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**12-V General Purpose Analog Switch**

## Features

- Analog Switch Voltage: 3.3 V, 5 V, 10 V,  $\pm 5$  V
- Low On-State Resistance:
  - Typical  $50\ \Omega$  at  $V_S = \pm 4.5\ V$  or  $9\ V$
  - Typical  $60\ \Omega$  at  $V_S = 4.5\ V$
  - Typical  $300\ \Omega$  at  $V_S = 3\ V$
- Bandwidth: 200 MHz
- Fast Switching Time:  $t_{ON} = 60\ ns$ ,  $t_{OFF} = 50\ ns$
- Break-Before-Make Switching
- Operating Temperature Range:  $-40^\circ C$  to  $125^\circ C$

## Applications

- Industry Control Systems
- Battery-Powered Systems
- Audio Signal Routing
- Instrumentation

## Description

The TPW4051 is a single-pole octal-throw (SP8T) analog switch, suitable for use in analog or digital 8:1 multiplexer/demultiplexer applications. The switch features three digital select inputs ( $S_0$ ,  $S_1$ , and  $S_2$ ), eight independent inputs/outputs ( $A_n$ ), a common input/output ( $A$ ), and a digital enable input ( $E$ ). When  $E$  is high, the switch is turned off.

The device is designed on an enhanced process that provides lower power dissipation and high switching speed. The device operates equally well as either multiplexers or demultiplexers, and has an input range that extends to the supplies. All channels exhibit break-before-make switching action, preventing momentary shorting when switching channels.

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**12-V General Purpose Analog Switch**

## Switch Selection Guide

Product	Switch Configuration	Supply Voltage (V)	R <sub>ON</sub> (Ω)	Bandwidth (MHz)	Package
TPW4051	8:1	12	50	200	SOP16, TSSOP16, QFN3X3-16
TPW4052	(4:1) × 2	12	50	200	SOP16, TSSOP16
TPW4053	(2:1) × 3	12	50	200	SOP16, TSSOP16
TPW3111	1:1	5.5	1	100	SOT353 (SC70-5)
TPW3115	1:1	5.5	5	250	SOT353 (SC70-5), SOT23-5
TPW4157	2:1	5.5	1	100	SOT363 (SC70-6)
TPW3157A	2:1	5.5	2	100	SOT363 (SC70-6)
TPW3221	(2:1) × 2	5.5	1	100	MSOP10
TPW3223	(2:1) × 2	5.5	1	100	QFN1.4X1.8-10

## Revision History

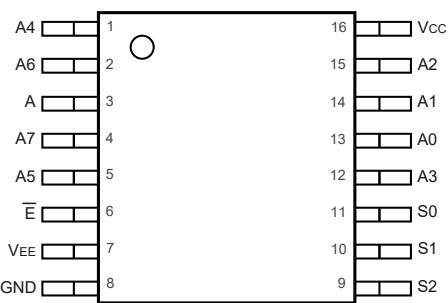
Date	Revision	Notes
2018-08-08	Rev.Pre.0	Pre-released version.
2019-03-04	Rev.A.0	Initial version.
2019-10-02	Rev.A.1	Changed the value of HBM: from 2 kV to 1 kV.
2019-12-25	Rev.A.2	<p>Corrected the test conditions of <math>\Delta R_{ON}</math> (On Resistance Match between Channels) and switch leakage to follow the product test (Product test is not changed):</p> <ul style="list-style-type: none"> <li>• Corrected all "0 V" to "<math>V_{EE}</math>";</li> <li>• Removed the <math>\Delta R_{ON}</math> at 3 to 3.6 V <math>V_{CC}</math>;</li> <li>• Changed the <math>\Delta R_{ON}</math> at 9 to 11 V <math>V_{CC}</math>: from <math>V_{IS} = 3.5</math> V to <math>V_{IS} = 1</math> V;</li> <li>• Changed the <math>\Delta R_{ON}</math> at 4.5 to 5.5 V <math>V_{CC}</math>, <math>V_{EE} = -4.5</math> V to 5.5 V: from <math>V_{IS} = 3.5</math> V to <math>V_{IS} = -3.5</math> V.</li> </ul>
2020-01-14	Rev.A.3	Corrected the "P0" information of TR in Tape and Reel Information.
2020-11-26	Rev.A.4	Corrected the Quantity of TPW4051-QF4R in Order Information: from 3000 to 4000.
2022-04-21	Rev.A.5	<p>Added the Thermal Information. Updated the high POD of the QFN3x3-16 package.</p>
2024-12-04	Rev.A.6	<p>Added a new part number: TPW4051-SOBR. The following updates are all about the new datasheet formats or typos, and the actual product remains unchanged. Updated to a new datasheet format. Updated the Tape and Reel Information. Updated the Package Outline Dimensions.</p>

## Pin Configuration and Functions

TPW4051

SOP16/TSSOP16/WSOP16

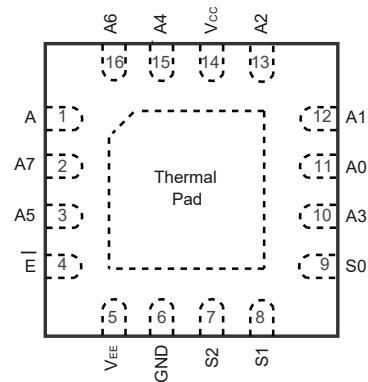
Top View



TPW4051

QFN3X3-16

Top View



**Table 1. Pin Functions: TPW4051**

Pin No.			Name	I/O	Description
SOP16	TSSOP16	QFN3X3-16			
1	1	15	A4	I/O	Channel 4 input or output
2	2	16	A6	I/O	Channel 6 input or output
3	3	1	A	I/O	Common input or output
4	4	2	A7	I/O	Channel 7 input or output
5	5	3	A5	I/O	Channel 5 input or output
6	6	4	E	I	Enable switch, active low
7	7	5	V <sub>EE</sub>		Negative power input
8	8	6	GND		Ground
9	9	7	S2	I	Control input
10	10	8	S1	I	Control input
11	11	9	S0	I	Control input
12	12	10	A3	I/O	Channel 3 input or output
13	13	11	A0	I/O	Channel 0 input or output
14	14	12	A1	I/O	Channel 1 input or output
15	15	13	A2	I/O	Channel 2 input or output
16	16	14	V <sub>cc</sub>		Positive power input

**12-V General Purpose Analog Switch****Table 2. Functional Table**

<b>E, Enable</b>	<b>S2</b>	<b>S1</b>	<b>S0</b>	<b>ON Channel</b>
L	L	L	L	A0
L	L	L	H	A1
L	L	H	L	A2
L	L	H	H	A3
L	H	L	L	A4
L	H	L	H	A5
L	H	H	L	A6
L	H	H	H	A7
H	X	X	X	None

(1) X = Don't care.

## 12-V General Purpose Analog Switch

### Specifications

#### Absolute Maximum Ratings (1)

Parameter		Min	Max	Unit
	Supply Voltage, V <sub>CC</sub> – V <sub>EE</sub>	-0.5	13	V
	Supply Voltage, V <sub>CC</sub> – GND	-0.5	13	V
	Supply Voltage, V <sub>EE</sub> – GND	-6.5	0.5	V
	Analog Switch Voltage	V <sub>EE</sub> – 0.5	V <sub>CC</sub> + 0.5	V
	Analog Switch Current	-25	25	mA
	Analog Switch Diode Current	-20	20	mA
	Digital Input Voltage, Ē, S2, S1, S0	GND	V <sub>CC</sub> + 0.5	V
	Digital Input Diode Current	-20	20	mA
T <sub>J</sub>	Maximum Junction Temperature		150	°C
T <sub>STG</sub>	Storage Temperature Range	-65	150	°C
T <sub>L</sub>	Lead Temperature (Soldering, 10 sec)		260	°C

(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, Electrostatic Discharge Protection

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001 (1)	1	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002 (2)	1	kV

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

#### Thermal Information

Package Type	θ <sub>JA</sub>	θ <sub>Jc</sub>	Unit
SOP16	100	50	°C/W
TSSOP16	150	60	°C/W
QFN3X3-16	65	41	°C/W

## 12-V General Purpose Analog Switch

### Recommended Operating Conditions <sup>(1)</sup>

All test conditions: over operating temperature range, unless otherwise noted.

Parameter		Min	Max	Unit
	Supply Voltage, $V_{CC} - V_{EE}$	3	12	V
	Supply Voltage, $V_{CC} - GND$ <sup>(2)</sup>	3	12	V
	Supply Voltage, $V_{EE} - GND$ <sup>(2)</sup>	-6	0	V
	Select Input Voltage	0	$V_{CC}$	V
	Input Transition Rise-and-Fall Rate		100	ns/V
	Switch I/O Port Voltage	$V_{EE}$	$V_{CC}$	V
T <sub>A</sub>	Operating Temperature Range	-40	125	°C

(1) The select input must be held high or low, and it must not float.

(2) The voltage of  $V_{CC}$ ,  $V_{EE}$  needs to be within the range of  $V_{CC} - V_{EE}$ .

**12-V General Purpose Analog Switch**
**Electrical Characteristics**

All test conditions: single supply,  $V_{CC} = 4.5\text{ V}$  to  $5.5\text{ V}$ ,  $V_{EE} = 0\text{ V}$ , GND =  $0\text{ V}$ , unless otherwise noted.

<b>Symbol</b>	<b>Parameter</b>	<b>Conditions</b>	<b><math>V_{CC}</math> (V)</b>	<b>25°C</b>	<b>-40°C to 85°C</b>	<b>-40°C to 125°C</b>	<b>Limit</b>	<b>Unit</b>
<b>Power Supply</b>								
$I_{CC}$	Quiescent Supply Current	$V_{IN} = V_{EE}$ or $V_{CC}$	5.5	4	6	8	Max	$\mu\text{A}$
<b>Digital Input</b>								
$V_{IH}$	Input Voltage High				2.0	2.0	Min	V
$V_{IL}$	Input Voltage Low				0.8	0.8	Max	V
$I_{IN}$	Control Input Leakage	$V_{IN} = 0\text{ V}$ or $V_{CC}$	5.5	$\pm 0.4$	$\pm 1$	$\pm 1$	Max	$\mu\text{A}$
<b>Analog Switch</b>								
$R_{ON}$	(1)	$I_{OUT} = 1\text{ mA}$ , $V_{IS} = V_{EE}$ or $V_{CC}$	4.5	60			Typ	$\Omega$
$R_{ON}$		$I_{OUT} = 1\text{ mA}$ , $V_{IS} = V_{EE}$ or $V_{CC}$	4.5	100	130	150	Max	$\Omega$
$\Delta R_{ON}$	On Resistance Match between Channels	$I_{OUT} = 1\text{ mA}$ , $V_{IS} = 2.5\text{ V}$	4.5	20	30	35	Max	$\Omega$
$R_{FLAT(ON)}$	On Resistance Flatness	$I_{OUT} = 1\text{ mA}$	4.5	60	80	80	Max	$\Omega$
$I_{CH(OFF)}$	Switch OFF Leakage Current on Channel	$V_{IS} = V_{EE}$ , $V_{OS} = V_{CC}$ ; or $V_{IS} = V_{CC}$ , $V_{OS} = V_{EE}$	5.5	$\pm 0.4$	$\pm 1$	$\pm 1$	Max	$\mu\text{A}$
$I_{COM(OFF)}$	Switch OFF Leakage Current on Common	$V_{IS} = V_{EE}$ , $V_{OS} = V_{CC}$ ; or $V_{IS} = V_{CC}$ , $V_{OS} = V_{EE}$	5.5	$\pm 0.4$	$\pm 4$	$\pm 4$	Max	$\mu\text{A}$
$I_{(ON)}$	Switch ON Leakage Current	$V_{IS} = V_{EE}$ or $V_{CC}$	5.5	$\pm 0.4$	$\pm 4$	$\pm 4$	Max	$\mu\text{A}$
<b>Dynamic Characteristics</b>								
$t_{PHL}, t_{PLH}$	Switch IN to OUT Time (1)	$C_L = 50\text{ pF}$	4.5	5			Typ	ns
$t_{ON}$	Switch Turn-on Time	$C_L = 50\text{ pF}$	4.5	60			Max	ns
$t_{OFF}$	Switch Turn-off Time	$C_L = 50\text{ pF}$	4.5	50			Max	ns
	Off Isolation (1)	$f = 1\text{ MHz}$ , $R_L = 50\text{ }\Omega$ , $C_L = 10\text{ pF}$	5	-70			Typ	dB
	Crosstalk in Channel (1)	$f = 1\text{ MHz}$ , $R_L = 50\text{ }\Omega$ , $C_L = 10\text{ pF}$	5	-70			Typ	dB
	Crosstalk in Control (1)	Between control and any switch; $R_L = 600\text{ }\Omega$ ; $f = 1\text{ MHz}$ ; E or Sn square wave between $V_{CC}$ and GND	5	110			Typ	mV
BW	Bandwidth (1)	$R_L = 50\text{ }\Omega$	5	200			Typ	MHz
THD	Total Harmonic Distortion (1)	$R_L = 10\text{ k}\Omega$ , $f = 1\text{ kHz}$	5	0.05			Typ	%

**12-V General Purpose Analog Switch**

Symbol	Parameter	Conditions	V <sub>cc</sub> (V)	25°C	-40°C to 85°C	-40°C to 125°C	Limit	Unit
<b>Capacitance</b>								
C <sub>IN</sub>	Switch Input Capacitance <sup>(1)</sup>		5	5			Typ	pF
C <sub>COM</sub>	Common Output Capacitance <sup>(1)</sup>		5	25			Typ	pF
C <sub>PD</sub>	Power Dissipation Capacitance <sup>(1)</sup>		5	50			Typ	pF

(1) The test data is based on bench tests and design simulation.

**12-V General Purpose Analog Switch**
**Electrical Characteristics (Continued)**

All test conditions: single supply,  $V_{CC} = 3$  V to 3.6 V,  $V_{EE} = 0$  V, GND = 0 V, unless otherwise noted.

<b>Symbol</b>	<b>Parameter</b>	<b>Conditions</b>	<b><math>V_{CC}</math> (V)</b>	<b>25°C</b>	<b>-40°C to 85°C</b>	<b>-40°C to 125°C</b>	<b>Limit</b>	<b>Unit</b>
<b>Power Supply</b>								
$I_{CC}$	Quiescent Supply Current	$V_{IN} = V_{EE}$ or $V_{CC}$	3.6	4	6	8	Max	$\mu A$
<b>Digital Input</b>								
$V_{IH}$	Input Voltage High				2.0	2.0	Min	V
$V_{IL}$	Input Voltage Low				0.8	0.8	Max	V
$I_{IN}$	Control Input Leakage	$V_{IN} = 0$ V or $V_{CC}$	3.6		$\pm 1$	$\pm 1$	Max	$\mu A$
<b>Analog Switch</b>								
$R_{ON}$	(1)	$I_{OUT} = 1$ mA, $V_{IS} = V_{EE}$ or $V_{CC}$	3	300			Typ	$\Omega$
$R_{FLAT(ON)}$	On Resistance Flatness (1)	$I_{OUT} = 1$ mA	3	100			Typ	$\Omega$
$I_{CH(OFF)}$	Switch OFF Leakage Current on Channel	$V_{IS} = V_{EE}$ , $V_{OS} = V_{CC}$ ; or $V_{IS} = V_{CC}$ , $V_{OS} = V_{EE}$	3.6	$\pm 0.4$	$\pm 1$	$\pm 1$	Max	$\mu A$
$I_{COM(OFF)}$	Switch OFF Leakage Current on Common	$V_{IS} = V_{EE}$ , $V_{OS} = V_{CC}$ ; or $V_{IS} = V_{CC}$ , $V_{OS} = V_{EE}$	3.6	$\pm 0.4$	$\pm 4$	$\pm 4$	Max	$\mu A$
$I_{(ON)}$	Switch ON Leakage Current	$V_{IS} = V_{EE}$ or $V_{CC}$	3.6	$\pm 0.4$	$\pm 4$	$\pm 4$	Max	$\mu A$
<b>Dynamic Characteristics</b>								
$t_{PHL}, t_{PLH}$	Switch IN to OUT Time (1)	$C_L = 50$ pF	3	5			Typ	ns
$t_{ON}$	Switch Turn-on Time (1)	$C_L = 50$ pF	3	70			Typ	ns
$t_{OFF}$	Switch Turn-off Time (1)	$C_L = 50$ pF	3	60			Typ	ns
	Off Isolation (1)	$f = 1$ MHz, $R_L = 50 \Omega$ , $C_L = 10$ pF	3.3	-70			Typ	dB
	Crosstalk (1)	$f = 1$ MHz, $R_L = 50 \Omega$ , $C_L = 10$ pF	3.3	-70			Typ	dB
	Crosstalk in Control (1)	Between control and any switch; $R_L = 600 \Omega$ ; $f = 1$ MHz; E or Sn square wave between $V_{CC}$ and GND	3.3	110			Typ	mV
BW	Bandwidth (1)	$R_L = 50 \Omega$	3.3	100			Typ	MHz
THD	Total Harmonic Distortion (1)	$R_L = 10$ k $\Omega$ , $f = 1$ kHz	3.3	0.2			Typ	%
<b>Capacitance</b>								
$C_{IN}$	Switch Input Capacitance (1)		3.3	5			Typ	pF
$C_{COM}$	Common Output Capacitance (1)		3.3	25			Typ	pF

**12-V General Purpose Analog Switch**

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	25°C	-40°C to 85°C	-40°C to 125°C	Limit	Unit
C <sub>PD</sub>	Power Dissipation Capacitance (1)		3.3	50			Typ	pF

(1) The test data is based on bench tests and design simulation.

**12-V General Purpose Analog Switch**
**Electrical Characteristics (Continued)**

All test conditions: single supply,  $V_{CC} = 9\text{ V}$  to  $11\text{ V}$ ,  $V_{EE} = 0\text{ V}$ , GND =  $0\text{ V}$ , unless otherwise noted.

<b>Symbol</b>	<b>Parameter</b>	<b>Conditions</b>	<b><math>V_{CC}</math> (V)</b>	<b>25°C</b>	<b>-40°C to 85°C</b>	<b>-40°C to 125°C</b>	<b>Limit</b>	<b>Unit</b>
<b>Power Supply</b>								
$I_{CC}$	Quiescent Supply Current	$V_{IN} = V_{EE}$ or $V_{CC}$	9	8	12	16	Max	$\mu\text{A}$
<b>Digital Input</b>								
$V_{IH}$	Input Voltage High				2.4	2.4	Min	V
$V_{IL}$	Input Voltage Low				0.8	0.8	Max	V
$I_{IN}$	Control Input Leakage	$V_{IN} = 0\text{ V}$ or $V_{CC}$	11	$\pm 0.4$	$\pm 1$	$\pm 1$	Max	$\mu\text{A}$
<b>Analog Switch</b>								
$R_{ON}$	(1)	$I_{OUT} = 1\text{ mA}$ , $V_{IS} = V_{EE}$ or $V_{CC}$	9	50			Typ	$\Omega$
$R_{ON}$		$I_{OUT} = 1\text{ mA}$ , $V_{IS} = V_{EE}$ or $V_{CC}$	9	80	95	105	Max	$\Omega$
$\Delta R_{ON}$	On Resistance Match between Channels	$I_{OUT} = 1\text{ mA}$ , $V_{IS} = 1\text{ V}$	9	15	25	30	Max	$\Omega$
$R_{FLAT(ON)}$	On Resistance Flatness	$I_{OUT} = 1\text{ mA}$	9	30	40	40	Max	$\Omega$
$I_{CH(OFF)}$	Switch OFF Leakage Current on Channel	$V_{IS} = V_{EE}$ , $V_{OS} = V_{CC}$ ; or $V_{IS} = V_{CC}$ , $V_{OS} = V_{EE}$	11	$\pm 0.4$	$\pm 1$	$\pm 1$	Max	$\mu\text{A}$
$I_{COM(OFF)}$	Switch OFF Leakage Current on Common	$V_{IS} = V_{EE}$ , $V_{OS} = V_{CC}$ ; or $V_{IS} = V_{CC}$ , $V_{OS} = V_{EE}$	11	$\pm 0.4$	$\pm 4$	$\pm 4$	Max	$\mu\text{A}$
$I_{(ON)}$	Switch ON Leakage Current	$V_{IS} = V_{EE}$ or $V_{CC}$	11	$\pm 0.4$	$\pm 4$	$\pm 4$	Max	$\mu\text{A}$
<b>Dynamic Characteristics</b>								
$t_{PHL}, t_{PLH}$	Switch IN to OUT Time (1)	$C_L = 50\text{ pF}$	9	5			Typ	ns
$t_{ON}$	Switch Turn-on Time	$C_L = 50\text{ pF}$	9	60			Max	ns
$t_{OFF}$	Switch Turn-off Time	$C_L = 50\text{ pF}$	9	50			Max	ns
	Off Isolation (1)	$f = 1\text{ MHz}$ , $R_L = 50\text{ }\Omega$ , $C_L = 10\text{ pF}$	10	-70			Typ	dB
	Crosstalk (1)	$f = 1\text{ MHz}$ , $R_L = 50\text{ }\Omega$ , $C_L = 10\text{ pF}$	10	-70			Typ	dB
	Crosstalk in Control (1)	Between control and any switch; $R_L = 600\text{ }\Omega$ ; $f = 1\text{ MHz}$ ; E or Sn square wave between $V_{CC}$ and GND	10	220			Typ	mV
BW	Bandwidth (1)	$R_L = 50\text{ }\Omega$	10	200			Typ	MHz
THD	Total Harmonic Distortion (1)	$R_L = 10\text{ k}\Omega$ , $f = 1\text{ kHz}$	10	0.03			Typ	%

**12-V General Purpose Analog Switch**

Symbol	Parameter	Conditions	V <sub>CC</sub> (V)	25°C	-40°C to 85°C	-40°C to 125°C	Limit	Unit
<b>Capacitance</b>								
C <sub>IN</sub>	Switch Input Capacitance <sup>(1)</sup>		10	5			Typ	pF
C <sub>COM</sub>	Common Output Capacitance <sup>(1)</sup>		10	25			Typ	pF
C <sub>PD</sub>	Power Dissipation Capacitance <sup>(1)</sup>		10	50			Typ	pF

(1) The test data is based on bench tests and design simulation.

**12-V General Purpose Analog Switch**
**Electrical Characteristics (Continued)**

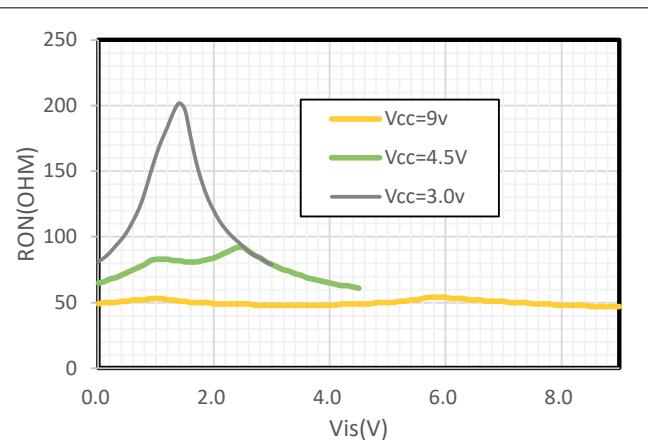
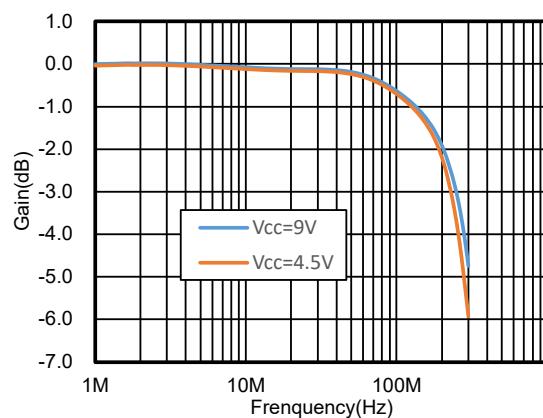
All test conditions: dual supply,  $V_{CC} = 4.5\text{ V}$  to  $5.5\text{ V}$ ,  $V_{EE} = -4.5\text{ V}$  to  $5.5\text{ V}$ , GND = 0 V, unless otherwise noted.

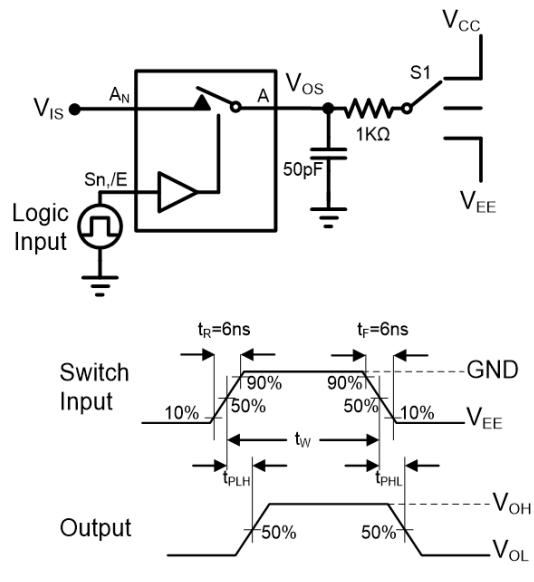
<b>Symbol</b>	<b>Parameter</b>	<b>Conditions</b>	$V_{CC}/V_{EE}$ (V)	25°C	-40°C to 85°C	-40°C to 125°C	<b>Limit</b>	<b>Unit</b>
<b>Power Supply</b>								
$I_{CC}$	Quiescent Supply Current	$V_{IN} = V_{EE}$ or $V_{CC}$	5.5/ -5.5	8	12	16	Max	μA
<b>Digital Input</b>								
$V_{IH}$	Input Voltage High				70% × $V_{CC}$	70% × $V_{CC}$	Min	V
$V_{IL}$	Input Voltage Low				30% × $V_{CC}$	30% × $V_{CC}$	Max	V
$I_{IN}$	Control Input Leakage	$V_{IN} = 0\text{ V}$ or $V_{CC}$	5.5/ -5.5	±0.4	±1	±1	Max	μA
<b>Analog Switch</b>								
$R_{ON}$	(1)	$I_{OUT} = 1\text{ mA}$ , $V_{IS} = V_{EE}$ or $V_{CC}$	4.5/ -4.5	50			Typ	Ω
$R_{ON}$		$I_{OUT} = 1\text{ mA}$ , $V_{IS} = V_{EE}$ or $V_{CC}$	4.5/ -4.5	80	95	105	Max	Ω
$\Delta R_{ON}$	On Resistance Match between Channels	$I_{OUT} = 1\text{ mA}$ , $V_{IS} = -3.5\text{ V}$	4.5/ -4.5	15	25	30	Max	Ω
$R_{FLAT(ON)}$	On Resistance Flatness	$I_{OUT} = 1\text{ mA}$	4.5/ -4.5	30	40	40	Max	Ω
$I_{CH(OFF)}$	Switch OFF Leakage Current on Channel	$V_{IS} = V_{EE}$ , $V_{OS} = V_{CC}$ ; or $V_{IS} = V_{CC}$ , $V_{OS} = V_{EE}$	5.5/ -5.5	±0.4	±1	±1	Max	μA
$I_{COM(OFF)}$	Switch OFF Leakage Current on Common	$V_{IS} = V_{EE}$ , $V_{OS} = V_{CC}$ ; or $V_{IS} = V_{CC}$ , $V_{OS} = V_{EE}$	5.5/ -5.5	±0.4	±4	±4	Max	μA
$I_{(ON)}$	Switch ON Leakage Current	$V_{IS} = V_{EE}$ or $V_{CC}$	5.5/ -5.5	±0.4	±4	±4	Max	μA
<b>Dynamic Characteristics</b>								
$t_{PHL}, t_{PLH}$	Switch IN to OUT Time (1)	$C_L = 50\text{ pF}$	4.5/ -4.5	5			Typ	ns
$t_{ON}$	Switch Turn-on Time	$C_L = 50\text{ pF}$	4.5/ -4.5	60			Max	ns
$t_{OFF}$	Switch Turn-off Time	$C_L = 50\text{ pF}$	4.5/ -4.5	50			Max	ns
	Off Isolation (1)	$f = 1\text{ MHz}$ , $R_L = 50\text{ Ω}$ , $C_L = 10\text{ pF}$	5/-5	-70			Typ	dB
	Crosstalk (1)	$f = 1\text{ MHz}$ , $R_L = 50\text{ Ω}$ , $C_L = 10\text{ pF}$	5/-5	-70			Typ	dB

**12-V General Purpose Analog Switch**

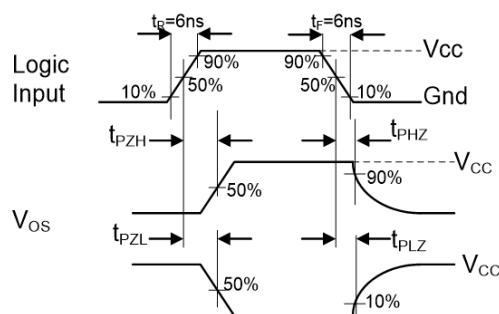
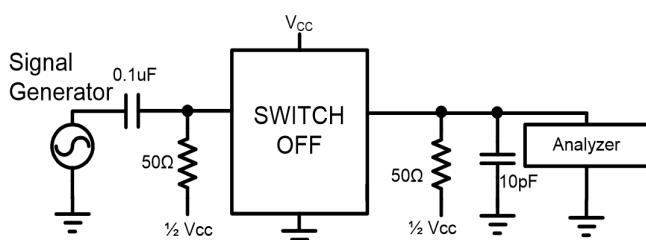
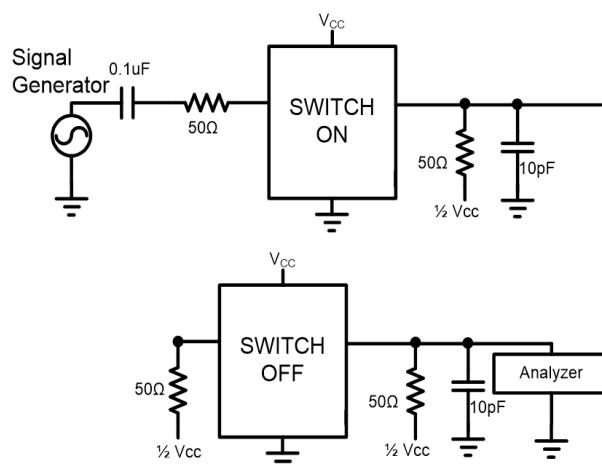
Symbol	Parameter	Conditions	V <sub>CC</sub> / V <sub>EE</sub> (V)	25°C	-40°C to 85°C	-40°C to 125°C	Limit	Unit
	Crosstalk in Control <sup>(1)</sup>	Between control and any switch; R <sub>L</sub> = 600 Ω; f = 1 MHz; E or Sn square wave between V <sub>CC</sub> and GND	5/-5	220			Typ	mV
BW	Bandwidth <sup>(1)</sup>	R <sub>L</sub> = 50 Ω	5/-5	200			Typ	MHz
THD	Total Harmonic Distortion <sup>(1)</sup>	R <sub>L</sub> = 10 kΩ, f = 1 kHz	5/-5	0.03			Typ	%
<b>Capacitance</b>								
C <sub>IN</sub>	Switch Input Capacitance <sup>(1)</sup>		5/-5	5			Typ	pF
C <sub>COM</sub>	Common Output Capacitance <sup>(1)</sup>		5/-5	25			Typ	pF
C <sub>PD</sub>	Power Dissipation Capacitance <sup>(1)</sup>		5/-5	50			Typ	pF

(1) The test data is based on bench tests and design simulation.

**Typical Performance Characteristics****Figure 1.  $R_{ON}$  vs.  $V_{IN}$** **Figure 2. Bandwidth**

**12-V General Purpose Analog Switch**
**Test Circuit and Waveforms**


Parameter	Vis	S1 Position
$t_{PHL}, t_{PLH}$	Pulse	Open
$t_{PZH}, t_{PHZ}$	$V_{CC}$	$V_{EE}$
$t_{PZL}, t_{PLZ}$	$V_{EE}$	$V_{CC}$

 $t_{ON}: t_{PZH} \text{ or } t_{PZL}$ 
 $t_{OFF}: t_{PHZ} \text{ or } t_{PLZ}$ 

**Figure 3. AC Test Circuit and Test Waveforms**

**Figure 4. Off Isolation**

**Figure 5. Crosstalk**

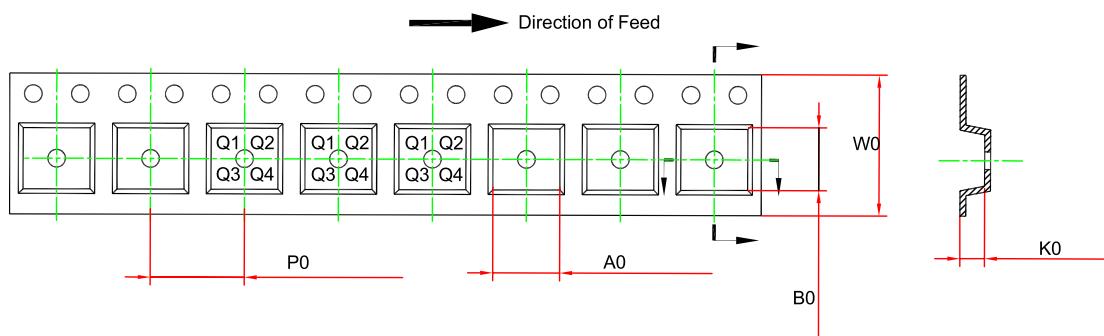
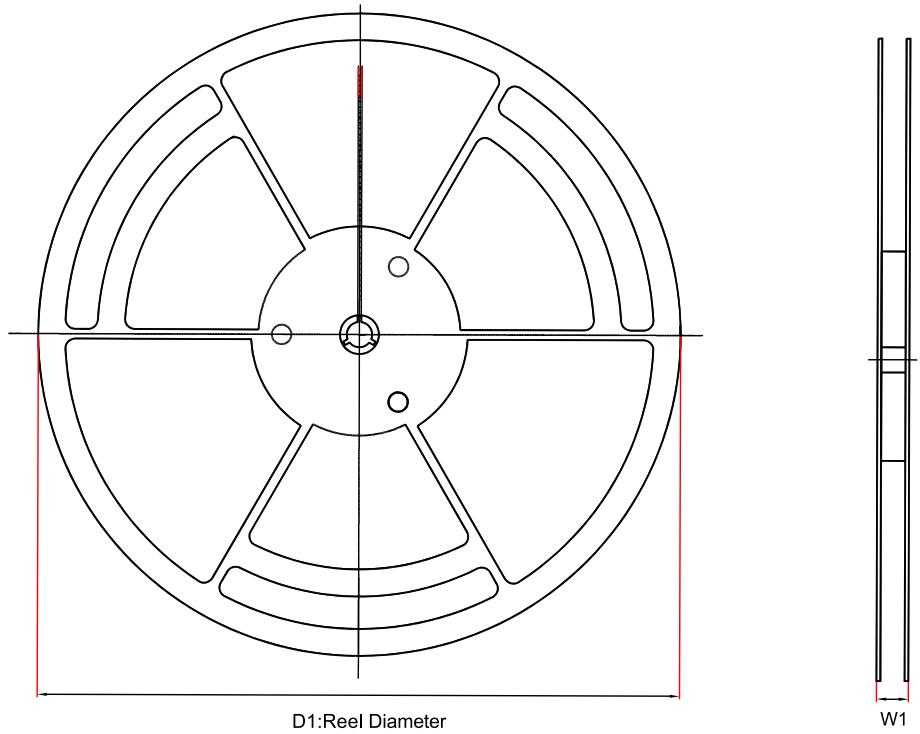
## Application and Implementation

### Note

Information in the following application sections is not part of the 3PEAK's component specification and 3PEAK does not warrant its accuracy or completeness. 3PEAK's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

## Application Information

A 0.1- $\mu$ F bypass capacitor on  $V_{CC}$  and GND is recommended to prevent power disturbance. Another 0.1- $\mu$ F bypass capacitor on  $V_{EE}$  and GND is also recommended if  $V_{EE}$  is not connected to GND.

**12-V General Purpose Analog Switch**
**Tape and Reel Information**


Order Number	Package	D1 (mm)	W1 (mm)	A0 (mm) <sup>(1)</sup>	B0 (mm) <sup>(1)</sup>	K0 (mm) <sup>(1)</sup>	P0 (mm)	W0 (mm)	Pin1 Quadrant
TPW4051-SR	SOP16	330	21.6	6.6	10.4	2.1	8	16	Q1
TPW4051-TR	TSSOP16	330	17.6	6.8	5.5	1.5	8	12	Q1
TPW4051-QF4R	QFN3X3-16	330	17.6	3.3	3.3	1.1	8	12	Q1
TPW4051-SOBR	WSOP16	330	21.6	10.9	10.8	3.1	12	16	Q1

(1) The value is for reference only. Contact the 3PEAK factory for more information.

## Package Outline Dimensions

SOP16

Package Outline Dimensions		SO3(SOP-16-A)			
Symbol	Dimensions In Millimeters		Dimensions In Inches		
	MIN	MAX	MIN	MAX	
A	1.350	1.750	0.053	0.069	
A1	0.050	0.250	0.002	0.010	
A2	1.300	1.600	0.051	0.063	
b	0.330	0.510	0.013	0.020	
c	0.170	0.250	0.007	0.010	
D	9.800	10.000	0.386	0.394	
E	5.800	6.200	0.228	0.244	
E1	3.800	4.000	0.150	0.157	
e	1.270 BSC		0.050 BSC		
L	0.400	1.000	0.016	0.039	
θ	0	8°	0	8°	

**NOTES**

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

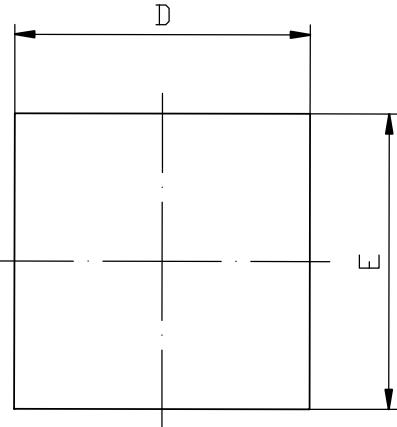
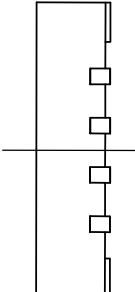
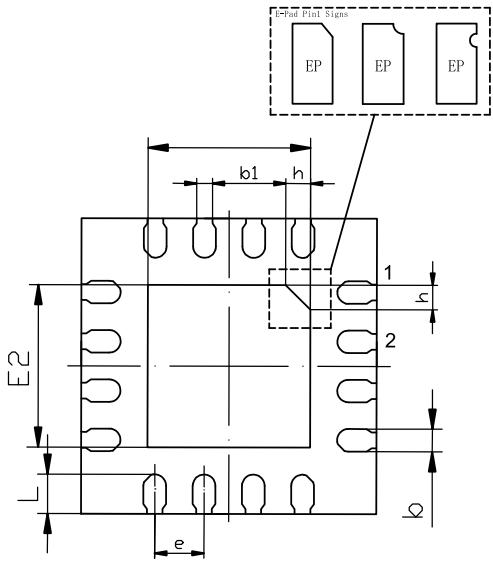
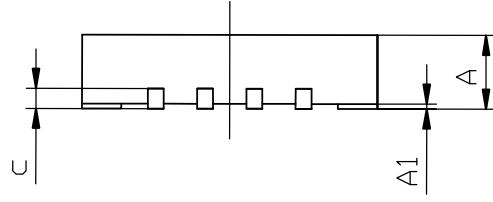
**12-V General Purpose Analog Switch**
**TSSOP16**

Package Outline Dimensions		TS3(TSSOP-16-A)			
Symbol	Dimensions In Millimeters		Dimensions In Inches		
	MIN	MAX	MIN	MAX	
A	0.900	1.200	0.035	0.047	
A1	0.050	0.150	0.002	0.006	
A2	0.800	1.050	0.031	0.041	
b	0.190	0.300	0.007	0.012	
c	0.090	0.200	0.004	0.008	
D	4.900	5.100	0.193	0.201	
E	6.200	6.600	0.244	0.260	
E1	4.300	4.500	0.169	0.177	
e	0.650 BSC		0.026 BSC		
L	0.450	0.750	0.018	0.030	
θ	0	8°	0	8°	

**NOTES**

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

**QFN3X3-16**

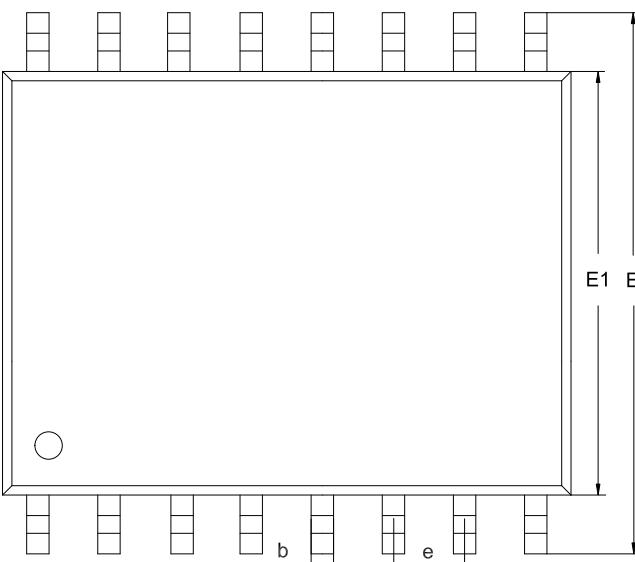
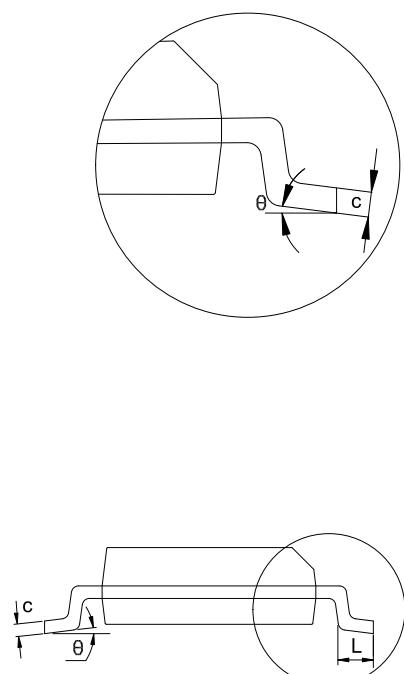
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**12-V General Purpose Analog Switch**
**WSOP16**

Package Outline Dimensions		SOB(WSOP-16-A)			
Symbol	Dimensions In Millimeters		Dimensions In Inches		
	MIN	MAX	MIN	MAX	
A	2.350	2.650	0.093	0.104	
A1	0.100	0.300	0.004	0.012	
A2	2.250	2.350	0.089	0.093	
b	0.350	0.450	0.014	0.018	
c	0.200	0.290	0.008	0.011	
D	10.100	10.500	0.398	0.413	
E	10.100	10.600	0.398	0.417	
E1	7.300	7.700	0.287	0.303	
e	1.270 BSC		0.050 BSC		
L	0.500	0.850	0.020	0.033	
$\theta$	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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**12-V General Purpose Analog Switch****Order Information**

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity	Eco Plan
TPW4051-SR	-40 to 125°C	SOP16	W4051	3	Tape and Reel, 2500	Green
TPW4051-TR	-40 to 125°C	TSSOP16	W4051	3	Tape and Reel, 3000	Green
TPW4051-QF4R	-40 to 125°C	QFN3X3-16	W4051	3	Tape and Reel, 4000	Green
TPW4051-SOBR	-40 to 125°C	WSOP16	W4051	3	Tape and Reel, 1500	Green

**Green:** 3PEAK defines "Green" to mean RoHS compatible and free of halogen substances.

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**12-V General Purpose Analog Switch**

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TPW4051

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**12-V General Purpose Analog Switch**

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