

Dual 4-Channel Analog Multiplexer/Demultiplexer

Features

- * Wide Analog Input Voltage Range:
From 3V to +18V
- * Fully Static Operation
- * 5V, 10V and 18V Parametric Ratings
- * Standardized Symmetrical Output Characteristics
- * Specified From -40°C to +125°C
- * Available in SOIC-16/TSSOP16 Package

Applications

- * Analog Multiplexing and demultiplexing
- * Digital Multiplexing and demultiplexing
- * Signal Gating

General Description

The HCR4052H is a dual single-pole quad-throw analog switch (2XSP4T) suitable for use in analog or digital 4:1 multiplexer/demultiplexer applications. Each switch features four independent inputs/outputs (nY0, nY1, nY2 and nY3) and a common input/output (nZ). A digital enable input ($\overline{E}$) and two digital select input (S0 and S1) are common both switches. When $\overline{E}$ is HIGH, the switches are turned off. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of VCC.

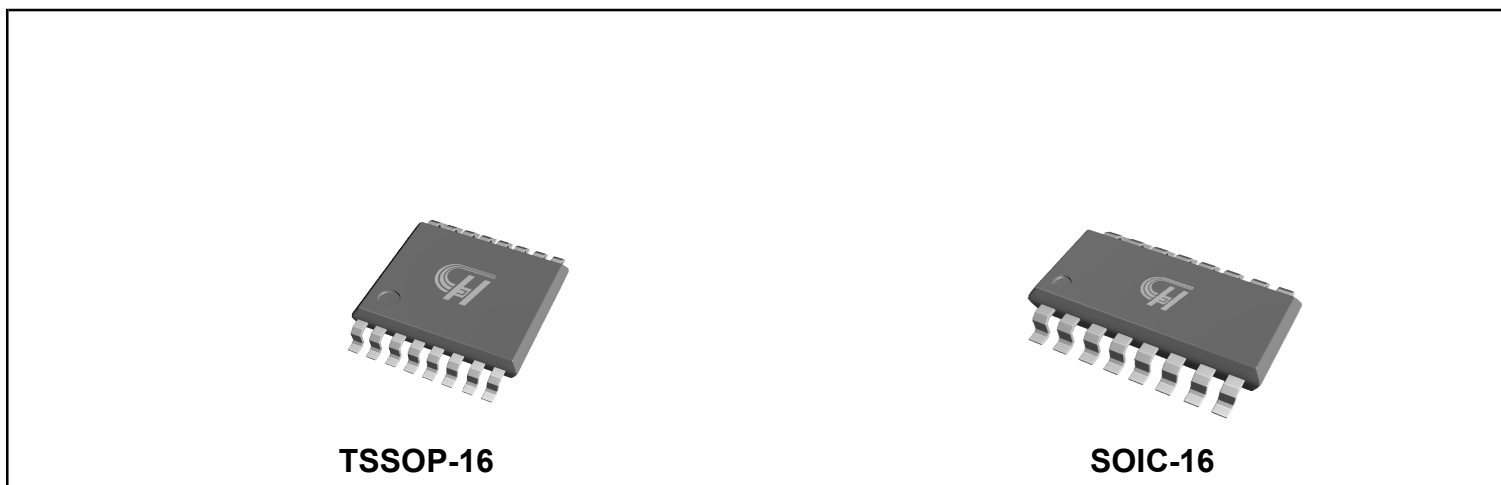


Figure 1. Package Type of HCR4052H

Dual 4-Channel Analog Multiplexer/Demultiplexer

Pin Configuration

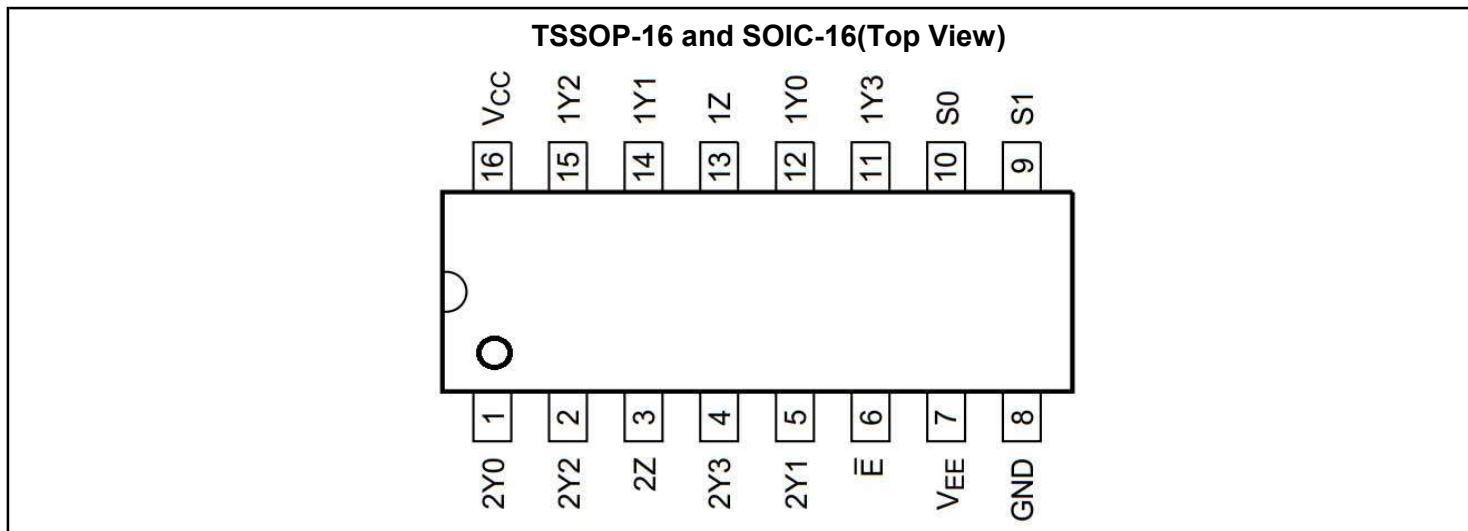


Figure 2. Pin Configuration of HCR4052H (Top View)

Pin Function Table

Pin	NAME	Description
TSSOP-16 SOIC-16		
1	2Y0	Independent input or output
2	2Y2	Independent input or output
3	2Z	Common input or output
4	2Y3	Independent input or output
5	2Y1	Independent input or output
6	$\overline{E}$	Enable input (active LOW)
7	VEE	Negative Supply Voltage
8	GND	Ground Supply Voltage
9	S1	Select Logic Input
10	S0	Select Logic Input
11	1Y3	Independent input or output
12	1Y0	Independent input or output
13	1Z	Common input or output
14	1Y1	Independent input or output
15	1Y2	Independent input or output
16	VCC	Positive Supply Voltage

Dual 4-Channel Analog Multiplexer/Demultiplexer

LOGIC SYMBOL

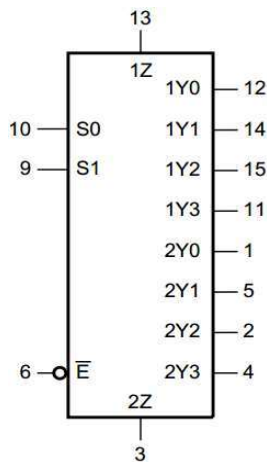


Figure 3-1. Logic Symbol

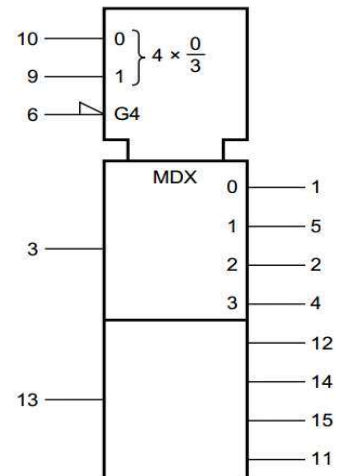


Figure 3-2. IEC Logic Symbol

Schematic Diagram (one switch)

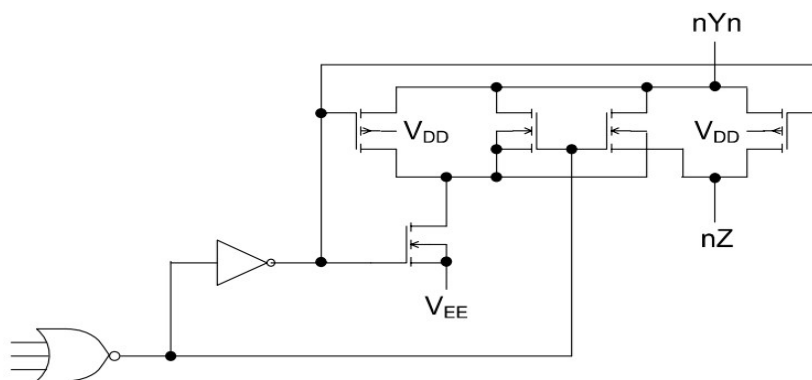


Figure 4. Schematic Diagram (one switch)

Function Diagram

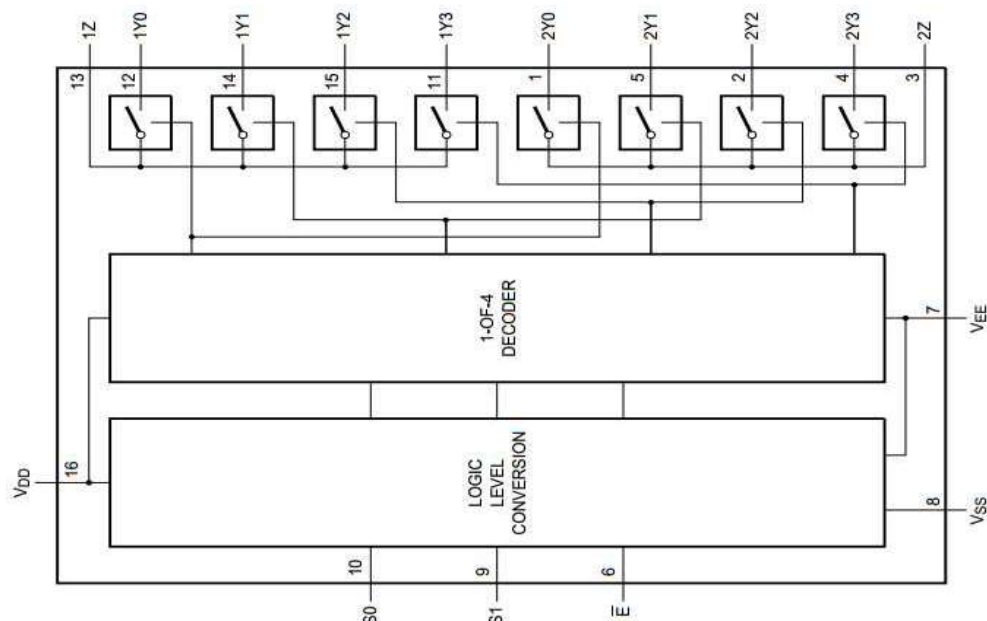
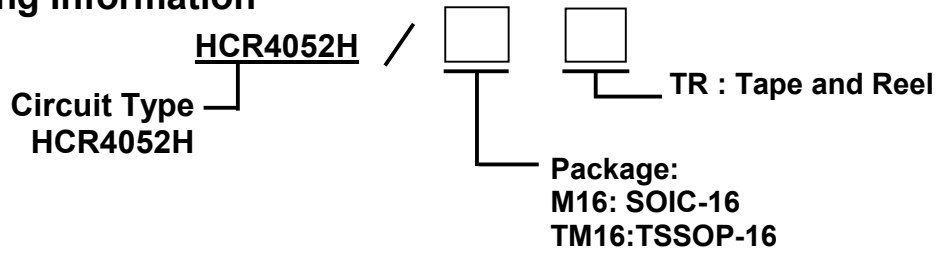


Figure 5. Functional Diagram

Dual 4-Channel Analog Multiplexer/Demultiplexer

Ordering Information



Ordering Code

Part Number	Marking	Temperature Range	Package	Quantity per Reel
HCR4052H/M16TR	HCR4052H	-40'C to +125'C	SOIC-16	4000pcs /TR
HCR4052H/TM16TR	HCR4052H	-40'C to +125'C	TSSOP-16	5000pcs /TR

Note: If the physical information is inconsistent with the ordweing information,
Please refer to the actual product

Functional Table

Input			Channel ON
$\overline{E}$	S2	S1	
L	L	L	nY0 to nZ
L	L	H	nY1 to nZ
L	H	L	nY2 to nZ
L	H	H	nY3 to nZ
H	X	X	swithes off

Note: H=HIGH Voltage Level;

L=LOW Voltage Level.

X=don't care.

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ELECTRICAL PARAMETER

Absolute Maximum Ratings

(Tamb=25°C, Voltages are referenced to VSS=GND (ground), unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Type	Max	Unit
Supply Voltage	VCC	- [1]	-0.5	-	+21.0	V
Supply Voltage	VEE	referenced to VCC	-21	-	+0.5	V
Input Voltage	VI	-	-0.5	-	VCC+0.5	V
Input Clamping Current	I _{IK}	VI<-0.5V to VI>VCC+0.5V	-	-	±10	mA
Input/output Current	I _{IO}	-	-	-	±10	mA
Supply Current	I _{CC}	-	-	-	+50	mA
Ground Current	I _{GND}	-	-50	-	-	mA
Total Power Dissipation	P _{tot}	-	-	-	500	mW
Device Dissipation	P	per output transistor	-	-	100	mW
Storage temperature	T _{stg}	-	-65	-	+150	°C
Soldering Temperature	T _L	10S	-	-	260	°C

Note 1: To avoid drawing VCC current of terminal nZ, when switch current flows into terminals nYn, the voltage drop across the bidirectional switch must not exceed 0.4V, If the switch current flows into terminal nZ, no VCC current will flow out of terminals nYn, and in this case there is no limit. For the voltage drop across the switch, but the voltages- at nYn and nZ may not exceed VCC or VEE.

Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	UNIT
Supply Voltage	VCC	-	3.0	-	18.0	V
Supply Voltage	VEE	-	-15.0	-	0	V
Supply Voltage	VCC-VEE	-	3.0	-	18.0	V
Input Voltage	VI	-	0	-	VCC	V
Ambient temperature	Tamb	in free air	-40	-	+125	°C
Input transition rise and fall rate	$\Delta t/\Delta V$	VCC=5V	-	-	3.75	us/V
		VCC=10V	-	-	0.5	us/V
		VCC=18V	-	-	0.08	us/V

Dual 4-Channel Analog Multiplexer/Demultiplexer

ELECTRICAL CHARACTERISTICS

DC Characteristics - 1

(Tamb= -40°C ~ +85°C, Voltages are referenced to GND(ground=0V), unless otherwise specified.)

Parameter	Symbol	Test Condition (V)		Tamb=25°C			Unit
				Min	Type	Max	
HIGH-Level Input Voltage	VIH	I _{IO} ≤ 1μA	VCC=5V	3.5	-	-	V
			VCC=10V	7.0	-	-	
			VCC=18V	12.6	-	-	
LOW-Level Input Voltage	VIL	I _{IO} ≤ 1μA	VCC=5V	-	-	1.5	V
			VCC=10V	-	-	3.0	
			VCC=18V	-	-	5.4	
Supply current	ICC	I _O =0A	VCC=5V	-	-	5	μA
			VCC=10V	-	-	10	μA
			VCC=18V	-	-	20	μA
Input Leakage Current	II	VCC=18V		-	-	±1.0	μA
OFF-state Leakage Current	IS(OFF)	VCC=18V	Z port; all channels off; see Figure 6	-	-	±1.0	μA
			Y port; all channels off; see Figure 7	-	-	±1.0	μA
ON Resistance (Peak)	RON(peak)	VI=0V to VCC-VEE; see Figure 8 & Figure 9	VCC-VEE=5V	-	117	836	Ω
			VCC-VEE=10V	-	58	178	
			VCC-VEE=15V	-	41	120	
			VCC-VEE=20V	-	36	105	
ON Resistance (Rail)	RON(rail)	VI=0V; see Figure 8 & Figure 9	VCC-VEE=5V	-	44	130	Ω
			VCC-VEE=10V	-	29	93	
			VCC-VEE=15V	-	24	69	
			VCC-VEE=20V	-	22	63	
		VI=VCC-VEE; see Figure 8 & Figure 9	VCC-VEE=5V	-	82	249	Ω
			VCC-VEE=10V	-	51	157	
			VCC-VEE=15V	-	41	127	
			VCC-VEE=20V	-	36	112	
ON Resistance Mismatch Between Channels	ΔRON	VI=0V to VCC-VEE; see Figure 8	VCC-VEE=5V	-	25	-	Ω
			VCC-VEE=10V	-	10	-	
			VCC-VEE=15V	-	5	-	
			VCC-VEE=20V	-	5	-	
Input Capacitance	CI	Sn, $\overline{E}$ Inputs		-	-	7.5	pF

Dual 4-Channel Analog Multiplexer/Demultiplexer

ELECTRICAL CHARACTERISTICS

DC Characteristics - 2

(Tamb= -40°C ~ +125°C, VSS=VEE=0V; VI=VSS or VCC, unless otherwise specified.)

Parameter	Symbol	Test Condition (V)		Tamb=-40°C		Tamb=+85°C		Tamb=+125°C		Unit
				Min	Max	Min	Max	Min	Max	
HIGH-Level Input Voltage	VIH	I _{IO} ≤ 1μA	VCC=5V	3.5	-	3.5	-	3.5	-	V
			VCC=10V	7.0	-	7.0	-	7.0	-	
			VCC=18V	12.6	-	12.6	-	12.6	-	
LOW-Level Input Voltage	VIL	I _{IO} ≤ 1μA	VCC=5V	-	1.5	-	1.5	-	1.5	V
			VCC=10V	-	3.0	-	3.0	-	3.0	
			VCC=18V	-	5.4	-	5.4	-	5.4	
Supply current	ICC	I _O =0A	VCC=5V	-	5	-	150	-	150	μA
			VCC=10V	-	10	-	300	-	300	μA
			VCC=18V	-	20	-	600	-	600	μA
Input Leakage Current	II	VCC=18V		-	±1.0	-	±1.0	-	±1.0	μA

AC Characteristics - 1

(Tamb= +25°C, VSS=VEE=0V, unless otherwise specified.)

Parameter	Symbol	Test Condition (V)		Min.	Typ.	Max.	Unit
HIGH to LOW propagation delay time	tPHL	nYn, nZ to nZ, nYn; see Figure 11	VCC=5V	-	10	20	ns
			VCC=10V	-	5	10	
			VCC=18V	-	5	10	
		Sn to nYn, nZ; see Figure 12	VCC=5V	-	150	305	ns
			VCC=10V	-	65	135	
			VCC=18V	-	50	100	
LOW to HIGH propagation delay time	tPLH	nYn, nZ to nZ, nYn; see Figure 11	VCC=5V	-	10	20	ns
			VCC=10V	-	5	10	
			VCC=18V	-	5	10	
		Sn to nYn, nZ; see Figure 12	VCC=5V	-	150	300	ns
			VCC=10V	-	75	150	
			VCC=18V	-	50	100	
HIGH to OFF-state propagation delay	tPHZ	$\overline{E}$ to nYn, nZ; see Figure 13	VCC=5V	-	95	190	ns
			VCC=10V	-	90	180	
			VCC=18V	-	85	180	

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ELECTRICAL CHARACTERISTICS

AC Characteristics - 1

(Tamb= +25°C, VSS=VEE=0V, unless otherwise specified.)

Parameter	Symbol	Test Condition (V)		Min.	Typ.	Max.	Unit
LOW to OFF-state propagation delay	tPLZ	$\overline{E}$ to nYn, nZ; see Figure 13	VCC=5V	-	100	205	ns
			VCC=10V	-	90	180	
			VCC=18V	-	90	180	
OFF-state to HIGH propagation delay	tPZH	$\overline{E}$ to nYn, nZ; see Figure 13	VCC=5V	-	130	260	ns
			VCC=10V	-	55	115	
			VCC=18V	-	45	85	
OFF-state to LOW propagation delay	tPZL	$\overline{E}$ to nYn, nZ; see Figure 13	VCC=5V	-	120	240	ns
			VCC=10V	-	50	100	
			VCC=18V	-	35	75	

AC Characteristics - 2

(Tamb= +25°C, VSS=VEE=0V, VI=0.5VDD(P-P), unless otherwise specified.)

Parameter	Symbol	Test Condition (V)		Min.	Typ.	Max.	Unit
total harmonic distortion	THD	see Figure 14; RL=10KΩ; CL=15pF; channel ON; fi=1KHz	VCC=5V	-	0.25	-	%
			VCC=10V	-	0.04	-	
			VCC=18V	-	0.04	-	
-3dB frequency response	f(-3dB)	see Figure 15; RL=1KΩ; CL=5pF; channel ON;	VCC=5V	-	13	-	MHz
			VCC=10V	-	40	-	
			VCC=18V	-	70	-	
isolation (OFF-state)	aiso	see Figure 16; fi=1MHz; RL=1KΩ; CL=5pF; channel OFF; VCC=10V		-	-50	-	dB
crosstalk voltage	Vct	digital inputs to switch; see Figure 17; RL=10KΩ; CL=15pF; $\overline{E}$ or Sn=VCC (square-wave); VCC=10V		-	50	-	mV
crosstalk	Xtalk	between switches; see Figure 18; fi=1MHz; RL=1KΩ; VCC=10V		-	-50	-	dB

Note; 【1】 fi is biased at 0.5VCC; VI=0.5VCC(P-P).

Dual 4-Channel Analog Multiplexer/Demultiplexer

Testing Circuit

DC Testing Circuit-1

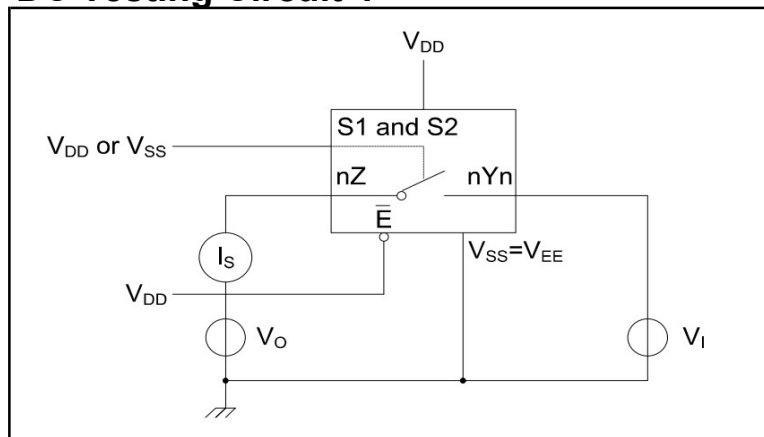


Figure 6. Test circuit for measuring OFF-state leakage current Z port

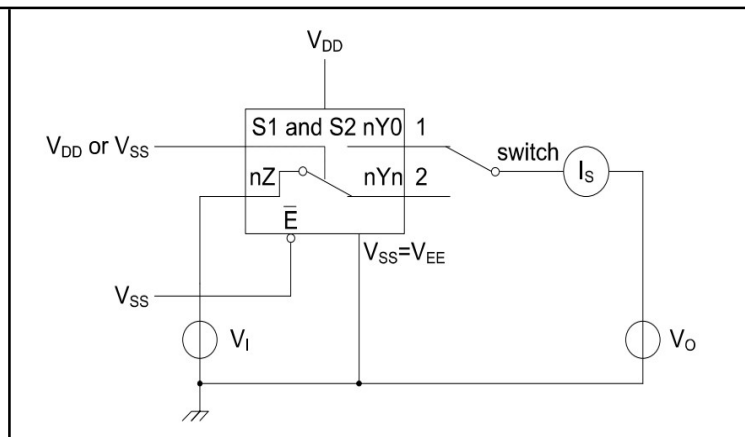


Figure 7. Test circuit for measuring OFF-state leakage current nYn port

ON Resistance Testing Circuit

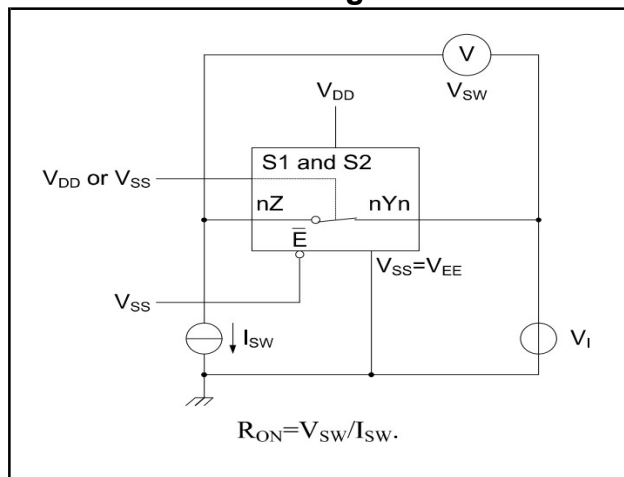


Figure 8. Test circuit for measuring Ron

ON resistance Waveforms

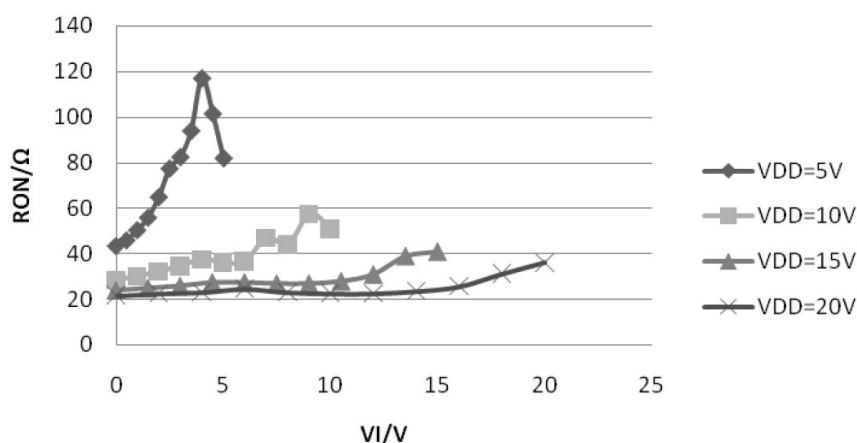


Figure 9. Typical Ron as a function of input voltage

AC Testing Circuit-1

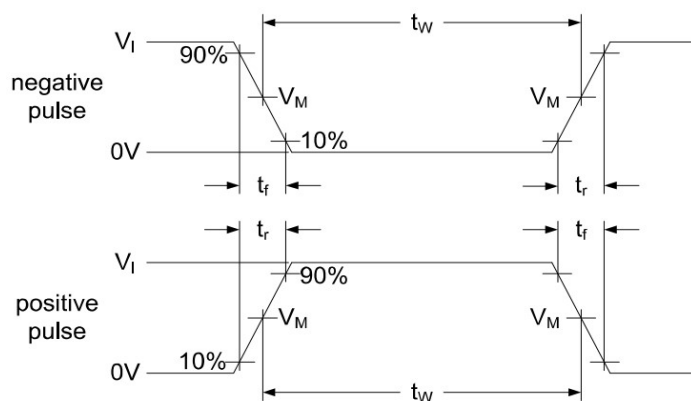
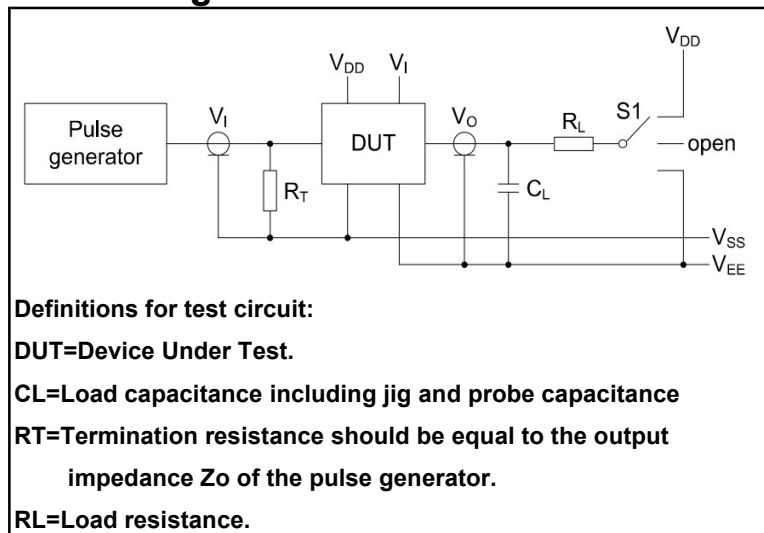


Figure 10. Test circuit for switching times

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AC Testing Waveforms

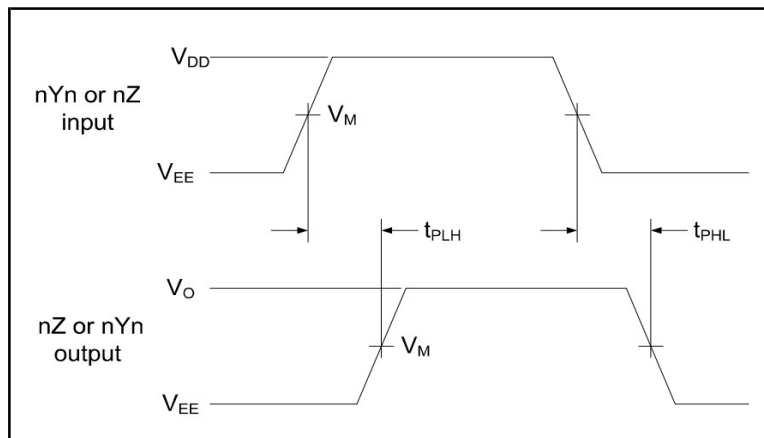


Figure 11. nYn, nZ to nZ, nYn
Propagation delays

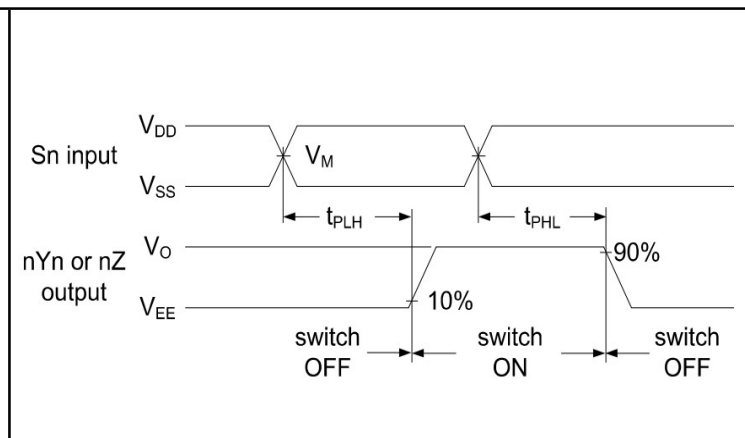


Figure 12. Sn to nYn, nZ
propagation delays

ON Resistance Testing Circuit

ON resistance Waveforms

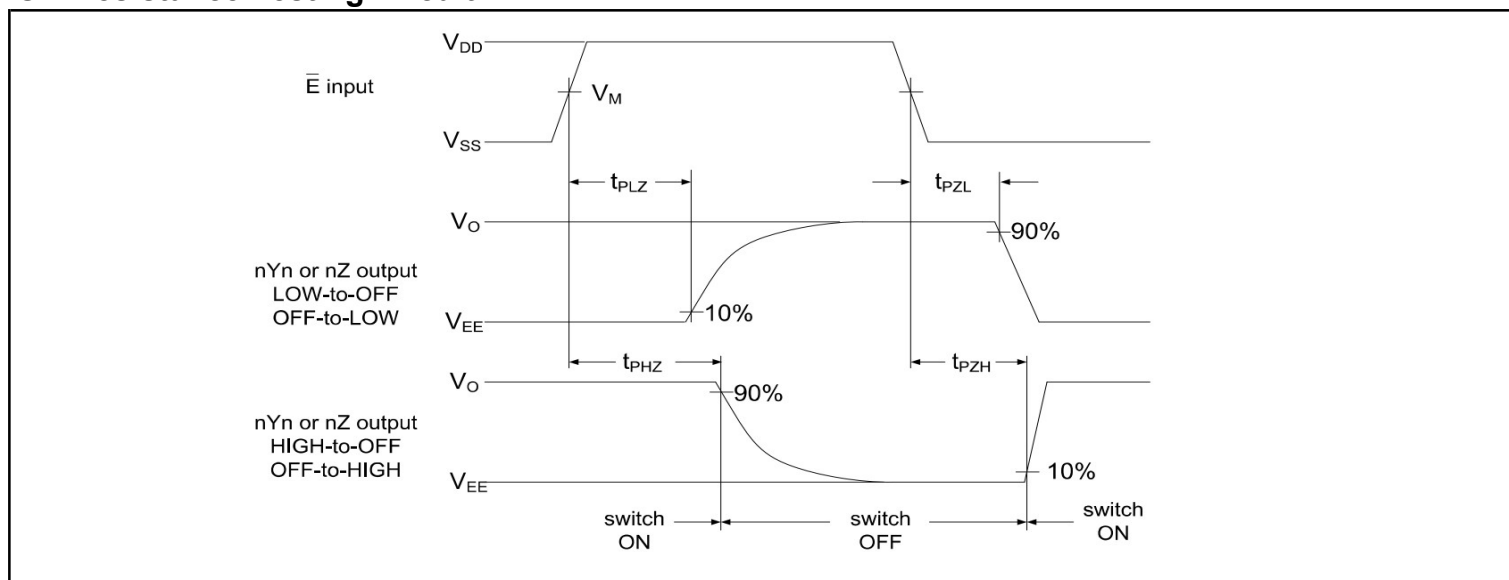


Figure 13. Enable and disable times

AC Testing Circuit-2

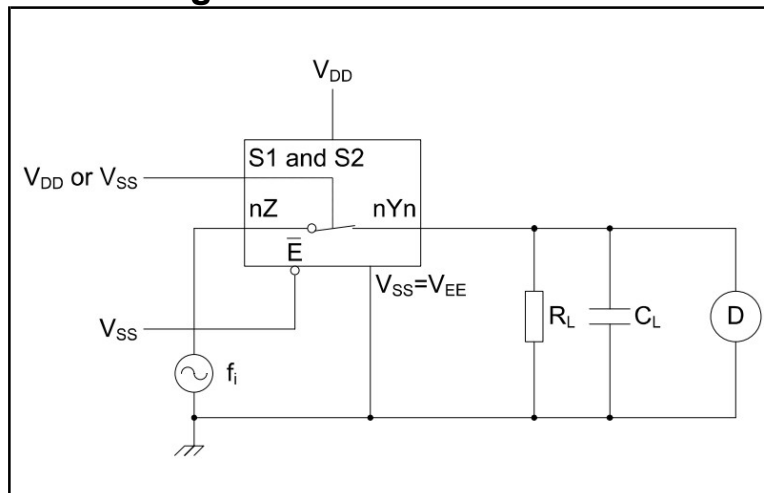


Figure 14. Test circuit for measuring
total harmonic distortion

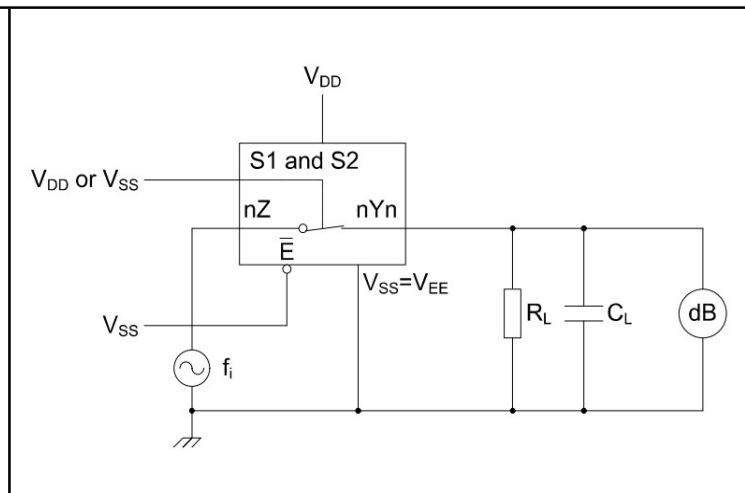


Figure 15. Test circuit for measuring
frequency response

Dual 4-Channel Analog Multiplexer/Demultiplexer

AC Testing Circuit-2 (Con.)

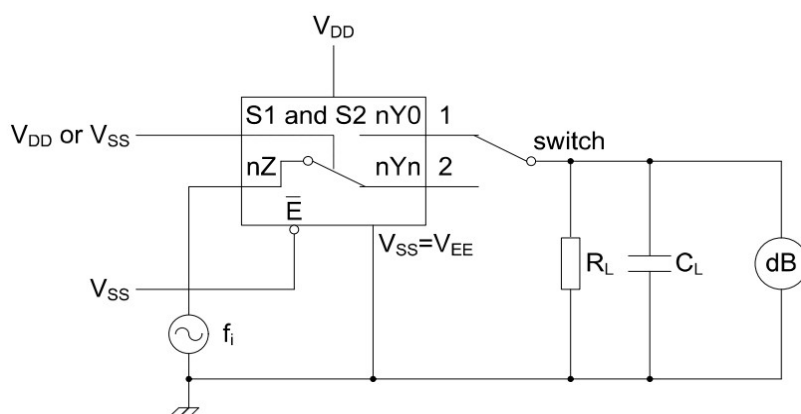
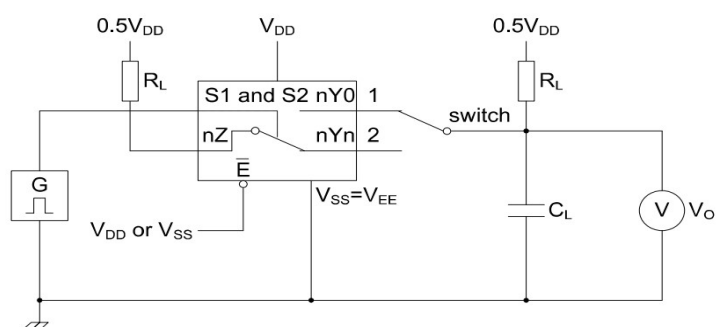


Figure 16. Test circuit for measuring isolation (OFF-state)

a. Test Circuit



b. Input and output pulse definitions

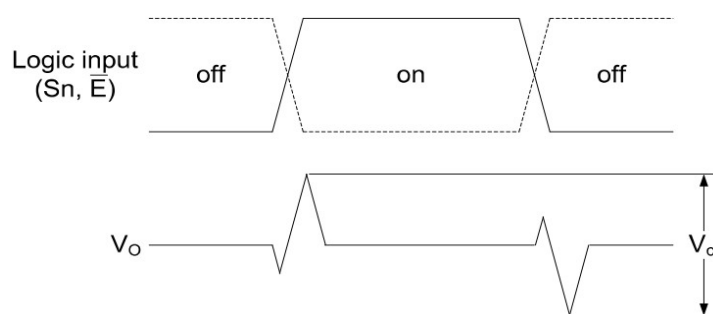


Figure 17. Test circuit for measuring crosstalk voltage between digital inputs and switch

a. Switch close condition

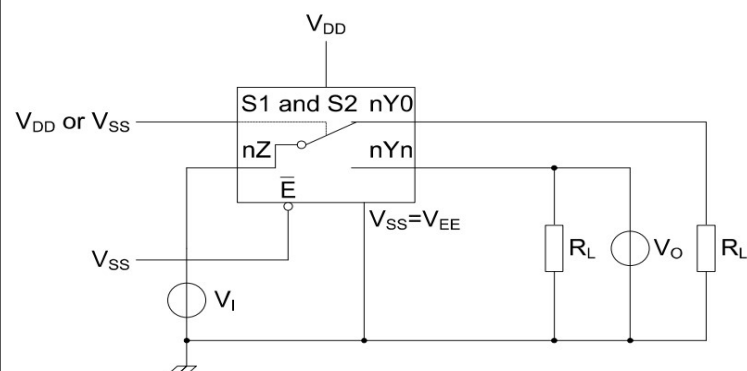
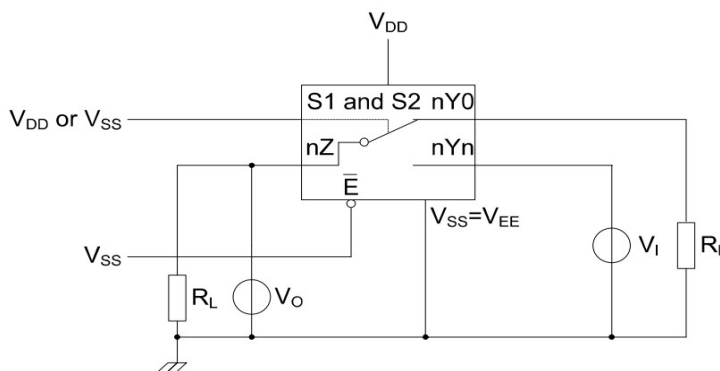
**b. Switch open condition**

Figure 18, Test circuit for measuring crosstalk between switches

Dual 4-Channel Analog Multiplexer/Demultiplexer**Measurement Points**

Supply Voltage	Input	Output
VCC	VM	VM
5V to 18V	0.5 X VCC	0.5 X VCC

Test Data

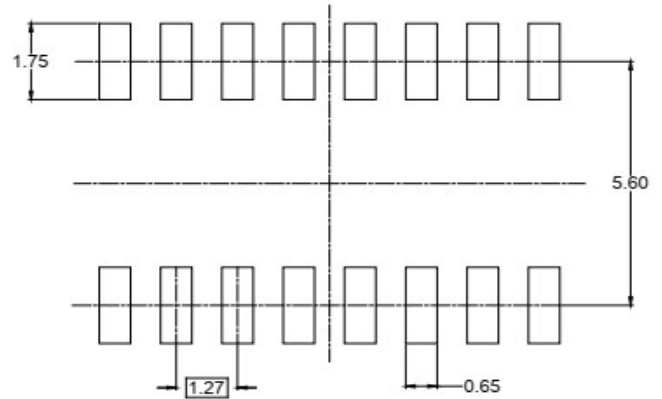
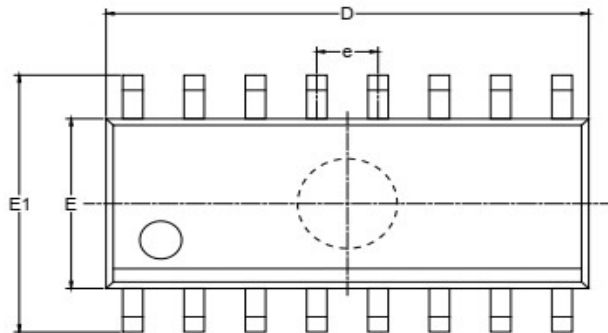
Input				Load		S1 position				
nYn, nZ	Sn and $\overline{E}$	tr, tf	VM	CL	RL	tPHL	tPLH	tPZH, tPHZ	tPZL, tPLZ	other
VCC or VEE	VCC or VSS	$\leq 20\text{ns}$	0.5X VCC	50pF	10K Ω	VCC or VEE	VEE	VEE	VCC	VEE

Dual 4-Channel Analog Multiplexer/Demultiplexer

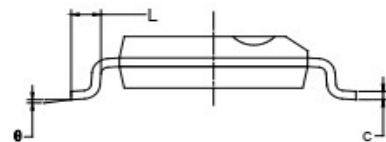
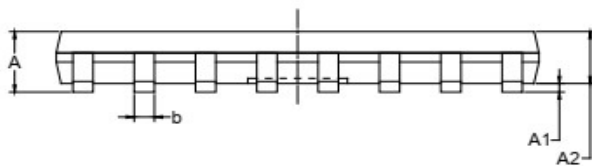
MECHANICAL DIMENSIONS.

PKG: SOIC-16 (M16)

unit:mm



RECOMMENDED LAND PATTERN (Unit: mm)



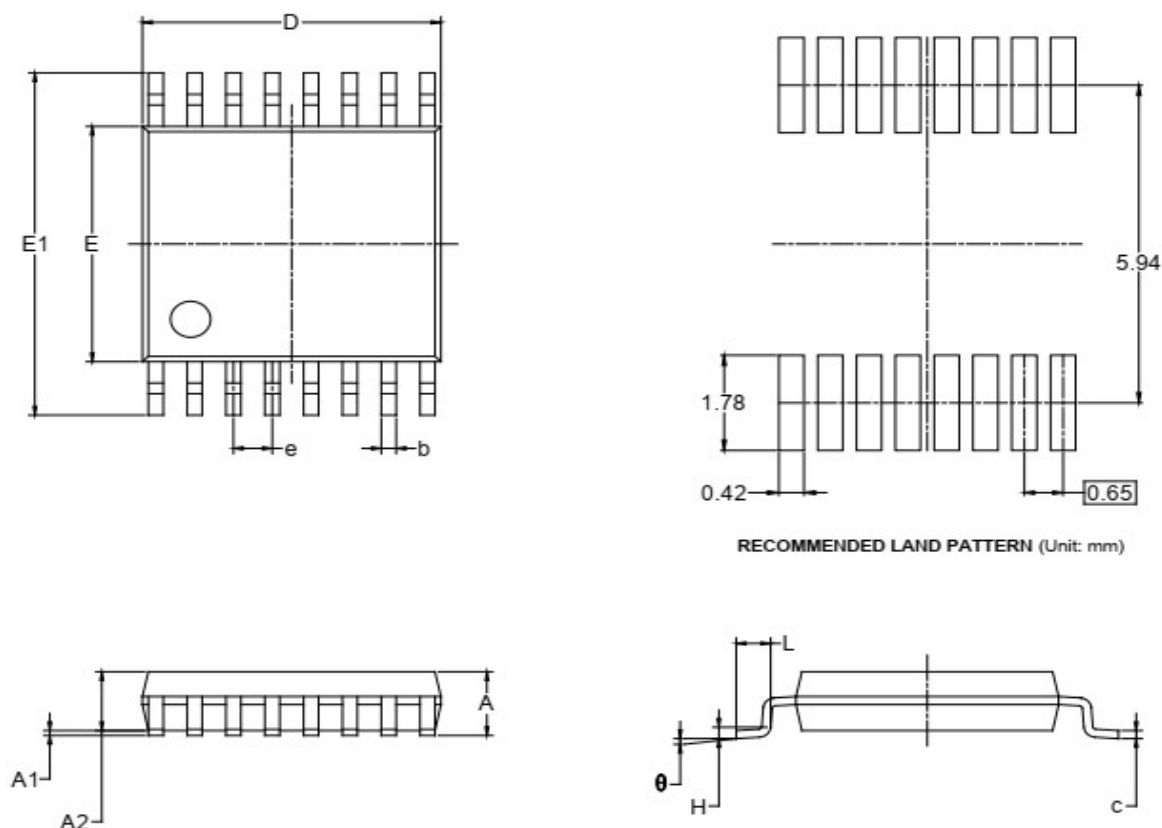
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.27 BSC		0.050 BSC	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

Dual 4-Channel Analog Multiplexer/Demultiplexer

MECHANICAL DIMENSIONS(Con.)

TM16 PKG: TSSOP-16
unit:mm


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A		1.200		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	4.860	5.100	0.191	0.201
E	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650 BSC		0.026 BSC	
L	0.500	0.700	0.02	0.028
H	0.25 TYP		0.01 TYP	
θ	1°	7°	1°	7°

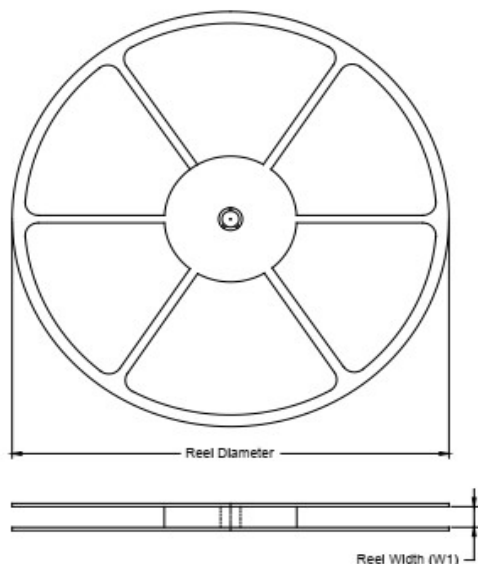
NOTES:

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

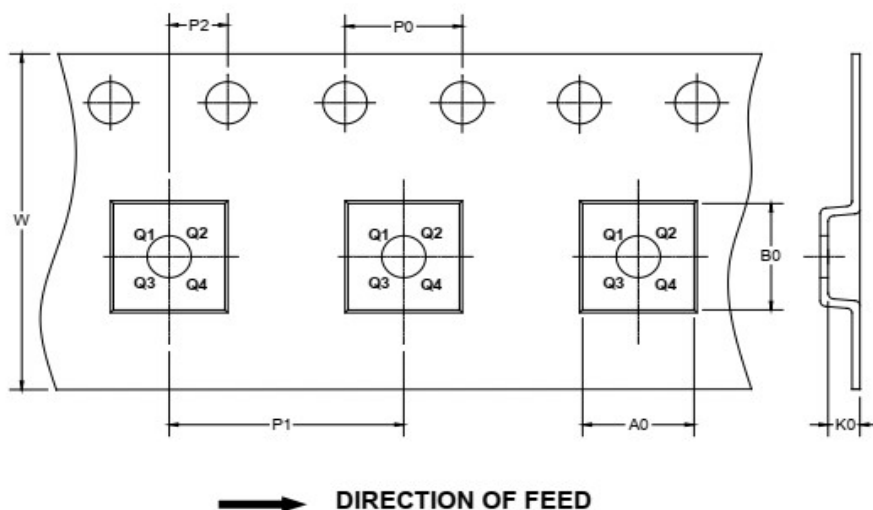
Dual 4-Channel Analog Multiplexer/Demultiplexer

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



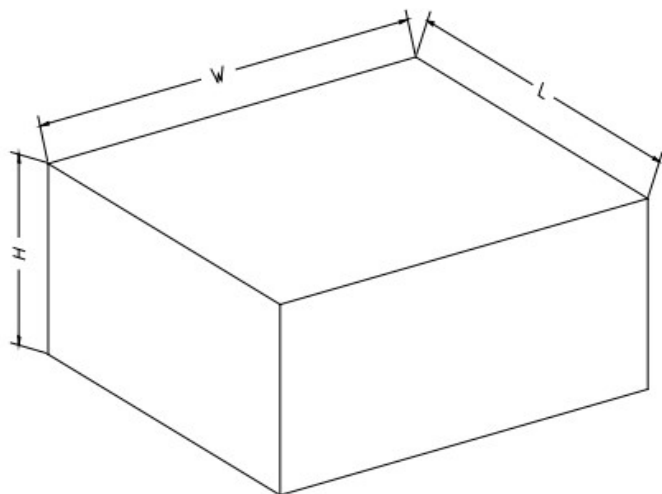
NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOIC-16	13"	16.4	6.5	10.3	2.1	4.0	8.0	2.0	16.0	Q1
TSSOP-16	13"	12.4	6.9	5.6	1.2	4.0	8.0	2.0	12.0	Q1

Dual 4-Channel Analog Multiplexer/Demultiplexer

CARTON BOX DIMENSIONS



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13"	386	280	370	5

Dual 4-Channel Analog Multiplexer/Demultiplexer

Statements And Notes

The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	o	o	o	o	o	o	o	o	o	o
Plastic resin	o	o	o	o	o	o	o	o	o	o
Chip	o	o	o	o	o	o	o	o	o	o
The lead	o	o	o	o	o	o	o	o	o	o
Plastic sheet installed	o	o	o	o	o	o	o	o	o	o
explanation	o: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. X: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

Notion

Recommended carefully reading this information before the use of this product;

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This information is using to the reference only, the company is not responsible for any loss;

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