Four-channel Differential Line Driver

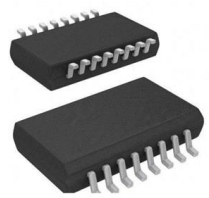
PRODUCT DESCRIPTION

The MS2576/MS2576T/MS2576S is a low-dissipation four-channel line driver, which is applied to equilibrium or non-equilibrium digital data transmission and can meet the demands of ANSI TIA/EIA-422-B and ITU (previous CCITT) suggestion V.11.

Tri-state outputs can provide high current for driving equalized line such as twisted-pair or parallel dual-line and maintain high impedance state when in power-down state.

The four drivers all have enabling functions, which support two optional inputs: active-high enabling input and active-low enabling input (G, GN).

The MS2576 is available in SOP16 package, the MS2576T is available in TSSOP16 package, and the MS2576S is available in SSOP16 package.



SOP16

TSSOP16

SSOP16

FEATURES

- Meet or Exceed the Demands of ANSI TIA/EIA-422-B, TIA/EIA-423-B and ITU Suggestion V.10 and V.11
- Low Dissipation
- Complementary Output
- Power Supply: 2.5V-5.5V
- Tri-state Outputs During Shutdown
- Fail-safe Circuit for Output
- SOP16, TSSOP16 and SSOP16 Packages

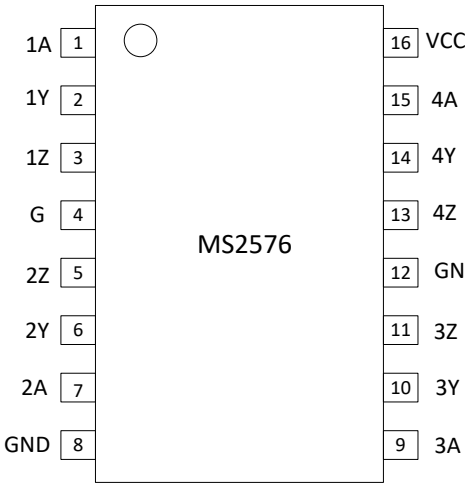
APPLICATIONS

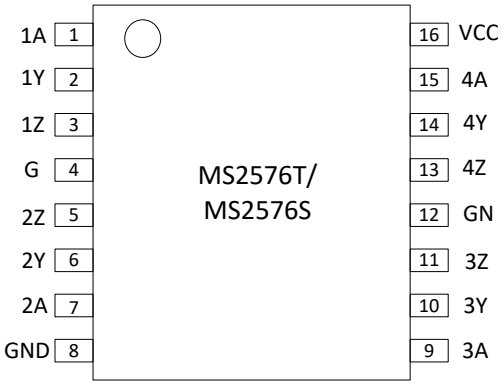
- Reliability Automotive Applications
- Factory Automation Equipment
- Motor Encoder
- AC and Servo Motor Driver

PRODUCT SPECIFICATION

Part Number	Package	Marking
MS2576	SOP16	MS2576
MS2576T	TSSOP16	MS2576T
MS2576S	SSOP16	MS2576S

PIN CONFIGURATION

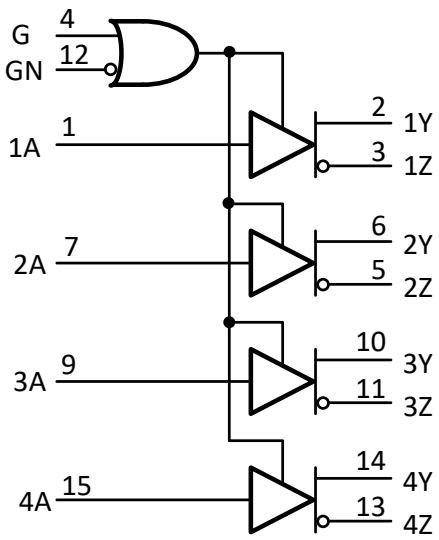




PIN DESCRIPTION

Pin	Name	Type	Description
1	1A	I	Data Input of RS422 Driver 1
2	1Y	O	Non-inverting Output of Driver 1
3	1Z	O	Inverting Output of Driver 1
4	G	I	Enabling Signal for Non-inverting Input
5	2Z	O	Inverting Output of Driver 2
6	2Y	O	Non-inverting Output of Driver 2
7	2A	I	Data Input of RS422 Driver 2
8	GND	-	Ground
9	3A	I	Data Input of RS422 Driver 3
10	3Y	O	Non-inverting Output of Driver 3
11	3Z	O	Inverting Output of Driver 3
12	GN	I	Enabling Signal for Inverting Input
13	4Z	O	Inverting Output of Driver 4
14	4Y	O	Non-inverting Output of Driver 4
15	4A	I	Data Input of RS422 Driver 4
16	VCC	-	Power Supply

BLOCK DIAGRAM



Function Table

Input A	Enable		Output	
	G	GN	Y	Z
H	H	X	H	L
L	H	X	L	H
H	X	L	H	L
L	X	L	L	H
X	L	H	Z	Z

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	Range	Unit
Power Supply Voltage	V_{CC}	2.5 ~ 7.0	V
Maximum Input Voltage	V_{INMAX}	7.0	V
Maximum Shutdown (Hi-Z) Output	V_{OZMAX}	-7 ~ 12	V
Soldering Temperature(10s)	$T_{SOLDERING}$	260	°C
Storage Temperature	T_{STG}	-65 ~ +150	°C
ESD(HBM) (Y, Z Pin)	V_{ESD}	±20k	V

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Range			Unit
		Min	Typ	Max	
Supply Voltage	V_{CC}	2.5		5.5	V
High-Level Output Current	I_{OH}			-150	mA
Low-Level Output Current	I_{OL}			150	mA
Operating Temperature	T_A	-45		125	°C

ELECTRICAL CHARACTERISTICS (V_{CC}=5V)

V_{CC}=5V, T_A=25°C

Parameter	Symbol	Condition		Min	Typ	Max	Unit
Clamp Input Voltage	V_{IK}	V_{CC}=5V, I_I=-18mA			-0.8		V
High-Level Output Voltage	V_{OH}	V_{CC}=5V, I_{OH}=-10mA		3.9			V
Low-Level Output Voltage	V_{OL}	V_{CC}=5V, I_{OH}=+10mA				0.8	V
Off-state (Hi-Z) Output Current	I_{OZ}	V_{CC}=5V	V_O=0.5V			20	μA
			V_O=2.5V				
High-Level Input Voltage	V_{IH}	V_{CC}=5V		2			V
Low-Level Input Voltage	V_{IL}	V_{CC}=5V				0.8	V
High-Level Input Current	I_{IH}	V_{CC}=5V, V_I=2.7V			0	20	μA
Low-Level Input Current	I_{IL}	V_{CC}=5V, V_I=0.4V			0	-20	μA
Shorted Output Current	I_{OS}	V_{CC}=5V, Note 1		45		150	mA
Supply Current	I_{CC}	V_{CC}=5V, Output No-load			2	10	μA

Switch Characteristics

Parameter	Symbol	Condition		Typ	Max	Unit
Propagation Delay Time (Low-to-High-Level Output)	t_{PLH}	C_L=30pF, Disconnect S1, S2		16	25	ns
Propagation Delay Time (High-to-Low-Level Output)	t_{PHL}			18	25	
Start Time (High-level Output)	t_{PZH}	C_L=30pF	R_L=75Ω	15	25	ns
Start Time (Low-level Output)	t_{PZL}		R_L=180Ω	16	25	
Turn-off Time (High-level Shutdown)	t_{PHZ}	C_L=10pF, Close S1, S2		10	25	ns
Turn-off Time (Low-level Shutdown)	t_{PLZ}			11	25	
In Phase and Out of Phase Output Skew Time	t_{SKEW}	C_L=30pF, Disconnect S1, S2		1	5	ns

Note 1: Only one output is shorted at most, and the duration shouldn't exceed 1s.

ELECTRICAL CHARACTERISTICS (V_{CC}=3.3V)

V_{CC}=3.3V, T_A=25°C

Parameter	Symbol	Condition		Min	Typ	Max	Unit
Clamp Input Voltage	V_{IK}	V_{CC}=3.3V, I_I=-18mA			-0.9		V
High-Level Output Voltage	V_{OH}	V_{CC}=3.3V, I_{OH}=-10mA		2.2			V
Low-Level Output Voltage	V_{OL}	V_{CC}=3.3V, I_{OH}=+10mA				0.9	V
Off-state (Hi-Z) Output Current	I_{OZ}	V_{CC}=3.3V	V_O=0.5V			20	μA
			V_O=2.5V				
Input Current at the Maximum Input Voltage	I_I	V_{CC}=3.3V, V_I=3.3V				10	μA
High-Level Input Voltage	V_{IH}	V_{CC}=3.3V		1.5			V
Low-Level Input Voltage	V_{IL}	V_{CC}=3.3V				0.8	V
High-Level Input Current	I_{IH}	V_{CC}=3.3V, V_I=2.7V			0	20	μA
Low-Level Input Current	I_{IL}	V_{CC}=3.3V, V_I=0.4V			0	-20	μA
Short-circuit Output Current	I_{OS}	V_{CC}=3.3V, Note 1		30		80	mA
Supply Current	I_{CC}	V_{CC}=3.3V, Output No-load			0.1	10	μA

Switch Characteristics

Parameter	Symbol	Condition		Typ	Max	Unit
Propagation Delay Time (Low-to-High-Level Output)	t_{PLH}	C_L=30pF, Disconnect S1, S2		25	30	ns
Propagation Delay Time (High-to-Low-Level Output)	t_{PHL}			25	30	
Start Time (High-level Output)	t_{PZH}	C_L=30pF	R_L=75Ω	12	20	ns
Start Time (Low-level Output)	t_{PZL}		R_L=180Ω	16	25	
Turn-off Time (High-level Shutdown)	t_{PHZ}	C_L=10pF, Close S1, S2		13	25	ns
Turn-off Time (Low-level Shutdown)	t_{PLZ}			22	30	
In Phase and Out of Phase Output Skew Time	t_{SKEW}	C_L=30pF, Disconnect S1, S2		1	5	ns

Note 1: Only one output is shorted at most, and the duration shouldn't exceed 1s.

TEST CIRCUIT

The test circuit is shown in figure 1. C_L includes parasitic capacitance of prod and socket. Input signal is from waveform generator, and it meets the following demands: PRR≤1MHz, Z_O≈50Ω, t_r≤15ns, t_f≤6ns; Each enabling terminal is tested alone.

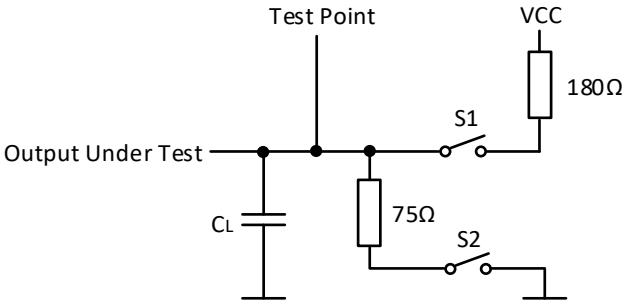


Figure 1. Switch Characteristic Test Circuit

Test propagation delay time and output skew, which needs to disconnect S1 and S2. The corresponding test waveform is shown in figure 2.

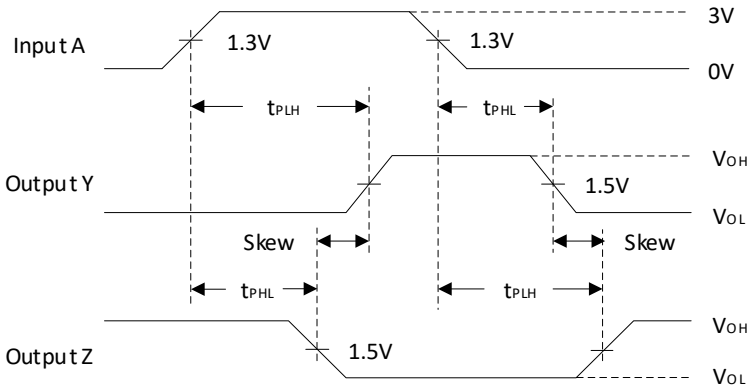


Figure 2. Propagation Delay Time and Output Skew Time

Test enabling time and disabling time. Note S1 and S2 states are different. Please refer to above table and figure 3 to adjust switch state and test respectively. Waveform 1 represents that driver maintains low-level by input and enabling signal (Unless enabling terminal controls driver in high-impedance state). Waveform 2 represents that driver maintains high-level by input and enabling signal (Unless enabling terminal controls driver in high-impedance state).

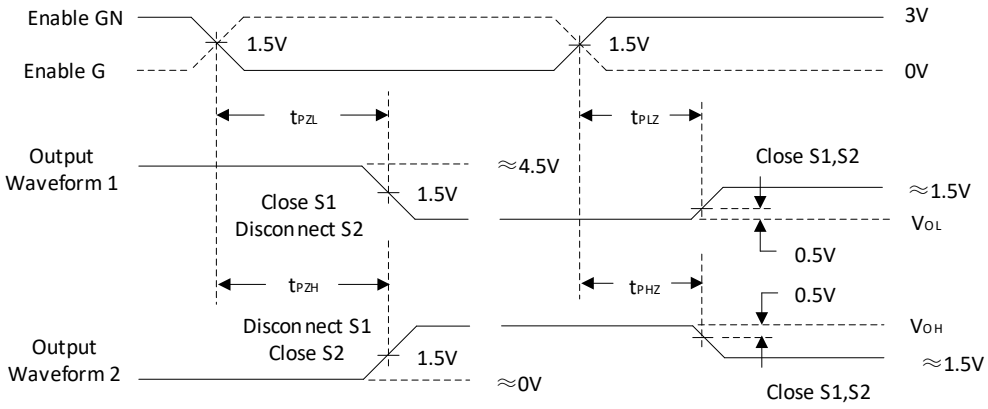
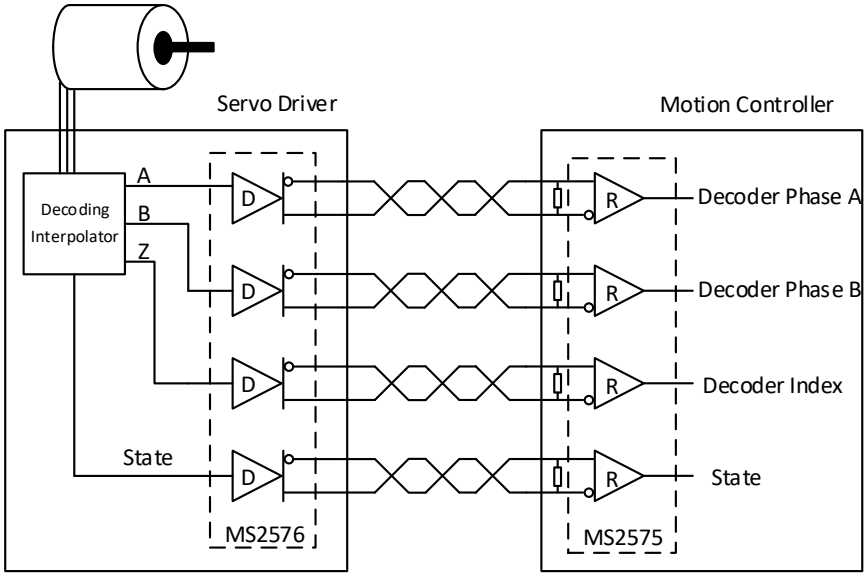


Figure 3. Enabling and Disabling Time Waveform

TYPICAL APPLICATION DIAGRAM

The following diagram shows a decoding circuit for servo system.



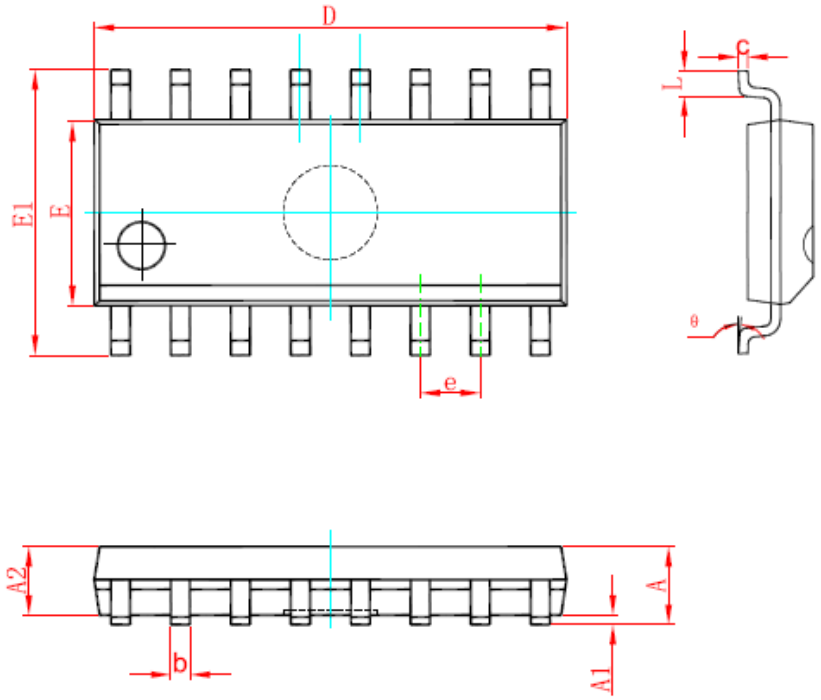
Note:

1. The circuit needs 5V power supply. The RS422 bus operating frequency is 10MHz or less. Ensure that the corresponding pins of driver and receiver are connected correctly.

2. Place chip as close to interface as possible, which could reduce line resistance to decrease bus signal reflection. If the driver is in high-impedance state, 200mV bias voltage will be increased on the A-B port for fail-safe.

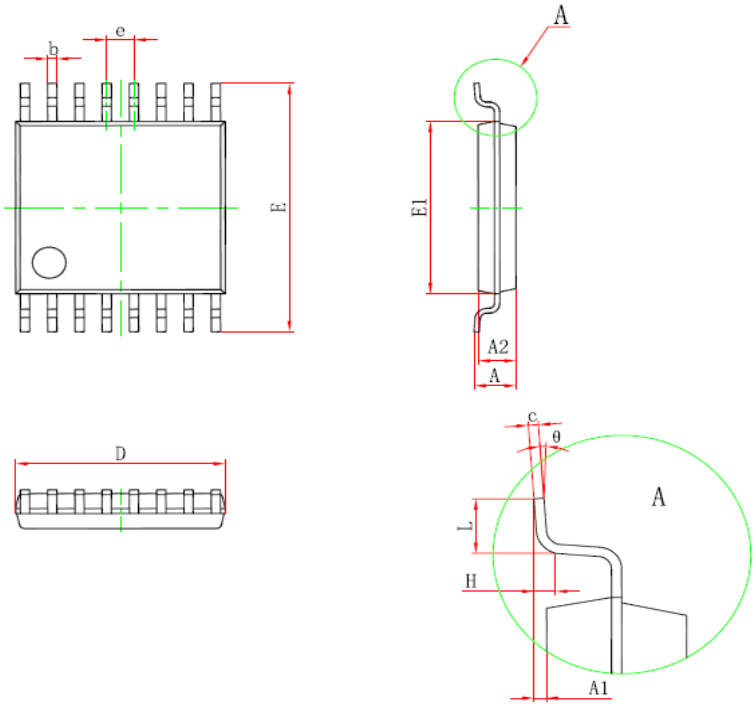
PACKAGE OUTLINE DIMENSIONS

SOP16



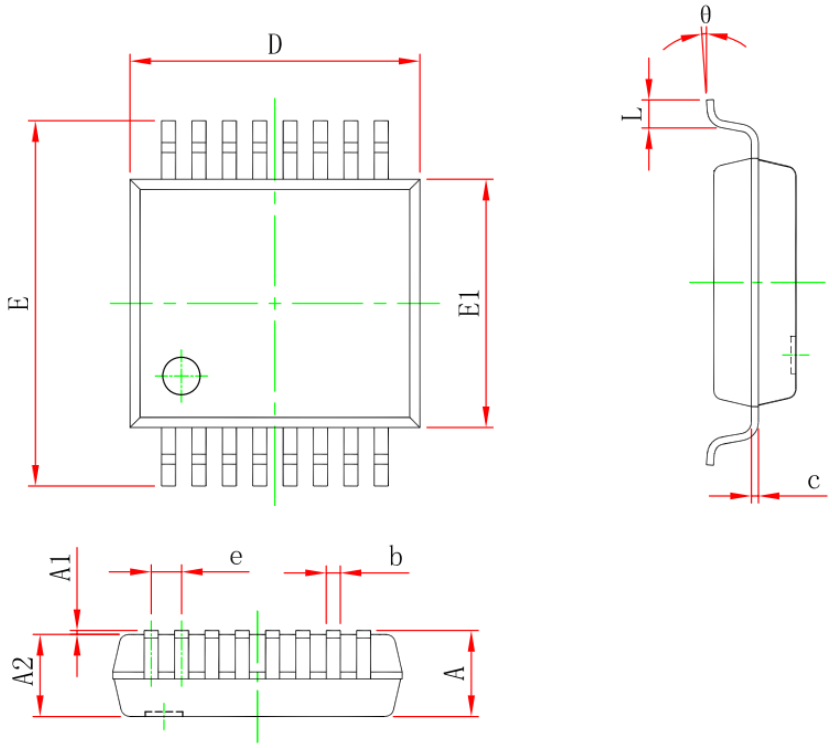
Symbol	Dimension in Millimeter		Dimension in Inch	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.200	0.386	0.402
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TSSOP16



Symbol	Dimension in Millimeter		Dimension in Inch	
	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°

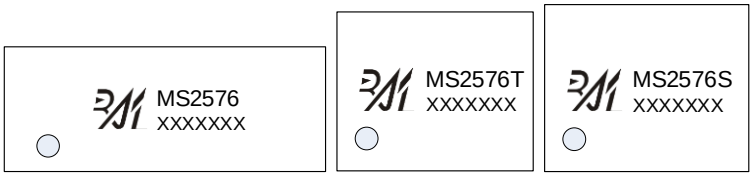
SSOP16



Symbol	Dimension in Millimeter		Dimension in Inch	
	Min	Max	Min	Max
A	-	2.000	-	0.079
A1	0.050	-	0.002	-
A2	1.650	1.850	0.065	0.073
b	0.220	0.380	0.009	0.015
c	0.090	0.250	0.004	0.010
D	5.900	6.500	0.232	0.256
E	7.400	8.200	0.291	0.323
E1	5.000	5.600	0.197	0.220
e	0.650(BSC)		0.026(BSC)	
L	0.550	0.950	0.022	0.037
θ	1°	8°	1°	8°

MARKING and PACKAGING SPECIFICATION

1. Marking Drawing Description



Product Name: MS2576, MS2576T, MS2576S

Product Code : XXXXXXX

2. Marking Drawing Demand

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

3. Packaging Specification

Device	Package	Piece/Reel	Reel/Box	Piece /Box	Box/Carton	Piece/Carton
MS2576	SOP16	4000	1	4000	8	32000
MS2576T	TSSOP16	3000	1	3000	8	24000
MS2576S	SSOP16	2500	1	2500	8	20000

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- 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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