

1. General Description

The EMS4899 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 EMS4899 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.

EMS4899 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 EMS4899 is available in QFN3x3-16L 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

EMS4899**Low On Resistance, Quad SPDT Analog Switch**

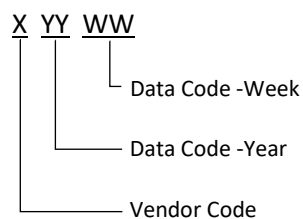
4. Ordering Information

Table 1. Ordering information

Type number	Topside marking	Package		
		Name	Description	Quantity
EMS4899UD	S4899 XYYWW	QFN3x3-16L	QFN package, 16 pins 3 mm × 3 mm; 0.6 mm (Max) height	3000

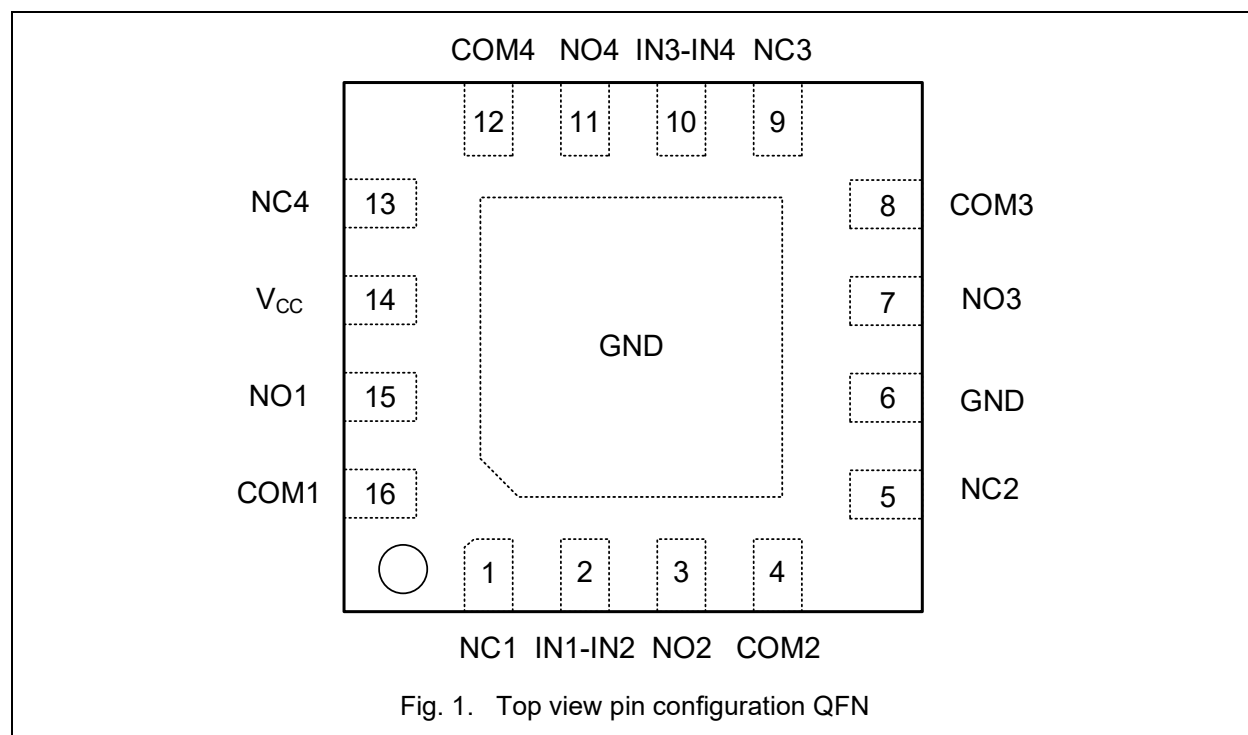
MARKING INFORMATION

NOTE: XYYWW = Vendor Code and Data Code.



5. Pinning Information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
NC1, NC2, NC3, NC4	1, 5, 9, 13	Normally Closed Pins.
IN1-IN2, IN3-IN4	2, 10	Digital Control Input Pin to Connect the COM Pins to the NO or NC Pins.
NO1, NO2, NO3, NO4	3,7,11,15	Normally Open Pins
COM1,COM2,COM3,COM4	4, 8, 12, 16	Common Pins.
GND	6	Ground
V _{CC}	14	Positive Power Supply
GND	Exposed Pad	Exposed Pad. Connect exposed pad to GND or left floating.

6.Functional Description

Table 3. Function table

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

IN1-IN2	NC1 and NC2 TO COM, COM TO NC1 and NC2	NO1 and NO2 TO COM, COM TO NO1 and NO2
L	ON	OFF
H	OFF	ON

IN3-IN4	NC3 and NC4 TO COM, COM TO NC3 and NC4	NO3 and NO4 TO COM, COM TO NO3 and NO4
L	ON	OFF
H	OFF	ON

7.Functional Block Diagram

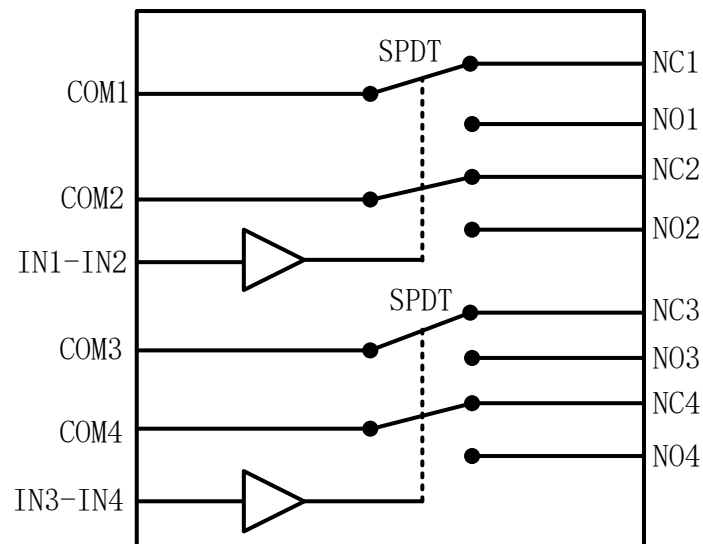


Fig. 2. Fncional Block Diagram

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

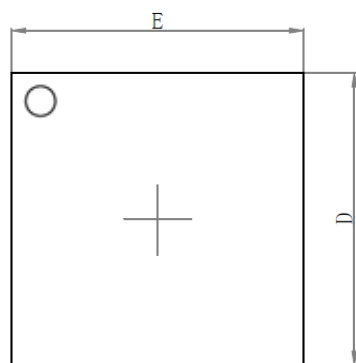
EMS4899

Low On Resistance, Quad SPDT Analog Switch

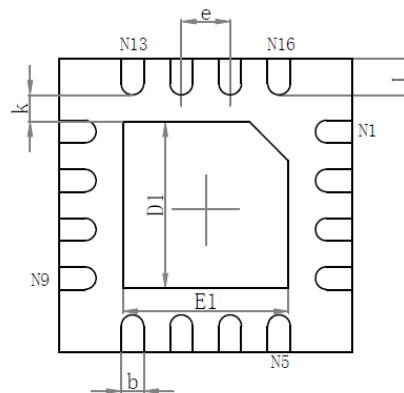
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
AC Electronics Characteristics						
t_{ON}	turn-On Time	$V_A=1.5V, C_L=50pF, R_L=50\Omega$		470		ns
t_{OFF}	turn-Off Time	$V_A=1.5V, C_L=50pF, R_L=50\Omega$		120		ns
t_{BBM}	break-before-make time	$V_A=1.5V, C_L=50pF, R_L=50\Omega$		600		ns
BW	-3dB Bandwidth	$C_L=0pF$		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

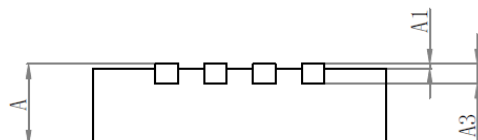
QFN3x3-16L



Top View



Bottom View



Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A3	0.203REF		0.008REF	
D	2.900	3.100	0.114	0.122
E	2.900	3.100	0.114	0.122
D1	1.600	1.800	0.063	0.071
E1	1.600	1.800	0.063	0.071
k	0.200MIN.		0.008MIN.	
b	0.180	0.300	0.007	0.012
e	0.500TYP.		0.500TYP.	
L	0.300	0.500	0.012	0.020

12. Tape and Reel Information

12.1. Carrier tape dimensions

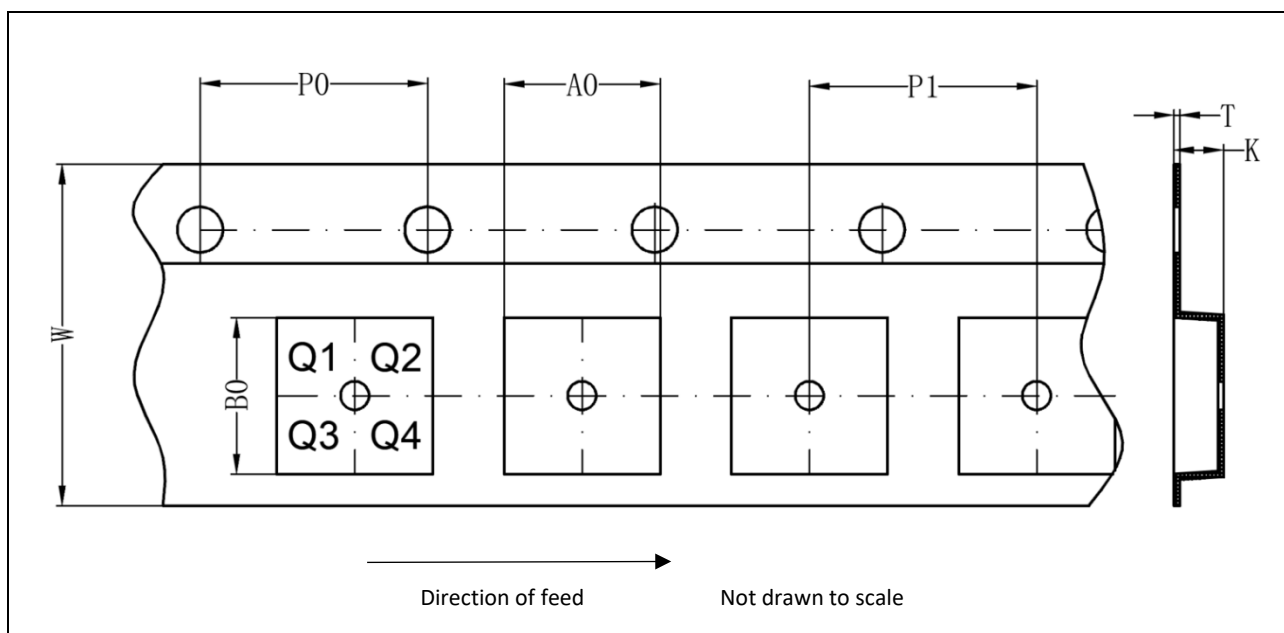


Table 7. Carrier tape dimensions

Package version	A0(mm)	B0(mm)	K(mm)	T(mm)	P1(mm)	W(mm)	P0(mm)	PIN 1
QFN3x3-16L	3.35	3.35	1.13	0.25	8	12	4	Q2

12.2. Reel and box dimensions

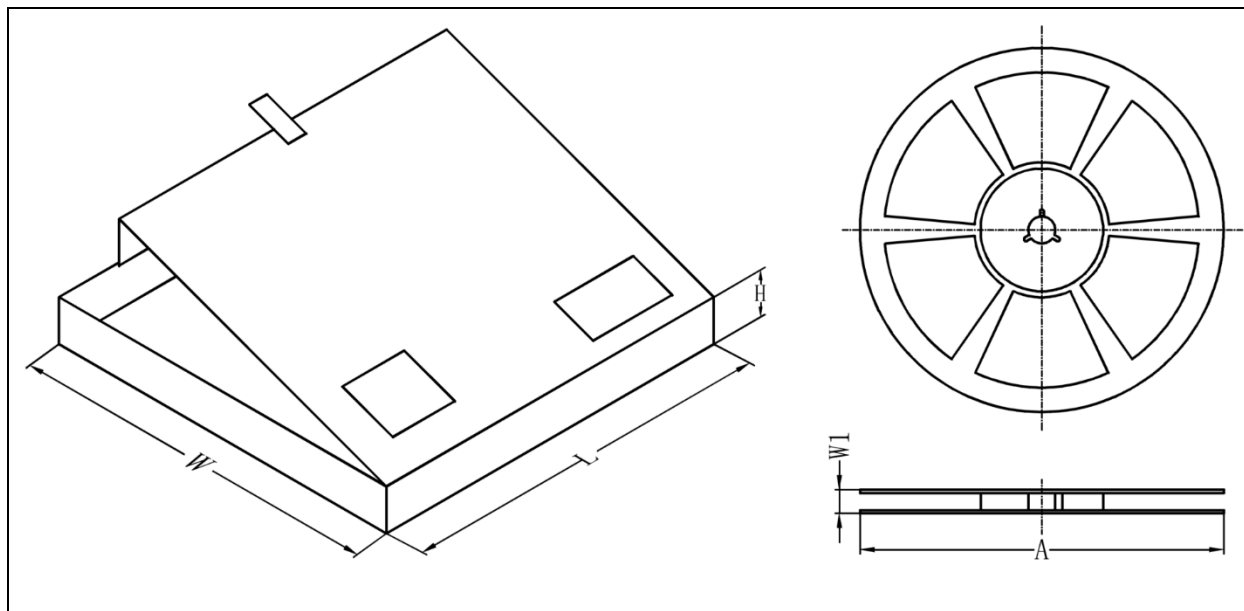


Table8. Dimensions and quantities

Package version	Type NO. ending	Reel Dimension A (mm)	Reel Width W1 (mm)	SPQ (pcs)[1]	Reels per box	Outer box dimensions L×W×H(mm)[2]
QFN3x3-16L	UD	330	18.4	3000	1	358x340x50

[1] Packing quantity dependent on specific product type. Please contact your local Energymath representative for ordering.

[2] Dimensions for reference only.

13. Revision History

Table 9. Revision history

Document ID	Release Date	Data sheet status	Change notice	Supersedes
EMS4899 Rev. 1.4	Mar 05, 2026	Product datasheet		EMS4899 Rev. 1.3
Modifications:	Added Fig.2. Fncional Block Diagram.			
EMS4899 Rev. 1.3	Oct 25, 2025	Product datasheet		EMS4899 Rev. 1.2
Modifications:	Section 11 : Added tape and reel information.			
EMS4899 Rev. 1.2	Apr 20, 2025	Product datasheet		EMS4899 Rev. 1.1
Modifications:	Table6: R_{FLAT} updated.			
EMS4899 Rev. 1.1	Jan 30, 2025	Product datasheet		EMS4899 Rev. 1.0
Modifications:	Update the type number and marking information.			
EMS4899 Rev. 1.0	Oct 30, 2024	Product datasheet		