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 Vs = 4.5V
- Bandwidth: 250 MHz
- Fast switching times: t_{ON} = 85 ns, t_{OFF} = 85 ns
- Break-Before-Make Switching
- Operation Temperature Range: –40°C to 125°C

Applications

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

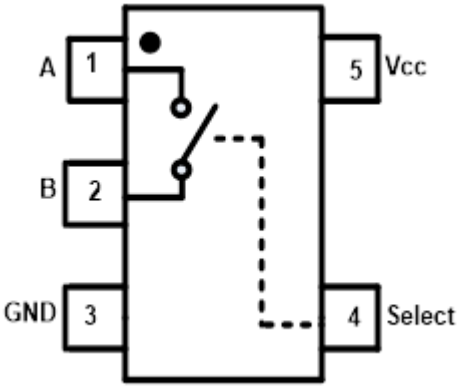
Description

TPW3115 is high performance Single Pole/Single Throw (SPST) analog switch. The device features low R_{ON} of 4Ω maximum at 4.5V V_{CC} and will operate over the wide V_{CC} range of 1.65V to 5.5V.

The TPW3115 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.

TPW3115 is available in SOT23-5 and SOT353 package, and characterized from –40°C to +125°C.

Pin Configuration



Function Table

Input: Select Pin	Function
Low	Switch Off
High	Switch On

Pin Description

Pin name	Pin No	Pin function
A	1	Switch Port 1
B	2	Switch Port 2
GND	3	Ground
Select	4	Select pin
V_{CC}	5	Power supply

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Revision History

Date	Revision	Notes
2019/5/1	Rev 0	Initial Version
2019/11/9	Rev Pre	Pre-Release Version
2020/6/28	Rev A.0	Page 5: update condition of ΔICC to test setup; Page 6: Remove ΔR_{ON} Spec for typo.
2022/8/4	Rev A.1	Update the package name from SC70-5 to SOT353

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity
TPW3115-S5TR	-40 to 125°C	5-Pin SOT23	W15XX Note 1	3	Tape and Reel, 3000
TPW3115-SC5R	-40 to 125°C	5-Pin SOT353	W15XX Note 1	3	Tape and Reel, 3000

Note 1: “XX” identify the manufacture information.

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	±50mA
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
5-Pin SOT353	400	100	°C/W
5-Pin SOT23	250	81	°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°C to 85°C	-40°C 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		1.5	1.5	Min	V
V_{IL}	Input Voltage Low		5		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, B = 3.5V	4.5	4			Typ	Ω
R_{ON}		I_{OUT} = 50mA, B = 3.5V	4.5	4.8	6	6	Max	Ω
$R_{FLAT(ON)}$	On Resistance Flatness	I_{OUT} = 50mA, B = 0V, 1V, 3.5V	4.5	1.2	2	2	Max	Ω
$I_{(OFF)}$	Switch OFF Leakage Current	A = 1V, 4.5V, B = 4.5V, 1V	5.5	±10	±50	±100	Max	nA
$I_{(ON)}$	Switch ON Leakage Current	A = 1V, 4.5V, B = 1V, 4.5V or Floating	5.5	±10	±50	±100	Max	nA
Dynamic Characteristics								
t_{PHL}, t_{PLH}	Switch IN to OUT time	B = 3V,RL = 50Ω, CL = 100pF, Figure 3	4.75	5			Typ	ns
t_{ON}	Switch turn-on time	B = 3V,RL = 50Ω, CL = 100pF, Figure 3	4.75	85	100	100	Max	ns
t_{OFF}	Switch turn-off time	B = 3V,RL = 50Ω, CL = 100pF, Figure 3	4.75	85	100	100	Max	ns
Q	Charge Injection	C_L = 1.0nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 4	5	20			Typ	pC
	OFF-Isolation	f = 1MHz, RL = 50Ω, Figure 5	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, B = 1.5V	2.7	10			Typ	Ω
R_{ON}		I_{OUT} = 10mA, B = 1.5V	2.7	15	20	20	Max	Ω
ΔR_{ON}	Maximum ON resistance	I_{OUT} = 10mA, B = 1.5V	2.7	2	4	4	Max	Ω
$R_{FLAT(ON)}$	On Resistance Flatness	I_{OUT} = 10mA, B = 0V, 0.75V, 1.5V	2.7	8	10	10	Max	Ω
$I_{(OFF)}$	Switch OFF Leakage Current	A = 0V, 3.6V, B = 3.6V, 0V	3.6	±10	±50	±100	Max	nA
$I_{(ON)}$	Switch ON Leakage Current	A = 0V, 3.6V, B = 0V, 3.6V or Floating	3.6	±10	±50	±100	Max	nA
Dynamic Characteristics								
t_{PHL}, t_{PLH}	Switch IN to OUT time	B = 2.5V,RL = 50Ω, CL = 100pF, Figure 3	2.7	10			Typ	ns
t_{ON}	Switch turn-on time	B = 2.5V,RL = 50Ω, CL = 100pF, Figure 3	2.7	200	220	220	Max	ns
t_{OFF}	Switch turn-off time	B = 2.5V,RL = 50Ω, CL = 100pF, Figure 3	2.7	200	220	220	Max	ns
Q	Charge Injection	C_L = 1.0nF, V_{GEN} = 0V, R_{GEN} = 0Ω, Figure 4	3	20			Typ	pC
	OFF-Isolation	f = 1MHz, R_L = 50Ω, Figure 5	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.

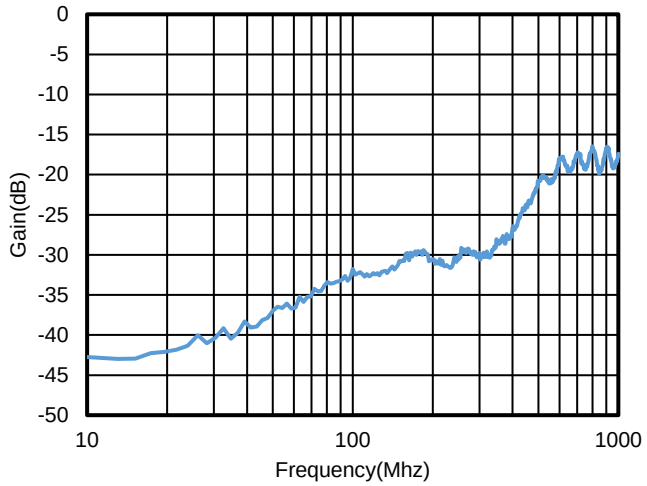


Figure 1. Off-Isolation, V_{CC} = 5V

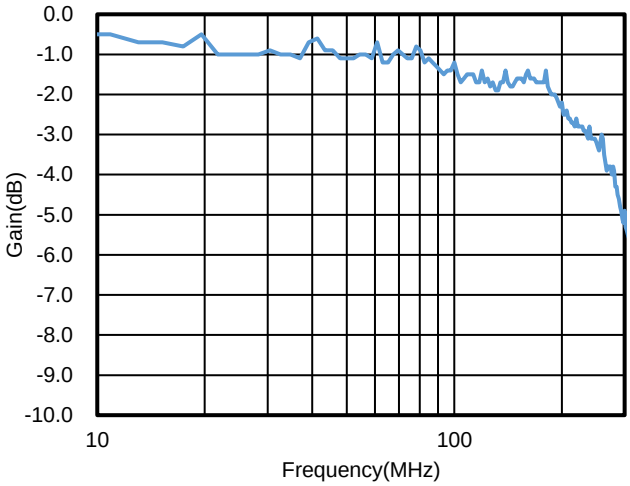


Figure 2. Bandwidth, V_{CC} = 5V

Test Circuit and Waveforms

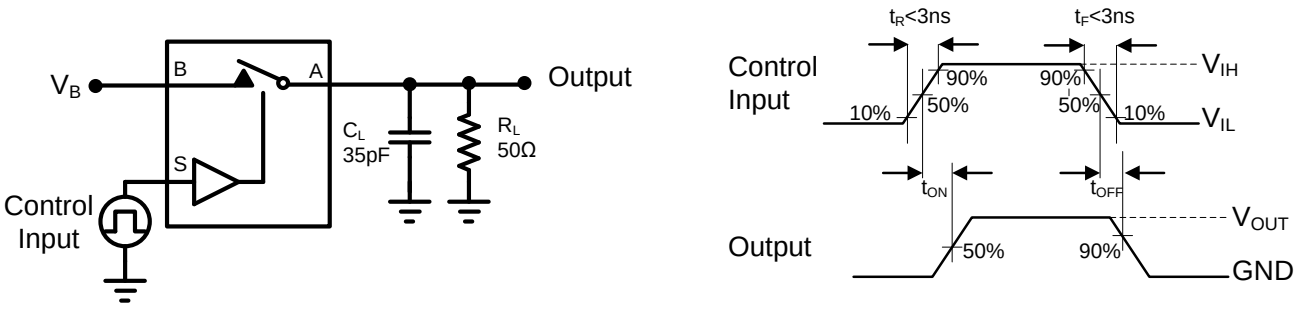


Figure 3 AC Test Circuit and Test Waveforms

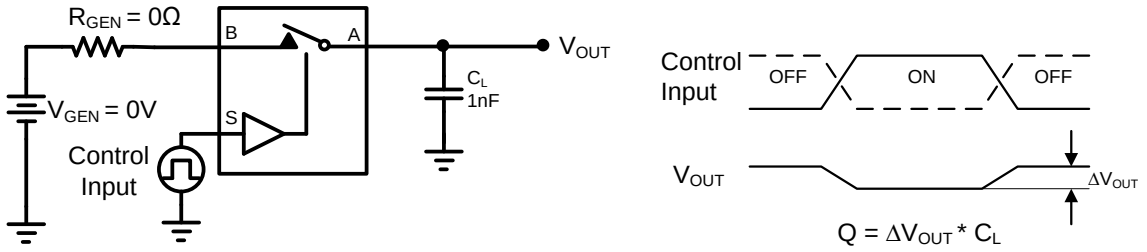


Figure 4 Charge Injection

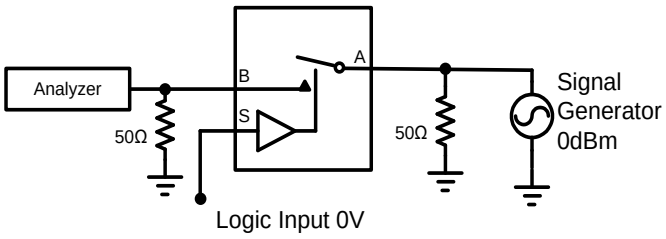
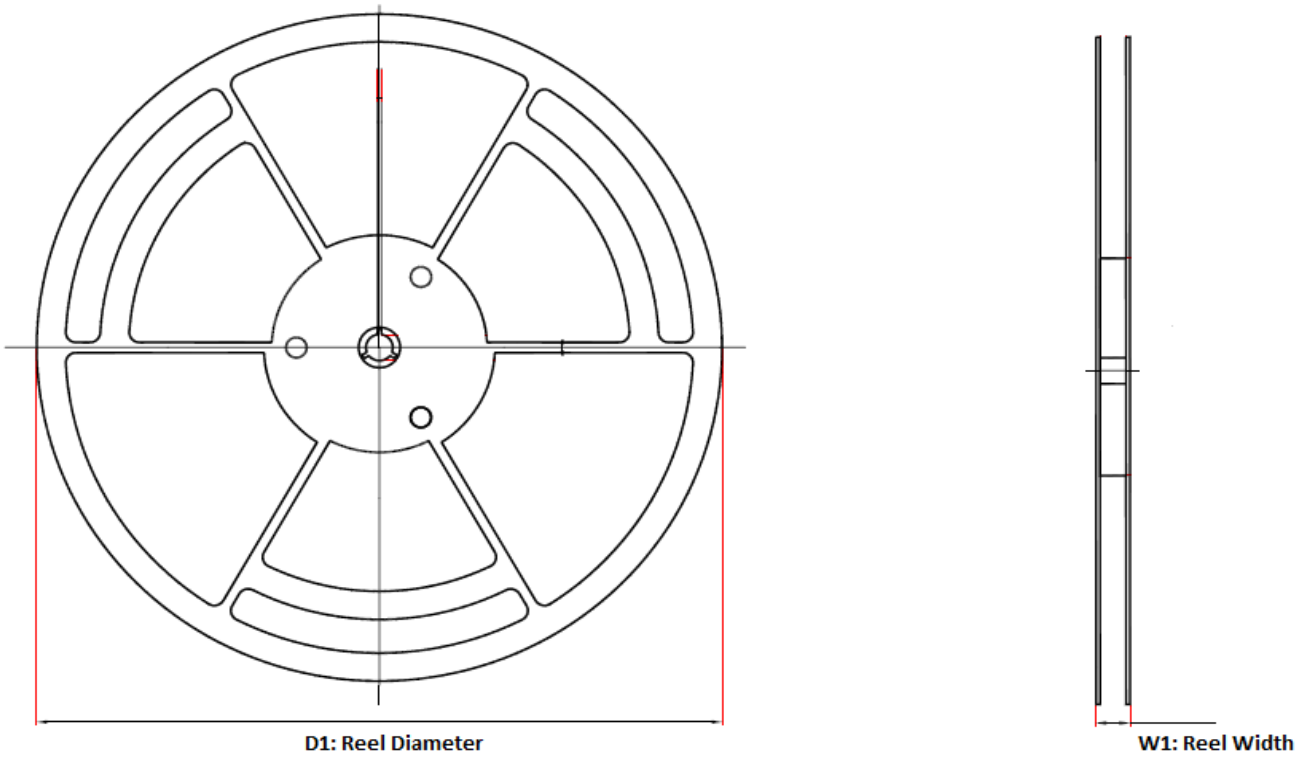


Figure 5 Off Isolation

Application Information

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

Tape and Reel Information

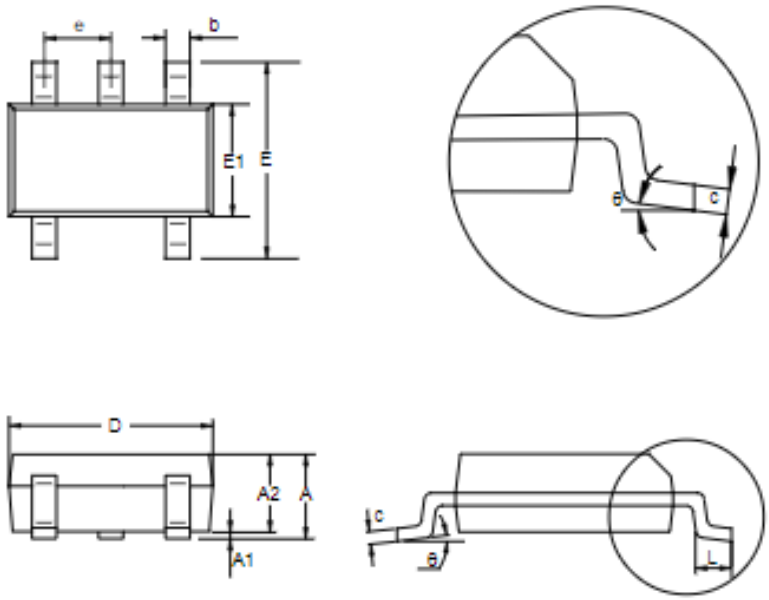


Order Number	Package	D1	W1	A0	B0	K0	P0	W0	Pin1 Quadrant
TPW3115-SC5R	5-Pin SOT353	178.0	12.3	2.4	2.5	1.2	4.0	8.0	Q3
TPW3115-S5TR	5-Pin SOT23	180.0	13.1	3.2	3.2	1.4	4.0	8.0	Q3

Package Outline Dimensions

SOT353

Package Outline Dimensions SC5(SOT353-5-A)



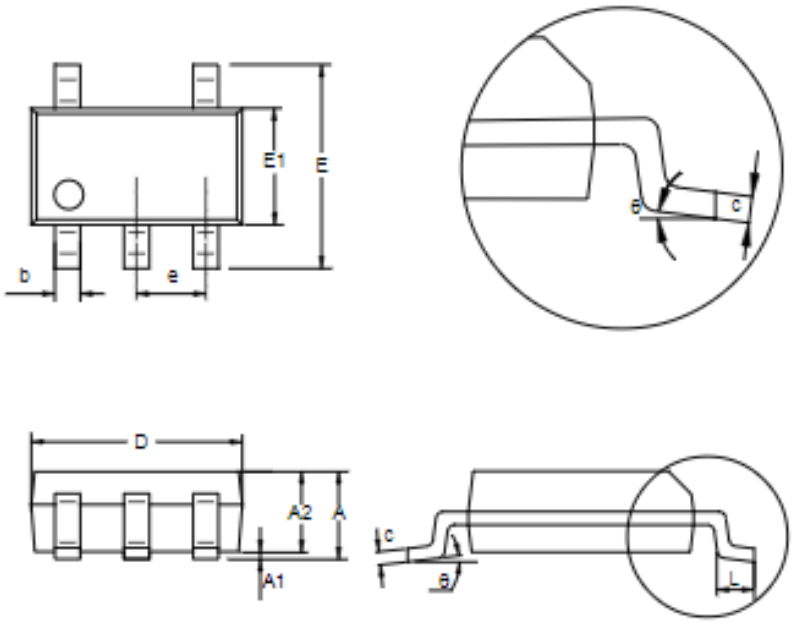
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.850	1.100	0.033	0.043
A1	0.000	0.100	0.000	0.004
A2	0.800	1.000	0.031	0.039
b	0.150	0.350	0.006	0.014
c	0.110	0.230	0.004	0.009
D	2.000	2.200	0.079	0.087
E	2.150	2.450	0.085	0.096
E1	1.150	1.350	0.045	0.053
e	0.650 BSC		0.026 BSC	
L	0.260	0.460	0.010	0.018
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

SOT23-5

Package Outline Dimensions S5T(SOT23-5-A)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.150	0.000	0.006
A2	1.000	1.200	0.039	0.047
b	0.280	0.500	0.011	0.020
c	0.100	0.230	0.004	0.009
D	2.820	3.020	0.111	0.119
E	2.600	3.000	0.102	0.118
E1	1.500	1.720	0.059	0.068
e	0.950 BSC		0.037 BSC	
L	0.300	0.600	0.012	0.024
θ	0	8°	0	8°

NOTES

1. Do not include mold flash or protrusion.
2. This drawing is subject to change without notice.

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