BCT48751

8:1 CMOS Analog Signal Multiplexer

GENERAL DESCRIPTION

The BCT48751 is a CMOS analog IC configured as an 8-channel multiplexer. This CMOS device can operate from 2.5V to 5.5V single supplies. Each switch can handle rail-to-rail analog signals. The off-leakage current is less then 1uA at 25°C. All digital inputs can support 1.8V logic control I/O.

APPLICATIONS

Battery-Operated Equipment
Audio and Video Signal Routing
Low-Voltage Data-Acquisition Systems
Communications Circuits
Automotive

FEATURES

- Guaranteed On-Resistance
  - 48Ω (TYP) with +5V Supply
- Guaranteed On-Resistance Match Between Channels
  - 1.5Ω (TYP) with +5V Supply
- High -3dB Bandwidth: 300MHz
- Low Off-Leakage Current 1uA (MAX) at 25°C
- Low On-Leakage Current 1uA (MAX) at 25°C
- 2.5V to 5.5V Single-Supply Operation
- 1.8V Logic Compatible
- High Off-Isolation:-83dB(RL=50Ω, f=1MHz)
- -40°C to 85°C Operating Temperature Range
- Available in Green QFN-3x3-16L, SOP16, SSOP16 or TSSOP16 Packages

ORDERING INFORMATION

Order Number	Package Type	Temperature Range	Marking	QTY/Reel
BCT48751EGE-TR	QFN3x3-16L	-40°C to +85°C	𝓑 48751 XXXXX	3000
BCT48751EOE-TU	SOP16	-40°C to +85°C	𝓑 48751 XXXXX	--
BCT48751EOE-TR	SOP16	-40°C to +85°C	𝓑 48751 XXXXX	3000
BCT48751ESE-TU	SSOP16	-40°C to +85°C	𝓑 48751 XXXXX	--
BCT48751ECE-TR	TSSOP16	-40°C to +85°C	𝓑 48751 XXXXX	3000

Note: "XXXXX" in Marking will be appeared as the batch code.

ABSOLUTE MAXIMUM RATINGS

V_{CC} to GND ....-0.3V to +6.0V

Voltage into Any Terminal ....-0.3V to (V_{CC}+ 0.3V)

Continuous Current into Any Terminal...................±20mA

Peak Current, X_

(Pulsed at 1ms, 10% duty cycle)............................±40mA

Storage Temperature Range......................-65℃ to +150℃

Junction Temperature..150℃

Operating Temperature Range...................-40℃ to +85℃

Lead Temperature (Soldering, 10 sec).......................260℃

ESD Susceptibility

HBM...2000V

MM..200V

NOTE:

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

CAUTION

This integrated circuit can be damaged by ESD if you don't pay attention to ESD protection. Broadchip recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Broadchip reserves the right to make any change in circuit design, specification or other related things if necessary without notice at any time. Please contact Broadchip sales office to get the latest datasheet.

PIN CONFIGURATION (TOP VIEW)

QFN3x3-16L

SOP16/SSOP16/TSSOP16
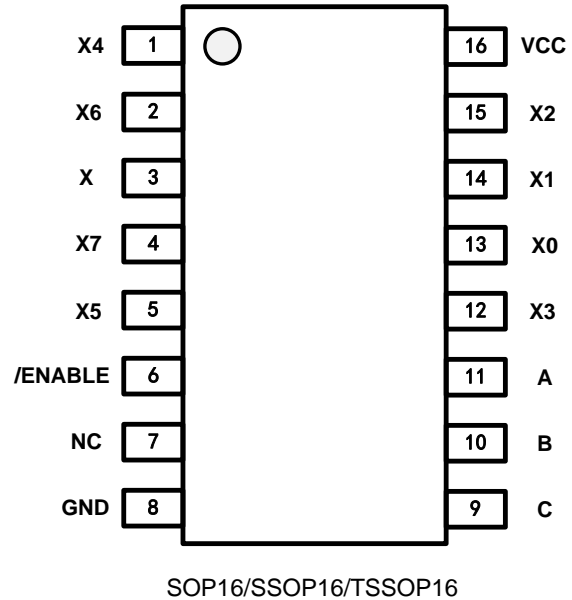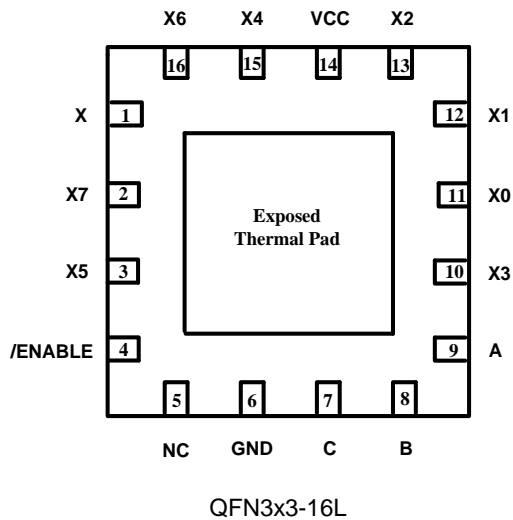
PIN DESCRIPTION

PIN		NAME	FUNCTION
QFN3x3-16L	SOP16 SSOP16 TSSOP16		
11,12,13,10, 15,3,16,2	13,14,15,12 ,1,5,2,4	X0-X7	Analog Switch Inputs X0-X7.
1	3	X	Analog Switch "X" Output.
14	16	V_{CC}	Positive Analog and Digital Supply Voltage Input.
9	11	A	Digital Address "A" Input.
8	10	B	Digital Address "B" Input.
7	9	C	Digital Address "C" Input.
6	8	GND	Ground. Connect to digital ground.
5	7	NC	No Connect.
4	6	/ENABLE	Digital Enable Input. Normally connected to GND.
Exposed Pad	-	EP	Exposed Pad. Connect EP to GND.

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FUNCTION TABLE

/ENABLE INPUT	SELECT INPUTS			ON SWITCHES
	C	B	A	
H	X	X	X	All Switches Open.
L	L	L	L	X-X0
L	L	L	H	X-X1
L	L	H	L	X-X2
L	L	H	H	X-X3
L	H	L	L	X-X4
L	H	L	H	X-X5
L	H	H	L	X-X6
L	H	H	H	X-X7

X=Don't care

NOTE: Input and output pins are identical and interchangeable. Either maybe considered an input or output; signals pass equally will in either direction.

ELECTRICAL CHARACTERISTICS

(V_{CC}= 5.0V, typical values are at T_A=+25℃, unless otherwise specified.)

| PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNITS
ANALOG SWITCH						
Analog Signal Range	V_{X-}, V_X		GND		V_{CC}	mV
On-Resistance	R_{ON}	I_X=1mA		48	58	Ω
On-Resistance Match Between Channels	ΔR_{ON}	I_X=1mA		1.5	5	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	I_X=1mA		17	25	Ω
X_ Off Leakage Current	$I_{X\_(OFF)}$	$V_{X\_}$=4.5V or 0V			1	uA
X Off Leakage Current	$I_{X(OFF)}$	V_X=4.5V or 0V			1	uA
X On Leakage Current	$I_{X(ON)}$	V_X=4.5V or 0V			1	uA
DIGITAL I/O						
Input Voltage High	V_{IH}	A,B,C,/ENABLE Pin	1.7			V
Input Voltage Low	V_{IL}	A,B,C,/ENABLE Pin			0.5	V
Input Current High	I_{IH}	V_A, V_B, V_C, $V_{/ENABLE}$=V_{CC}			1	uA
Input Current Low	I_{IL}	V_A, V_B, V_C, $V_{/ENABLE}$=0V			1	uA
DYNAMIC CHARACTERISTICS						
Address Transition Time	t_{TRANS}	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		85		ns
/ENABLE Turn-On Time	t_{ON}	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		60		ns
/ENABLE Turn-Off Time	t_{OFF}	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		70		ns
Internal A, B, C Rise Time	t_R	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		45		ns
Internal A, B, C Fall Time	t_F	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		50		ns
Break-Before-Make Time Delay	t_D	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		50		ns
Charge Injection	Q	R_S=0Ω, C_L=1nF		6		pC
ANALOG SWITCH						
Input Off-Capacitance	$C_{X\_(OFF)}$	$V_{X\_}$=0V, f=1MHz		4.7		pF
Output Off-Capacitance	$C_{X(OFF)}$	$V_{X\_}$=0V, f=1MHz		12.7		pF
Output On-Capacitance	$C_{X(ON)}$	$V_{X\_}$=0V, f=1MHz		16		pF
-3dB Bandwidth	BW	R_L=50Ω		300		MHz
Off Isolation	O_{ISO}	RL=50Ω, f=1MHz		-83		dB
Total Harmonic Distortion	THD	R_L=600Ω, $5V_{P\_P}$, f=20Hz to 20kHz		0.7		%
Power Supply						
Power Supply Range	V_{CC}		2.5		5.5	V
Power Supply Current	I_{CC}	V_{CC}=5V, V_A, V_B, V_C, $V_{/ENABLE}$=V_{CC} or 0		0.001	6	uA

ELECTRICAL CHARACTERISTICS

(V_{CC}= 3.3V, typical values are at T_A=+25℃, unless otherwise specified.)

PARAMETER	SYM	CONDITIONS	MIN	TYP	MAX	UNITS
ANALOG SWITCH						
Analog Signal Range	V_{X-}, V_X		GND		V_{CC}	mV
On-Resistance	R_{ON}	I_X=1mA		80	110	Ω
X_ Off Leakage Current	$I_{X\_(OFF)}$	$V_{X\_}$=1V, 3V			1	uA
X Off Leakage Current	$I_{X(OFF)}$	V_X=1V, 3V			1	uA
X On Leakage Current	$I_{X(ON)}$	V_X=1V, 3V			1	uA
DIGITAL I/O						
Input Voltage High	V_{IH}		1.7			V
Input Voltage Low	V_{IL}				0.5	V
Input Current High	I_{IH}	V_A, V_B, V_C, $V_{/ENABLE}$=V_{CC}		1	1000	nA
Input Current Low	I_{IL}	V_A, V_B, V_C, $V_{/ENABLE}$=0V		1	1000	nA
DYNAMIC CHARACTERISTICS						
Address Transition Time	t_{TRANS}	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		150		ns
/ENABLE Turn-On Time	t_{ON}	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		110		ns
/ENABLE Turn-Off Time	t_{OFF}	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		100		ns
Internal A, B, C Rise Time	t_R	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		80		ns
Internal A, B, C Fall Time	t_F	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		85		ns
Break-Before-Make Time Delay	t_D	$V_{X\_}$=3V, R_L=300Ω, C_L=35pF		80		ns
ANALOG SWITCH						
-3dB Bandwidth	BW	R_L=50Ω		300		MHz
Charge Injection	Q	R_S=0Ω, C_L=1nF		6		pC
POWER SUPPLY						
Power Supply Current	I_{CC}	V_{CC}=5V, V_A, V_B, V_C, $V_{/ENABLE}$=V_{CC} or 0		0.001	3	uA
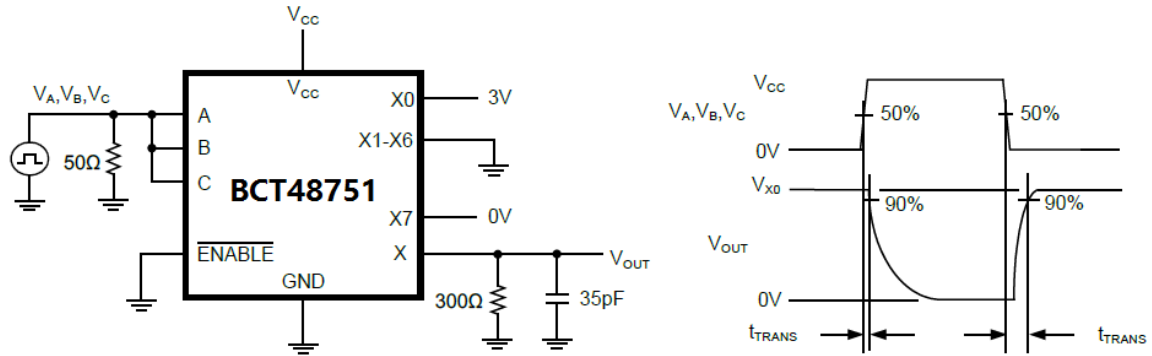
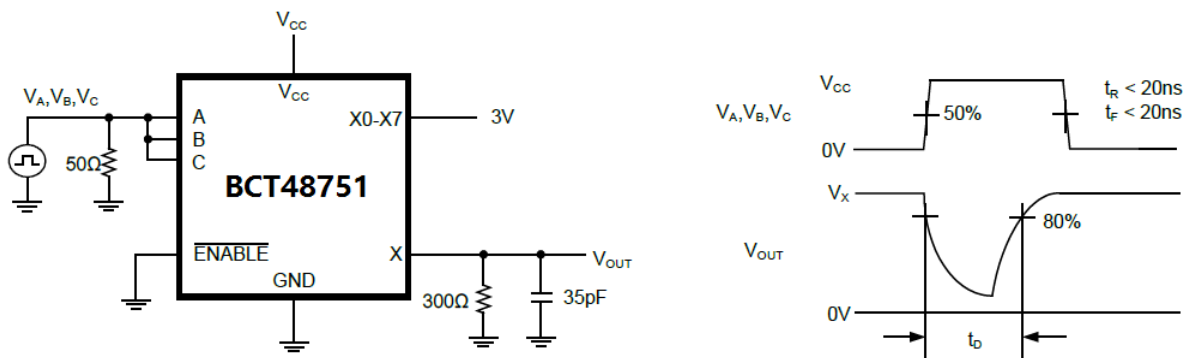## TEST CIRCUITS

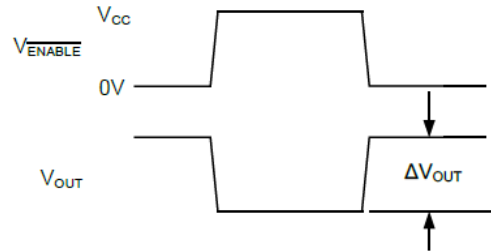**Test Circuit 1. Address Transition Times (t$_{TRANS}$)**
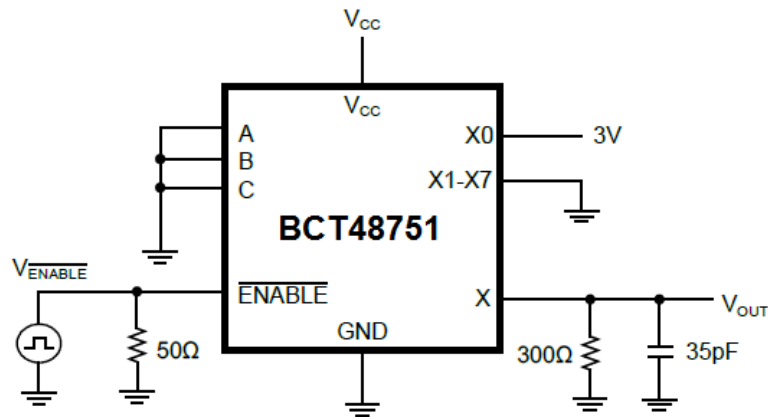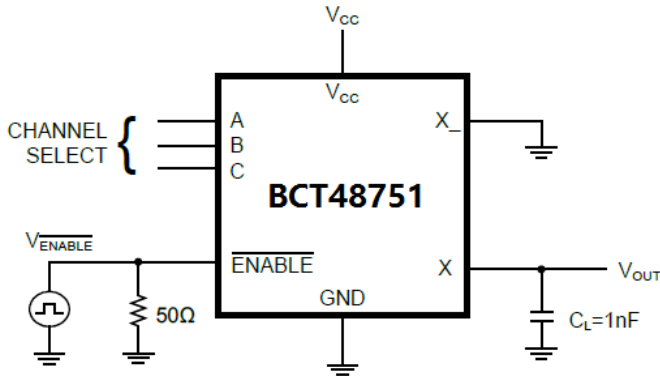

Test Circuit 2. Switching Times (t$_{ON}$, t$_{OFF}$)
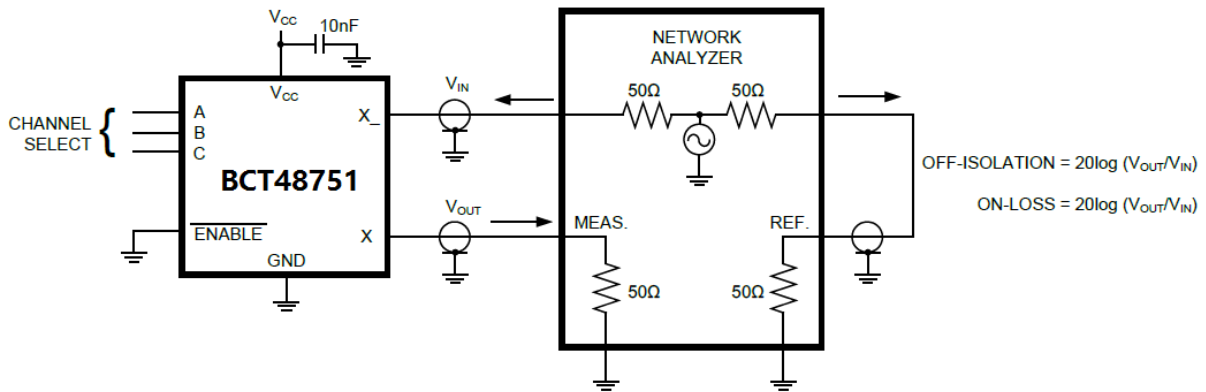

**Test Circuit 3. Break-Before-Make Time Delay (t$_D$)**

TEST CIRCUITS

ΔV$_{OUT}$ IS THE MEASURED VOLTAGE DUE TO CHARGE
TRANSFER ERROR Q WHEN THE CHANNEL TURNS OFF.
$Q = \Delta V_{OUT} \times C_L$

Test Circuit 4. Charge Injection (Q)

OFF-ISOLATION = $20\log (V_{OUT}/V_{IN})$

ON-LOSS = $20\log (V_{OUT}/V_{IN})$

MEASUREMENTS ARE STANDARDIZED AGAINST SHORT AT SOCKET TERMINALS.
OFF-ISOLATION IS MEASURED BETWEEN COM AND "OFF" NO TERMINAL ON EACH SWITCH.
ON-LOSS IS MEASURED BETWEEN COM AND "ON" NO TERMINAL ON EACH SWITCH.
SIGNAL DIRECTION THROUGH SWITCH IS REVERSED; WORST VALUES ARE RECORDED.

Test Circuit 5. Off Isolation, On Loss
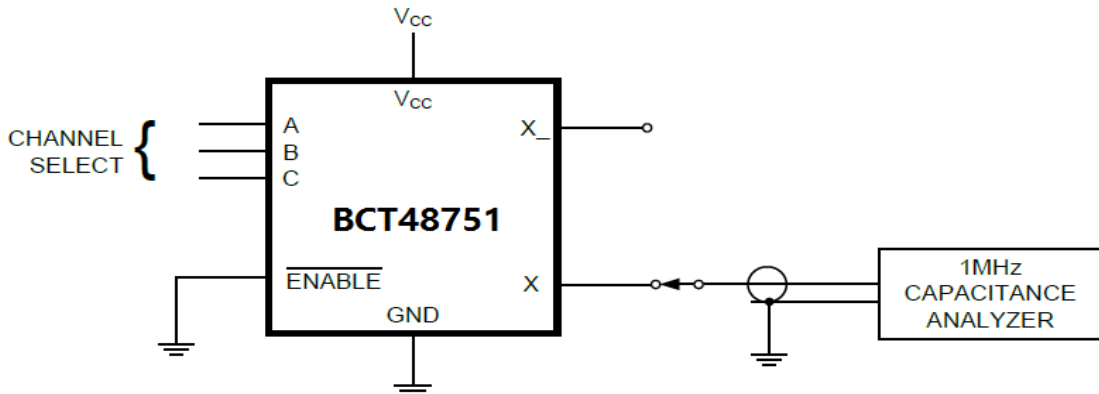
Test Circuit 6. Capacitance

APPLICATION NOTES

Power-Supply Considerations
Overview

The BCT48751 construction is typical of most CMOS analog switch. It supports single power supply. V_{CC} and GND used to drive the internal CMOS switches and set the limits of the analog voltage on any switch. Reserve ESD protection diodes are internally connected between each analog-signal pin and both V_{CC} and GND. If any analog signal exceeds V_{CC} or GND, one of these diodes will conduct. During normal operation, these and other reverse-biased ESD diodes leak, forming the only current drawn from V_{CC} or GND.

Virtually all the analog leakage current comes from the ESD diodes. Although the ESD diodes on a given signal pin are identical and therefore fairly well balanced, they are reverse biased differently. Each is biased by either V_{CC} or GND and the analog signal. This means their leakages will vary as the signal varies. The difference in the two diode leakages to the V_{CC} and GND pins constitutes the analog-signal-path leakage current. All analog leakage current flows between each pin one of the supply terminals, not to the other switch terminal. This is why both sides of a given switch can show leakage currents of either the same or opposite polarity.

Over-Voltage Protection

Proper power-supply sequencing is recommended for the CMOS device. Do not exceed the absolute maximum ratings because stresses beyond the listed ratings can cause permanent damage to the devices. Always sequence VCC on first, followed by the logic inputs and analog signals. If power-supply sequencing is not possible, add one 100 resistor in series with the supply VCC pin for over-voltage protection (Figure 1).
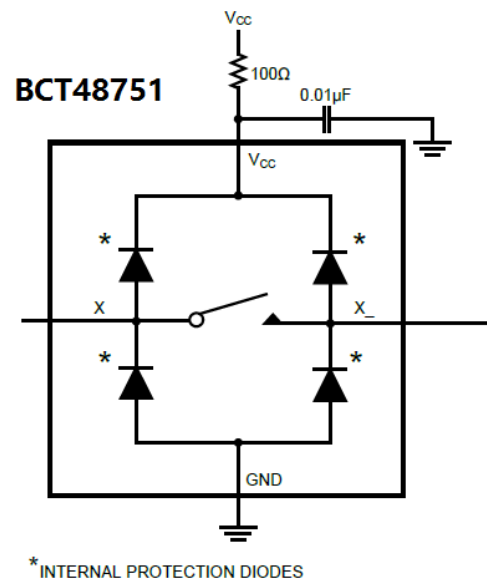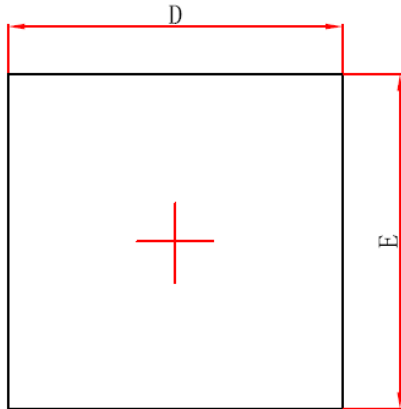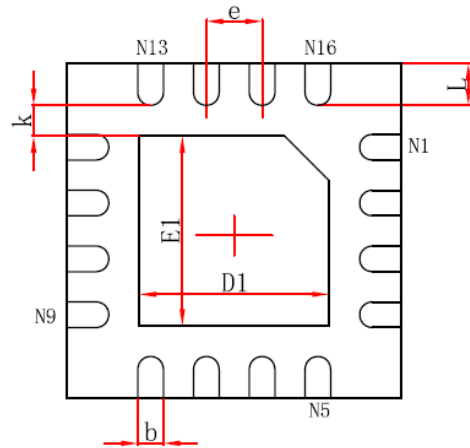

Figure 1. Over-Voltage Protection Using External Resistor

PACKAGE OUTLINE DIMENSIONS

QFN3x3-16L

Top View

Bottom View
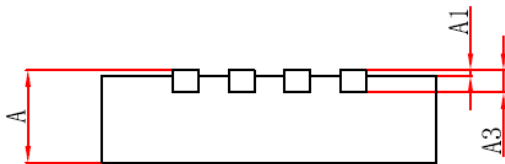
Side View

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	**Max**	**Min**	**Max**
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF		0.008REF	
D	2.924	3.076	0.115	0.121
E	2.924	3.076	0.115	0.121
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	0.280	0.007	0.011
e	0.500TYP.		0.020TYP.	
L	0.324	0.476	0.013	0.019

QFN3X3-16L Surface Mount Package

PACKAGE OUTLINE DIMENSIONS

SOP16
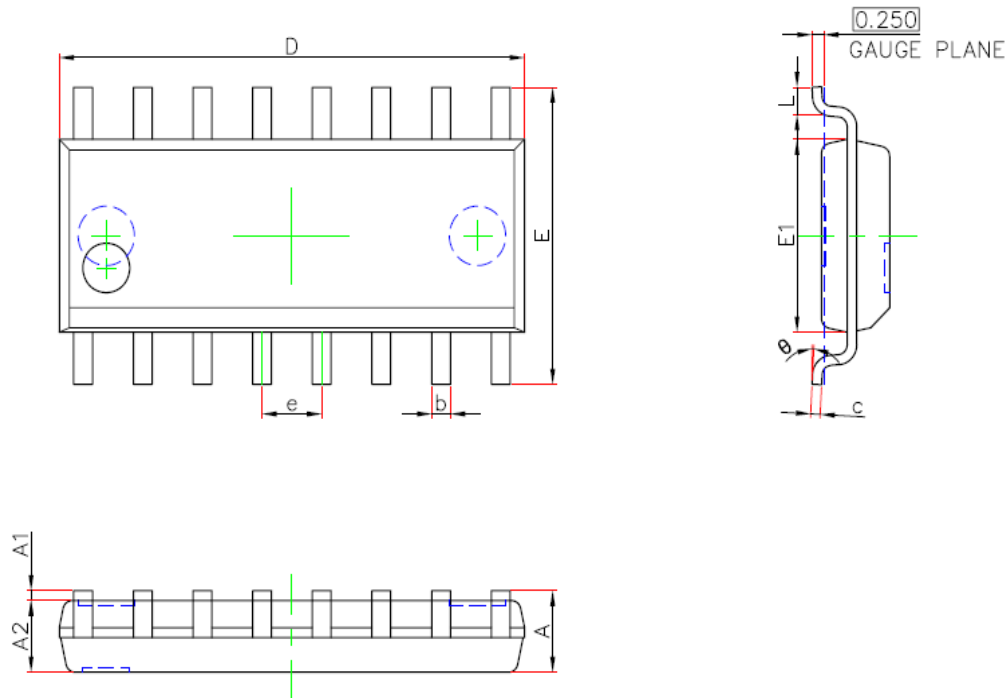
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A		1.750		0.069
A1	0.150	0.250	0.006	0.010
A2	1.400	1.500	0.055	0.059
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.000	0.386	0.394
e	1.270(BSC)		0.050(BSC)	
E	5.900	6.100	0.232	0.240
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SOP16 Surface Mount Package

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PACKAGE OUTLINE DIMENSIONS

SSOP16
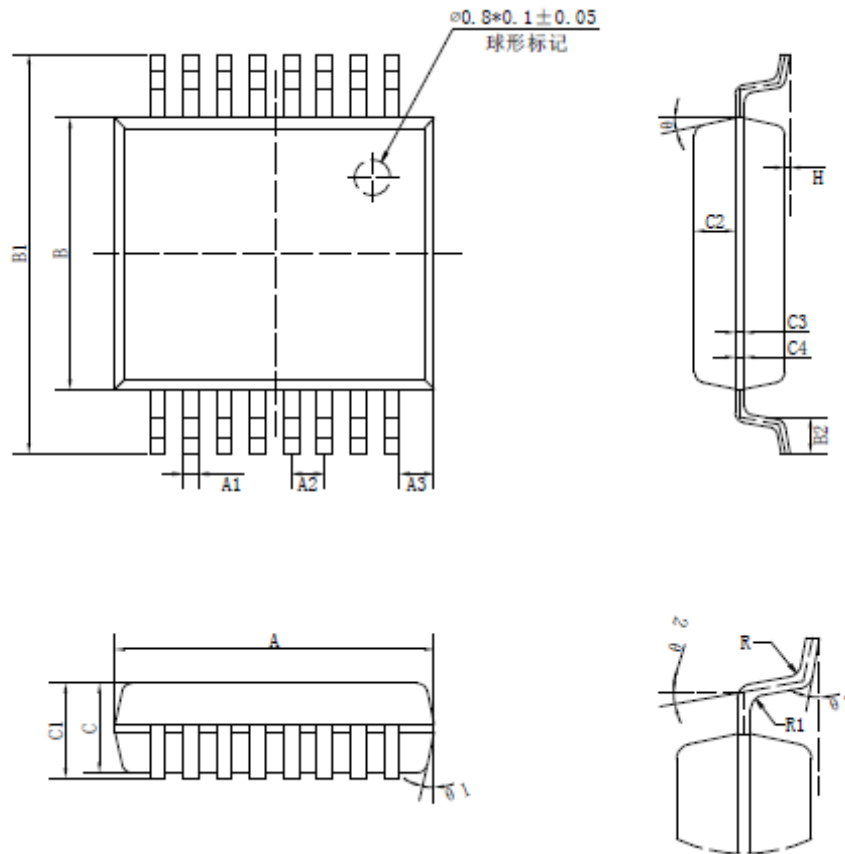
Symbol	Min	Max	Symbol	Min	Max
A	6.15	6.25	C3	0.152 TYP	
A1	0.30 TYP		C4	0.172 TYP	
A2	0.65 TYP		H	0.05	0.06
A3	0.675 TYP		θ	12° TYP	
B	5.25	5.35	θ1	12° TYP	
B1	7.65	7.95	θ2	10° TYP	
B2	0.60	0.80	θ3	0°	8°
C	1.70	1.80	R	0.20 TYP	
C1	1.75	1.95	R1	0.15 TYP	
C2	0.799 TYP				

SSOP16 Surface Mount Package (unit: mm)

PACKAGE OUTLINE DIMENSIONS

TSSOP16
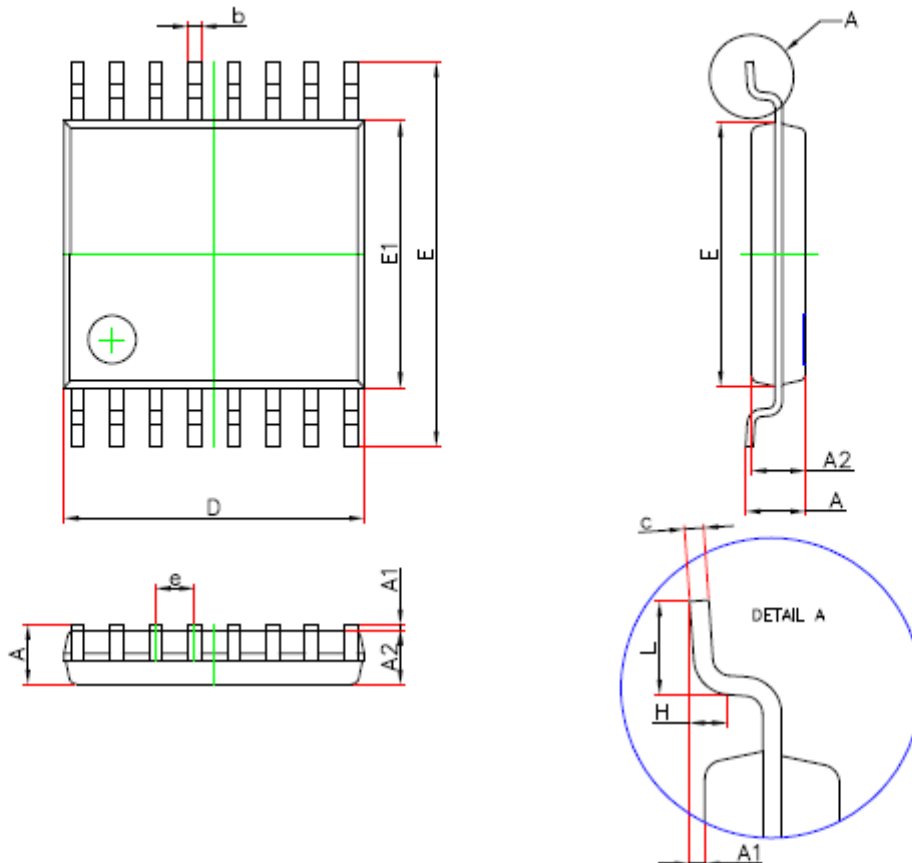
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	—	1.200	—	0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.900	5.100	0.193	0.201
E	6.250	6.550	0.246	0.258
E1	4.300	4.500	0.169	0.177
e	0.650(BSC)		0.026(BSC)	
L	0.500	0.700	0.020	0.028
H	0.250(TYP)		0.010(TYP)	
θ	1°	7°	1°	7°

TSSOP16 Surface Mount Package

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单击下面可查看定价，库存，交付和生命周期等信息

>>Broadchip(广芯电子)