

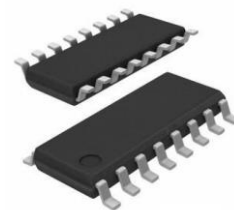
## CMOS Low Voltage, 4Ω Four-Channel Switch

### PRODUCT DESCRIPTION

The MS713/MS713T is a CMOS optional four-channel switch with several features, such as low power dissipation, high switch speed, low on-resistance, low leakage current and wide bandwidth. The operating voltage ranges from 1.8V to 5.5V. The MS713/MS713T can be widely used in battery-powered devices, new generation DAC and ADC systems. The wide bandwidth feature makes it ideal for USB1.1 signal and video signal processing systems.

The logic control of the MS713/MS713T is that when two channels are low level, the switch is turned on and the other two are opposite On-resistance is matched well when the switch is turned on.

The MS713/MS713T has lead SOP16 and TSSOP16 packages respectively.



SOP16



TSSOP16

### FEATURES

- Operating Voltage : 1.8V to 5.5V
- Low On-resistance : 2.5Ω Typ
- Low On-resistance Flatness
- -3dB Bandwidth : 200MHz
- Low Power Dissipation
- Fast On and Off Time
- Package : SOP16, TSSOP16

### APPLICATIONS

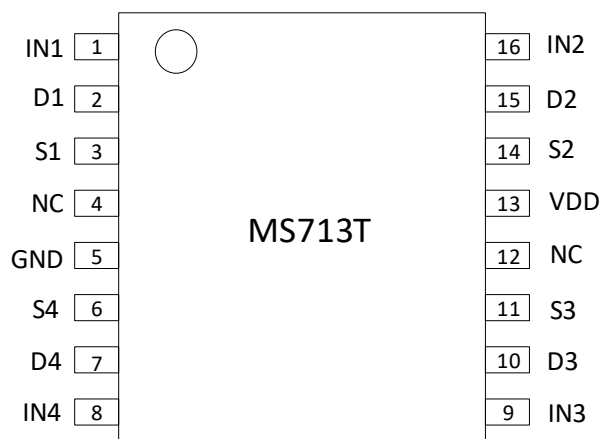
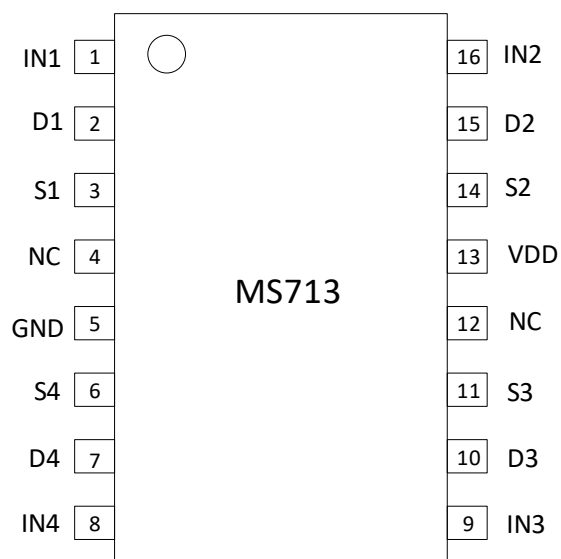
- USB1.1 Signal Switching System
- Earphone
- PDAs
- Battery-powered System
- Sample Hold Circuit
- Audio System
- Video Switching System

### PRODUCT SPECIFICATION

Part Number	Package	Marking
MS713T	TSSOP16	MS713T
*MS713	SOP16	MS713

\*The package is not available temporarily. If necessary, please contact Hangzhou Ruimeng Sales Department Center.

## PIN CONFIGURATION



## PIN DESCRIPTION

Pin	Name	Type	Description
1	IN1	I	Digital Control Input, control switch S1-D1
2	D1	IO	Drain Pin, can be used as input or output
3	S1	IO	Source Pin, can be used as input or output
4	NC	-	Not Connection
5	GND	-	Ground
6	S4	IO	Source Pin, can be used as input or output
7	D4	IO	Drain Pin, can be used as input or output
8	IN4	I	Digital Control Input, control switch S4-D4
9	IN3	I	Digital Control Input, control switch S3-D3
10	D3	IO	Drain Pin, can be used as input or output
11	S3	IO	Source Pin, can be used as input or output
12	NC	-	Not Connection
13	VDD	-	Power Supply
14	S2	IO	Source Pin, can be used as input or output
15	D2	IO	Drain Pin, can be used as input or output
16	IN2	I	Digital Control Input, control switch S2-D2

## Logic Control

Logic Control Input	MS713/MS713T
IN1/IN2/IN3/IN4	High Level, Switch S1-D1, S4-D4 On; Low Level, Switch S1-D1, S4-D4 Off
	High Level, Switch S2-D2, S3-D3 Off; Low Level, Switch S2-D2, S3-D3 On

**ABSOLUTE MAXIMUM RATINGS**

Any exceeding absolute maximum rating application causes permanent damage to device. Because long-time absolute operation state affects device reliability. Absolute ratings just conclude from a series of extreme tests. It doesn't represent chip can operate normally in these extreme conditions.

Parameter	Symbol	Ratings	Unit
Power Supply	$V_{DD}$	-0.3 ~ +6	V
Continuous Current on Source, Drain Pin	I	30	mA
Analog Digital Input Voltage	$V_{IN}$	-0.3 ~ $V_{DD}+0.3$	V
Operating Temperature	$T_A$	-40 ~ +85	°C
Storage Temperature	$T_{STG}$	-65 ~ +150	°C
Maximum Junction Temperature	$T_{JMAX}$	150	°C
Lead Temperature (10s)		260	°C
ESD(HBM)	$V_{ESD}$	±3000	V

## ELECTRICAL CHARACTERISTICS

 $V_{DD}=5V\pm 10\%$ ,  $GND=0V$ 

Parameter	Symbol	Condition	TA (°C)	Min	Typ	Max	Unit
Analog Switch							
Analog Signal Range	V <sub>IS</sub>		-40~85	0		V <sub>DD</sub>	V
On-resistance	R <sub>ON</sub>	V <sub>DD</sub> =5.0V, V <sub>IS</sub> =0~V <sub>DD</sub> , I <sub>D</sub> =10mA	+25		2.5	4	Ω
			-40~85			4.5	
On-resistance Match for Channel-to-Channel	ΔR <sub>ON</sub>	V <sub>DD</sub> =5.0V, V <sub>IS</sub> =0~V <sub>DD</sub> , I <sub>D</sub> =10mA	+25				Ω
			-40~85		0.05	0.3	
On-resistance Flatness	R <sub>FLAT(ON)</sub>	V <sub>DD</sub> =5.0V, V <sub>IS</sub> =0~V <sub>DD</sub> , I <sub>D</sub> =10mA	+25		0.5		Ω
			-40~85			1.0	
Leakage Current							
Leakage Current on Source Pin (Off)	I <sub>S(off)</sub>	V <sub>DD</sub> =+5.5V, V <sub>D</sub> =1V/4.5V, V <sub>S</sub> =4.5V/1V	+25		±0.01	±0.1	μA
			-40~85			±0.2	
Leakage Current on Drain Pin (Off)	I <sub>D(off)</sub>	V <sub>DD</sub> =+5.5V, V <sub>D</sub> =1V/4.5V, V <sub>S</sub> =4.5V/1V	+25		±0.01	±0.1	μA
			-40~85			±0.2	
Leakage Current (On)	I <sub>D(ON)</sub>	V <sub>D</sub> =V <sub>S</sub> =1V/4.5V	+25		±0.01	±0.1	μA
	I <sub>S(ON)</sub>		-40~85			±0.2	
Digital Input							
High-level Input Voltage	V <sub>IH</sub>		-40~85	3.0			V
Low-level Input Voltage	V <sub>IL</sub>		-40~85			0.8	V
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> =V <sub>IL</sub> or V <sub>IH</sub>	+25		0.005		μA
			-40~85			±0.1	
Dynamic Performance							
On Time	t <sub>ON</sub>	R <sub>L</sub> =300Ω, C <sub>L</sub> =50pF	+25		30		ns
			-40~85			40	
Off Time	t <sub>OFF</sub>	R <sub>L</sub> =300Ω, C <sub>L</sub> =50pF	+25		6		ns
			-40~85			10	
Off before On Delay Time	t <sub>D</sub>	R <sub>L</sub> =300Ω, C <sub>L</sub> =50pF, V <sub>S1</sub> =V <sub>S2</sub> =3V	+25		6		ns
			-40~85	1			
Charge Injection		V <sub>S</sub> =2V, R <sub>S</sub> =0Ω, C <sub>L</sub> =1nF	+25	3			pC

Parameter	Symbol	Condition	TA (°C)	Min	Typ	Max	Unit
Off Isolation	OISO	R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF, f=10MHz	+25		-58		dB
		R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF, f=1MHz	+25		-78		
Channel-to-Channel Crosstalk	XTALK	R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF, f=10MHz	+25		-90		dB
-3dB Bandwidth	BW	R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF	+25		200		MHz
Capacitance on Source Pin	C <sub>S</sub>		+25		10		pF
Capacitance on Drain Pin	C <sub>D</sub>		+25		10		pF
Capacitance on Source, Drain Pin	C <sub>S</sub> , C <sub>D(on)</sub>		+25		22		pF
<b>Power Dissipation</b>							
Current	I <sub>DD</sub>	V <sub>DD</sub> =5.5V,	+25		0.001		μA
		Digital Input 0V or 5V	-40~85			1	

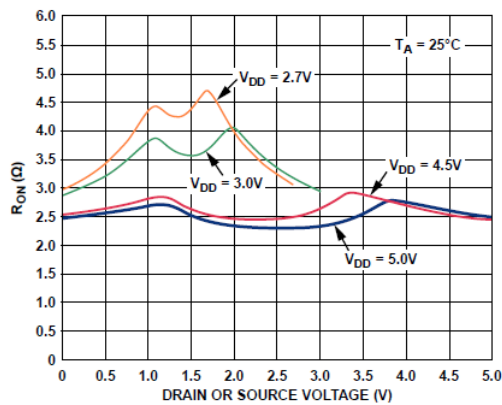
$V_{DD}=3V\pm 10\%$ ,  $GND=0V$ 

Parameter	Symbol	Condition	TA (°C)	Min	Typ	Max	Unit
Analog Switch							
Analog Signal Range	V <sub>IS</sub>		-40~85	0		V <sub>DD</sub>	V
On-resistance	R <sub>ON</sub>	V <sub>DD</sub> =3.0V, V <sub>IS</sub> =0~V <sub>DD</sub> , I <sub>D</sub> =10mA	+25		5		Ω
			-40~85		5.5	8	
On-resistance Match for Channel-to-Channel	ΔR <sub>ON</sub>	V <sub>DD</sub> =3.0V, V <sub>IS</sub> =0~V <sub>DD</sub> , I <sub>D</sub> =10mA	+25		0.1		Ω
			-40~85			0.3	
On-resistance Flatness	R <sub>FLAT(ON)</sub>	V <sub>DD</sub> =3.0V, V <sub>IS</sub> =0~V <sub>DD</sub> , I <sub>D</sub> =10mA	+25		2.5		Ω
			-40~85				
Leakage Current							
Leakage Current on Source Pin (Off)	I <sub>S(off)</sub>	V <sub>D</sub> =1V/3V, V <sub>S</sub> =3V/1V	+25		±0.01	±0.1	μA
			-40~85			±0.2	
Leakage Current on Drain Pin (Off)	I <sub>D(off)</sub>	V <sub>D</sub> =1V/3V, V <sub>S</sub> =3V/1V	+25		±0.01	±0.1	μA
			-40~85			±0.2	
Leakage Current (On)	I <sub>D(ON)</sub>	V <sub>D</sub> =V <sub>S</sub> =1V/3V	+25		±0.01	±0.1	μA
	I <sub>S(ON)</sub>		-40~85			±0.2	
Digital Input							
High-level Input Voltage	V <sub>IH</sub>		-40~85	2.0			V
Low-level Input Voltage	V <sub>IL</sub>		-40~85			0.4	V
Input Leakage Current	I <sub>IN</sub>	V <sub>IN</sub> =V <sub>IL</sub> or V <sub>IH</sub>	+25		0.005		μA
			-40~85			±0.1	
Dynamic Performance							
On Time	t <sub>ON</sub>	R <sub>L</sub> =300Ω, C <sub>L</sub> =50pF	+25		30		ns
			-40~85			40	
Off Time	t <sub>OFF</sub>	R <sub>L</sub> =300Ω, C <sub>L</sub> =50pF	+25		7		ns
			-40~85			12	
Off before On Delay Time	t <sub>D</sub>	R <sub>L</sub> =300Ω, C <sub>L</sub> =50pF, V <sub>S1</sub> =V <sub>S2</sub> =3V	+25		7		ns
			-40~85	1			
Charge Injection		V <sub>S</sub> =2V, R <sub>S</sub> =0Ω, C <sub>L</sub> =1nF	+25	3			pC
Off Isolation	OISO	R <sub>L</sub> =50Ω, C <sub>L</sub> = 5pF, f=10MHz	+25		-58		dB
		R <sub>L</sub> =50Ω, C <sub>L</sub> =5pF,f=1MHz	+25		-78		

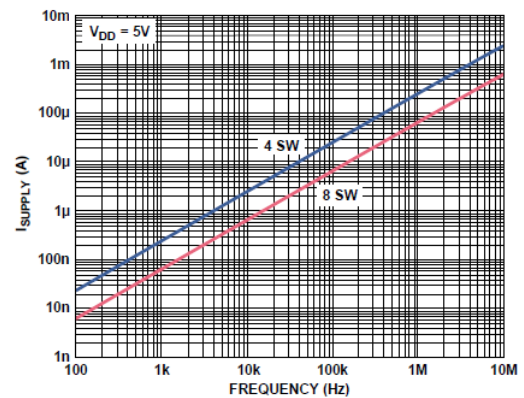
Parameter	Symbol	Condition	TA (°C)	Min	Typ	Max	Unit
Channel-to-Channel Crosstalk	XTALK	$R_L=50\Omega$ , $C_L=5pF$ , $f=10MHz$	+25		-90		dB
-3dB Bandwidth	BW	$R_L=50\Omega$ , $C_L=5pF$	+25		200		MHz
Capacitance on Source Pin	$C_S$		+25		10		pF
Capacitance on Drain Pin	$C_D$		+25		10		pF
Capacitance on Source, Drain Pin	$C_S, C_{D(on)}$		+25		22		pF
<b>Power Dissipation</b>							
Current	$I_{DD}$	$V_{DD}=5.5V$ , Digital Input 0V or 5V	+25		0.001		$\mu A$
			-40~85			1	



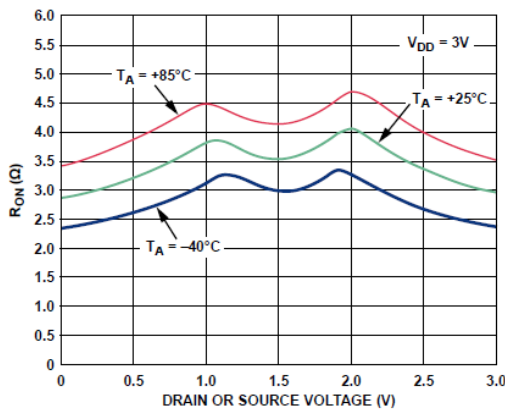
## TYPICAL CURVES



On-resistance VS. Source or Drain Voltage

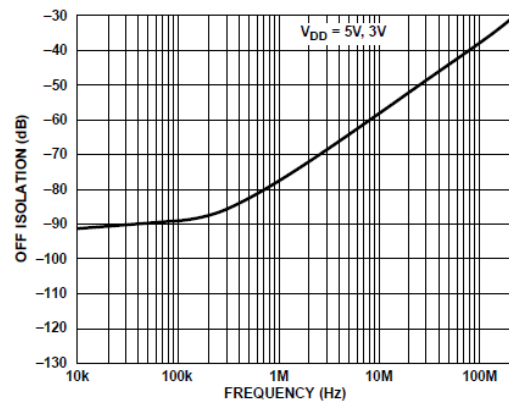


Power Supply Current VS. Switching Frequency

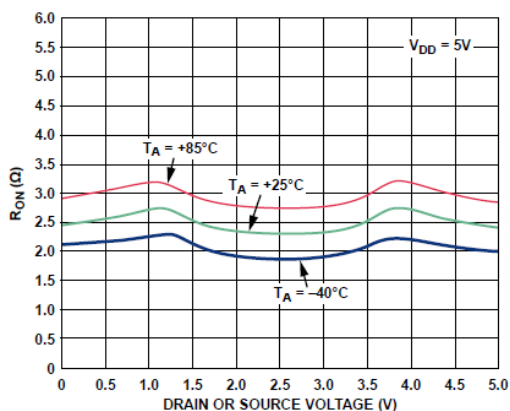


On-resistance VS. Source or Drain Voltage (Different Temperatures)

VDD=3V

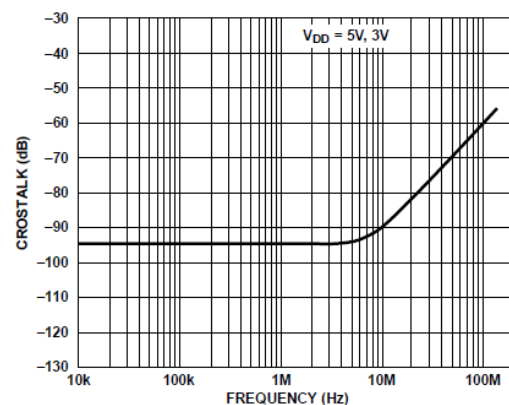


Off Isolation VS. Frequency

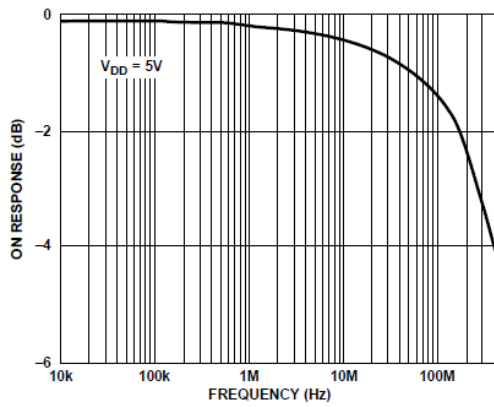


On-resistance VS. Source or Drain Voltage (Different Temperatures)

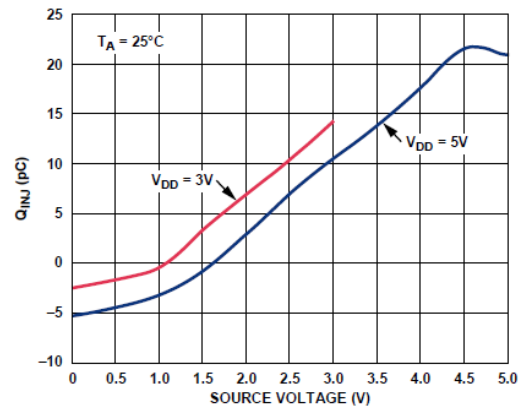
VDD=5V



Crosstalk VS. Frequency

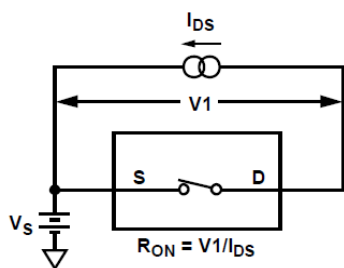


On Response VS. Frequency

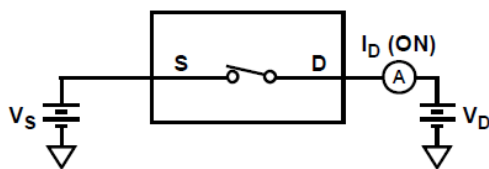


Charge Injection VS. Source Voltage

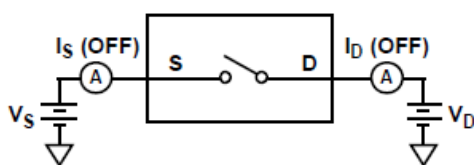
## TEST CIRCUITS



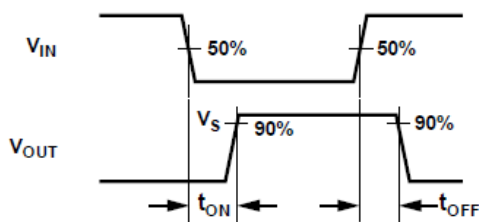
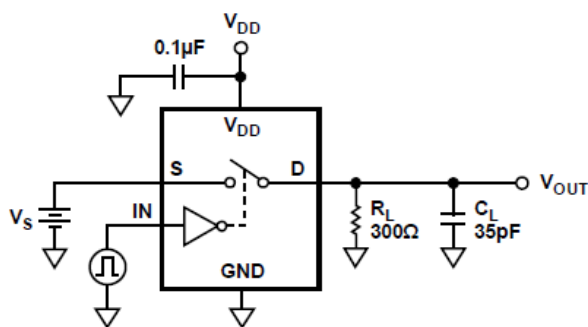
On-resistance Test Circuit



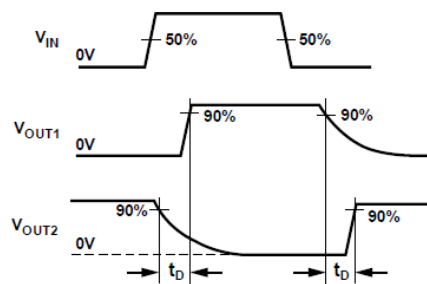
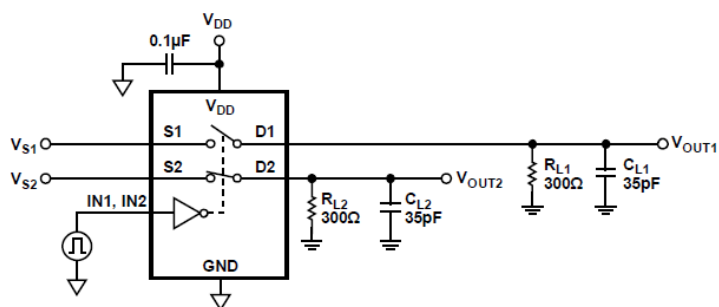
Leakage Current (On) Test Circuit



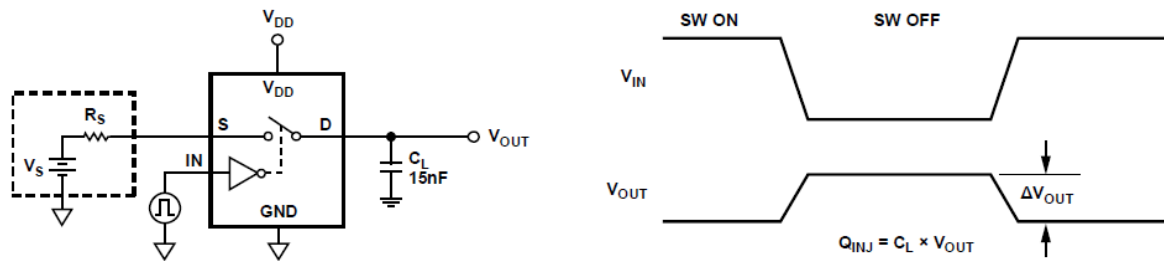
Leakage Current (Off) Test Circuit



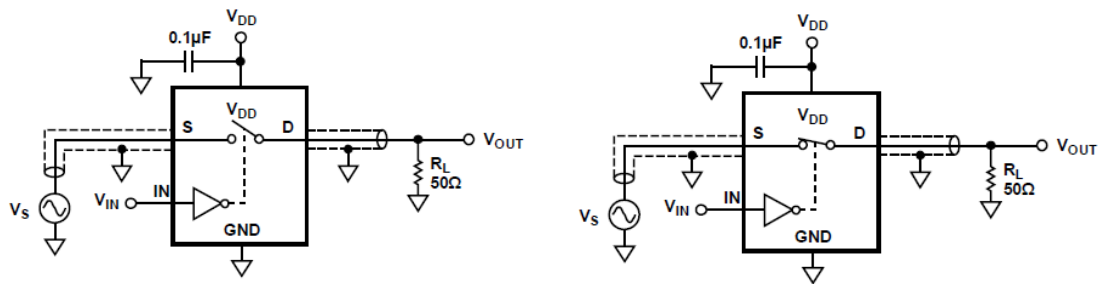
Switching Time Test Circuit



Off before On Delay Time Test Circuit

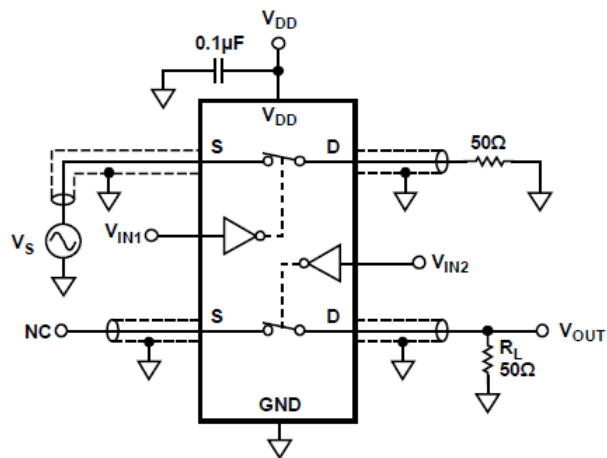


Charge Injection Test Circuit



Off Isolation Test Circuit

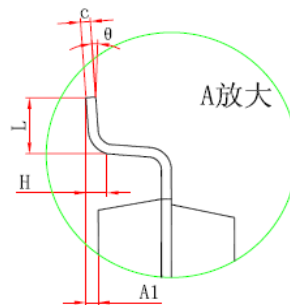
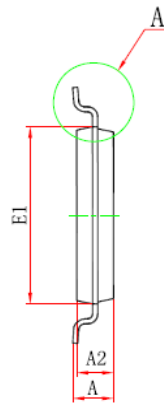
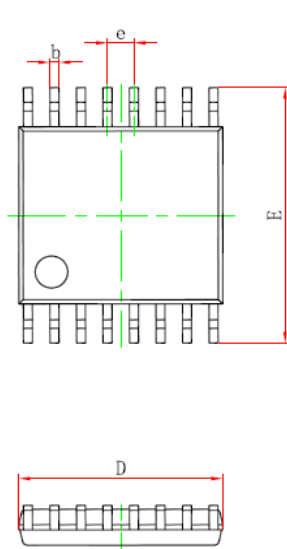
-3dB Bandwidth Test Circuit



Channel-to-Channel Crosstalk Test Circuit

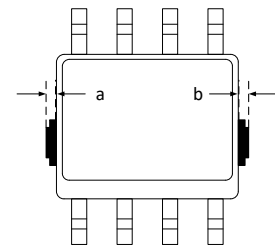
# PACKAGE OUTLINE DIMENSIONS

## TSSOP16

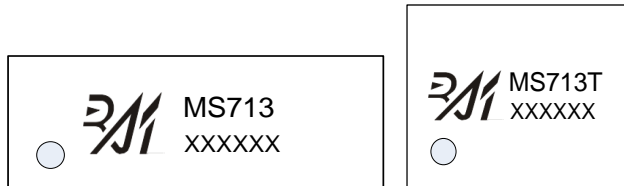


Note: In addition to the package size, a, b are allowed to have the maximum size of 0.15mm for waste glue simultaneously.

The diagram is as follows: taking SOP8 package as an example.



Symbol	Dimensions in Millimeters		Dimensions Inches	
	Min	Max	Min	Max
D	4.900	5.100	0.193	0.201
E	6.250	6.550	0.246	0.258
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
E1	4.300	4.500	0.169	0.177
A		1.200		0.047
A2	0.800	1.000	0.031	0.039
A1	0.050	0.150	0.002	0.006
e	0.65(BSC)		0.026(BSC)	
L	0.400	1.270	0.016	0.050
H	0.25(TYP)		0.01(TYP)	
θ	1°	7°	1°	7°

**MARKING and PACKAGING SPECIFICATIONS****1. Marking Drawing Description**

Product Name : MS713, MS713T

Product Code : XXXXXX

**2. Marking Drawing Demand**

Laser printing, contents in the middle, font type Arial.

**3. Packaging Specifications**

Device	Package	Piece/Reel	Reel/Box	Piece /Box	Box/Carton	Piece/Carton
MS713	SOP16	4000	1	4000	8	32000
MS713T	TSSOP16	3000	1	3000	8	24000

**STATEMENT**

- All Revision Rights of Datasheets Reserved for Ruimeng. Don't release additional notice.  
Customer should get latest version information and verify the integrity before placing order.
- When using Ruimeng products to design and produce, purchaser has the responsibility to observe safety standard and adopt corresponding precautions, in order to avoid personal injury and property loss caused by potential failure risk.
- The process of improving product is endless. And our company would sincerely provide more excellent product for customer.

**MOS CIRCUIT OPERATION PRECAUTIONS**

Static electricity can be generated in many places. The following precautions can be taken to effectively prevent the damage of MOS circuit caused by electrostatic discharge:

1. The operator shall ground through the anti-static wristband.
2. The equipment shell must be grounded.
3. The tools used in the assembly process must be grounded.
4. Must use conductor packaging or anti-static materials packaging or transportation.



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[http:// www.relmon.com](http://www.relmon.com)