

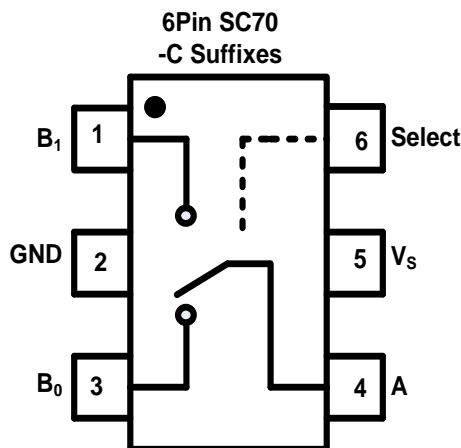
Features

- Latch-Up Performance Exceeds 600 mA Per JESD 78, Class II
- Supply Voltage: 1.65V to 5.5V
- Low ON-State Resistance: typical 4Ω at $V_s = 4.5V$
- Bandwidth: 250 MHz
- Fast switching times: $t_{ON} = 100\text{ ns}$, $t_{OFF} = 100\text{ ns}$
- Break-Before-Make Switching
- No overshoot and undershoot when switch open and close
- Operation Temperature Range: $-40^{\circ}C$ to $125^{\circ}C$

Applications

- Industry control systems
- Battery-powered systems
- Audio Signal Routing
- Portable Instruments and Mobile Device

Pin Configuration



Description

TPW3125 is high performance Single Pole/Double Throw (SPDT) analog switches. The devices feature ultra low R_{ON} of 6 Ω maximum at 4.5V V_{CC} and will operate over the wide V_{CC} range of 1.65V to 5.5V.

The TPW3125 features very low quiescent current even when the control voltage is lower than the V_{CC} supply. This feature services the portable applications very well allowing for the direct interface with processor general purpose I/Os, can tolerate 1.8V CMOS logic in select input when V_{CC} supply is in the range of 4.75V to 5.25V.

Function Table

| Input: Select Pin | Function |
|-------------------|-------------------|
| Low | B0 Connected to A |
| High | B1 Connected to A |

Pin Description

| Pin name | Pin No | Pin function |
|----------|--------|--------------------|
| B1 | 1 | Switch Port 1 |
| GND | 2 | Ground |
| B0 | 3 | Switch Port 0 |
| A | 4 | Common switch port |
| V_{CC} | 5 | Power supply |
| Select | 6 | Select pin |

Table of Contents

| | |
|---|----|
| Features | 1 |
| Applications | 1 |
| Description | 1 |
| Function Table | 1 |
| Pin Description | 1 |
| Table of Contents | 2 |
| Revision History | 3 |
| Order Information | 3 |
| Absolute Maximum Ratings ^{Note 1} | 4 |
| ESD and Latch Up Rating | 4 |
| Thermal Information | 4 |
| Recommended Operating Conditions ^{Note 1} | 4 |
| Electrical Characteristics | 5 |
| V _{CC} = 4.5 to 5.5V, unless otherwise noted. | 5 |
| V _{CC} = 2.7 to 3.6V, unless otherwise noted. | 6 |
| Typical Performance Characteristics | 7 |
| Test Circuit and Waveforms | 8 |
| Application Information | 9 |
| Tape and Reel Information | 10 |
| Package Outline Dimensions | 11 |
| SC70-6 | 11 |
| IMPORTANT NOTICE AND DISCLAIMER | 12 |

Revision History

| Date | Revision | Notes |
|------------|-------------|---|
| 2019/11/28 | Rev.Pre | Pre-release Version |
| 2020/2/27 | Rev.Pre.001 | Add VIH Spec at 4.5~5.5Vcc, 25 to 125degree |
| | | |

Order Information

| Order Number | Operating Temperature Range | Package | Marking Information | MSL | Transport Media, Quantity |
|------------------|-----------------------------|------------|---------------------|-----|---------------------------|
| TPW3125L1-SC6R-S | -40 to 125°C | 6-Pin SC70 | W25XX | 1 | Tape and Reel, 3000 |

Absolute Maximum Ratings ^{Note 1}

| Parameters | Rating |
|--------------------------------------|------------------------|
| Supply Voltage, V_{CC} | -0.5V to 6V |
| Select Input Voltage | -0.5V to 6V |
| Select Input Diode Current | -50mA |
| Switch I/O Port Voltage | -0.5 to $V_{CC} + 0.5$ |
| Switch I/O Port diode current | ± 50 mA |
| Switch Current | 100mA |
| Maximum Junction Temperature | 150°C |
| Storage Temperature Range | -65 to 150°C |
| Lead Temperature (Soldering, 10 sec) | 260°C |

Note 1: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

ESD and Latch Up Rating

| Symbol | Parameter | Condition | Minimum Level | Unit |
|--------|--------------------------|------------------------|---------------|------|
| HBM | Human Body Model ESD | ANSI/ESDA/JEDEC JS-001 | 3.5 | KV |
| CDM | Charged Device Model ESD | ANSI/ESDA/JEDEC JS-002 | 1.5 | KV |
| LU | Latch Up | JESD 78, 25°C | 600 | mA |
| | | JESD 78, 125°C | 600 | mA |

Thermal Information

| Package Type | θ_{JA} | θ_{JC} | Unit |
|--------------|---------------|---------------|------|
| 6-Pin SC70 | 400 | 100 | °C/W |

Recommended Operating Conditions ^{Note 1}

Over operating temperature range

| Parameters | Min | Max | Unit |
|-------------------------------------|------|----------|------|
| Supply Voltage, V_{CC} | 1.65 | 5.5 | V |
| Select Input Voltage | 0 | V_{CC} | V |
| Input Transition Rise and Fall Rate | | 100 | ns/V |
| Switch I/O Port Voltage | 0V | V_{CC} | V |
| Operating Temperature Range | -40 | 125 | °C |

Note 1: Select input must be held HIGH or LOW and it must not float.

Electrical Characteristics

V_{CC} = 4.5 to 5.5V, unless otherwise noted.

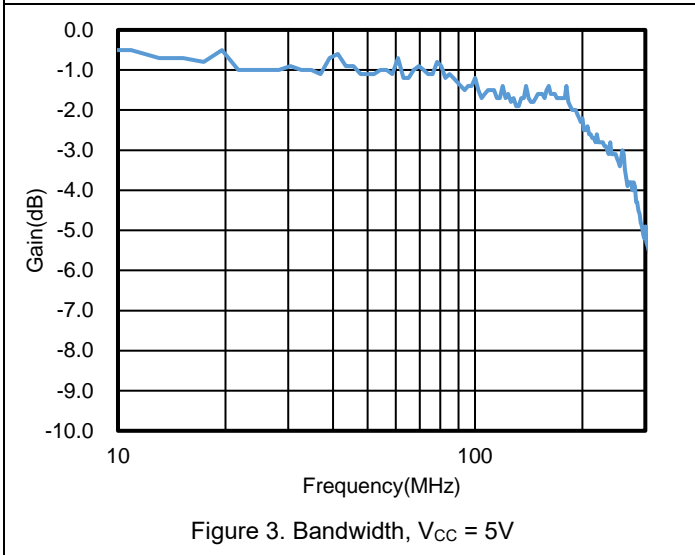
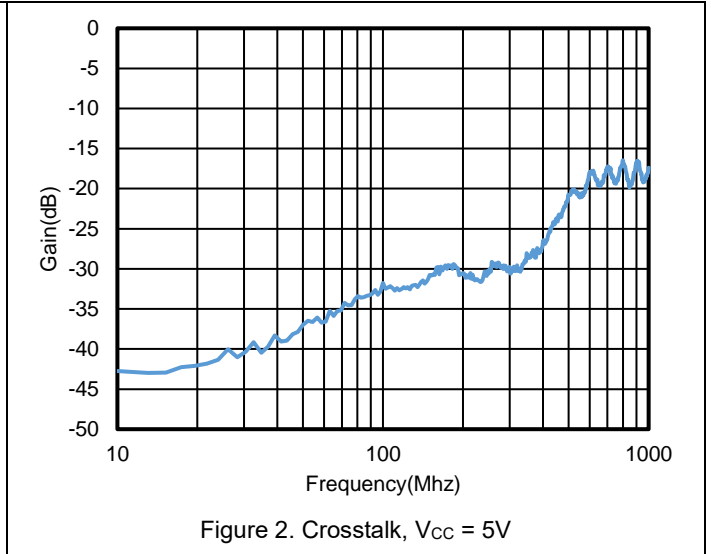
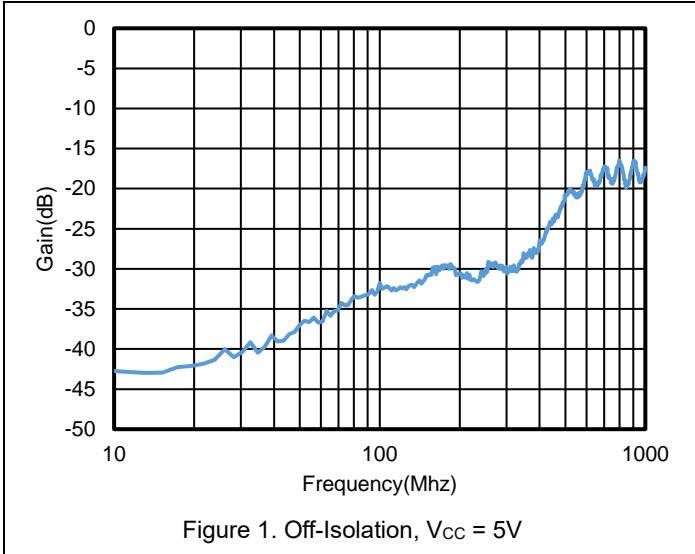
| Symbol | Parameter | Conditions | V _{CC} (V) | 25°C | -40 to 85°C | 25 to 125°C | -40 to 125°C | Limit | Unit |
|--|---------------------------------------|---|------------------------|-------|----------------|----------------|-----------------|-------|------|
| Power Supply | | | | | | | | | |
| I _{CC} | Quiescent Supply Current | V _{IN} = 0V or V _{CC} | 5.5 | 0.3 | 0.5 | | 1.5 | Max | μA |
| ΔI _{CC} | Increase in I _{CC} per Input | Select Input at 1.8V, others at V _{CC} or GND | 5.5 | 50 | | | | Max | μA |
| Digital Input | | | | | | | | | |
| V _{IH} | Input Voltage High | | 5 | | 1.42 | 1.35 | 1.42 | Min | V |
| V _{IL} | Input Voltage Low | | 5 | | 0.7 | 0.7 | 0.7 | Max | V |
| I _{IN} | Control Input Leakage | V _{IN} = 0V or V _{CC} | 5.5 | ±50 | ±500 | | ±1000 | Max | nA |
| Analog Switch | | | | | | | | | |
| R _{ON} | | I _{OUT} = 50mA, B0 or B1 = 3.5V | 4.5 | 4 | | | | Typ | Ω |
| R _{ON} | | I _{OUT} = 50mA, B0 or B1 = 3.5V | 4.5 | 4.8 | 6 | | 6 | Max | Ω |
| ΔR _{ON} | Maximum ON resistance | I _{OUT} = 50mA, B0 or B1 = 3.5V | 4.5 | 0.5 | 0.8 | | 0.8 | Max | Ω |
| R _{FLAT(ON)} | On Resistance Flatness | I _{OUT} = 50mA, B0 or B1 = 0V, 1V, 3.5V | 4.5 | 1.2 | 2 | | 2 | Max | Ω |
| I _{NO(OFF)} , I _{NC(OFF)} | Switch OFF Leakage Current on B0, B1 | A = 1V, 4.5V, B0 or B1 = 4.5V, 1V | 5.5 | ±10 | ±25 | | ±50 | Max | nA |
| I _{A(OFF)} | Switch OFF Leakage Current on A | A = 1V, 4.5V, B0 or B1 = 4.5V, 1V | 5.5 | ±10 | ±50 | | ±100 | Max | nA |
| I _{A(ON)} | Switch ON Leakage Current on A | A = 1V, 4.5V, B0 or B1 = 1V, 4.5V or Floating | 5.5 | ±10 | ±50 | | ±100 | Max | nA |
| Dynamic Characteristics | | | | | | | | | |
| t _{PHL} , t _{PLH} | Switch IN to OUT time | B0 or B1 = 3V, R _L = 50Ω, C _L = 100pF, Figure 4 | 4.75 | 5 | | | | Typ | ns |
| t _{ON} | Switch turn-on time | B0 or B1 = 3V, R _L = 50Ω, C _L = 100pF, Figure 4 | 4.75 | 85 | 100 | | 100 | Max | ns |
| t _{OFF} | Switch turn-off time | B0 or B1 = 3V, R _L = 50Ω, C _L = 100pF, Figure 4 | 4.75 | 85 | 100 | | 100 | Max | ns |
| t _B | Break before make time | B0 or B1 = 3V, R _L = 50Ω, C _L = 100pF, Figure 5 | 4.75 | 50 | | | | Typ | ns |
| Q | Charge Injection | C _L = 1.0nF, V _{GEN} = 0V, R _{GEN} = 0Ω, Figure 6 | 5 | 20 | | | | Typ | pC |
| | OFF-Isolation | f = 1MHz, R _L = 50Ω, Figure 7 | 5 | -65 | | | | Typ | dB |
| | Crosstalk | f = 1MHz, R _L = 50Ω, Figure 8 | 5 | -65 | | | | Typ | dB |
| BW | Bandwidth | R _L = 50Ω | 5 | 250 | | | | Typ | MHz |
| THD | Total Harmonic Distortion | R _L = 600Ω, V _{IN} = 0.5V _{PP} , f = 20Hz to 20kHz | 5 | 0.004 | | | | Typ | % |
| Capacitance | | | | | | | | | |
| C _{IN} | Select Input capacitance | | 5 | 5 | | | | Typ | pF |
| C _{OFF} | B-Port Off capacitance | | 5 | 12 | | | | Typ | pF |
| C _{ON} | ON Capacitance | | 5 | 40 | | | | Typ | pF |

V_{CC} = 2.7 to 3.6V, unless otherwise noted.

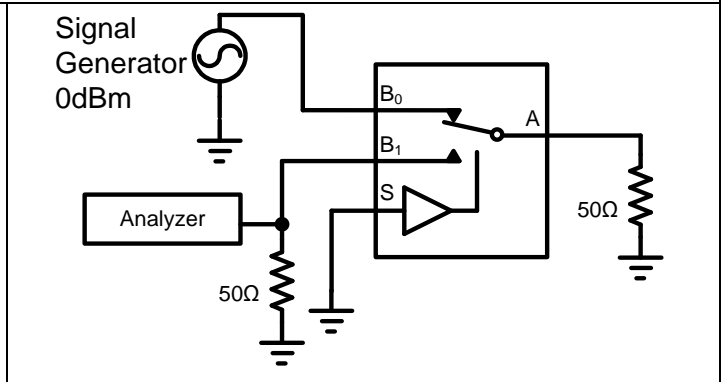
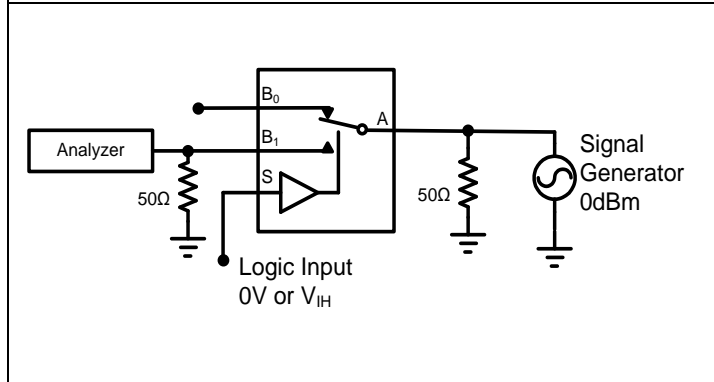
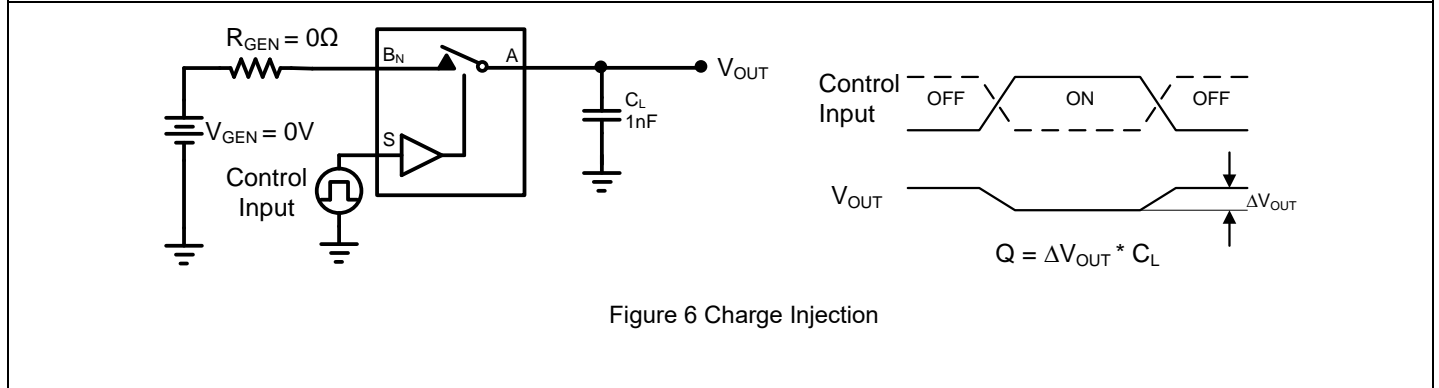
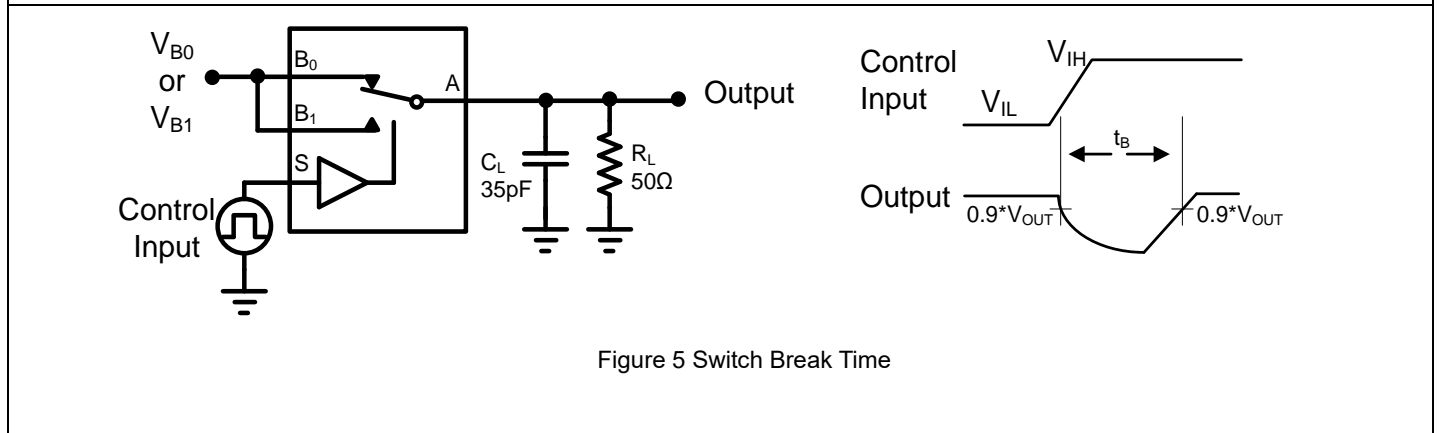
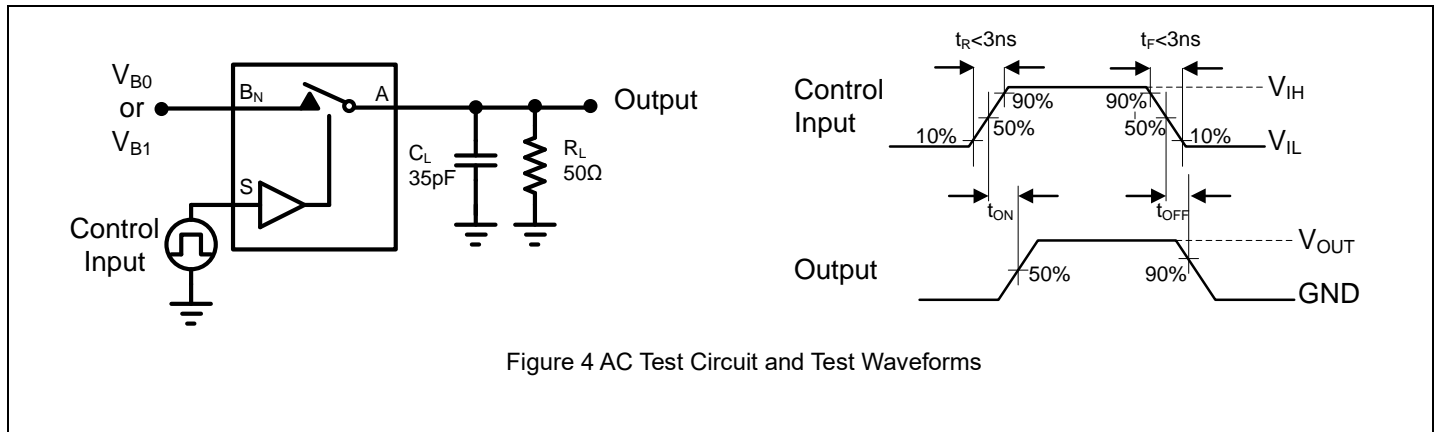
| Symbol | Parameter | Conditions | V _{CC} (V) | 25°C | -40°C to 85°C | -40°C to 125°C | Limit | Unit |
|--|--------------------------------------|---|------------------------|------|------------------|-------------------|-------|------|
| Power Supply | | | | | | | | |
| I _{CC} | Quiescent Supply Current | V _{IN} = 0V or V _{CC} | 3.6 | 0.3 | 0.5 | 1.5 | Max | μA |
| Digital Input | | | | | | | | |
| V _{IH} | Input Voltage High | | | | 1.35 | 1.35 | Min | V |
| V _{IL} | Input Voltage Low | | | | 0.3 | 0.3 | Max | V |
| I _{IN} | Control Input Leakage | V _{IN} = 0V or V _{CC} | 3.6 | | ±1 | ±1 | Max | μA |
| Analog Switch | | | | | | | | |
| R _{ON} | | I _{OUT} = 10mA, B0 or B1 = 1.5V | 2.7 | 10 | | | Typ | Ω |
| R _{ON} | | I _{OUT} = 10mA, B0 or B1 = 1.5V | 2.7 | 15 | 20 | 20 | Max | Ω |
| ΔR _{ON} | Maximum ON resistance | I _{OUT} = 10mA, B0 or B1 = 1.5V | 2.7 | 2 | 4 | 4 | Max | Ω |
| R _{FLAT(ON)} | On Resistance Flatness | I _{OUT} = 10mA, B0 or B1 = 0V, 0.75V, 1.5V | 2.7 | 8 | 10 | 10 | Max | Ω |
| I _{NO(OFF)} , I _{NC(OFF)} | Switch OFF Leakage Current on B0, B1 | A = 0V, 3.6V, B0 or B1 = 3.6V, 0V | 3.6 | ±10 | ±25 | ±50 | Max | nA |
| I _{A(OFF)} | Switch OFF Leakage Current on A | A = 0V, 3.6V, B0 or B1 = 3.6V, 0V | 3.6 | ±10 | ±50 | ±100 | Max | nA |
| I _{A(ON)} | Switch ON Leakage Current on A | A = 0V, 3.6V, B0 or B1 = 0V, 3.6V or Floating | 3.6 | ±10 | ±50 | ±100 | Max | nA |
| Dynamic Characteristics | | | | | | | | |
| t _{PHL} , t _{PLH} | Switch IN to OUT time | B0 or B1 = 2.5V, R _L = 50Ω, C _L = 100pF, Figure 4 | 2.7 | 10 | | | Typ | ns |
| t _{ON} | Switch turn-on time | B0 or B1 = 2.5V, R _L = 50Ω, C _L = 100pF, Figure 4 | 2.7 | 200 | 220 | 220 | Max | ns |
| t _{OFF} | Switch turn-off time | B0 or B1 = 2.5V, R _L = 50Ω, C _L = 100pF, Figure 4 | 2.7 | 200 | 220 | 220 | Max | ns |
| t _B | Break before make time | B0 or B1 = 2.5V, R _L = 50Ω, C _L = 100pF, Figure 5 | 2.7 | 50 | | | Typ | ns |
| Q | Charge Injection | C _L = 1.0nF, V _{GEN} = 0V, R _{GEN} = 0Ω, Figure 6 | 3 | 20 | | | Typ | pC |
| | OFF-Isolation | f = 1MHz, R _L = 50Ω, Figure 7 | 3 | -65 | | | Typ | dB |
| | Crosstalk | f = 1MHz, R _L = 50Ω, Figure 8 | 3 | -65 | | | Typ | dB |
| BW | Bandwidth | R _L = 50Ω | 3 | 250 | | | Typ | MHz |
| THD | Total Harmonic Distortion | R _L = 600Ω, V _{IN} = 0.5V _{PP} , f = 20Hz to 20kHz | 3 | 0.01 | | | Typ | % |

Typical Performance Characteristics

V_{CC} = 5V, unless otherwise specified.



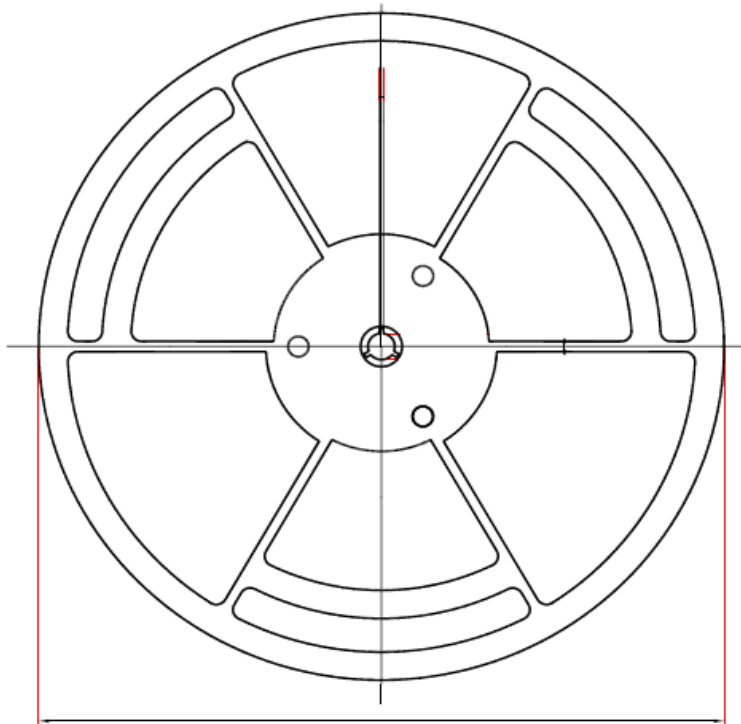
Test Circuit and Waveforms



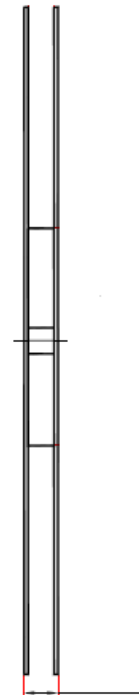
Application Information

A 0.1-μF bypass capacitor on V_{CC} and GND is recommended to prevent power disturbance.

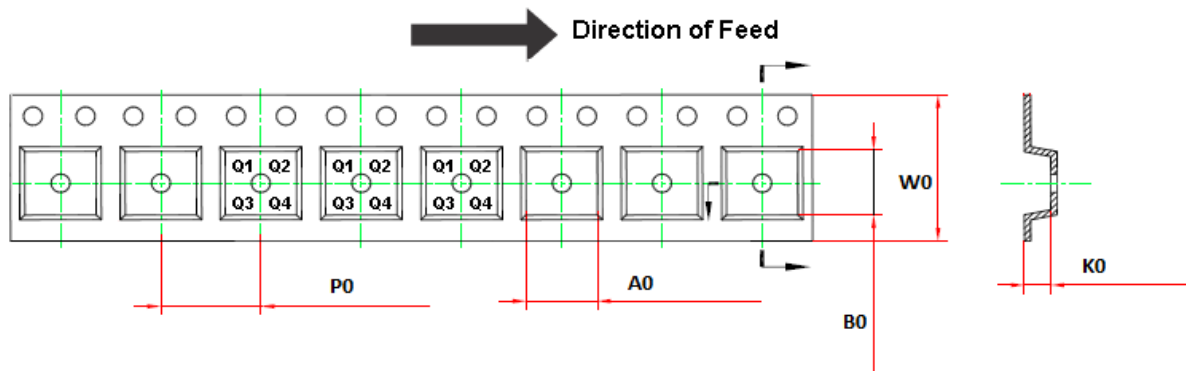
Tape and Reel Information



D1: Reel Diameter



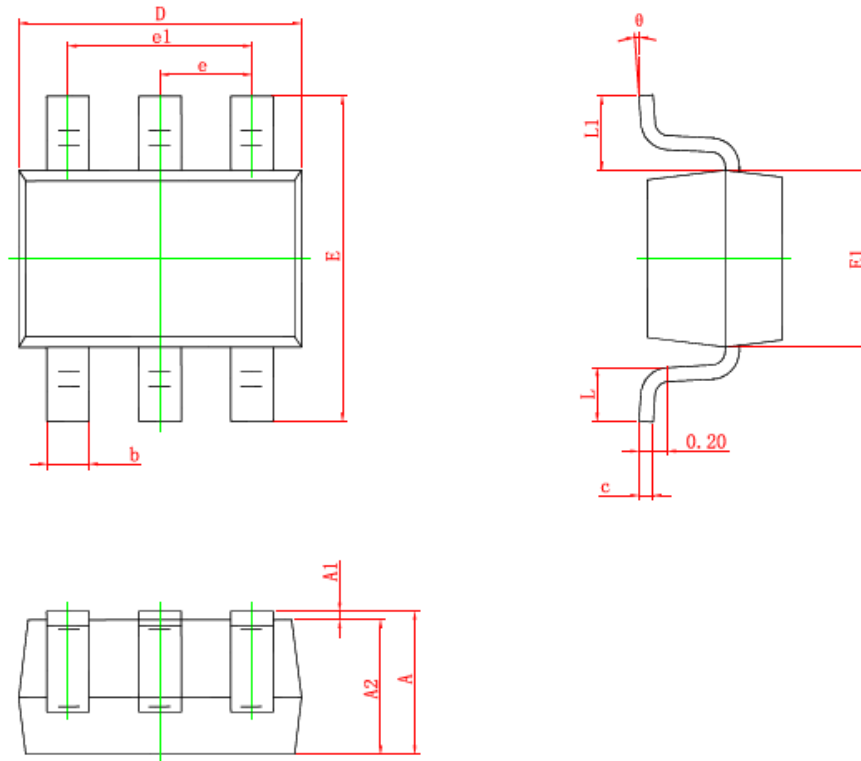
W1: Reel Width



| Order Number | Package | D1 | W1 | A0 | B0 | K0 | P0 | W0 | Pin1 Quadrant |
|----------------|------------|-------|--------|---------|---------|---------|---------|---------|---------------|
| TPW3125-SC6R-S | 6-Pin SC70 | 178±1 | 12.3±1 | 2.4±0.1 | 2.5±0.1 | 1.2±0.1 | 4.0±0.1 | 8.0±0.1 | Q3 |

Package Outline Dimensions

SC70-6



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 0.900 | 1.100 | 0.035 | 0.043 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.000 | 0.035 | 0.039 |
| b | 0.150 | 0.350 | 0.006 | 0.014 |
| c | 0.110 | 0.175 | 0.004 | 0.007 |
| D | 2.000 | 2.200 | 0.079 | 0.087 |
| E | 2.150 | 2.450 | 0.085 | 0.096 |
| E1 | 1.150 | 1.350 | 0.045 | 0.053 |
| e | 0.650 TYP. | | 0.026 TYP. | |
| e1 | 1.200 | 1.400 | 0.047 | 0.055 |
| L | 0.260 | 0.460 | 0.010 | 0.018 |
| L1 | 0.525 REF. | | 0.021 REF. | |
| θ | 0° | 8° | 0° | 8° |

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