

1. General Description

The EMS4567 is a high performance, quad, Single Pole Double Throw (SPDT) analog switch that features ultra-low R_{ON} of $1.9\ \Omega$ (typical) at $5.5V\ V_{CC}$. The EMS4567 operates over a wide V_{CC} range of $1.5V$ to $5.5V$ and is designed for break-before-make operation. The select input is TTL-level compatible.

EMS4567 is also featured with smart circuitry to minimize V_{CC} leakage current even when the control voltage is lower than V_{CC} supply voltage. This feature suits mobile handset applications by allowing direct interface with baseband processor general-purpose IO with minimal battery consumption. In other word, there is no need of additional device to shift control level to be the same as that of V_{CC} in real application.

The EMS4567 is available in QFN1.8x2.6-16L package. Standard Products are Pb-free and halogen-free.

2. Features and Benefits

- Wide supply voltage range from $1.5\ V$ to $5.5\ V$
- Low On-resistance, $R_{ON} = 1.9\ \Omega$ when $V_{CC} = 5.5\ V$
- High Bandwidth: $-3\ dB$ @ $700\ MHz$
- Rail-to-Rail Signal Range
- Break-Before-Make Switching
- Low quiescent current over an Expanded Control Input Range
- ESD protection: HBM ESDA/JEDEC JS-001 Class 2 exceeds $2000\ V$

3. Applications

- Cell phones, PDA, Digital Camera and Notebook
- LCD Monitor, TV and Set-Top Box
- Audio and Video Signal Routing
- Other electronic equipment

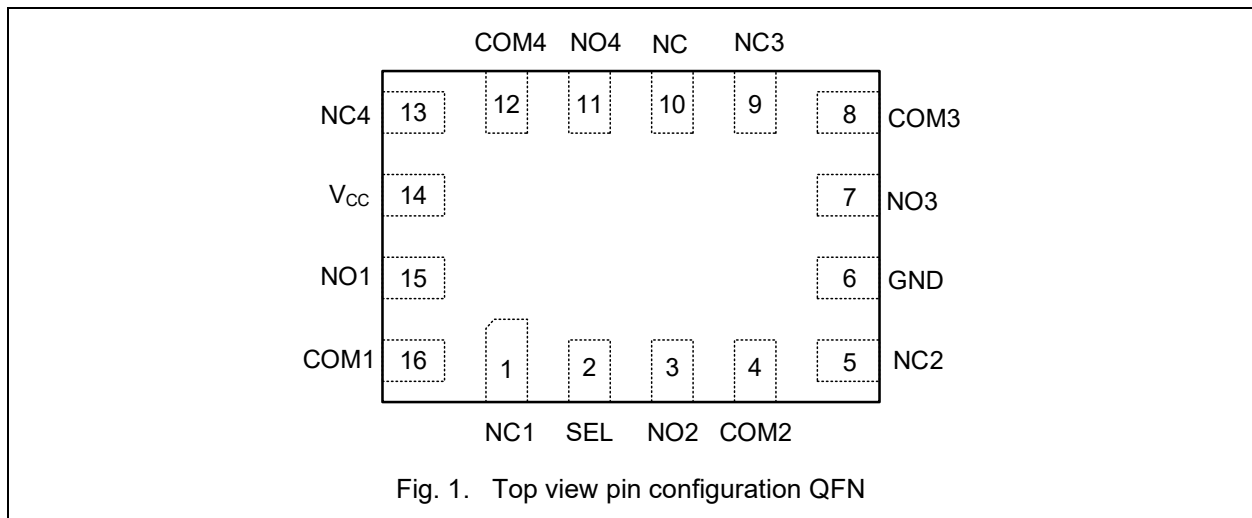
4. Ordering Information

Table 1. Ordering information

Type number	Package		
	Name	Description	Quantity
EMS4567Q	QFN1.8x2.6-16L	QFN package, 16 pins 1.8 mm × 2.6 mm; 0.6 mm (Max) height	3000

5. Pinning Information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
COM1,COM2,COM3,COM4	4,8,12,16	Common Port
NC1,NC2,NC3,NC4	1,5,9,13	Data Port (Normally closed)
NO1,NO2,NO3,NO4	15,3,7,11	Data Port (Normally open)
SEL	2	Logic Input Control
V _{CC}	14	Positive Power Supply
GND	6	Ground
NC	10	Not Connect

6.Function Diagram

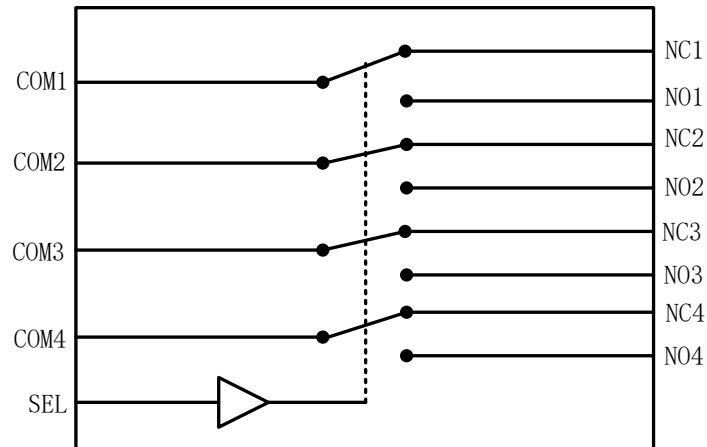


Fig. 2. Logic symbol

7.Function Description

Table 3. Function table

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

SEL	Function
L	NC1 Connected to COM1, NC2 Connected to COM2 NC3 Connected to COM3, NC4 Connected to COM4
H	NO1 Connected to COM1, NO2 Connected to COM2 NO3 Connected to COM3, NO4 Connected to COM4

8. 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 _{θJA}	thermal resistance			350	°C/W

9. 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

10. Electrical Characteristics

Table 6. Static characteristics
 $T_{amb}=25\text{ }^{\circ}\text{C}$, $V_{CC}=3.3\text{ V}$, unless otherwise specified.

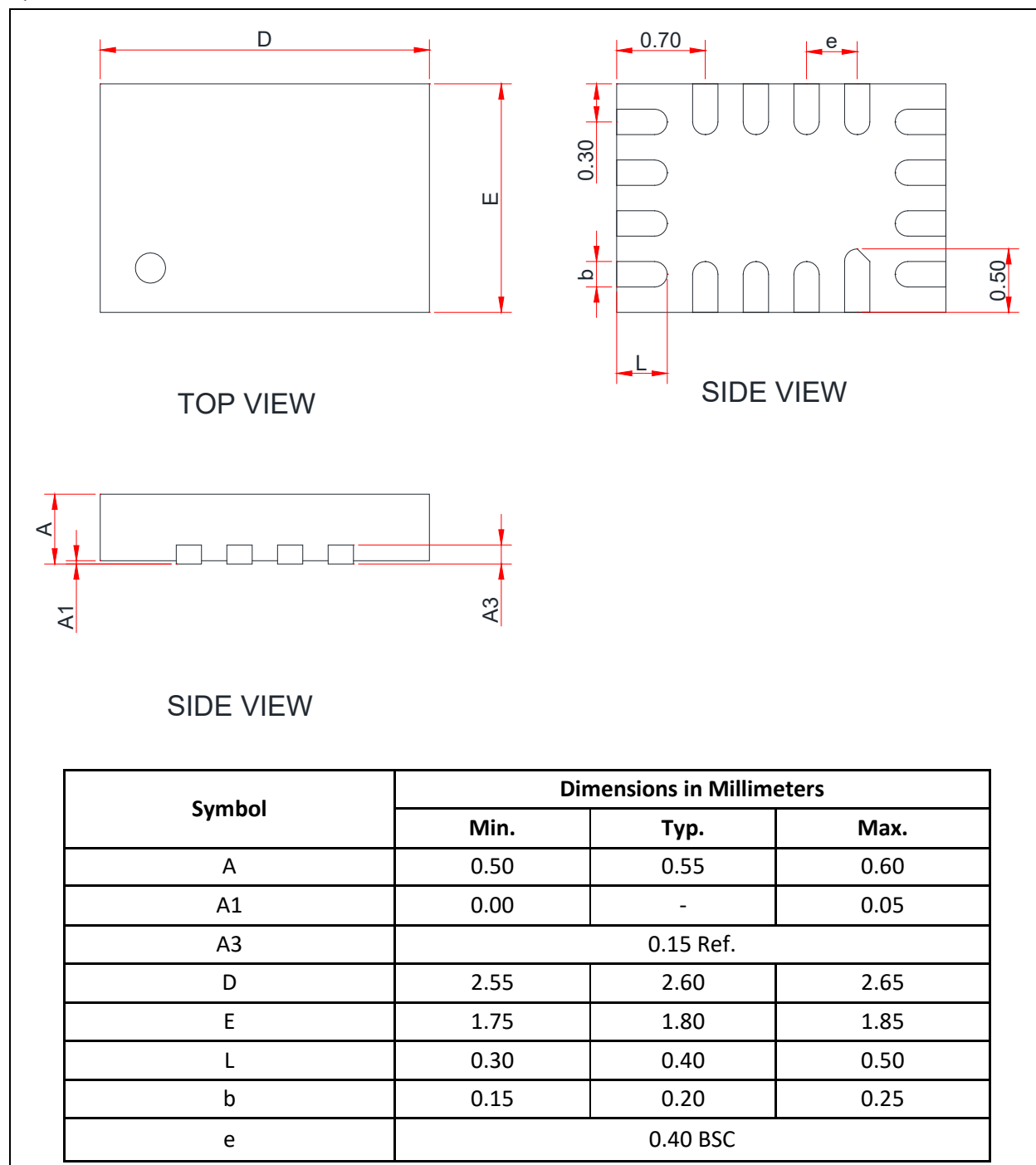
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
DC Electrical Characteristics						
V_{IH}	input logic high level	$V_{CC} = 3.4\text{ V to }5.5\text{ V}$	1.6			V
		$V_{CC} = 1.5\text{ V to }3.3\text{ V}$	1.4			V
V_{IL}	input logic low level	$V_{CC} = 3.4\text{ V to }5.5\text{ V}$			0.6	V
		$V_{CC} = 1.5\text{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

EMS4567

Low On Resistance, Quad SPDT Analog Switch

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
AC Electronics Characteristics						
t_{ON}	turn-On Time	$V_A=1.5V$, $C_L=50pF$, $R_L=50\Omega$		470		ns
t_{OFF}	turn-Off Time	$V_A=1.5V$, $C_L=50pF$, $R_L=50\Omega$		120		ns
t_{BBM}	break-before-make time	$V_A=1.5V$, $C_L=50pF$, $R_L=50\Omega$		600		ns
BW	-3dB Bandwidth	$C_L=0pF$		800		MHz
OIRR	off isolation	$f=10\text{ KHz}$		-80		dB
		$f=240\text{ MHz}$		-31		dB
X_{TALK}	crosstalk	$f=10\text{ KHz}$		-82		dB
		$f=240\text{ MHz}$		-26		dB
THD	total harmonic distortion	$f=20\text{Hz to }20\text{KHz}$ $V_A=600mV_{pp}$, $R_L=32\Omega$		-80		dB
Capacitance						
C_{ON}	On Capacitance	$f=100\text{KHz}$		12		pF
C_{OFF}	Off Capacitance	$f=100\text{KHz}$		4		pF

11. Package Outline

QFN1.8x2.6-16L


12. Revision History

Table . Revision history

Document ID	Release Date	Data sheet status	Change notice	Supersedes
EMS4567 Rev. 1.0	Oct 30, 2024	Product datasheet		