

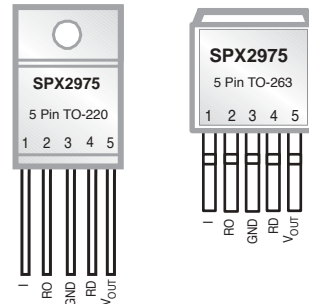
400mA Low Dropout Voltage Regulator

FEATURES

- 5V Fixed Output
- High Accuracy
- Very Low Current Consumption: 60 μ A
- Power-on and Under Voltage Reset
- Reset Low Down to $V_{OUT} = 1V$
- Extremely Low Dropout Voltage
- Short Circuit Protection
- Programmable Safety Timer
- 4kV ESD Protection

APPLICATIONS

- Automotive Electronics
- Wireless Station
- Industrial Systems

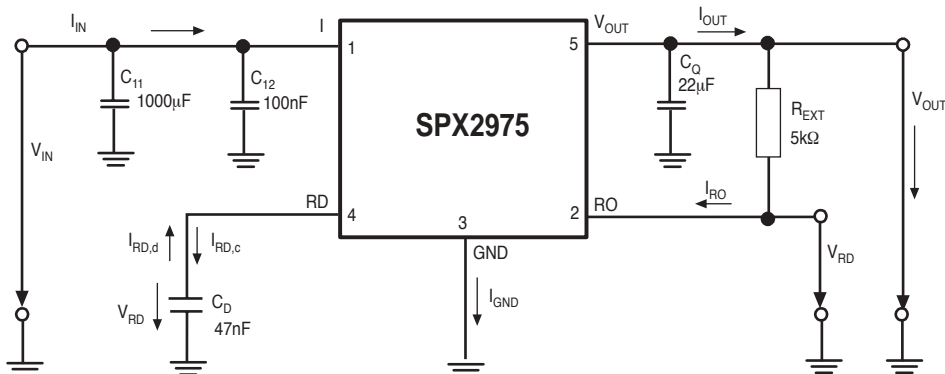


Now Available in Lead Free Packaging

DESCRIPTION

Sipex's SPX2975 is a low dropout linear regulator with integrated PNP pass transistor. The part is available in a 5 pin TO-220 package or surface mount TO-263. The part used to convert an automotive battery voltage, with allowable input up to 45V, down to 5V with at least 400mA output current delivered. Internal power consumption is kept to 60uA ideal for applications where micro-power operation is important. At over-temperature the SPX2975 is turned off by the integrated temperature protection circuit. A reset signal is generated for a typical output voltage of 4.65V with a time delay that can be programmed by an external capacitor.

TYPICAL APPLICATION CIRCUIT



ABSOLUTE MAXIMUM RATINGS

| | |
|-------------------------------------|--------------------|
| Input Voltage | -42V to 45V |
| Output Voltage | -1.0 to 16V |
| Output Current | Internally limited |
| Reset Output Voltage | -0.3 to 25V |
| Reset Output Current | -5mA to +5mA |
| Reset Delay Voltage | -0.3V to 7.0V |
| Reset Delay Current | -2mA to 2mA |
| Storage Temperature | -50°C to +150°C |
| Junction Temperature.(Note 1) | -40°C to +150°C |

| | |
|--|--------|
| T_{JA} (TO-252)..... | 78°C/W |
| T_{JA} (TO-220)..... | 65°C/W |
| T_{JA} (TO-263)..... | 53°C/W |
| T_{JC} (TO-220, TO 263, and TO-252)..... | 4°C/W |

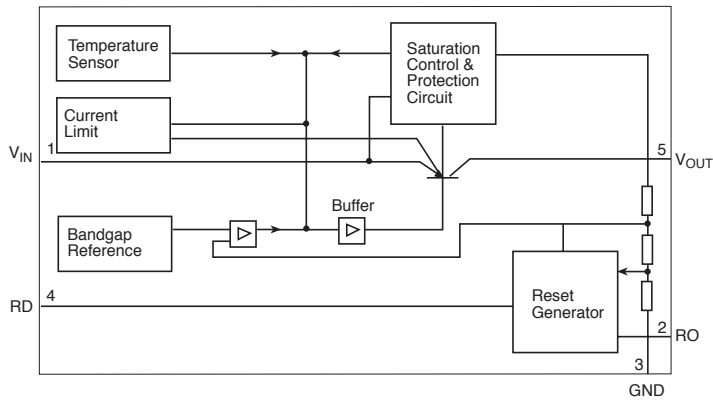
These are stress ratings only and functional operation of the device at these ratings or any other above those indicated in the operation sections of the specifications below is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

ELECTRICAL CHARACTERISTICS

$V_{IN} = 13.5V$; $-40^{\circ}C < T_J < 150^{\circ}C$. Unless otherwise specified.

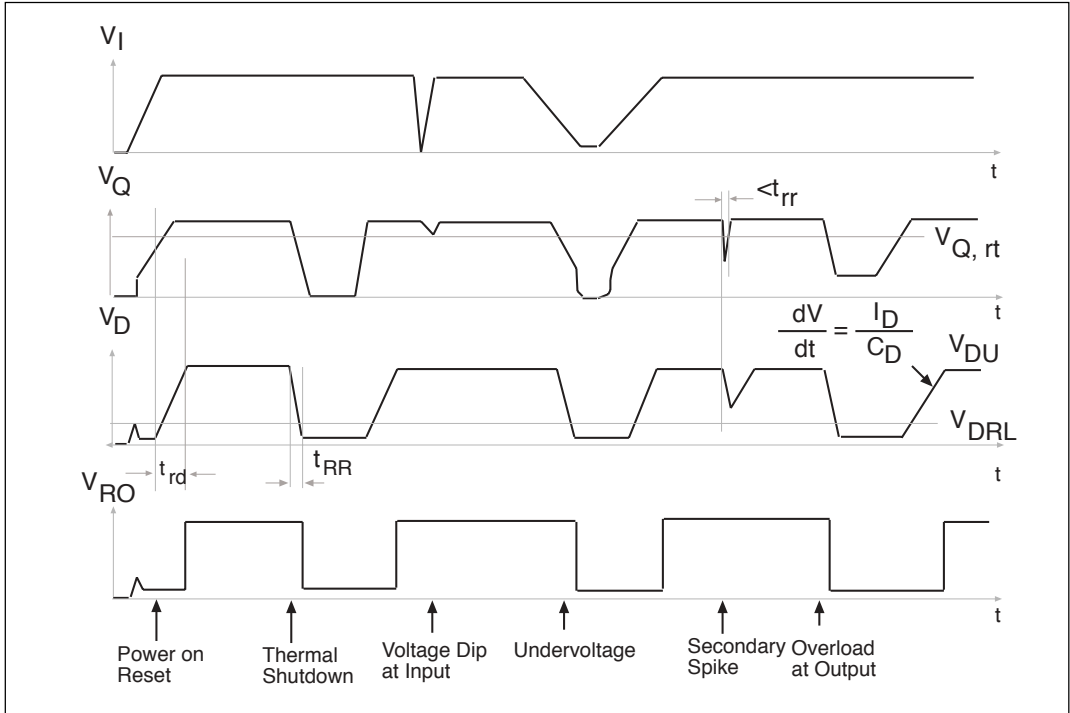
| PARAMETER | SYM | MIN. | TYP. | MAX. | UNITS | CONDITIONS |
|----------------------------------|--------------|------|------|------|---------|---|
| Input Voltage | V_I | 5.5 | | 42 | V | |
| Junction Temperature | T_J | -40 | | 150 | °C | |
| Output Voltage | V_O | 4.9 | 5.0 | 5.1 | V | $5mA < I_O < 400mA$, $6V < V_I < 28V$ |
| | | 4.9 | 5.0 | 5.1 | | $5mA < I_O < 200mA$, $6V < V_I < 40V$ |
| | | 4.9 | | 5.25 | | $100\mu A \leq I_O \leq 5mA$, $6V < V_I < 28V$ |
| Output Current limitation | I_O | 450 | 700 | | mA | |
| Current Consumption | I_q | | 60 | 100 | μA | $I_{OUT} = 100 \mu A$, $T_J = 25^{\circ}C$ |
| | | | 60 | 120 | | $I_{OUT} = 100 \mu A$, $T_J = 85^{\circ}C$ |
| | | | 70 | 180 | | $I_{OUT} = 1mA$, $T_J = 25^{\circ}C$ |
| | | | 70 | 200 | | $I_{OUT} = 1mA$, $T_J = 85^{\circ}C$ |
| | | | 7 | 10 | mA | $I_{OUT} = 250mA$ |
| | | | 17 | 22 | | $I_{OUT} = 400mA$ |
| Dropout Voltage (note 1) | V_{dr} | | 350 | 500 | mV | $I_{OUT} = 300mA$, $V_{DO} = V_{OUT} - V_{IN}$ |
| Load Regulation | ΔV_O | -30 | 5 | 30 | mV | $I_{OUT} = 5mA$ to 400mA |
| | | -200 | | 200 | | $I_{OUT} = 100\mu A \leq I_O \leq 5mA$ |
| Line Regulation | ΔV_O | -15 | 2 | 15 | mV | $V_{IN} = 8V$ to 32V, $I_{OUT} = 5mA$ |
| PSRR | PSRR | | 60 | | dB | $f_r = 100Hz$; $V_r = 0.5 V_{pp}$ |
| Temperature Output Voltage Drift | dV_O/dT | | 0.2 | | mV/K | |
| Reset Switching Threshold | V_{RT} | 4.51 | 4.65 | 4.8 | V | V_{TH} |
| Reset Output Low Voltage | V_{RQL} | | 0.2 | 0.4 | V | $R_{ext} \geq 5k\Omega$; $V_{OUT} > 1V$ |
| Reset Output Leakage Current | I_{ROH} | | 0 | 10 | μA | $V_{ROH} = 5V$ |
| Reset Charging Current | I_D | 3.0 | 5.5 | 9.0 | μA | $V_{RD} = 1V$ |
| Upper Timing Threshold | V_{DU} | 1.5 | 1.8 | 2.2 | V | V_{th_H} |
| Lower Timing Threshold | V_{DL} | 0.2 | 0.4 | 0.7 | V | V_{th_L} |
| Reset Delay Time | t_d | 10 | 16 | 22 | ms | $C_O = 47nF$, Td |
| Reset Reaction Time | t_{RR} | | 0.5 | 2.0 | μs | $C_O = 47nF$, Trv |

Note 1: Measured when the output voltage (Vout) has dropped 100mV from the nominal value obtained at $V_{IN}=13.5V$



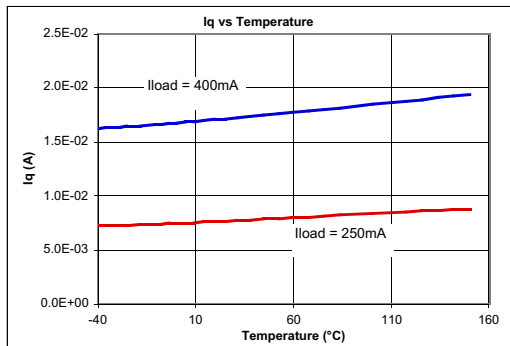
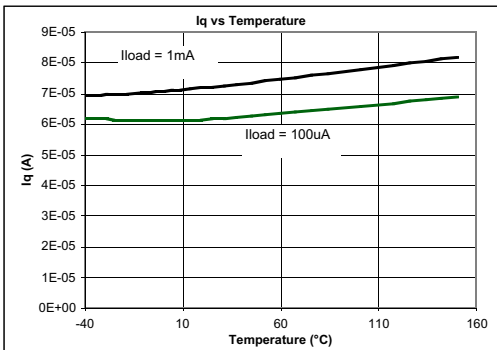
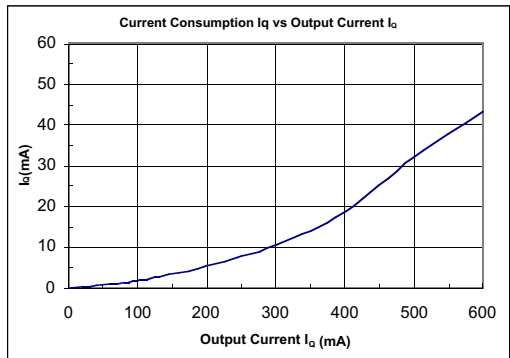
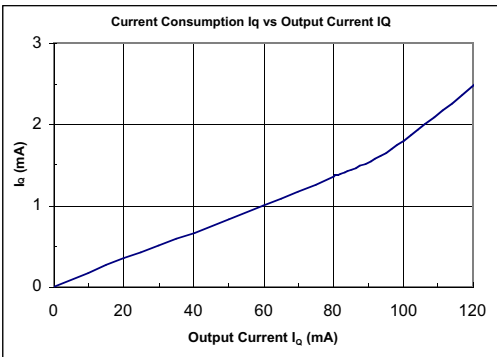
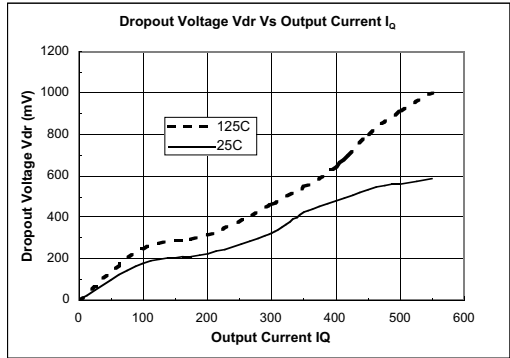
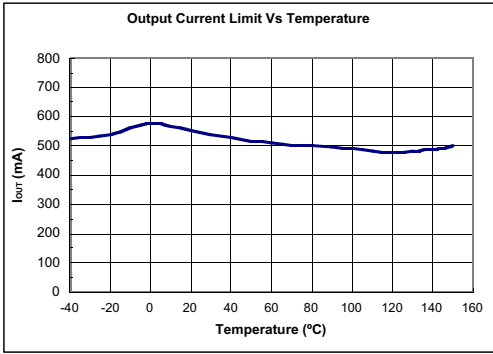
PIN DESCRIPTION

| PIN NUMBER | PIN NAME | DESCRIPTION |
|------------|-----------|--|
| 1 | V_{IN} | LDO Input. Bypass V_{IN} to GND with a Ceramic capacitor. |
| 2 | RO | Reset Output. RO remains low while V_{OUT} is below the reset switching threshold. RO is in open conector output. |
| 3 | GND | Ground. This pin also functions as a heatsink. Solder to large pads or the circuit-board ground plane to maximize thermal dissipation. |
| 4 | RD | Reset Delay. RD connects capacitor to GND for setting delay time. |
| 5 | V_{OUT} | LDO Output. Bypass V_{OUT} to GND with a minimum 22 μ F capacitor with ESR less than 5 Ω at 10kHz. |

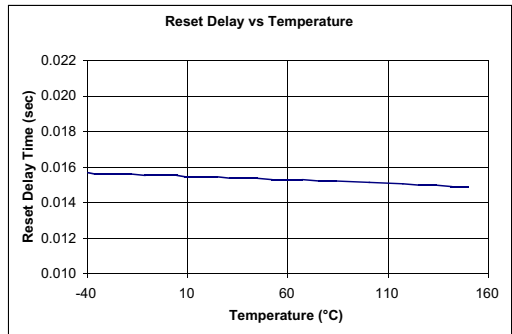
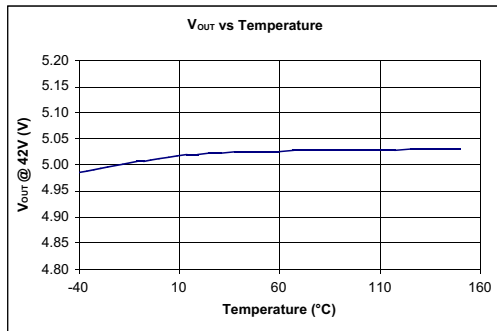
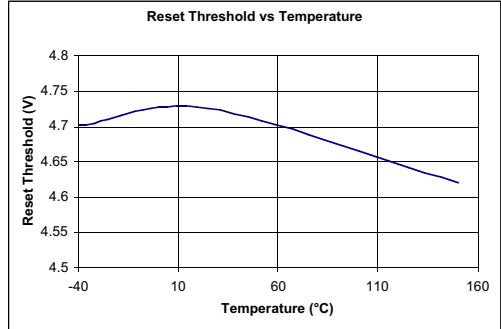
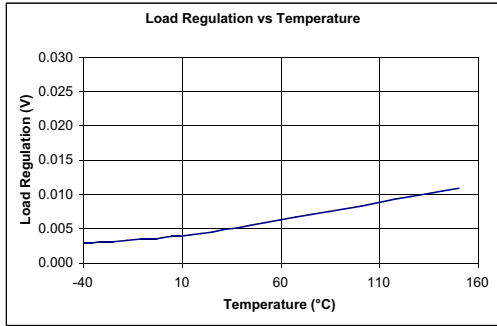


Reset Timing

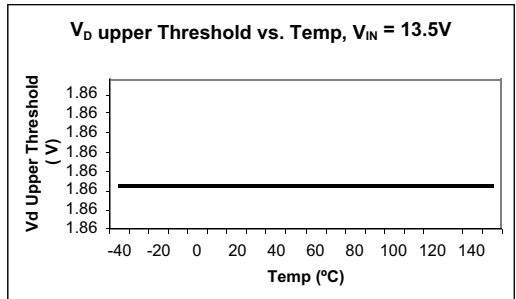
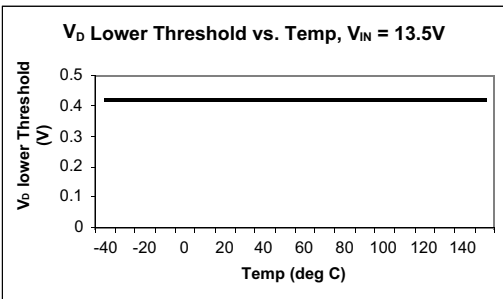
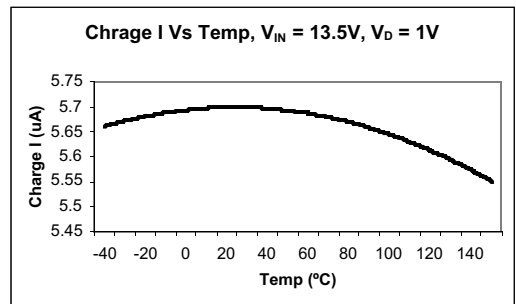
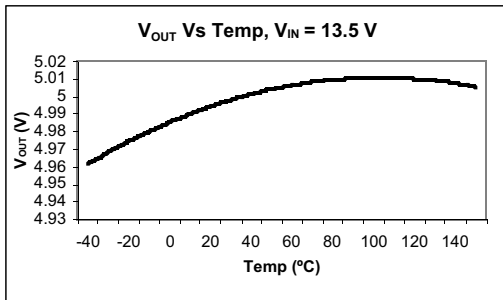
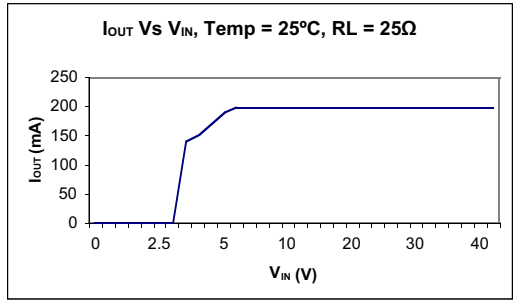
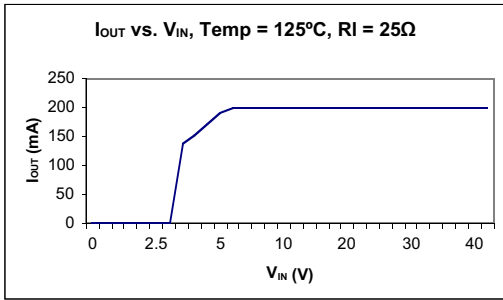
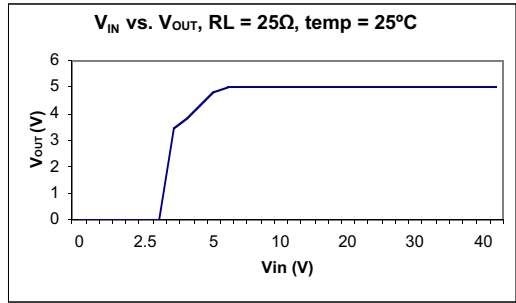
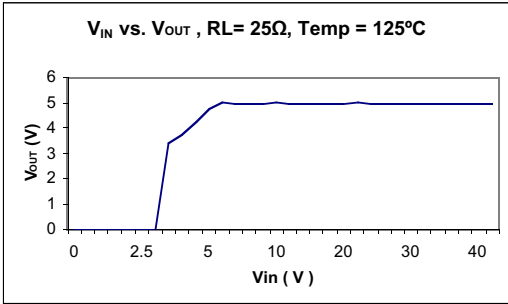
TYPICAL PERFORMANCE CHARACTERISTICS



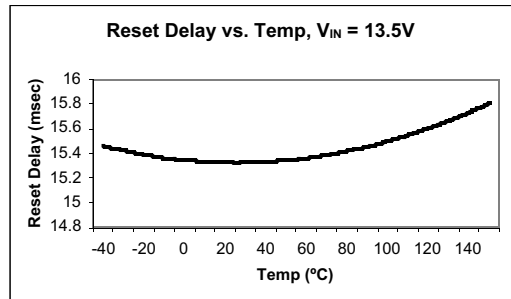
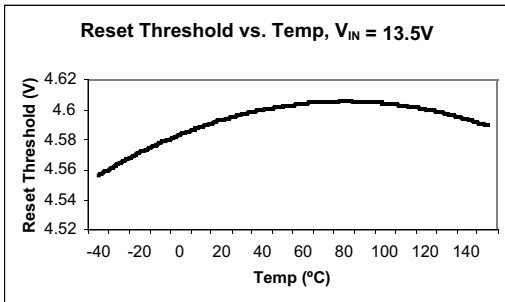
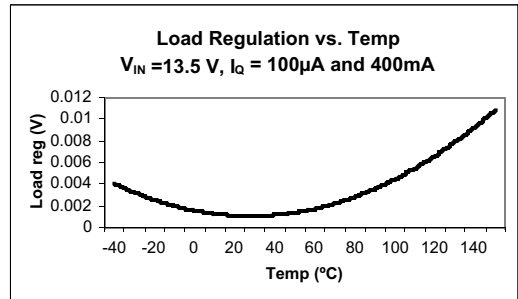
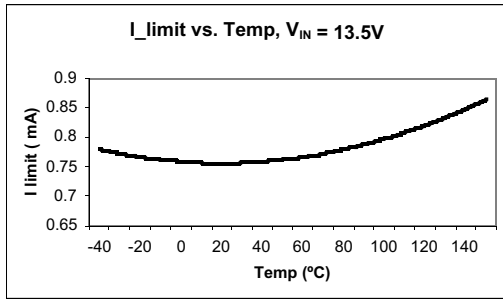
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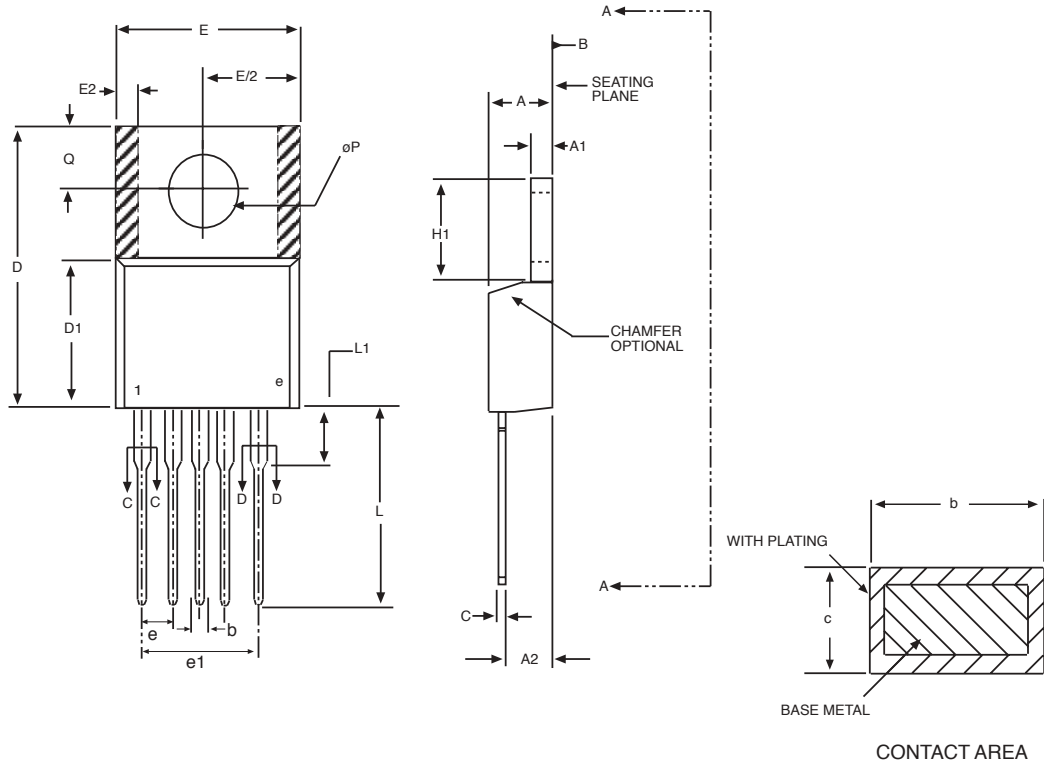


TPYICAL PERFORMANCE CHARACTERISTICS



TPYICAL PERFORMANCE CHARACTERISTICS



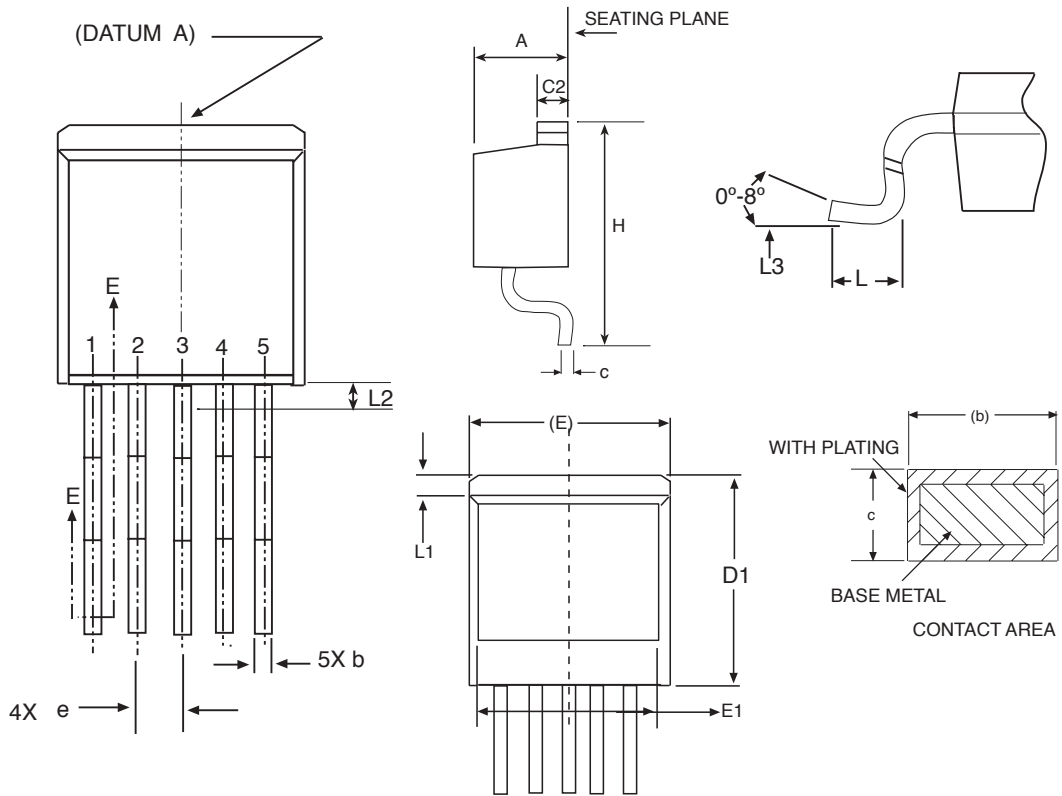


| 5 Pin TO-220 JEDEC TO-220 (AC) Variation | | | |
|---|----------|-------|-------|
| SYMBOL | MIN | NOM | MAX |
| A | 0.16 | - | 0.19 |
| A1 | 0.02 | - | 0.055 |
| A2 | 0.08 | - | 0.115 |
| b | 0.015 | 0.027 | 0.04 |
| b2 | 0.045 | - | 0.07 |
| c | 0.014 | - | 0.024 |
| D | 0.56 | - | 0.65 |
| D1 | 0.33 | - | 0.355 |
| D2 | 0.48 | - | 0.507 |
| E | 0.38 | - | 0.42 |
| E1 | 0.27 | - | 0.35 |
| E2 | - | - | 0.03 |
| e | .100 BSC | | |
| e1 | .100 BSC | | |
| H1 | 0.23 | - | 0.27 |
| L1 | - | - | 0.25 |
| L2 | - | - | - |
| ΔP | 0.139 | - | 0.161 |
| Q | 0.1 | - | 0.135 |

Note: Dimensions in (mm)

| 5 Pin TO-220 JEDEC TO-220 (AC) Variation | | | |
|---|----------|-------|-------|
| SYMBOL | MIN | NOM | MAX |
| A | 0.006 | - | 0.007 |
| A1 | 0.001 | - | 0.002 |
| A2 | 0.003 | - | 0.005 |
| b | 0.001 | 0.001 | 0.002 |
| b2 | 0.002 | - | 0.003 |
| c | 0.001 | - | 0.001 |
| D | 0.022 | - | 0.026 |
| D1 | 0.013 | - | 0.014 |
| D2 | 0.019 | - | 0.020 |
| E | 0.015 | - | 0.017 |
| E1 | 0.011 | - | 0.014 |
| E2 | - | - | 0.001 |
| e | .004 BSC | | |
| e1 | .004 BSC | | |
| H1 | 0.009 | - | 0.011 |
| L1 | - | - | 0.010 |
| L2 | - | - | - |
| ΔP | 0.005 | - | 0.006 |
| Q | 0.004 | - | 0.005 |

Note: Dimensions in (inch)

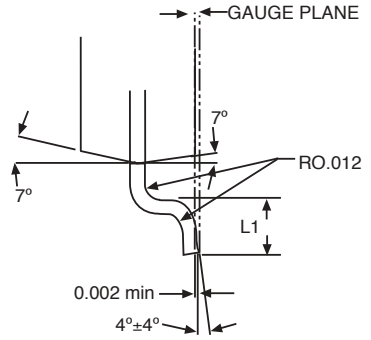
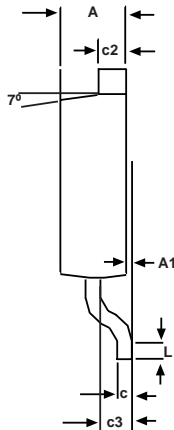
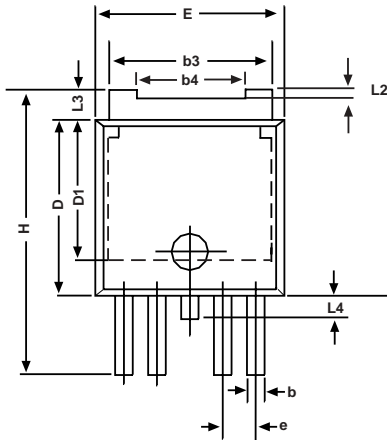


| 5 Pin TO-263 JEDEC TO-263 (BB) Variation | | | |
|---|----------|-----|-------|
| SYMBOL | MIN | NOM | MAX |
| A | 0.16 | - | 0.19 |
| A1 | 0 | - | 0.01 |
| b | 0.02 | - | 0.039 |
| c | 0.015 | - | 0.029 |
| c2 | 0.45 | - | 0.23 |
| D1 | 0.27 | - | - |
| E | 0.38 | - | 0.42 |
| E1 | 0.245 | - | - |
| e | .067 BSC | | |
| H | 0.575 | - | 0.625 |
| L | 0.07 | - | 0.11 |
| L1 | - | - | 0.066 |
| L2 | - | - | 0.07 |
| L3 | .010 BSC | | |

Note: Dimensions in (mm)

| 5 Pin TO-263 JEDEC TO-263 (BB) Variation | | | |
|---|----------|-----|-------|
| SYMBOL | MIN | NOM | MAX |
| A | 0.006 | - | 0.007 |
| A1 | 0.000 | - | 0.000 |
| b | 0.001 | - | 0.002 |
| c | 0.001 | - | 0.001 |
| c2 | 0.018 | - | 0.009 |
| D1 | 0.011 | - | - |
| E | 0.015 | - | 0.017 |
| E1 | 0.010 | - | - |
| e | .026 BSC | | |
| H | 0.023 | - | 0.025 |
| L | 0.003 | - | 0.004 |
| L1 | - | - | 0.003 |
| L2 | - | - | 0.003 |
| L3 | .004 BSC | | |

Note: Dimensions in (inch)



| Symbol | MIN | NOM | MAX |
|--------|-----------|-------|-------|
| A | 0.086 | 0.090 | 0.094 |
| b | 0.020 TYP | | |
| b3 | 0.205 | 0.210 | 0.215 |
| b4 | - | 0.110 | - |
| c | 0.020 | 0.021 | 0.022 |
| c2 | 0.018 | 0.020 | 0.022 |
| c3 | 0.037 | 0.040 | 0.043 |
| D | 0.235 | 0.240 | 0.245 |
| D1 | 0.184 | 0.189 | 0.194 |
| E | 0.253 | 0.258 | 0.263 |
| e | 0.045 TYP | | |
| H | 0.390 TYP | | |
| L1 | 0.051 | 0.053 | 0.055 |
| L2 | - | 0.013 | - |
| L3 | 0.037 | 0.042 | 0.047 |
| L4 | 0.028 | 0.032 | 0.036 |

Note: dimensions in (INCHES)

| Symbol | MIN | NOM | MAX |
|--------|----------|------|------|
| A | 2.18 | 2.29 | 2.39 |
| b | 0.51 TYP | | |
| b3 | 5.21 | 5.33 | 5.46 |
| b4 | - | 2.79 | - |
| c | 0.51 | 0.53 | 0.56 |
| c2 | 0.46 | 0.51 | 0.56 |
| c3 | 0.94 | 1.02 | 1.09 |
| D | 5.97 | 6.10 | 6.22 |
| D1 | 4.67 | 4.80 | 4.93 |
| E | 6.43 | 6.55 | 6.68 |
| e | 1.14 TYP | | |
| H | 9.91 TYP | | |
| L1 | 1.30 | 1.35 | 1.40 |
| L2 | - | 0.33 | - |
| L3 | 0.94 | 1.07 | 1.19 |
| L4 | 0.71 | 0.81 | 0.91 |

Note: Dimensions in (mm)

ORDERING INFORMATION

| Part number | Accuracy | Output Voltage | Package Type |
|------------------------|-----------------|-----------------------|---------------------|
| SPX2975R5-5.0 | 2% | 5.0V | 5 Lead TO-252 |
| SPX2975R5-5.0/TR | 2% | 5.0V | 5 Lead TO-252 |
| SPX2975T5-5.0 | 2% | 5.0V | 5 Lead TO-263 |
| SPX2975T5-5.0/TR | 2% | 5.0V | 5 Lead TO-263 |
| SPX2975U5-5.0 | 2% | 5.0V | 5 Lead TO-220 |

Available in lead free packaging. To order add "-L" suffix to part number.

Example: SPX2975T5-5.0/TR = standard; SPX2975T5-5.0-L/TR = lead free

/TR = Tape and Reel

Pack quantity is 500 for TO-263 and 2,000 for TO-252.

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ANALOG EXCELLENCE

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