

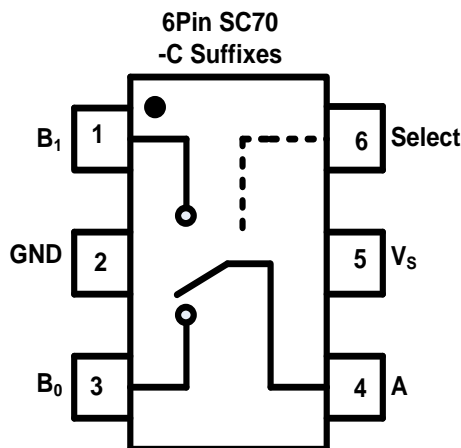
## Features

- 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 6Ω 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

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## 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 <sup>Note 1</sup>

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	$\pm 50$ 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	$\theta_{JA}$	$\theta_{JC}$	Unit
6-Pin SC70	400	100	°C/W

## Recommended Operating Conditions <sup>Note 1</sup>

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<sub>CC</sub> = 4.5 to 5.5V, unless otherwise noted.**

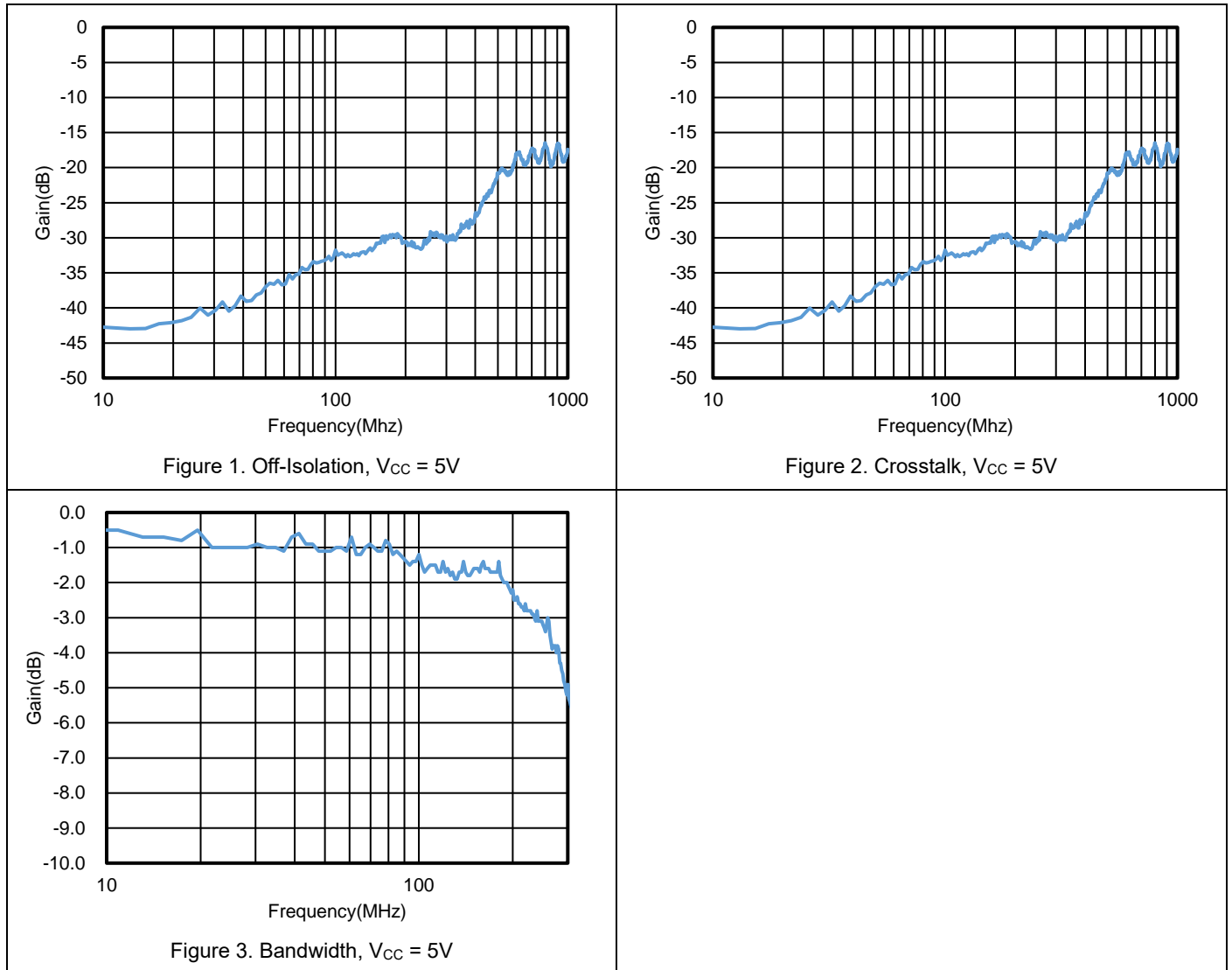
Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	25°C	-40 to 85°C	25 to 125°C	-40 to 125°C	Limit	Unit
Power Supply									
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = 0V or V <sub>CC</sub>	5.5	0.3	0.5		1.5	Max	μA
ΔI <sub>CC</sub>	Increase in I <sub>CC</sub> per Input	Select Input at 1.8V,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

**V<sub>CC</sub> = 2.7 to 3.6V, unless otherwise noted.**

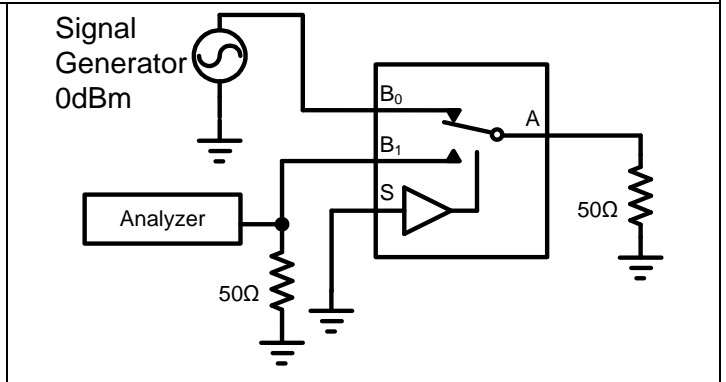
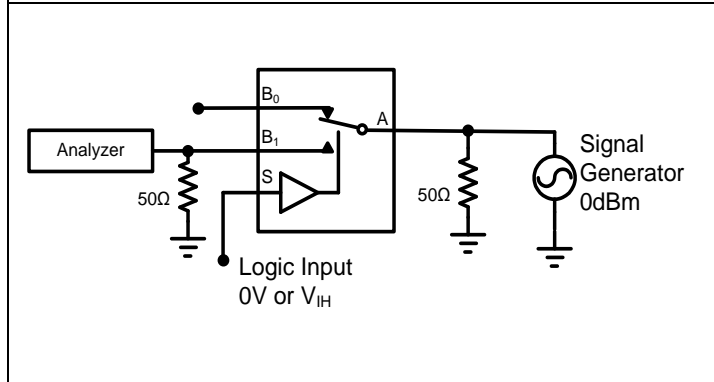
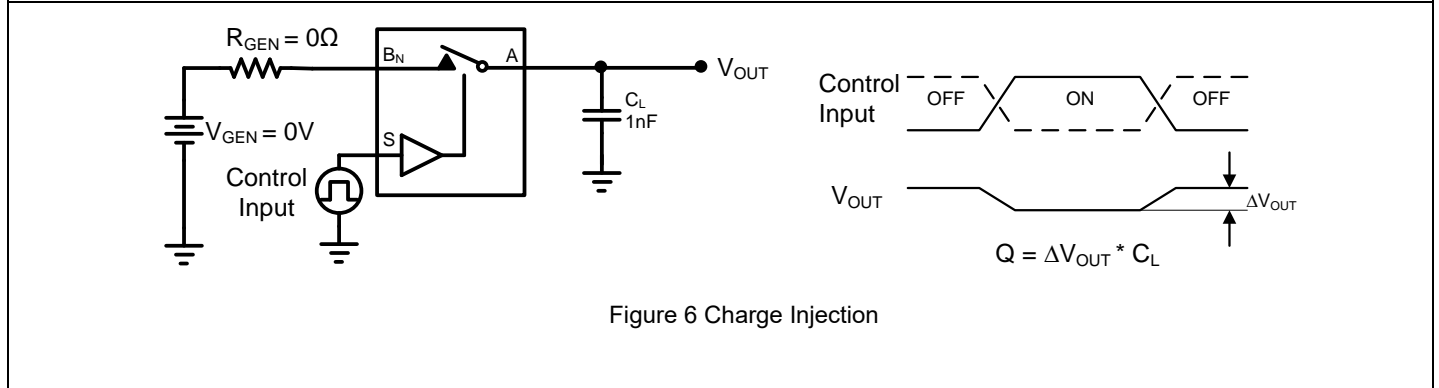
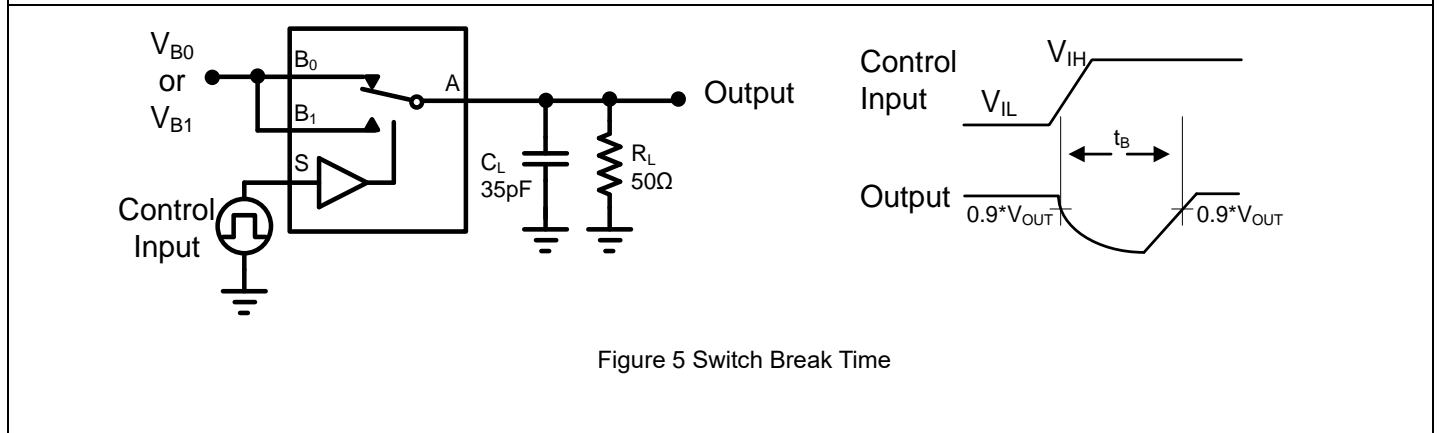
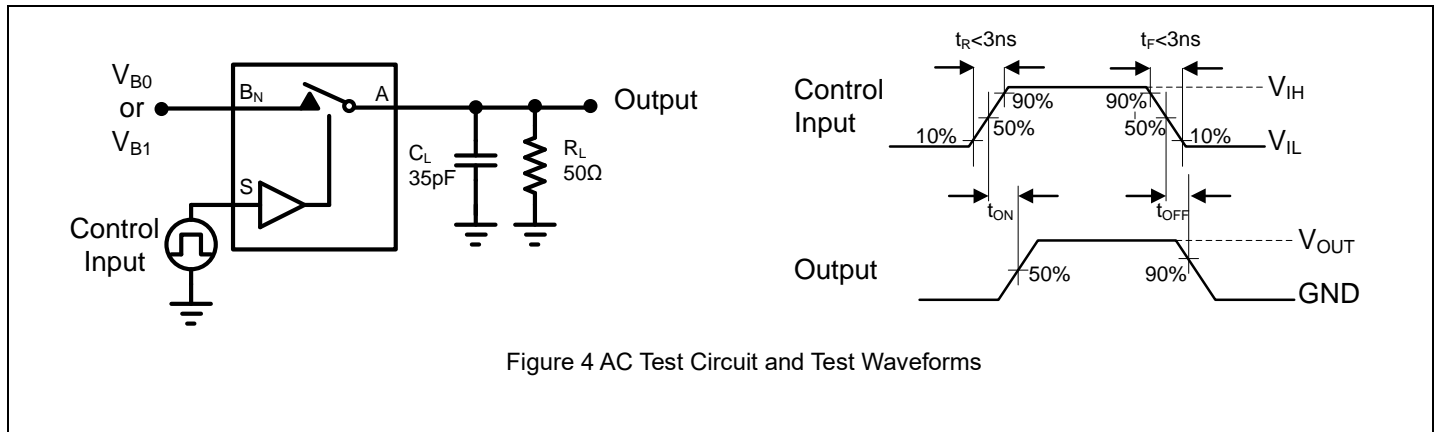
Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	25°C	-40°C to 85°C	-40°C to 125°C	Limit	Unit
<b>Power Supply</b>								
I <sub>CC</sub>	Quiescent Supply Current	V <sub>IN</sub> = 0V or V <sub>CC</sub>	3.6	0.3	0.5	1.5	Max	μA
<b>Digital Input</b>								
V <sub>IH</sub>	Input Voltage High				1.35	1.35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

## Typical Performance Characteristics

V<sub>CC</sub> = 5V, unless otherwise specified.



**Test Circuit and Waveforms**

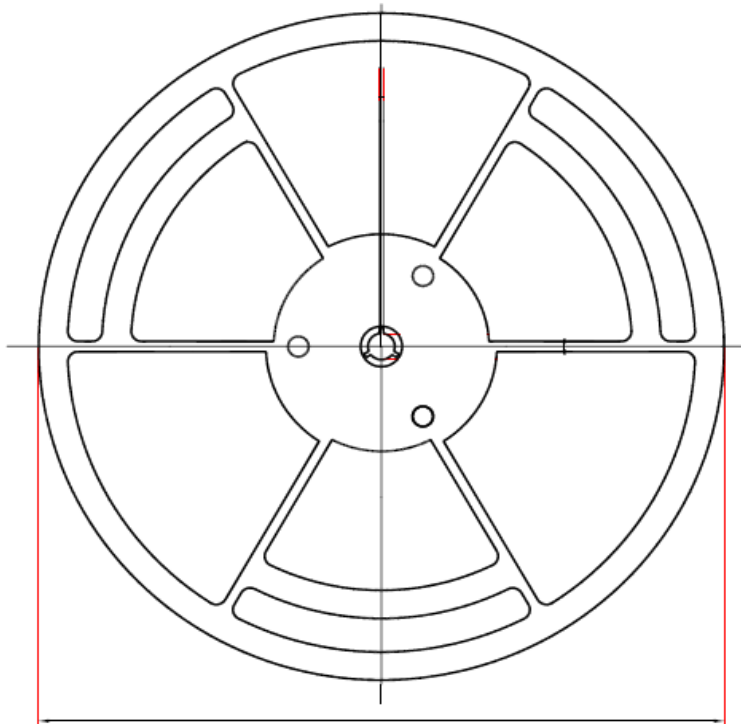




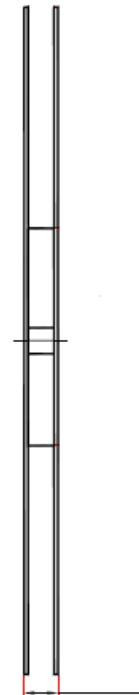
## Application Information

A 0.1-μF bypass capacitor on V<sub>CC</sub> and GND is recommended to prevent power disturbance.

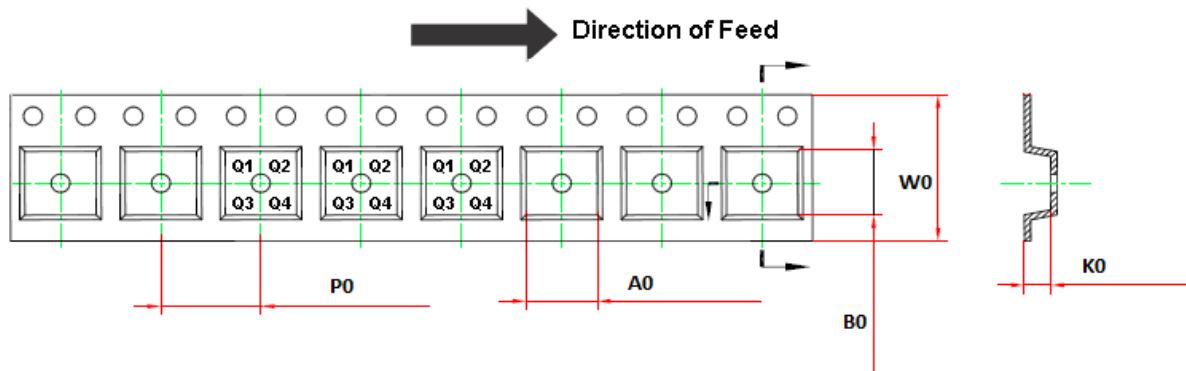
### Tape and Reel Information



D1: Reel Diameter



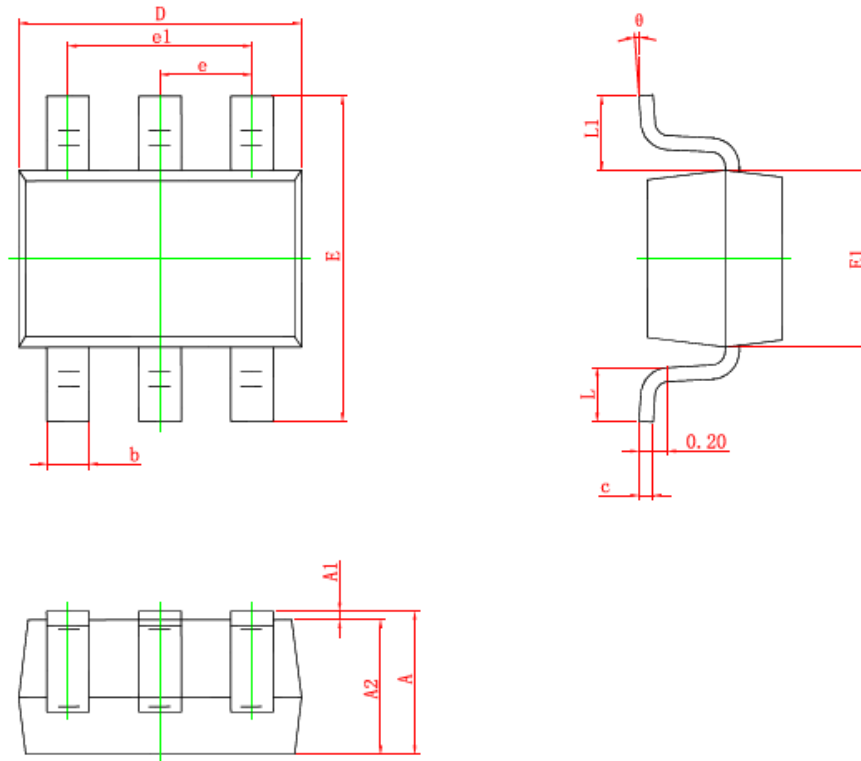
W1: Reel Width



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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