1.General Description

The EMS23157 is a dual SPDT low on-resistance analog switch. It can operate from 1.5V to 5.5V power supply. The device offers low ON-state resistance and excellent ON-state resistance matching with break-before-make feature, to prevent signal distortion during the transferring of a signal from one channel to another. The device is capable of truly isolation. Even when A overrides V_{CC}, very little current will flow back to the supply.

2.Features and Benefits

- Wide Supply Range from 1.5 V to 5.5 V
- Low ON-state resistance, typically 1.9 Ω (V_{CC}=5.5 V)
- 1.8 V Compatible Control Logic Inputs
- High Off-Isolation: -80 dB @ 10 kHz
- Low Channel-to-Channel Crosstalk: -82 dB @ 10 kHz
- High Bandwidth (-3dB @ 800MHz) Suitable For USB2.0 High-Speed Routing
- Low Quiescent Current (< 1uA) when V_{CC} = 3.3 V

3.Applications

- Audio, Video, UART, USB2.0 Signal and Supply Routing
- Cell phones and TWS headset

4. Ordering Information

Table 1. Ordering information

Type number	Topside marking	Package		
		Name	Description	Quantity
EMS23157MS	23157 XYYWW	MSOP-10L	MSOP package, 10 pins 3.0mm × 3.0mm; 1.1 mm (Max) height	3000

5. Pinning Information

5.1. Pin map

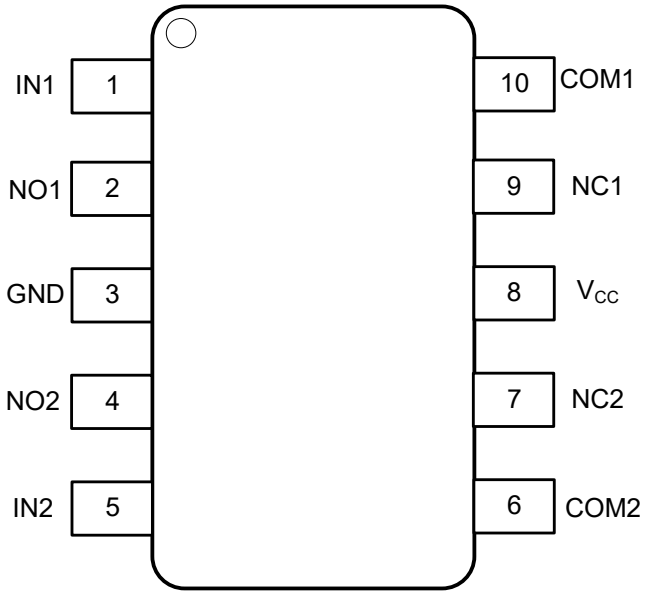


Fig 1. Top view pin configuration MSOP-10L

5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
IN1	1	Select pin for switch 1
NO1	2	Normally open I/O for switch 1
GND	3	Ground
NO2	4	Normally open I/O for switch 2
IN2	5	Select pin for switch 2
COM2	6	Common I/O for switch 2
NC2	7	Normally closed I/O for switch 2
V_{CC}	8	Power supply pin
NC1	9	Normally closed I/O for switch 1
COM1	10	Common I/O for switch 1

6.Functional Description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level.

IN	NC TO COM, COM TO NC	NO TO COM, COM TO NO
L	ON	OFF
H	OFF	ON

7.Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Table 4. Absolute Maximum Ratings

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.3	6.5	V
V_{IN}	control Input Voltage		-0.3	6.5	V
V_A	signal input voltage		-0.3	6.5	V
I_A	continuous Current Through COM, NC, NO			±100	mA
	peak Current Through COM, NC, NO (pulsed at 1ms 50% duty cycle)			±200	mA
T_J	junction Temperature under Bias			150	°C
T_L	lead Temperature (Soldering, 10 seconds)			260	°C
$R_{\theta JA}$	thermal resistance			350	°C/W

8.Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. EnergyMath does not recommend exceeding them or designing to Absolute Maximum Ratings.

Table 5. Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		1.5	5.5	V
V_{IN}	control input voltage		0	5.5	V
V_A	signal input voltage		0	V_{CC}	V
T_{amb}	ambient temperature		-40	125	°C

9. Electrical Characteristics

Table 6. Static characteristics

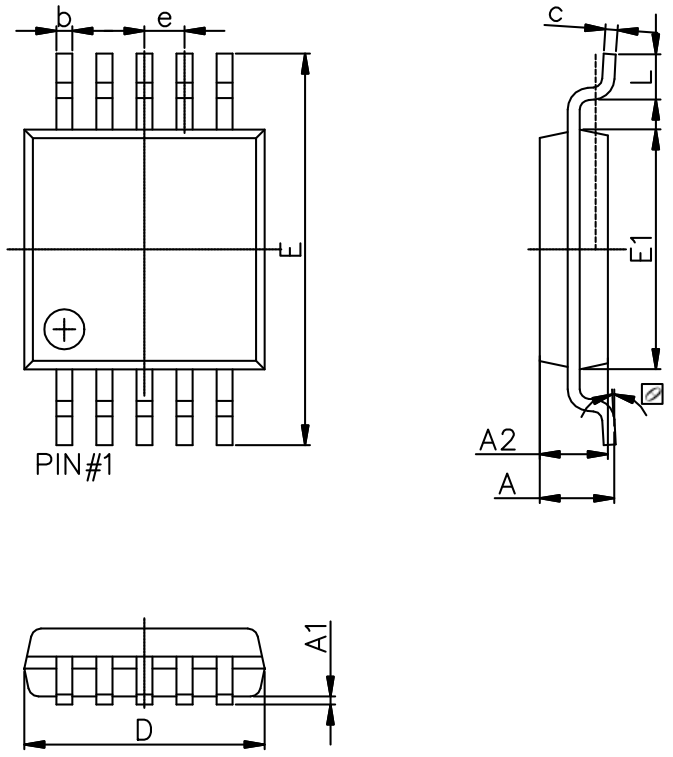
T_{amb}=25 ℃, V_{CC}=3.3 V, unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DC Electrical Characteristics						
V_{IH}	input logic high level	V_{CC} = 3.4 V to 5.5 V	1.6			V
		V_{CC} = 1.5 V to 3.3 V	1.4			V
V_{IL}	input logic low level	V_{CC} = 3.4 V to 5.5 V			0.6	V
		V_{CC} = 1.5 V to 3.3 V			0.4	V
I_{CC}	supply current	I_A = 0, V_{SEL} = 0 or V_{SEL} = V_{CC}			1.0	µA
ΔI_{CC}	additional supply current	I_A = 0, V_{CC} = 2.5 V or 4.2 V V_{SEL} = 1.6 V			3.0	µA
I_{off}	OFF-state switch leakage current from COM to NC (or NO)	V_A = 5 V , V_{NC} or V_{NO} = 0 V			±2.0	µA
R_{ON}	on-resistance	V_{CC} = 3.5 V , V_A = 0.8 V to 2.0 V, I_A = 10 mA		3.4	4.0	Ω
		V_{CC} = 4.5 V , V_A = 0.8 V to 2.3 V, I_A = 10 mA		2.4	3.0	Ω
		V_{CC} = 5.5 V , V_A = 0.8 V to 2.6 V, I_A = 10 mA		1.9	2.5	Ω
R_{FLAT}	on-resistance flatness	V_{CC} = 3.5 V , V_A = 0.8 V to 2.0 V, I_A = 10 mA		0.2	0.4	Ω
		V_{CC} = 4.5 V , V_A = 0.8 V to 2.3 V, I_A = 10 mA		0.25	0.45	Ω
		V_{CC} = 5.5 V , V_A = 0.8 V to 2.6 V, I_A = 10 mA		0.3	0.5	Ω
ΔR_{ON}	on-resistance matching between channels	V_{CC} = 3.5 V , V_A = 0.8 V to 2.0 V, I_A = 10 mA		0.1	0.2	Ω
		V_{CC} = 4.5 V , V_A = 0.8 V to 2.3 V, I_A = 10 mA		0.1	0.2	Ω
		V_{CC} = 5.5 V , V_A = 0.8 V to 2.6 V, I_A = 10 mA		0.1	0.2	Ω

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
AC Electronics Characteristics						
t_{ON}	turn-On Time	V_A=1.5V, C_L=50pF, R_L=50Ω		470		ns
t_{OFF}	turn-Off Time	V_A=1.5V, C_L=50pF, R_L=50Ω		120		ns
t_{BBM}	break-before-make time	V_A=1.5V, C_L=50pF, R_L=50Ω		600		ns
BW	-3dB Bandwidth	C_L=0pF		800		MHz
OIRR	off isolation	f=1KHz		-81		dB
		f=10KHz		-80		dB
X_{TALK}	crosstalk	f=1KHz		-83		dB
		f=10KHz		-82		dB
THD	total harmonic distortion	f=20Hz to 20KHz V_A=600mVpp, R_L=32Ω		-80		dB
Capacitance						
C_{ON}	On Capacitance	f=100KHz		12		pF
C_{OFF}	Off Capacitance	f=100KHz		4		pF

10. Package Outline

MSOP-10L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	---	1.100	---	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.180	0.330	0.007	0.013
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.500(BSC)		0.020(BSC)	
E	4.750	5.050	0.187	0.199
E1	2.900	3.100	0.114	0.122
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

11. Revision History

Table 7. Revision history

Document ID	Release Date	Data sheet status	Change notice	Supersedes
EMS23157 Rev. 1.0	Feb 13, 2024	Product datasheet		