

WAS7222M

USB High speed (480Mbps), DPDT Analog Switch

Descriptions

The WAS7222M is a high performance, double pole double throw (DPDT) CMOS analog switch that operates from a single +2.3V to +4.5V power supply.

The WAS7222M is designed for switching of high-speed USB2.0 signals in handset and consumer applications, such as cell phones, digital cameras, and notebooks with hubs or controllers with limited USB I/Os.

The WAS7222M has low bit-to-bit skew and high channel-to-channel noise isolation, and is compatible with various standards, such as high-speed USB 2.0 (480Mbps). Each switch is bi-directional and offers little attenuation of the high-speed signals at the outputs. Its bandwidth is quite marginal to pass high-speed USB 2.0 differential signals (480Mbps) with good signal integrity.

The WAS7222M is featured with special circuitry on the D+/D-, which allows the device to withstand a VBUS short to D+ or D- when the USB devices are either powered off or on.

The SEL/OE pin has overvoltage protection that allows voltages above VCC, up to 7.0V to be present on the pin without damage or disruption of operation of the part, regardless of the operating voltage. The WAS7222M is also featured with smart circuitry to minimize VCC leakage current even when SEL/OE control voltage is lower than VCC supply voltage. In other word, there is no need of additional device to shift SEL/OE level to be the same as that of VCC in real application.

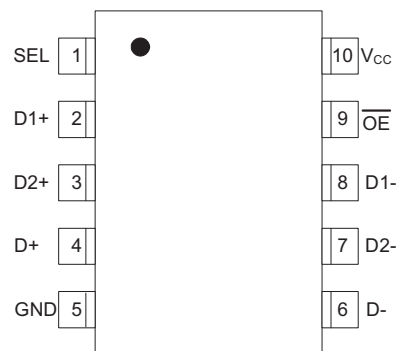
The WAS7222M is available in MSOP-10L package. Standard products are Pb-Free and halogen-Free.

Applications

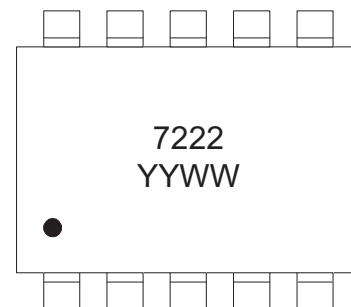
- Cell phones
- MID
- Router
- Other electronics equipments



MSOP-10L



Pin configuration (Top view)



7222 = Device code
YY = Year
WW = Week
Marking

Order information

Device	Package	Shipping
WAS7222M-10/TR	MSOP-10L	3000/Reel&Tape

Features

- Supply voltage : 2.3 ~ 4.5V
- -3dB Bandwidth : 550MHz @ C_L=5pF
- Off isolation : -36dB @ 250MHz
- Crosstalk : -47dB @ 250MHz
- Low quiescent current : <1uA

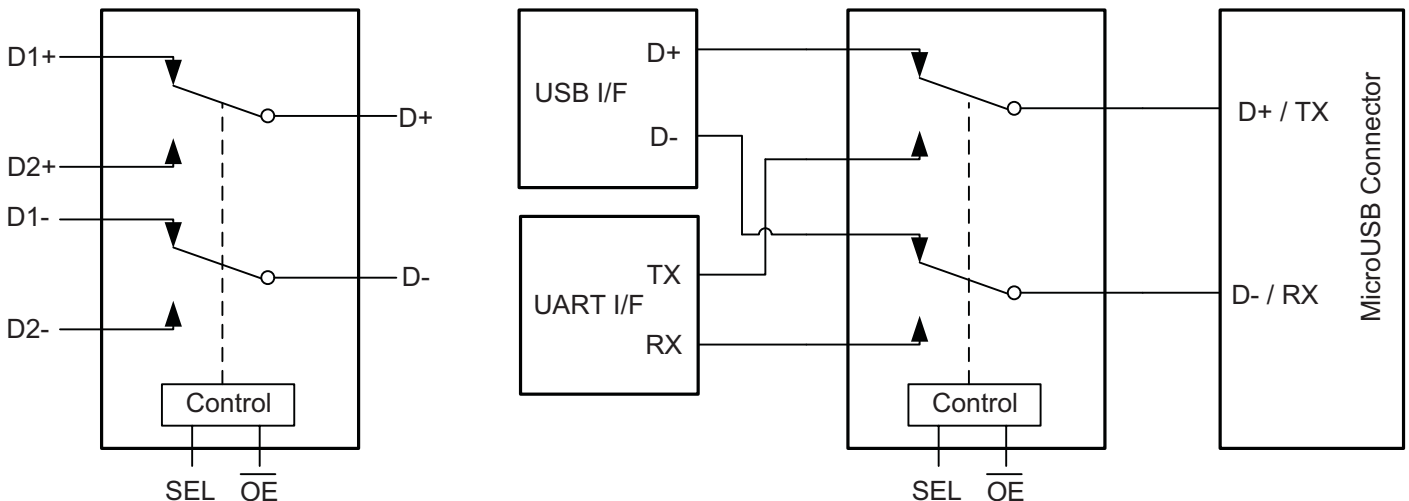
Pin descriptions

Pin Number	Symbol	Descriptions
1	SEL	Switch select pin, digital logic low or high.
2	D1+	Port A data 1 terminal, normally closed
3	D2+	Port A data 2 terminal, normally open
4	D+	Port A common data terminal, Connect to D1+ or D2+ according to SEL logic
5	GND	Ground
6	D-	Port B common data terminal, Connect to D1- or D2- according to SEL logic
7	D2-	Port B data 2 terminal, normally open
8	D1-	Port B data 1 terminal, normally closed
9	\overline{OE}	Enable control, Active low
10	V _{CC}	Power supply

Function descriptions

SEL	\overline{OE}	Function
X	H	Bus switch disconnected
L	L	D+ connect to D1+ and D- connect to D1-
H	L	D+ connect to D2+ and D- connect to D2-

Logic symbol and typical applications



Logic Symbol

Typical Applications

Absolute maximum ratings

Parameter	Symbol	Value	Unit
Supply voltage range	VCC	-0.5 ~ 6.5	V
Data input/output voltage range	V _{DATA}	-0.5 ~ 6.5	V
Select input voltage range	V _{SEL}	-0.5 ~ 6.5	V
Continues output current	I _{OUT}	±50	mA
Junction temperature range	T _J	150	°C
Lead temperature range	T _L	260	°C
Storage temperature range	T _{STG}	-65 ~ 150	°C
Thermal resistance	R _{θJA}	250	°C/W
ESD protection (HBM)	I/O to VCC, I/O to GND	±7000	V
	I/O to I/O	±5000	V

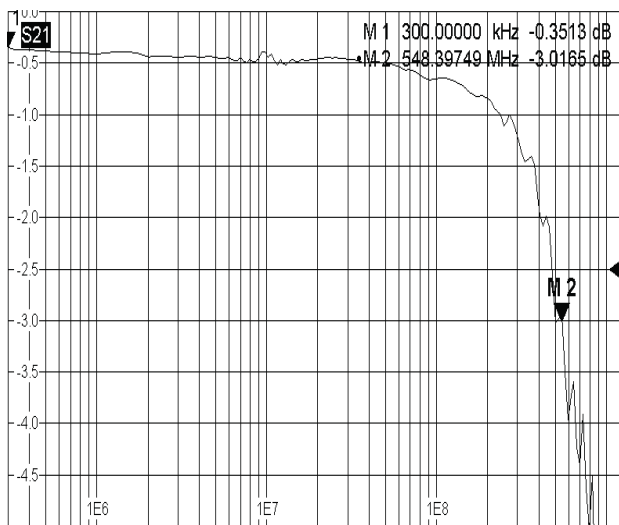
Recommend operating ratings

Parameter	Symbol	Value	Unit
Supply voltage range	VCC	2.3 ~ 4.5	V
Data input/output voltage range	V _{DATA}	0.0 ~ VCC	V
Select input voltage range	V _{SEL}	0.0 ~ VCC	V
Enable control input voltage range	V _{OE}	0.0 ~ VCC	V
Operating temperature range	T _A	-40 ~ 85	°C

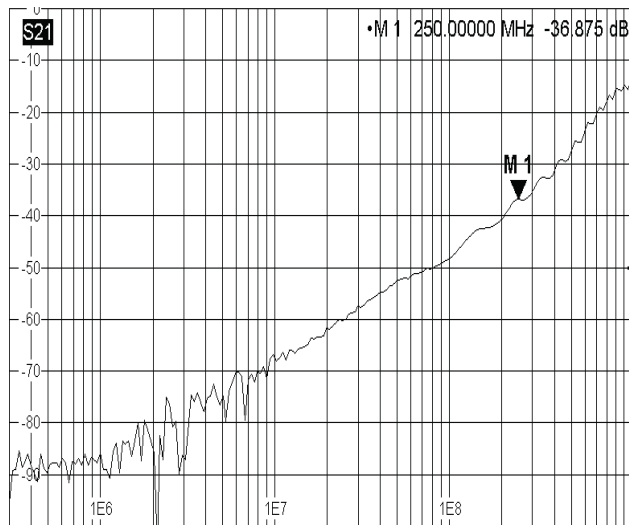
Electronics Characteristics (Ta=25°C, VCC=4.5V, unless otherwise noted)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Select and OE logic high level	V _{IH}	VCC=3.0~4.5	1.7			V
		VCC=2.3~3.0	1.4			
Select and OE logic low level	V _{IL}	VCC=3.0~4.5			0.6	V
		VCC=2.3~3.0			0.4	
Supply quiescent current	I _{CC}	I _{OUT} =0, V _{SEL} > 1.5V or V _{SEL} < 0.7V Refer to figure1			1.0	uA
Select input leakage current	I _{SEL}	V _{SEL} =VCC			±1.0	uA
Off state switch leakage current	I _{OFF}	See figure 2			±1.0	uA
On state switch leakage current	I _{ON}	See figure 3			±1.0	uA
On-Resistance	R _{ON}	VCC=3.0V, V _{DATA} =0~0.4V, I _{OUT} =8mA, See figure 4		5.0	7.5	Ω
On-Resistance match	Δ R _{ON}	VCC=3.0V, V _{DATA} =0~0.4V, I _{OUT} =8mA, See figure 4		0.15	0.20	Ω
On-Resistance flatness	R _{FLAT(ON)}	VCC=3.0V, V _{DATA} =0~1.0V, I _{OUT} =8mA, See figure 4		1.8	2.2	Ω
Propagation delay time	T _{PLH} / T _{PHL}	C _L =10pF, R _L =50Ω See figure 5		0.3	1.2	ns
Select input to switch on time	T _{ON}	C _L =10pF, R _L =50Ω See figure 6		75	120	ns
Select input to switch off time	T _{OFF}	C _L =10pF, R _L =50Ω See figure 6		40	80	ns
Break-Before-Make time	T _{BBM}	Generated by design	0.5			ns
-3dB Bandwidth	BW	R _L =50Ω, C _L =5pF		550		MHz
		R _L =50Ω, C _L =0pF		800		
Off isolation	OIRR	R _L =50Ω, F=250MHz		-36		dB
Crosstalk	Xtalk	R _L =50Ω, F=250MHz		-47		dB
Charge injection (Select input to common I/O)	Qg	C _L =0.1nF, VCC=3.3V R _G =0Ω, V _G =GND		5		pC
Select pin input capacitance	C _{IN}	VCC=0V		5		pF
D1n, D2n, Dn Off capacitance	C _{OFF}	VCC=3.3V, \overline{OE} =3.3V		5		pF
D1n, D2n, Dn On capacitance	C _{ON}	VCC=3.3V, \overline{OE} =0V		6.5		pF

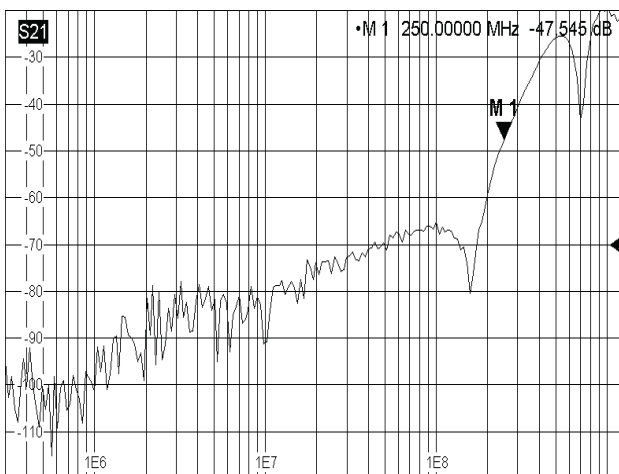
Typical Characteristics (Ta=25°C, VCC=4.5V, unless otherwise noted)



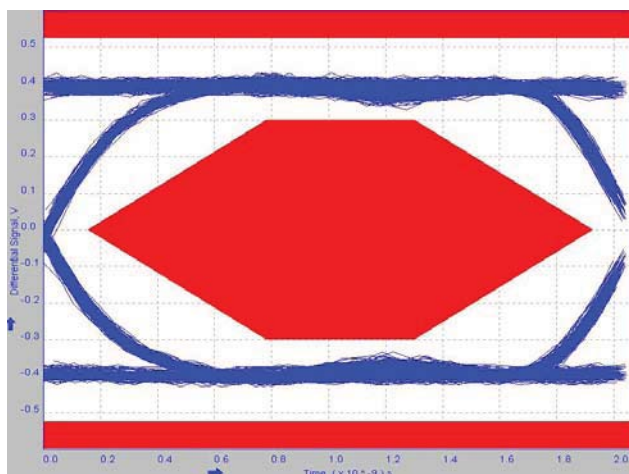
Bandwidth



Off isolation



Crosstalk



Eye Diagram (480Mbps)

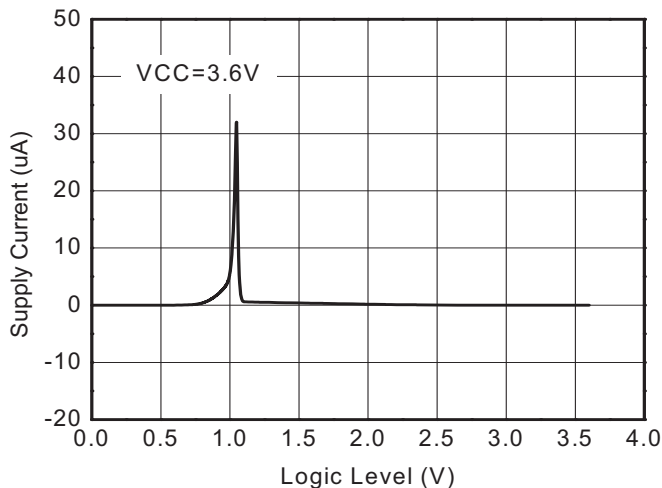
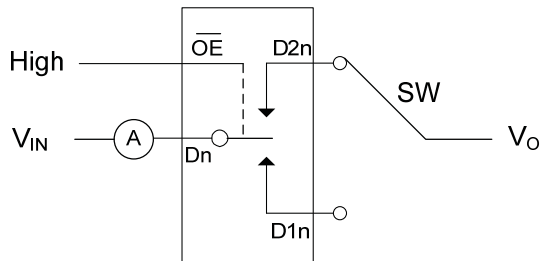


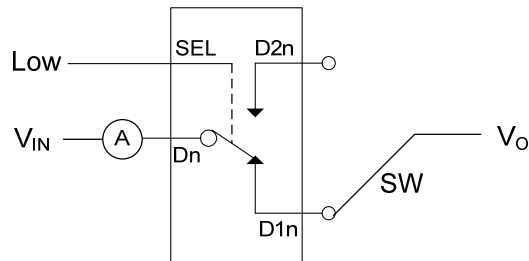
Figure 1: Supply current vs. Logic level

Test Circuit



Conditions: $V_{IN}=4.5V$, $V_O=GND$

Figure 2: Off state switch leakage current



Conditions: $V_{IN}=4.5V$, $V_O=Open$

Figure 3: On state switch leakage current

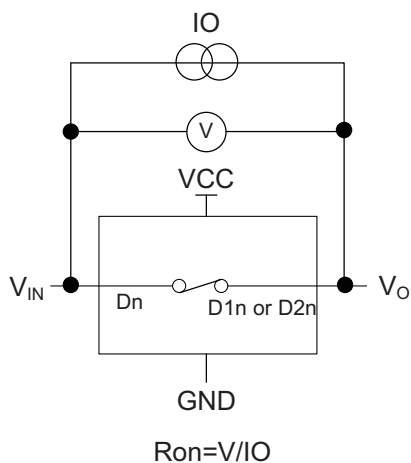


Figure 4: On-Resistance

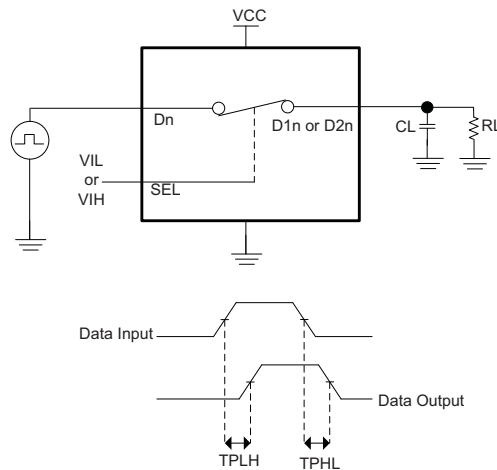


Figure 5: Propagation delay time

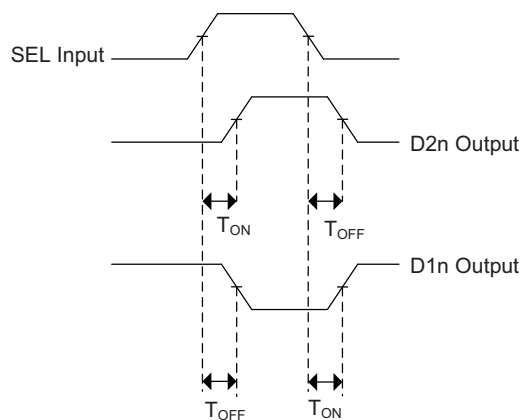
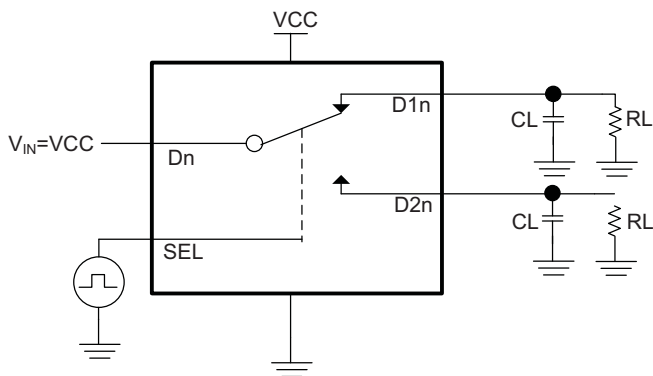
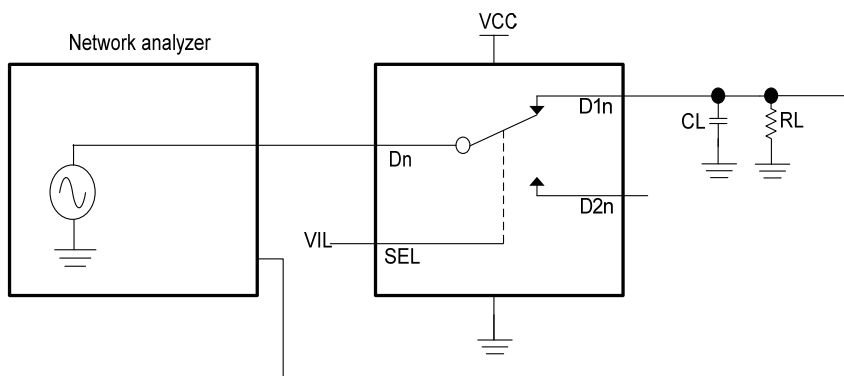
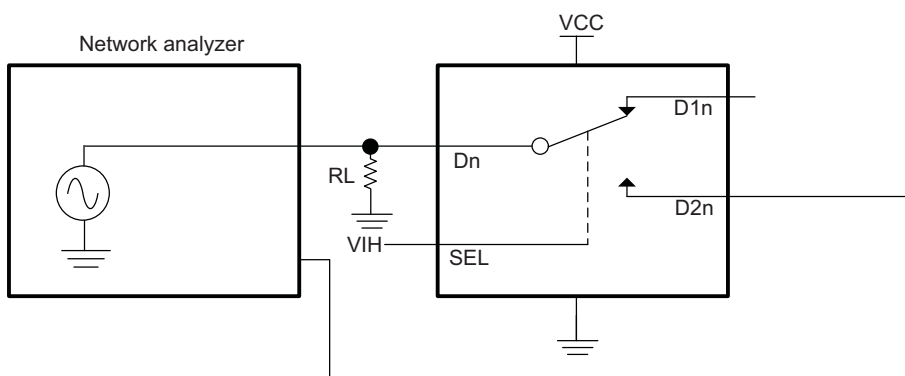


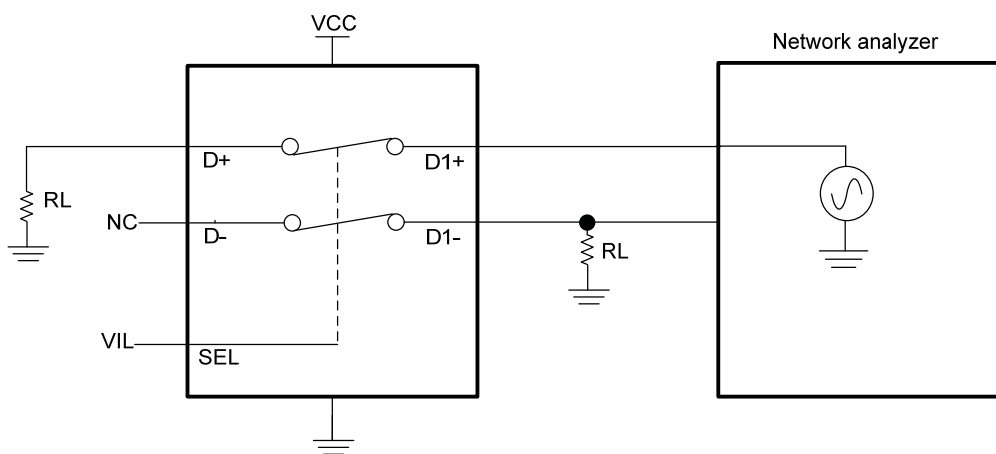
Figure 6: Select input to switch on/off time



Bandwidth (BW)



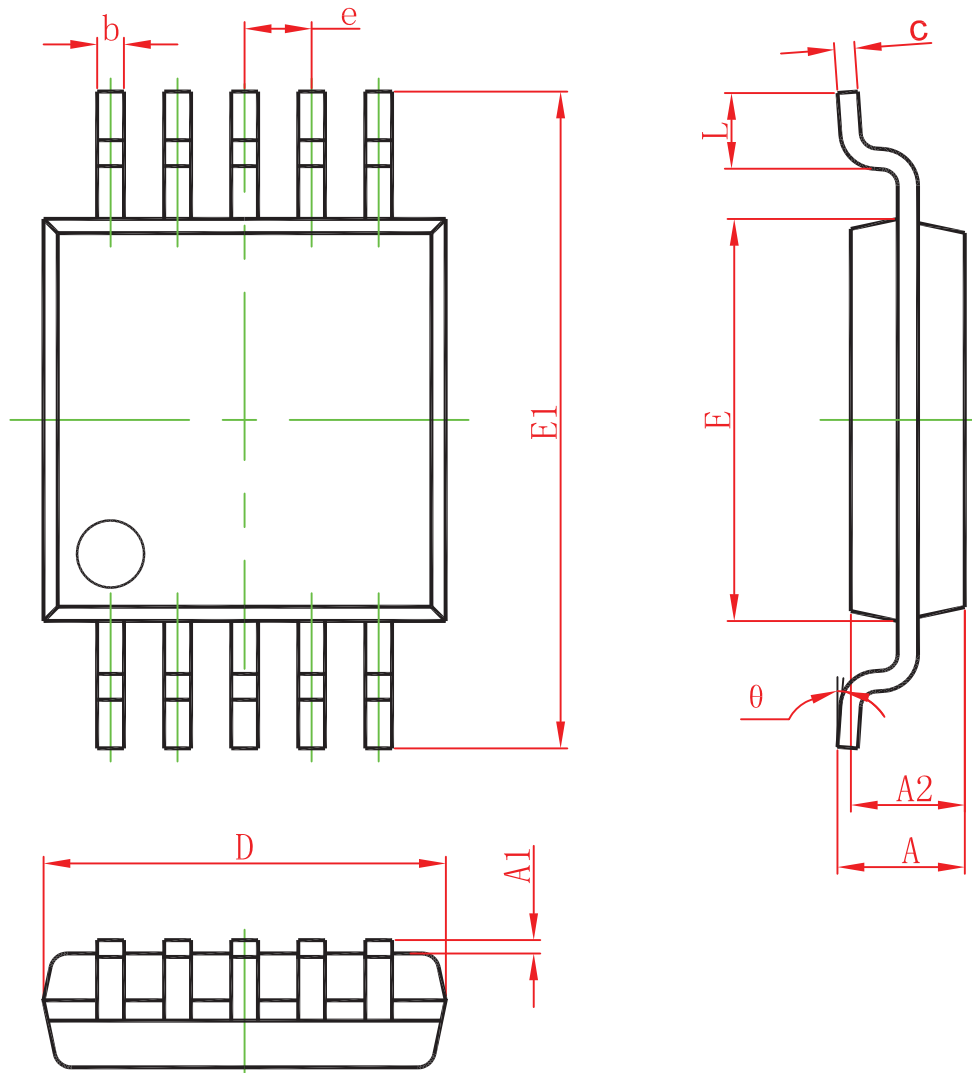
Off isolation (OIRR)



Crosstalk (Xtalk)

Package outline dimensions

MSOP-10L



Symbol	Dimension in Millimeters	
	Min.	Max.
A	0.820	1.100
A1	0.020	0.150
A2	0.750	0.950
b	0.180	0.280
c	0.090	0.230
D	2.900	3.100
e	0.50(BSC)	
E	2.900	3.100
E1	4.750	5.050
L	0.400	0.800
θ	0°	6°