPE2033 to be used in logic systems, instrumentation and other solid-state electronic equipment.

The VPE2033 is available in TO-92 package, SOT-23-3 package, SOT-89-3 package, and SOP-8 package. With adequate heat sinking, the regulator can deliver 100mA output current. Current limiting is included to limit the peak output current to a safe value. Safe area protection for the output transistors is provided to limit internal power dissipation. If internal power dissipation is too high for the heat sinking provided, the thermal shutdown circuit prevents the IC from overheating.

Key Features

- Output voltage tolerances of $\pm 5\%$ over the temperature range
- 100 mA output current driving capacity
- Output transistor safe area protection
- Internal thermal shutdown protection
- Internal short-circuit current limit
- Available in TO-92, SOT-23-3, SOT-89-3 and SOP-8 packages

Applications

- Battery Powered Equipment
- Low Power Microcontrollers
- LED Lighting
- Low Wattage Power Supplies

Typical Application

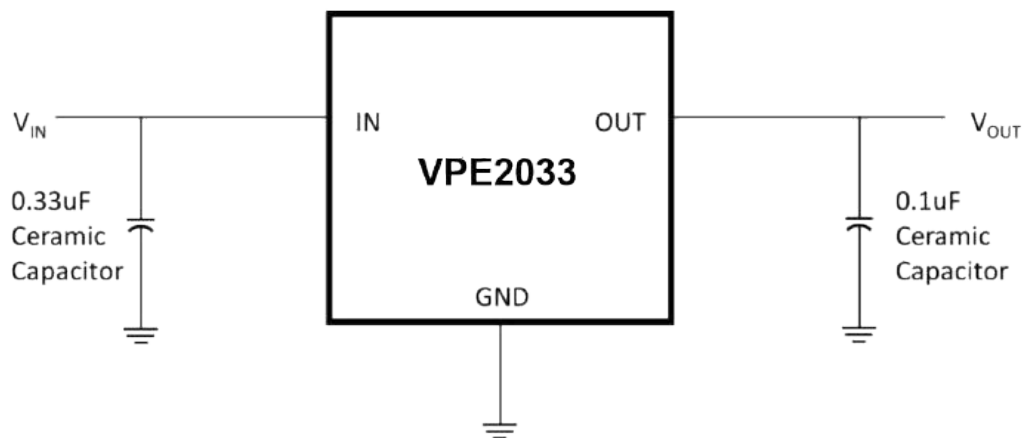
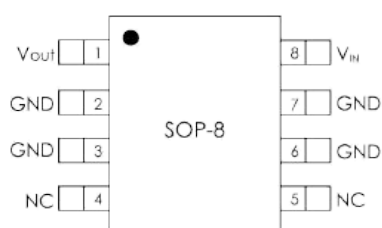
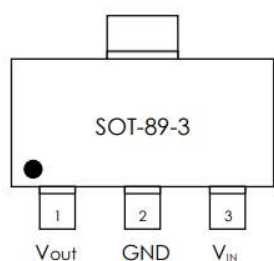
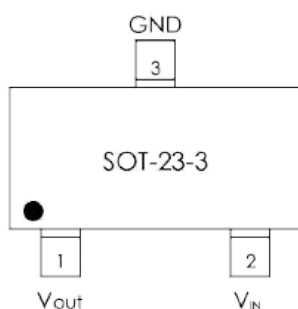
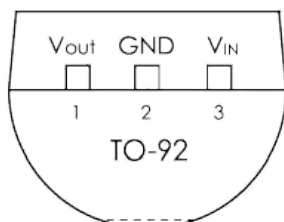


Fig. 1 VPE2033 Typical Application Circuit

Connection Diagrams



Order Information

VPE2033-XXTM03NRA/B

VPE2033-XXTN03NRA/B

XX Output voltage

TM03 TO-92 2.54mm

TN03 TO-92 1.27mm

NR RoHS & Halogen free package

Rating: -40 to 85°C

Package in Ammo pack

A Ammo pack

B Bulk pack

VPE2033-XXVD03NRR

XX Output voltage

VD03 SOT-23-3 Package

NRR RoHS & Halogen free package

Rating: -40 to 85°C

Package in Tape & Reel

VPE2033-XXVLX3NRR

XX Output voltage

VLX3 SOT-89-3 Package

NRR RoHS & Halogen free package

Rating: -40 to 85°C

Package in Tape & Reel

VPE2033-XXSO08NRR

XX Output voltage

SO08 SOP-8 Package

NRR RoHS & Halogen free package

Rating: -40 to 85°C

Package in Tape & Reel

Order, Marking & Packing Information

Package	Vout	Product ID.	Marking Code	Packing
TO-92	3.3V	VPE2033-33TM03NRA	2033	Ammo pack, 2Kpcs
	5.0V	VPE2033-50TM03NRA		
	3.3V	VPE2033-33TN03NRA		
	5.0V	VPE2033-50TN03NRA		
	3.3V	VPE2033-33TM03NRB		Bulk pack, 1Kpcs
	5.0V	VPE2033-50TM03NRB		
	3.3V	VPE2033-33TN03NRB		
	5.0V	VPE2033-50TN03NRB		
SOT-23-3	3.3V	VPE2033-33VD03NRR	2033	Tape & Reel, 3Kpcs
	5.0V	VPE2033-50VD03NRR		
SOT-89-3	3.3V	VPE2033-33VLX3NRR	2033	Tape & Reel, 1Kpcs
	5.0V	VPE2033-50VLX3NRR		
SOP-8	3.3V	VPE2033-33SO08NRR	2033	Tape & Reel, 3Kpcs
	5.0V	VPE2033-50SO08NRR		

Pin Functions

Name	TO-92	SOT-23-3	SOT-89-3	SOP-8	Function
V _{IN}	3	2	3	8	Supply Voltage Input. Require a minimum input capacitor of close to 0.33μF to ensure stability and sufficient decoupling from the ground pin.
GND	2	3	2,4	2,3,6,7	Ground Pin
NC	N/A	N/A	N/A	4,5	No connection
V _{OUT}	1	1	1	1	Output Voltage

Functional Block Diagram

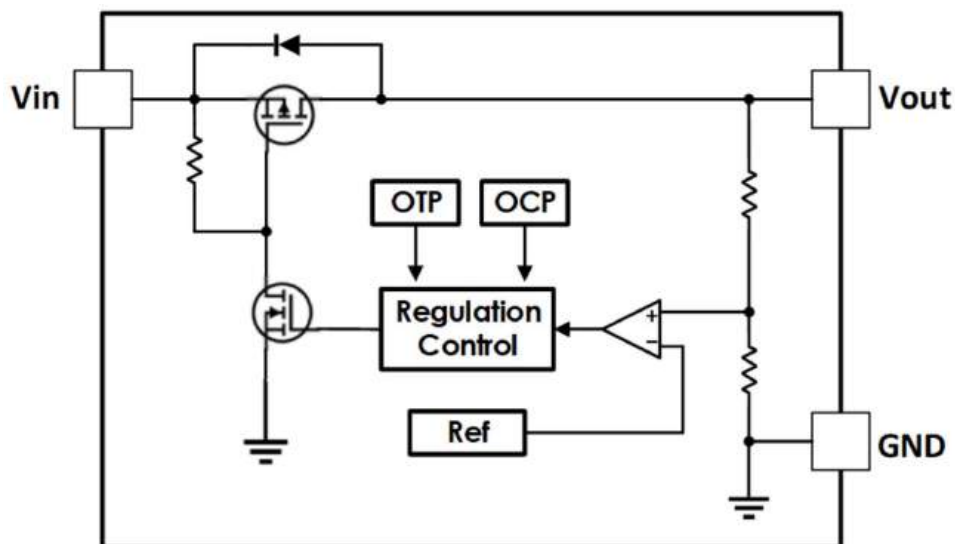


Fig. 2. Functional Block Diagram of VPE2033

Absolute Maximum Ratings (Notes 1, 2)

V_{IN}	–0.3V to 35V	Lead Temperature (Soldering, 10 sec.)	260°C
Storage Temperature Range	–65°C to 150°C	ESD Rating	
Junction Temperature	150°C	- Human Body Model	2KV

Operating Ratings (Notes 1, 2)

Supply Voltage	7V to 30V	Junction Temperature Range	–40°C to 125°C
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Thermal Resistance

Symbol	θ_{JA} (Note 3)	θ_{JC} (Note 4)
TO-92	159(°C/W)	76(°C/W)
SOT-23-3	250(°C/W)	81(°C/W)
SOT-89-3	152(°C/W)	81(°C/W)
SOP-8	90(°C/W)	52(°C/W)

Electrical Characteristics

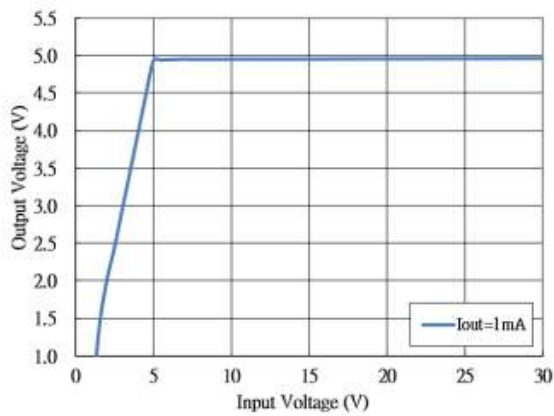
$V_{IN}=10V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^{\circ}C$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
VPE2033-33 Output Voltage	V_{OUT}	$T_J = 25^{\circ}C$	3.168	3.3	3.432	V
		$V_{IN} = 7V$ to $20V$, $I_{OUT} = 1mA$ to $40mA$, $T_J = 0^{\circ}C$ to $125^{\circ}C$ (Note 5)	3.135	–	3.465	
		$I_{OUT} = 1mA$ to $70mA$, $T_J = 0^{\circ}C$ to $125^{\circ}C$ (Note 5)	3.135	–	3.465	
VPE2033-50 Output Voltage	V_{OUT}	$T_J = 25^{\circ}C$	4.8	5	5.2	V
		$V_{IN} = 8V$ to $20V$, $I_{OUT} = 1mA$ to $40mA$, $T_J = 0^{\circ}C$ to $125^{\circ}C$ (Note 5)	4.75	–	5.25	
		$I_{OUT} = 1mA$ to $70mA$, $T_J = 0^{\circ}C$ to $125^{\circ}C$ (Note 5)	4.75	–	5.25	
Line Regulation	ΔV_{LINE}	$V_{IN} = 8V$ to $20V$,	–	15	30	mV
Load Regulation	ΔV_{LOAD}	$I_{OUT} = 1mA$ to $100mA$	–	20	60	mV
		$I_{OUT} = 1mA$ to $40mA$	–	10	30	
Quiescent Current	I_Q	$T_J = 25^{\circ}C$	–	0.3	–	mA
		$T_J = 125^{\circ}C$	–	–	1	
Quiescent Current Change	ΔI_Q	$V_{IN} = 8$ to $20V$, $T_J = 0^{\circ}C$ to $125^{\circ}C$	–	–	0.2	mA
		$I_{OUT} = 1mA$ to $40mA$, $T_J = 0^{\circ}C$ to $125^{\circ}C$	–	–	0.1	
Ripple Rejection	PSRR	$f = 120Hz$, $V_{IN} = 8V$ to $20V$, $T_J = 25^{\circ}C$	–	60	–	dB
Dropout Voltage	V_{DROP}	–	–	0.8	–	V
V_{OUT} Temp. Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT} = 5mA$	–	0.5	–	mV/ $^{\circ}C$
Peak Output Current	I_{PK}	–	–	170	–	mA
Thermal Shutdown	T_{SD}	–	–	165	–	$^{\circ}C$
Thermal Shutdown Hysteresis	T_{HY}	–	–	25	–	$^{\circ}C$

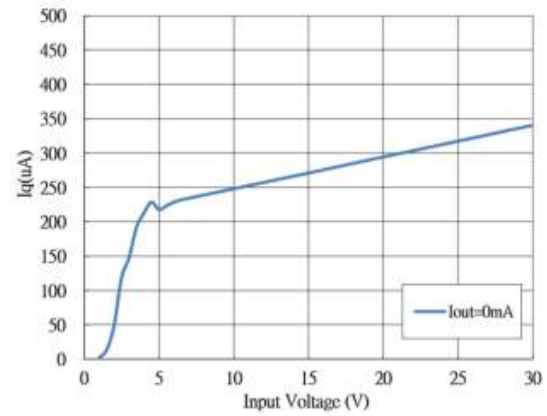
- **Note 1:** Absolute Maximum ratings indicate limits beyond which damage may occur. Electrical specifications do not apply when operating the device outside of its rated operating conditions.
- **Note 2:** All voltages are with respect to the potential at the ground pin.
- **Note 3:** θ_{JA} is measured in the natural convection at $T_J=25^{\circ}C$ on a high effective thermal conductivity test board (2 layers, 2S0P).
- **Note 4:** θ_{JC} represents the resistance to the heat flows the chip to package top case.
- **Note 5:** Power dissipation<0.5W

Typical Performance Characteristics

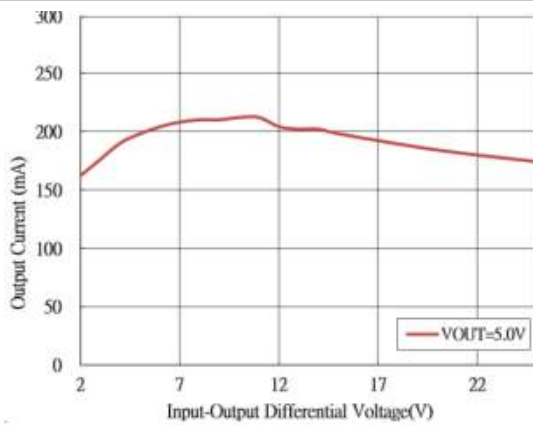
$V_{IN}=10V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^{\circ}C$, Unless otherwise specified.



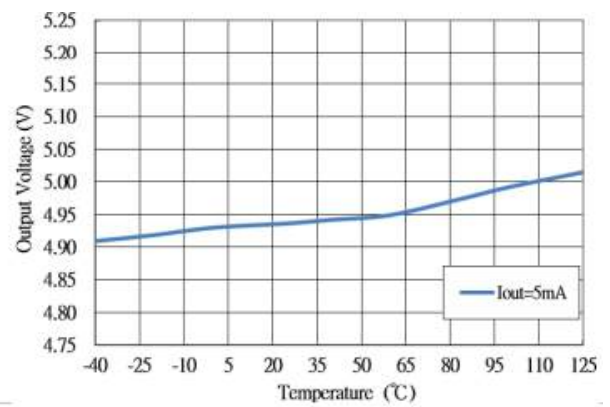
V_{OUT} vs. V_{IN}



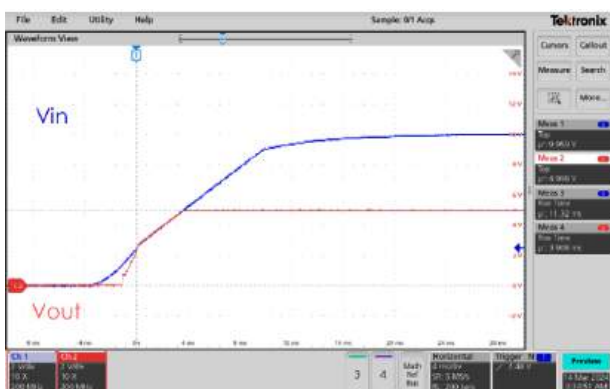
I_Q vs. V_{IN}



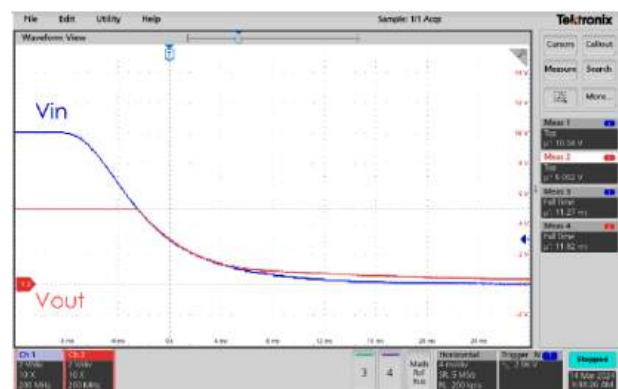
Peak Output Current vs. Input-Output Differential



V_{OUT} (5V) vs. Temperature



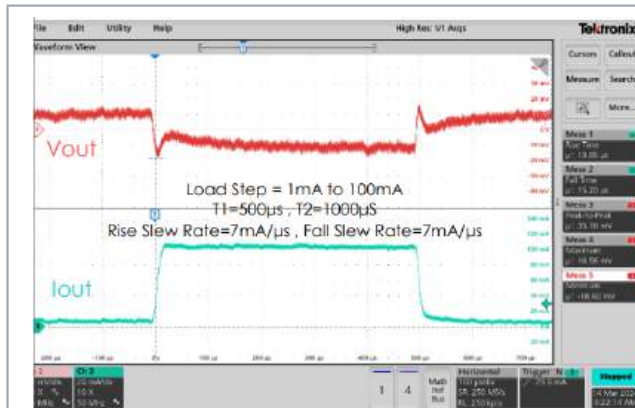
V_{IN} Start up



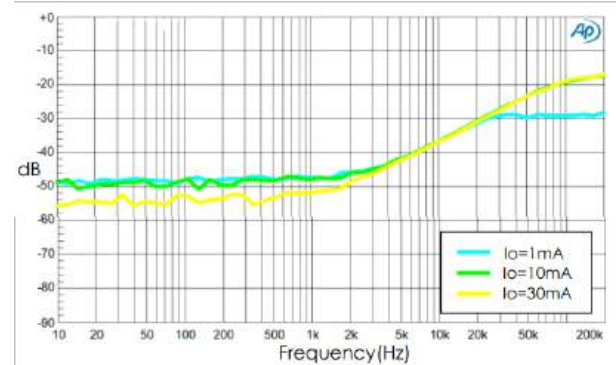
V_{IN} Power off

Typical Performance Characteristics (cont.)

$V_{IN}=10V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^{\circ}C$, Unless otherwise specified.



Load Transient



PSRR vs. Frequency

Application Information

Input Capacitor

Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators. A 0.33 μ F capacitor on the input is suitable for most applications.

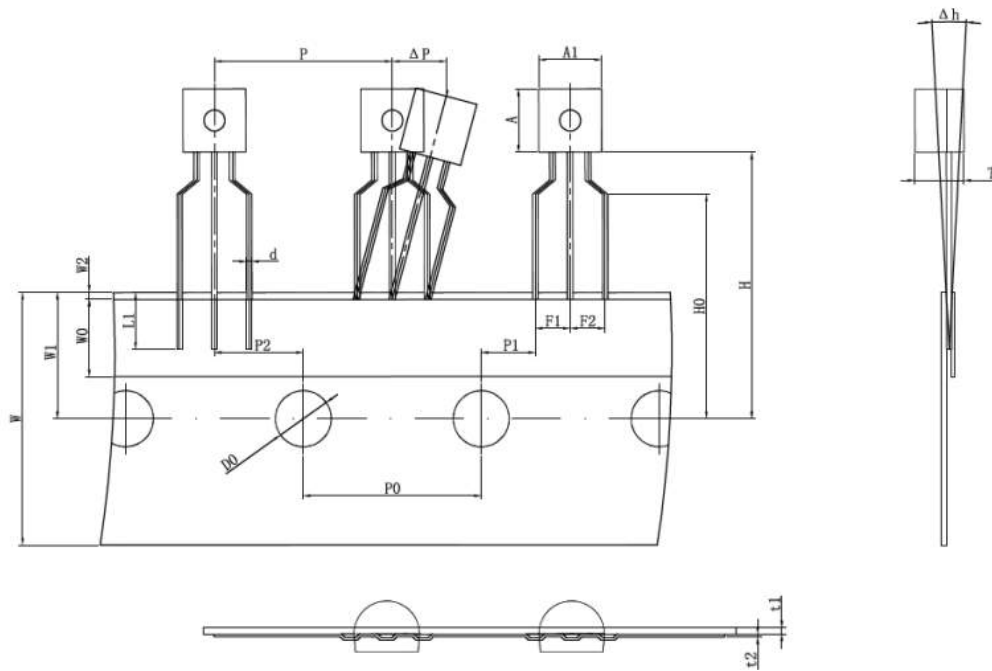
Output Capacitor

A minimum load capacitance of 0.1 μ F to limit high-frequency noise.

Shutdown

The device automatically shuts down if its internal temperature becomes too high.

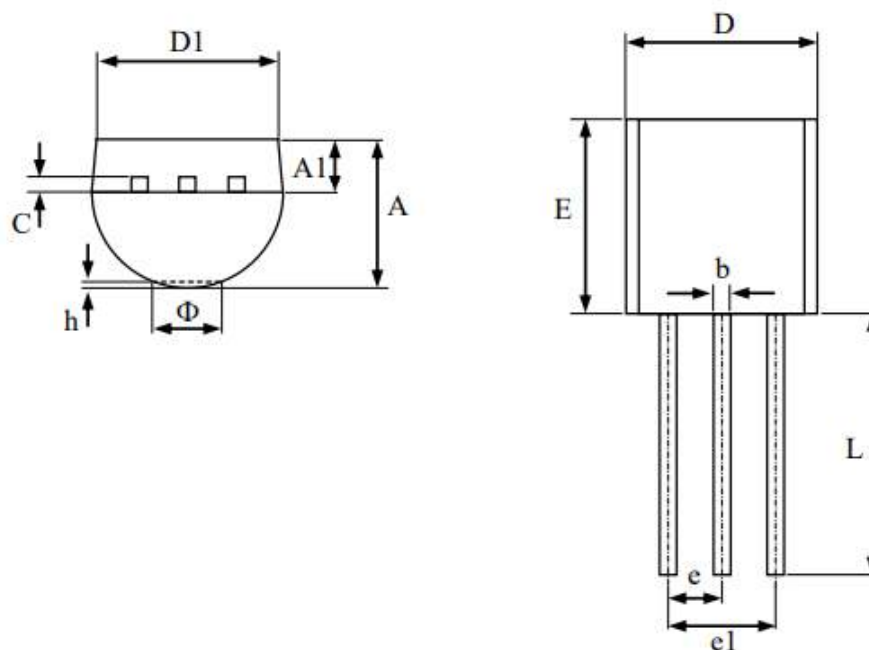
Package Outline Drawing(TO-92 2.54mm (TM))



Item	Symbol	Value & Tolerance
Body width	A1	4.5 ± 0.2
Body height	A	4.5 ± 0.2
Body thickness	T	3.5 ± 0.1
Lead wire diameter	d	0.46 +0.09, -0.08
Pitch of component	P	12.7 ± 0.3
Feed hole pitch	P0	12.7 ± 0.2
Hole center to component center	P2	6.35 ± 0.3
Lead to lead distance	F1, F2	2.5 ± 0.3
Component alignment, F-R	Δh	0 ± 1.0
Type width	W	18.0 +1.0, -0.5
Hole down tape width	W0	6.0 ± 0.5
Hole position	W1	9.0 ± 0.5
Hole down tape position	W2	1.0 MAX.
Height of component from tape center	H	19.0 +2.0, -1.0
Lead wire clinch height	H0	16.0 ± 0.5
Lead wire (tape portion)	L1	2.5 MIN.
Feed hole diameter	D0	4.0 ± 0.2
Taped Lead Thickness	t1	0.4 ± 0.05
Carrier Tape Thickness	t2	0.2 ± 0.05
Position of hole	P1	3.85 ± 0.3
Component alignment	ΔP	0 ± 1.0

Unit: mm

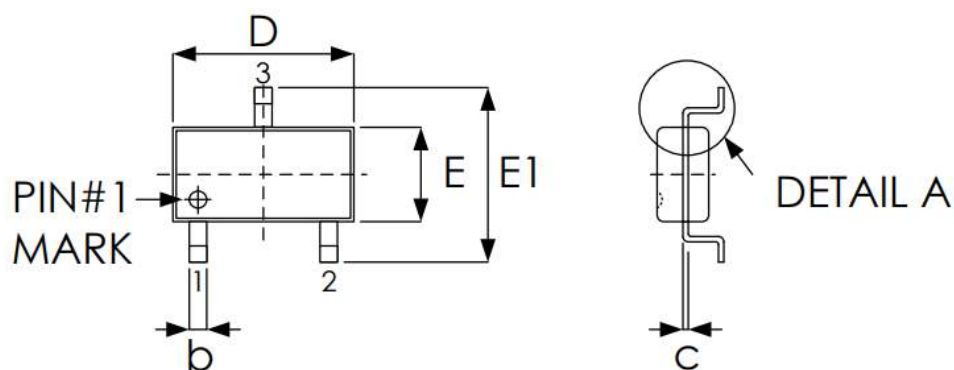
Package Outline Drawing(TO-92 1.27mm (TN))



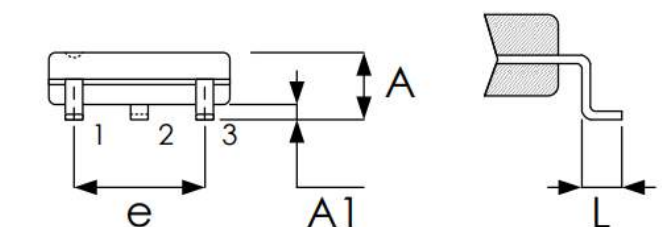
Symbol	Dimension in mm	
	Min.	Max.
A	3.30	3.70
A1	1.10	1.40
b	0.36	0.56
c	0.28	0.51
D	4.30	4.70
D1	3.43	4.30
E	4.30	4.70
e	1.27 TYP.	
e1	2.44	2.64
L	14.10	14.50
Φ	1.60	
h	0.00	0.38

All dimensions are in millimeters.

Package Outline Drawing(SOT-23-3)



TOP VIEW



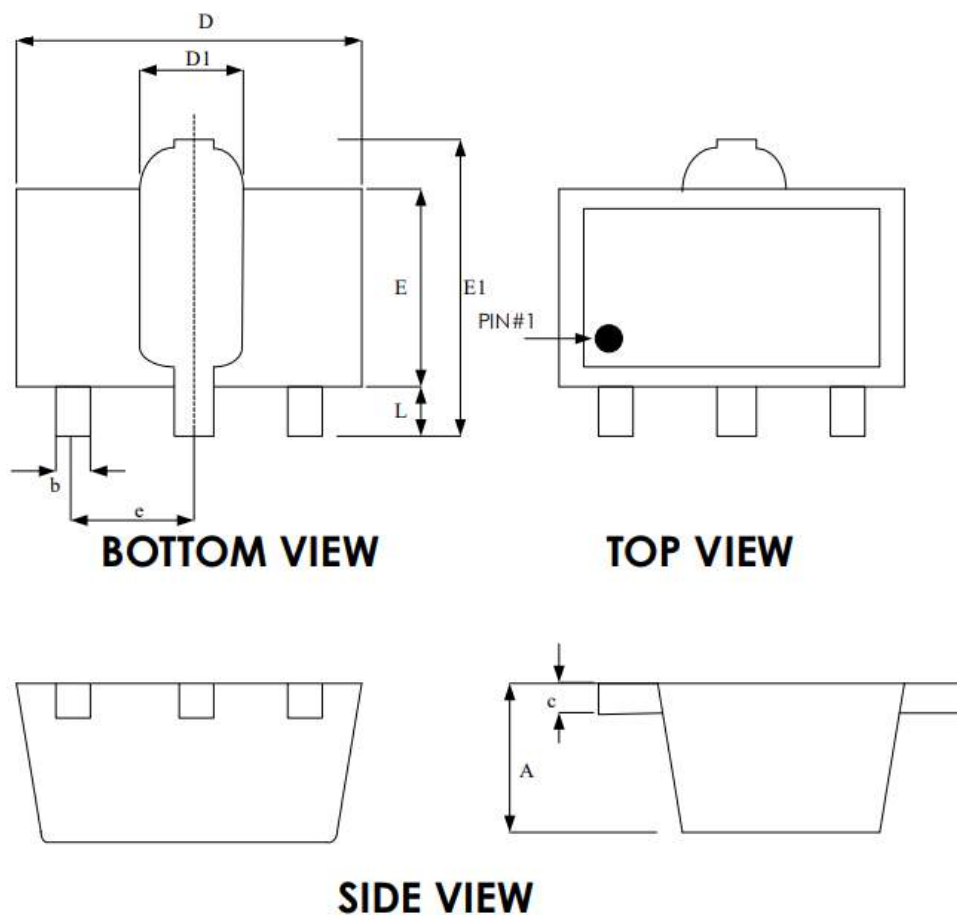
SIDE VIEW

DETAIL A

Symbol	Dimension in mm	
	Min.	Max.
A	0.90	1.45
A1	0.00	0.15
b	0.30	0.50
c	0.08	0.25
D	2.7	3.10
E	1.04	1.80
E1	2.60	3.00
e	1.50 BSC	
L	0.30	0.60

All dimensions are in millimeters.

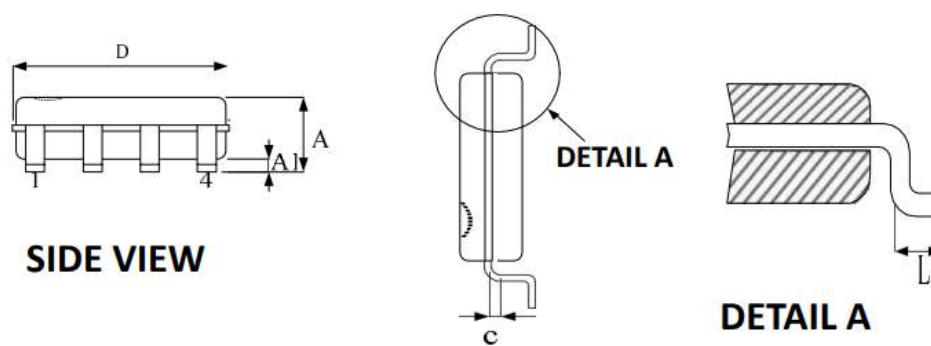
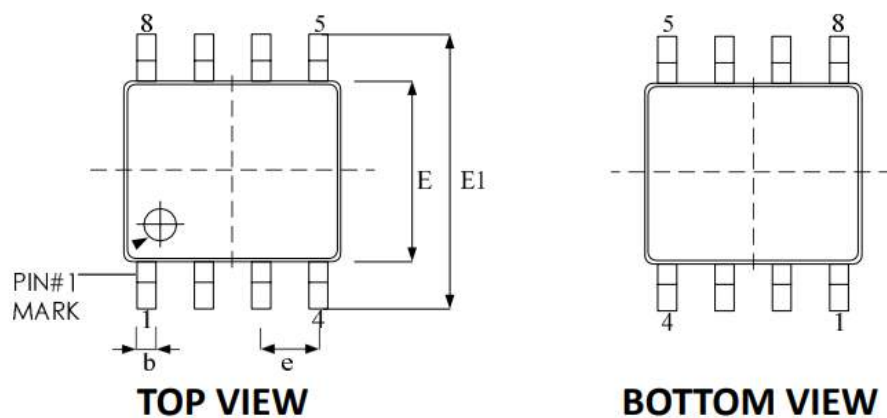
Package Outline Drawing(SOT-89-3)



Symbol	Dimension in mm	
	Min.	Max.
A	1.40	1.60
b	0.40	0.56
c	0.35	0.41
D	4.40	4.60
D1	1.50	1.83
E	2.29	2.60
E1	3.94	4.25
e	1.50 BSC	
L	0.89	1.20

All dimensions are in millimeters.

Package Outline Drawing(SOP-8 (150mil))



Symbol	Dimension in mm	
	Min.	Max.
A	—	1.70
A1	0.00	0.15
b	0.31	0.51
c	0.10	0.25
D	4.80	5.00
E	3.81	4.00
E1	5.79	6.20
e	1.27 BSC	
L	0.40	1.27

All dimensions are in millimeters.

Disclaimer

The information provided in this datasheet is believed to be accurate and reliable. Errors or omissions are expected. indiaVP Semiconductor Pvt. Ltd. reserves the right to make changes to the product specifications without prior notice. Users should verify the suitability of the product for their specific applications. Please visit our website for the latest datasheet.

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