

DATA SHEET

PS432

ADJUSTABLE PRECISION SHUNT REGULATORS

DESCRIPTION

The PS432 are three-terminal adjustable shunt regulators with specified thermal stability. The output voltage may be set to any value between V_{ref} (approximately 1.24V) and 16V with two external resistors. These devices have a typical output impedance of 0.05Ω . Active output circuitry provides a very sharp turn-on characteristics, making these devices excellent replacements for zener diodes in many applications.

FEATURES

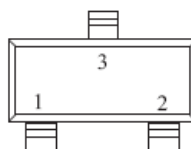
- Low voltage operation (down to 1.24V)
- Wide operating current range $80\mu A$ to 100mA
- Low Dynamic output impedance 0.05Ω typ
- Lead free and halogen free

APPLICATION

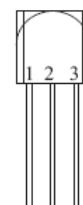
- Switching power supplies
- Linear Regulators
- Adjustable supplies
- Battery-operated computers
- Computer disk drives
- Instrumentation

PIN CONFIGURATION

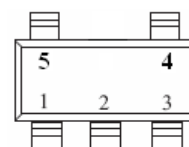
PIN	FUNCTION		
	SOT-23	SOT-23-5L	TO-92
1	Ref	NC	Ref
2	Cathode	NC	Anode
3	Anode	Cathode	Cathode
4	-	Reference	-
5	-	Anode	-



SOT-23

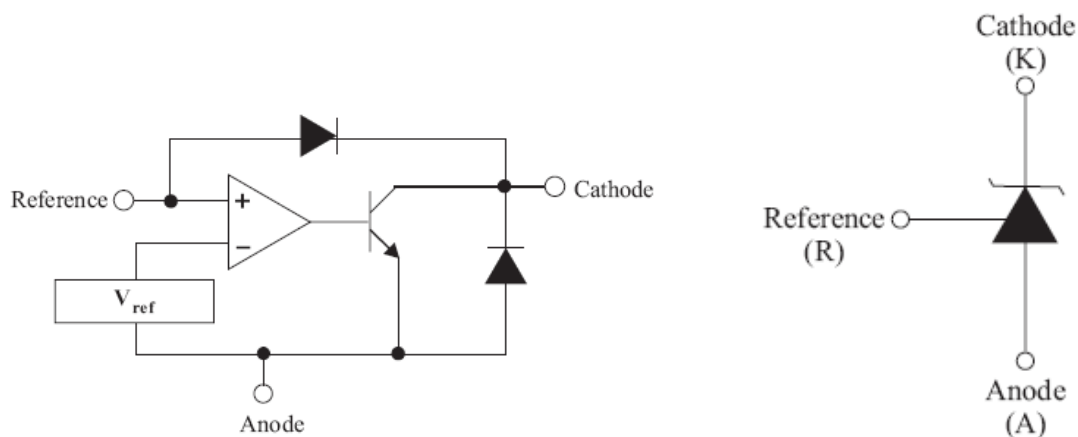


TO-92



SOT-23-5L

REPRESENTATIVE BLOCK DIAGRAM AND SYMBOL



ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	VALUE	UNITS
Cathode Voltage (NOTE 1)	V_{KA}	18	V
Continuous Cathode Current Range	I_K	100	mA
Reference Input Current	I_{ref}	3	mA
Operation Ambient Temperature Range	T_A	0 TO +70	°C
Lead Temperature (soldering) 10 seconds	T_{LEAD}	260	°C

NOTE: 1. Voltage values are with respect to the anode terminal unless otherwise noted.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	Min	Max	UNITS
Cathode Voltage	V_{KA}	V_{ref}	16	V
Cathode Current	I_K	0.08	100	mA

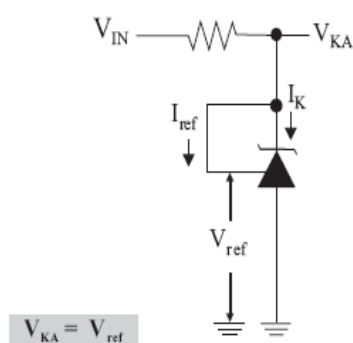
ELECTRICAL CHARACTERISTICS

$T_A = 25^\circ\text{C}$, unless otherwise noted.

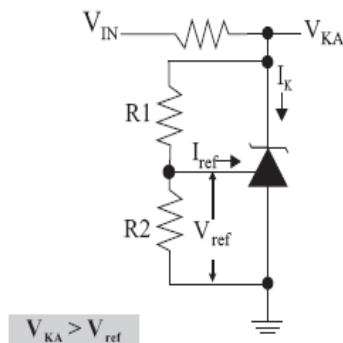
Parameter	Symbol	Test Circuit	Test Conditions	Min	Typ	Max	Units
Reference Voltage	PS432A (0.5%)	1	$V_{KA} = V_{ref}$, $I_K = 10\text{mA}$	1.234	1.24	1.246	V
	PS432B (1.0%)			1.227	1.24	1.253	
Deviation of reference input voltage over full Temperature range	V_{dev}	1	$V_{KA} = V_{ref}$, $I_K = 10\text{mA}$, $T_A = \text{full range}$		10	25	mV
Ratio of change in reference input voltage To cathode voltage	$\frac{\Delta V_{ref}}{\Delta V_{KA}}$	2	$I_K = 10\text{mA}$, $\Delta V_{KA} = 16\text{V}$ to V_{ref}	-2.7	-1.0		mV/V
Reference input current	I_{ref}	2	$I_K = 10\text{mA}$, $R_1 = 10\text{K}\Omega$, $R_2 = \infty$		0.15	0.5	μA
Deviation of reference input current over full temperature range	$I_{ref(dev)}$	2	$I_K = 10\text{mA}$, $R_1 = 10\text{K}\Omega$, $R_2 = \infty$, $I_A = \text{full range}$		0.1	0.4	μA
Minimum cathode current for regulation	$I_{K(min)}$	1	$V_{KA} = V_{ref}$		20	80	μA
Off-state cathode current	$I_{K(off)}$	3	$V_{KA} = 16\text{V}$, $V_{ref} = 0\text{V}$		0.135	0.15	μA
Dynamic impedance	$ Z_{KA} $	1	$V_{KA} = V_{ref}$, $f \leq 1\text{kHz}$, $I_K = 100\mu\text{A}$ to 100mA		0.05	0.15	Ω

TEST CIRCUIT

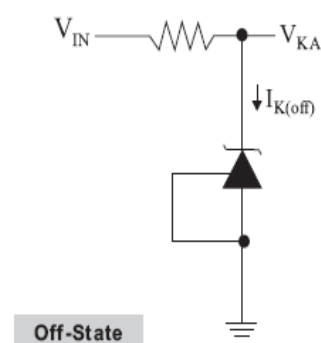
Test Circuit 1.



Test Circuit 2.



Test Circuit 3.



TYPICAL CHARACTERISTICS

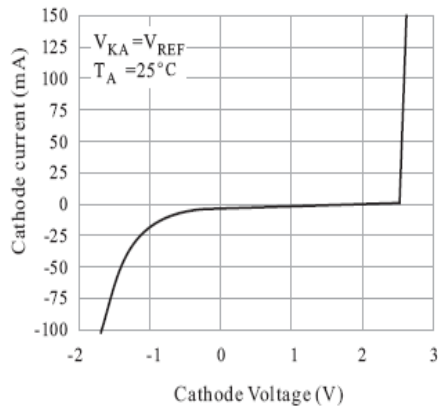


Figure 1. Cathode Current vs. Cathode Voltage

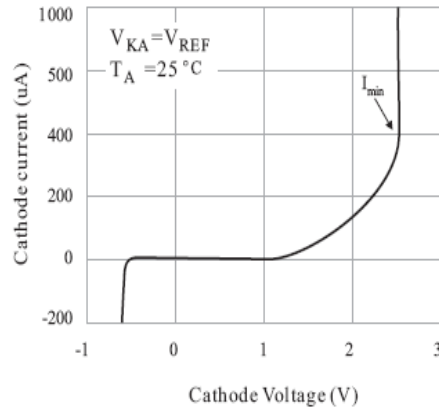


Figure 2. Cathode Current vs. Cathode Voltage

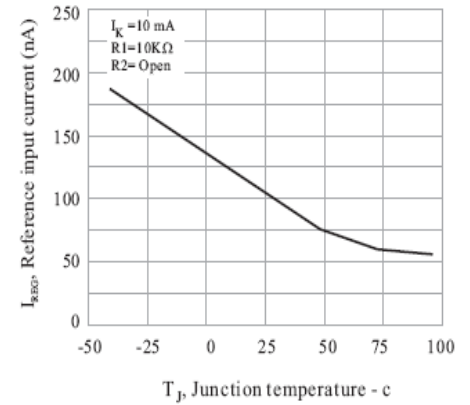


Figure 3. Ref. Voltage vs. Junction Temperature

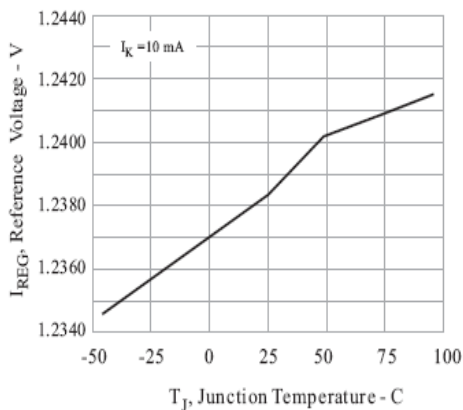


Figure 4. Ref. Input Current vs. Junction Temperature

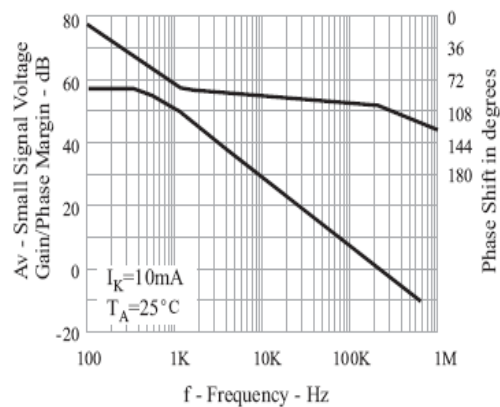


Figure 5. Small Signal Voltage Gain/ Phase Margin vs. Frequency

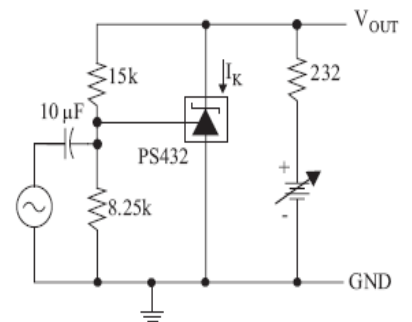


Figure 6. Test Circuit Small Signal Gain and Phase

TYPICAL APPLICATIONS

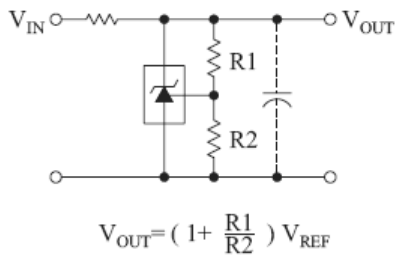


Figure 7. Shunt Regulator

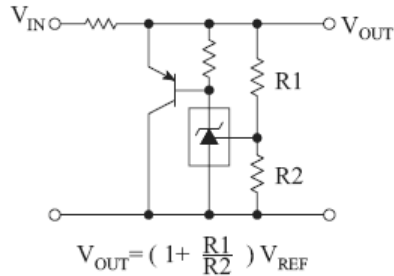


Figure 8. High Current Shunt Regulator

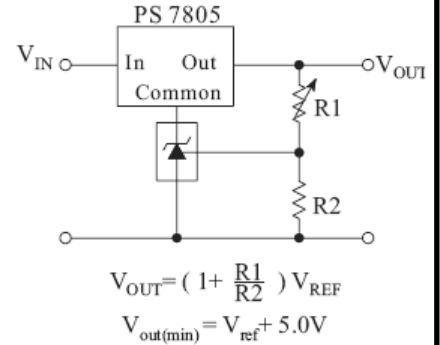


Figure 9. Output Control for a Three Terminal Fixed Regulator

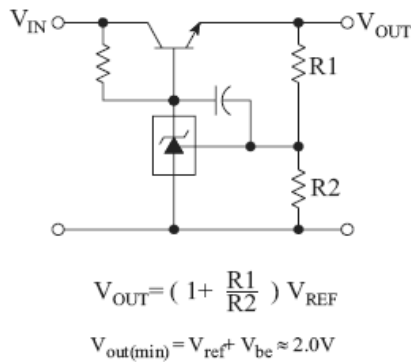


Figure 10. Series Pass Regulator

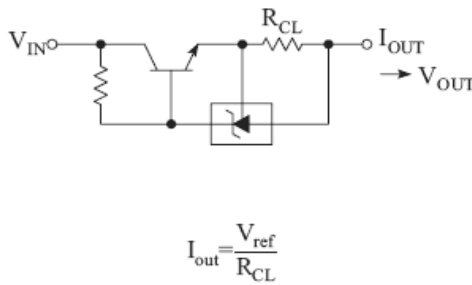


Figure 11. Constant Current Source

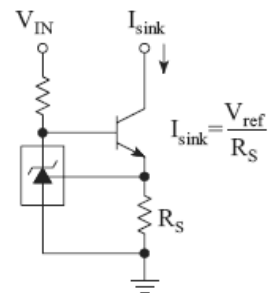


Figure 12. Constant Current Sink

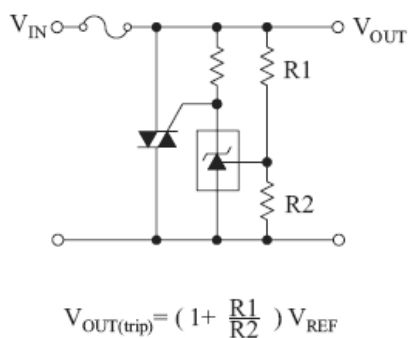


Figure 13. TRIAC Crowbar

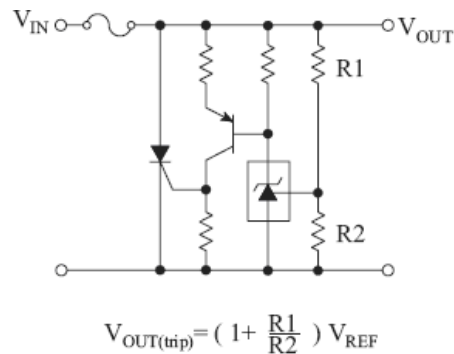
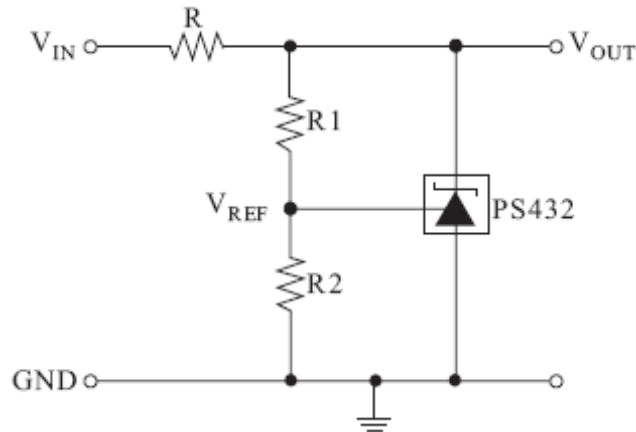


Figure 14. SCR Crowbar

TYPICAL APPLICATION CIRCUIT



NOTES:

1. Set V_{out} according to the following equation : $V_{out} = V_{ref} (1 + \frac{R_1}{R_2}) + I_{ref} R_1$

2. Chose the value for R as follows

The maximum limit for R should be such that the cathode current, I_K is greater than the minimum operating current ($80\mu A$) at $V_{IN(min)}$

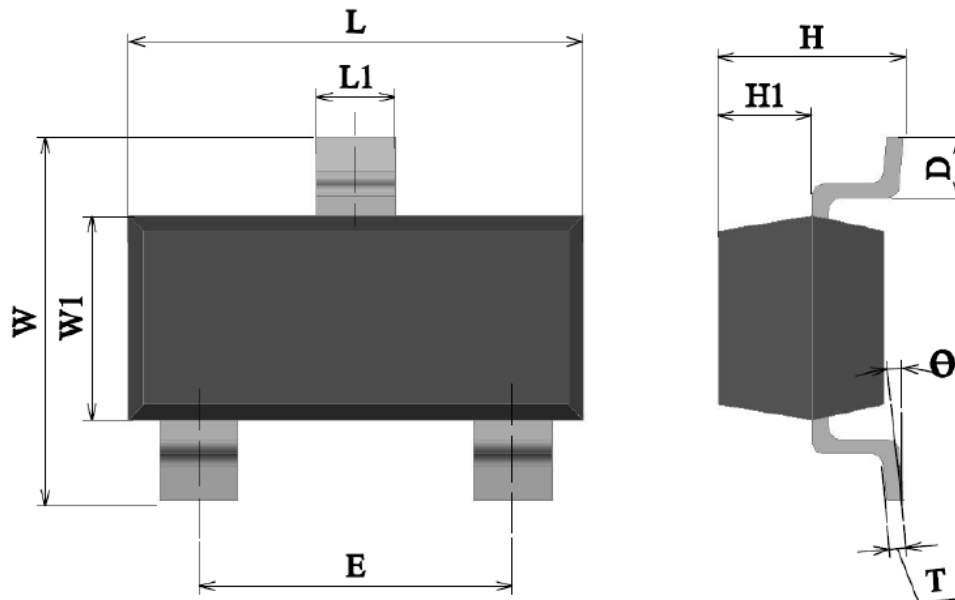
- The minimum limit for R should be such that the current, I_K does not exceed $100mA$ under all load conditions, and instantaneous
- Turn-on value for I_K does not exceed $150mA$. Both of the following conditions must be met:

$$R_{min} \geq \frac{V_{IN(max)}}{150mA} \quad (\text{to limit instantaneous turn-on } I_K)$$

$$R_{min} \geq \frac{V_{IN(max)} - V_{out}}{I_{out(min)} + 100mA} \quad (\text{to limit } I_K \text{ under normal operating conditions})$$

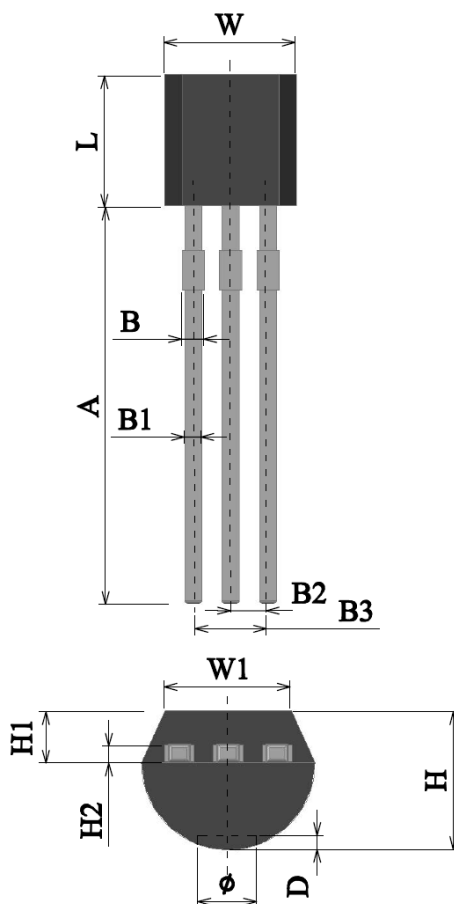
PHYSICAL DIMENSIONS

SOT-23 DIMENSION



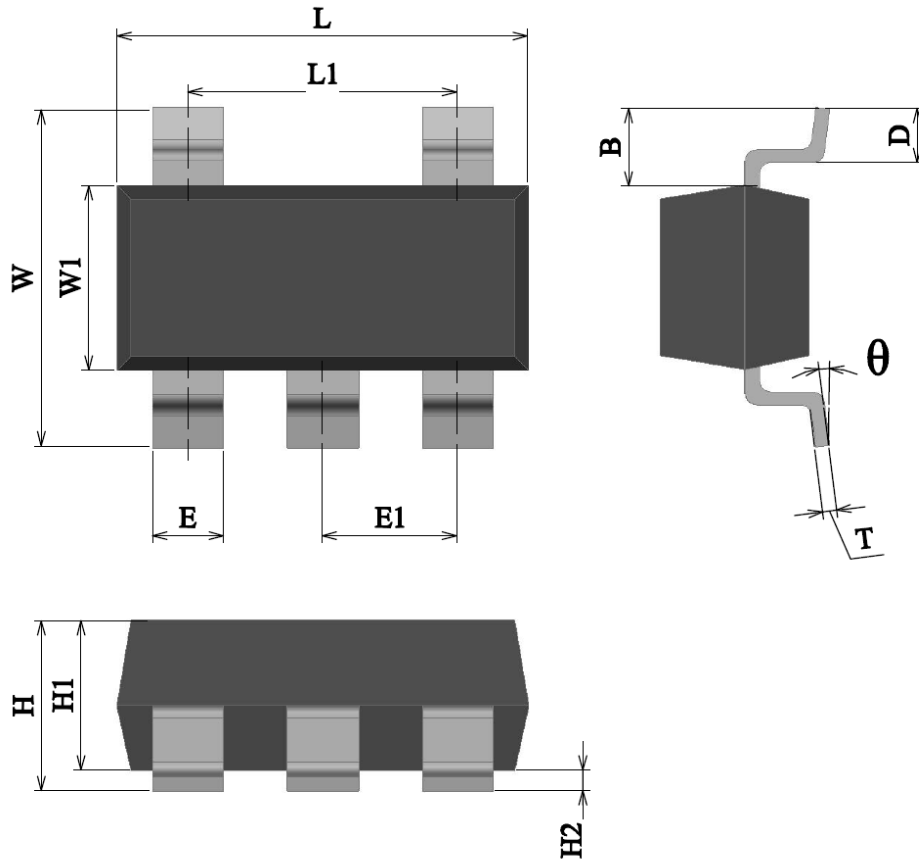
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
L	2.80	3.10	0.110	0.122
L1	0.30	0.50	0.012	0.020
W	2.25	2.54	0.089	0.100
W1	1.20	1.40	0.047	0.055
E	1.80	2.00	0.071	0.079
H	0.90	1.15	0.035	0.045
H1	0.40	0.80	0.016	0.031
D	0.30	0.50	0.012	0.020
T	0.08	0.15	0.003	0.006
θ	0°	8°	0°	8°

TO-92 DIMENSION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
L	4.30	4.70	0.169	0.185
W	4.40	4.70	0.173	0.185
W1	-	3.43	-	0.135
A	13.80	14.20	0.543	0.559
B	0.40	0.60	0.016	0.024
B1	0.38	0.55	0.015	0.022
B2	1.27 TYP		0.050 TYP	
B3	2.44	2.64	0.096	0.104
H	3.30	3.70	0.130	0.146
H1	1.10	1.40	0.043	0.055
H2	0.36	0.51	0.014	0.020
D	-	0.38	-	0.015
ϕ	-	1.60	-	0.063

SOT-23-5L DIMENSION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
L	2.80	3.00	0.110	0.118
L1	1.90 BSC		0.075 BSC	
E	0.30	0.50	0.012	0.020
E1	0.095 BSC		0.004 BSC	
W	2.60	3.00	0.102	0.118
W1	1.50	1.70	0.059	0.067
D	0.30	0.60	0.012	0.024
B	0.6 REF		0.024 REF	
H	0.95	1.45	0.037	0.057
H1	0.90	1.30	0.035	0.051
H2	0.05	0.15	0.002	0.006
T	0.10	0.25	0.004	0.010
θ	0°	8°	0°	8°

ORDERING INFORMATION

Part Number	Tolerance	Package	Shipping
PS432A	±0.5%	SOT-23	Tape Reel
PS432B	±1.0%	SOT-23	Tape Reel
PS432C	±2.0%	SOT-23	Tape Reel
PS432A-T5LR	±0.5%	SOT-23-5L	Tape Reel
PS432B-T5LR	±1.0%	SOT-23-5L	Tape Reel
PS432C-T5LR	±2.0%	SOT-23-5L	Tape Reel
PS432A-T92	±0.5%	TO-92	Bulk
PS432B-T92	±1.0%	TO-92	Bulk
PS432C-T92	±2.0%	TO-92	Bulk
PS432A-T92R	±0.5%	TO-92	Tape Reel
PS432B-T92R	±1.0%	TO-92	Tape Reel
PS432C-T92R	±2.0%	TO-92	Tape Reel
PS432A-T92B	±0.5%	TO-92	Tape Box
PS432B-T92B	±1.0%	TO-92	Tape Box
PS432C-T92B	±2.0%	TO-92	Tape Box