Ultra Low ON-Resistance, Low Voltage, Dual, SPDT Analog Switch

Features

- Wide Power Supply Range:1.65V to 5.5V
- Low On-Resistance:
  $R_{ON(NC)}$ = 0.3Ω (VCC=5V)
  $R_{ON(NO)}$ = 0.3Ω (VCC=5V)
- Low On-Resistance Flatness:
  $R_{FLAT(NC)}$ = 0.08Ω (VCC=5V)
  $R_{FLAT(NO)}$ = 0.08Ω (VCC=5V)
- -3dB Bandwidth: 33MHz
- Rail-to-Rail Signal Range
- High Off-Isolation: -66dB (f=100 kHz)
- Crosstalk Rejection: -74dB
- Low Total Harmonic Distortion: 0.035%
- Available in MSOP10 and QFN1.8x1.4-10L packages

Applications

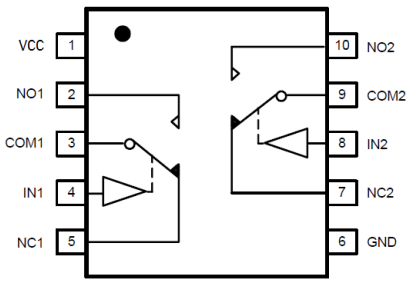
- Wireless Handsets
- Portable Electronic Devices
- Relay Replacement
- PDAs
- Audio & Video Signal Routing
- PCMCIA Cards
- Computer Peripherals
- Modems

Description

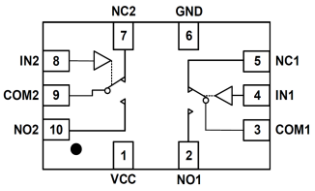
The BL1555 is a Dual Wide-Bandwidth, fast single-pole double-throw (SPDT) CMOS switch featuring an On-Resistance of 0.3 ohm at V_{DD}=5V and wide power supply range from 1.65V to 5.5V. It can be used as an analog switch or as a low-delay bus switch. Break-before-make function for both parts eliminates signal disruption during switching from preventing both switches being enabled simultaneously.

Pin Configuration

MSOP10



QFN1.8x1.4-10L



Pin Description

Pin Name	Type	Description
VCC	PWR	Power Supply
GND	Ground	Ground
COMx	Input/Output	Data Port
NCx	Input/Output	Data Port
NOx	Input/Output	Data Port
IN_X	Input	Logic Control Signal

** X = 1or 2

Function Table

IN_X	Function
0	NC_X Connected to COM_X
1	NO_X Connected to COM_X

Ordering Information

Order No.	Package	Packing
BL1555QN	QFN1.8×1.4-10L	Tape and Reel, 3000
BL1555MM	MSOP10	Tape and Reel, 3000

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Units
DC Supply Voltage	V_{CC}	-0.5	6	V
DC Switch Voltage	V_{NCX}/ V_{NOX}/ V_{COMX}	-0.5	V_{SUP} + 0.3	V
DC Input Voltage	V_{INX}	-0.5	6	V
Continuous Current	$I_{(NCX/NOX/COMX)}$	-250	+250	mA
Peak Current(1)	$I_{PEAK(NCX/NOX/COMX)}$	-500	+500	mA
Storage Temperature Range	T_{STG}	-65	150	℃

Notes:

(1) Pulsed at 1ms, 50% duty circle

(2) Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

(3) Control input(V_{INX}) must be held HIGH or LOW, and mustn’t be floated.

RECOMMENDED OPERATING CONDITIONS

DC Supply Voltage (V_{CC}) ……1.65V to 5.5V

Switch Input Voltage (V_S) ……...0V to V_{CC}

Control Input Voltage (V_{IN}) …… 0V to V_{CC}

Operation Temperature (TA) ……..-40℃ to +125℃

DC ELECTRICAL CHARACTERISTICS

（VCC=5V，TA=+25℃，unless otherwise noted）

Parameter	Symbol	Conditions	Guaranteed Limit			Unit
			Min.	Typ.	Max.	
Analog Switch						
Analog Signal Range	$V_{NOX}/V_{NCX}/V_{COMX}$		0		V_{CC}	V
NC On-Resistance	$R_{ON(NC)}$	V_{CC} = 5V; I_{COM} =100mA ; V_{NC} = 0 to V_{CC}		0.3	0.6	Ω
NO On-Resistance	$R_{ON(NO)}$	V_{CC} = 5V; I_{COM} =100mA ; V_{NO}= 0 to V_{CC}		0.3	0.6	Ω
NC On-Resistance Flatness(1)	$R_{FLAT(NC)}$	V_{CC} = 5V; I_{COM} =100mA ; V_{NC} = 0 to V_{CC}		0.08	0.2	Ω
NO On-Resistance Flatness(1)	$R_{FLAT(NO)}$	V_{CC} = 5V; I_{COM} =100mA ; V_{NO} = 0 to V_{CC}		0.08	0.2	Ω
On-Resistance Match Between Channels(2)	$\triangle R_{ON}$	V_{CC} = 5V; I_{COM} =100mA ; V_{NC} /V_{NO}=1.5		0.03	0.09	Ω
NC or NO Off Leakage Current	$I_{OFF(NC)}$ or $I_{OFF(NO)}$	V_{CC} = 5V; V_{NO} or V_{NC} = 3V, 0.3V; V_{COM} = 0.3V, 3 V		4		nA
COM On Leakage Current	$I_{ON(COM)}$	V_{CC} = 5V; V_{NO} or V_{NC} = 3V, 0.3V; V_{COM} = 0.3V, 3 V or floating		4		nA
Digital I/O						
Input Voltage High	V_{IH}	Minimum High Level Input Voltage	1.8			V
Input Voltage Low	V_{IL}	Maximum Low Level Input Voltage			0.6	V
Input Hysteresis	I_H	V_{CC} = 5V		200		mV
Input Leakage Current	I_{IN}	V_{IN} = 0 or Vcc	-1		1	uA

DC ELECTRICAL CHARACTERISTICS

（VCC=2.7V，TA=+25℃，unless otherwise noted）

Parameter	Symbol	Conditions	Guaranteed Limit			Unit
			Min.	Typ.	Max.	
Analog Switch						
Analog Signal Range	$V_{NOX}/V_{NCX}/V_{COMX}$		0		V_{CC}	V
NC On-Resistance	$R_{ON(NC)}$	V_{CC} = 2.7V; I_{COM} =100mA ; V_{NC} = 0 to V_{CC}		0.6	1.1	Ω
NO On-Resistance	$R_{ON(NO)}$	V_{CC} = 2.7V; I_{COM} =100mA ; V_{NO}= 0 to V_{CC}		0.6	1.1	Ω

NC On-Resistance Flatness(1)	$R_{FLAT(NC)}$	V_{CC} = 2.7V; I_{COM} =100mA ; V_{NC} = 0 to V_{CC}		0.26	0.4	Ω
NO On-Resistance Flatness(1)	$R_{FLAT(NO)}$	V_{CC} = 2.7V; I_{COM} =100mA ; V_{NO} = 0 to V_{CC}		0.26	0.4	Ω
On-Resistance Match Between Channels(2)	$\triangle R_{ON}$	V_{CC} = 2.7V; I_{COM} =100mA ; V_{NC} /V_{NO}=1.5		0.05	0.1	Ω
NC or NO Off Leakage Current	$I_{OFF(NC)}$ or $I_{OFF(NO)}$	V_{CC} = 2.7V; V_{NO} or V_{NC} = 2.7V, 0.3V; V_{COM} = 0.3V, 2.7V		4		nA
COM On Leakage Current	$I_{ON(COM)}$	V_{CC} = 2.7V; V_{NO} or V_{NC} = 2.7V, 0.3V; V_{COM} = 0.3V, 2.7V or floating		4		nA
Digital I/O						
Input Voltage High	V_{IH}	Minimum High Level Input Voltage	1.3			V
Input Voltage Low	V_{IL}	Maximum Low Level Input Voltage			0.6	V
Input Hysteresis	I_H	V_{CC} = 2.7V		200		mV
Input Leakage Current	I_{IN}	V_{IN} = 0 or Vcc	-1		1	uA

Note:

(1) Flatness is defined as the difference between the maximum and minimum value of on resistance as measured over the specified analog signal ranges.

(2) $\triangle R_{ON}= R_{ON(MAX)} - R_{ON(MIN)}$, between NC1 and NC2 or between NO1 and NO2.

DYNAMIC CHARACTERISTICS

（VCC=3.3V，TA=+25℃，unless otherwise noted）

Parameter	Symbol	Conditions	Guaranteed Limit			Unit
			Min.	Typ.	Max.	
AC ELECTRICAL CHARACTERISTICS						
Turn-On Time	t_{ON}	V_{CC} = 5V; V_{NO} or V_{NC} = 1.5V, R_L = 50Ω; C_L = 35pF, Figure1		42		ns
		V_{CC} = 3.3; V_{NO} or V_{NC} = 1.5V, R_L = 50Ω; C_L = 35pF, Figure1		43		
Turn-Off Time	t_{OFF}	V_{CC} = 5V; V_{NO} or V_{NC} = 1.5V, R_L = 50Ω; C_L = 35pF, Figure1		25		ns
		V_{CC} = 3.3; V_{NO} or V_{NC} = 1.5V, R_L = 50Ω; C_L = 35pF, Figure1		30		
Break-Before-Make Time	t_{BBM}	V_{CC} = 5V; V_{NO} or V_{NC} = 1.5V, R_L = 50Ω; C_L = 35pF, Figure2		22		ns
		V_{CC} = 3.3V; V_{NO} or V_{NC} = 1.5V, R_L = 50Ω; C_L = 35pF, Figure2		22		
NC OFF Capacitance	$C_{OFF(NC)}$	f = 1MHz, Figure6		82		pF
NO OFF Capacitance	$C_{OFF(NO)}$	f = 1MHz, Figure6		70		pF
NC ON Capacitance	$C_{ON(NC)}$	f = 1MHz, Figure7		255		pF

NO ON Capacitance	$C_{ON(NO)}$	f = 1MHz, Figure7		245		pF
ADDITIONAL APPLICATION CHARACTERISTICS						
3dB Bandwidth	f_{3dB}	Figure8		33		MHz
Charge Injection	Q	VCC=5V; V_{GEN} = 0V; R_{GEN} = 0Ω; C_L = 1nF; Figure3		58		pC
		VCC=3.3V; V_{GEN} = 0V; R_{GEN} = 0Ω; C_L = 1nF; Figure3		45		
Off Isolation(1)	V_{Iso}	VCC=5V; f = 100kHz; R_L = 50Ω; C_L = 5pF; V_{COM} = 1 V_{RMS}; Figure4		-66		dB
Crosstalk (2)	V_{CT}	VCC=5V; f = 100kHz; R_L = 50Ω; C_L = 5pF; V_{COM} = 1 V_{RMS}; Figure5		-74		dB
Total Harmonic Distortion	THD	V_{CC} = 5V; R_L = 32Ω; V_{IN} = 2.8V_{P-P};		0.035		%
Supply						
Power Supply Range	V_{cc}		1.65		5.5	V
Maximum Quiescent Supply Current	I_{cc}	V_{CC} = 5.5V; V_{IN} = V_{CC} or 0			1	uA

Note:

(1) Off Channel Isolation = $20\log_{10}[(V_{NO\backslash NC})/V_{COM}]$

(2) Between any two switches

TEST SETUP CIRCUITS

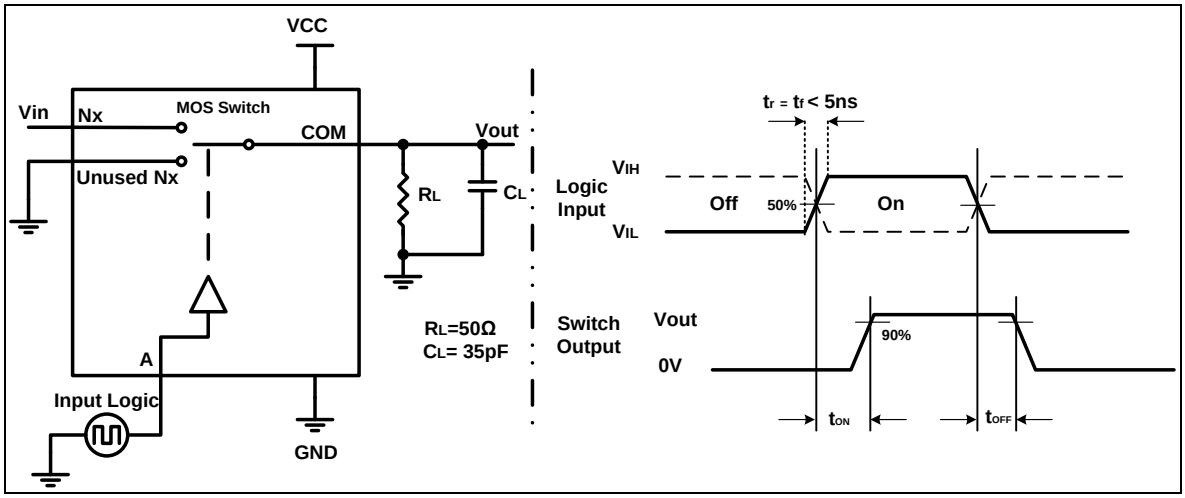


Figure1. AC Test Circuit & Waveforms

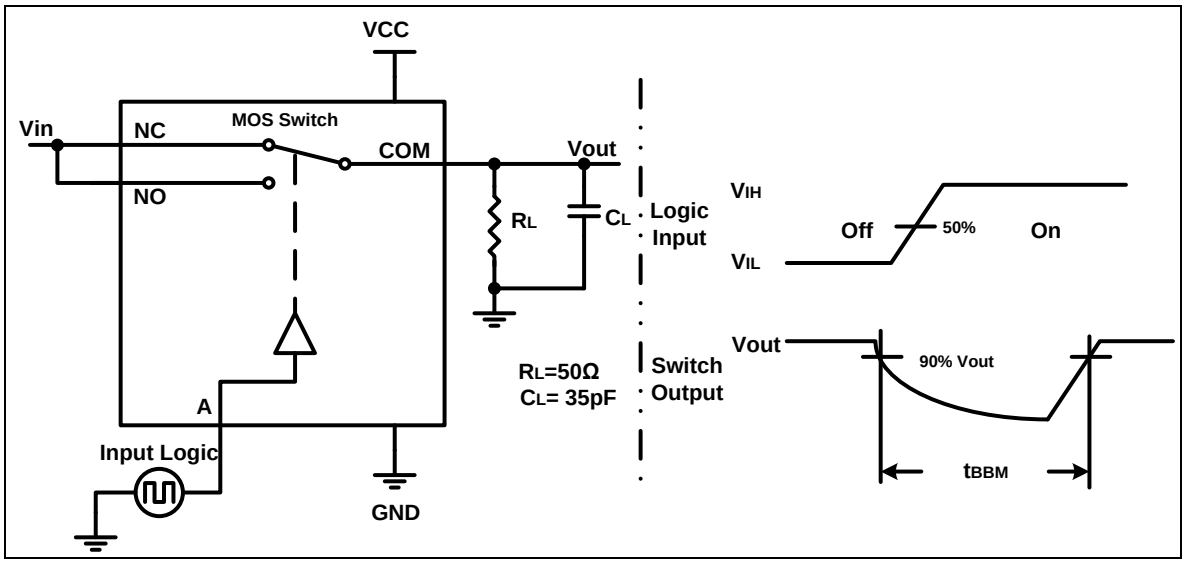


Figure2. Break-Before-Make Time (t_{BBM})

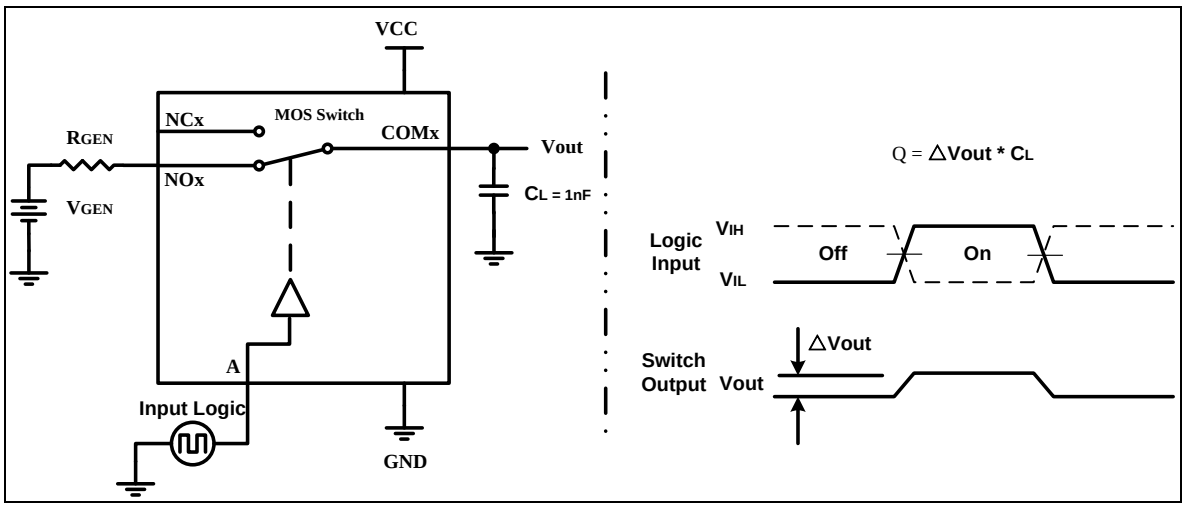


Figure3. Charge Injection (Q)

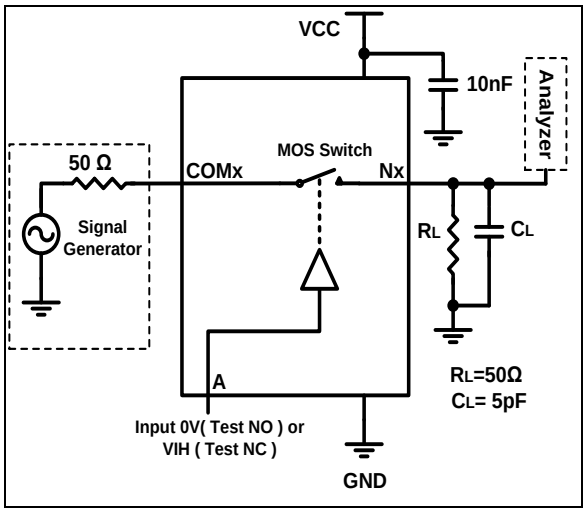


Figure4. Off Isolation (V_{ISO})

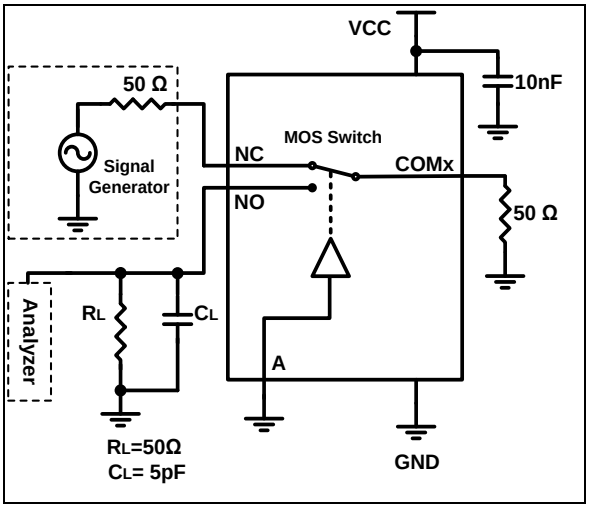


Figure5. Cross Talk (V_{CT})

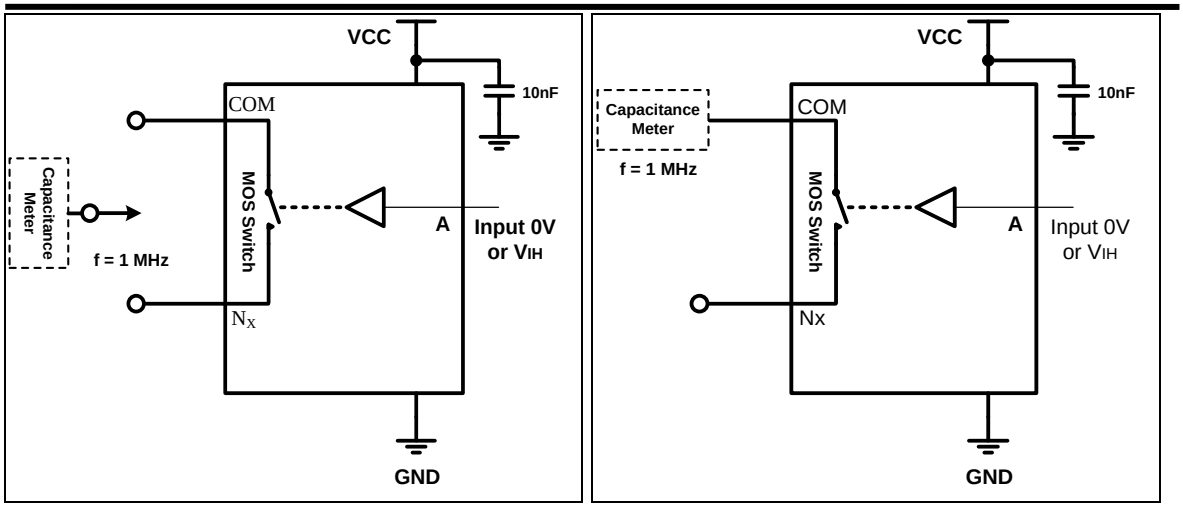


Figure6. Channel Off Capacitance($C_{OFF(NX)}$) Figure7. Channel On Capacitance($C_{ON(NX)}$)

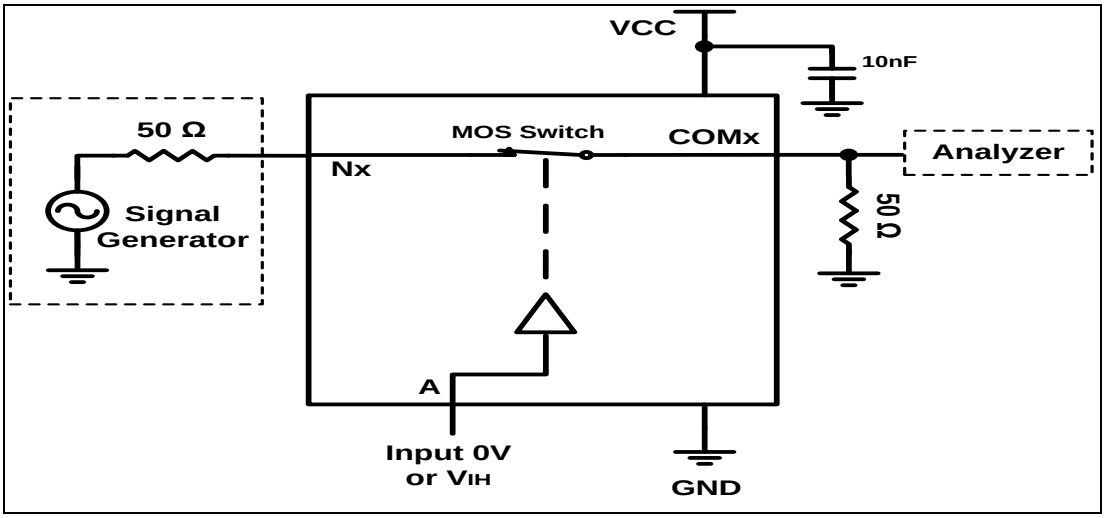
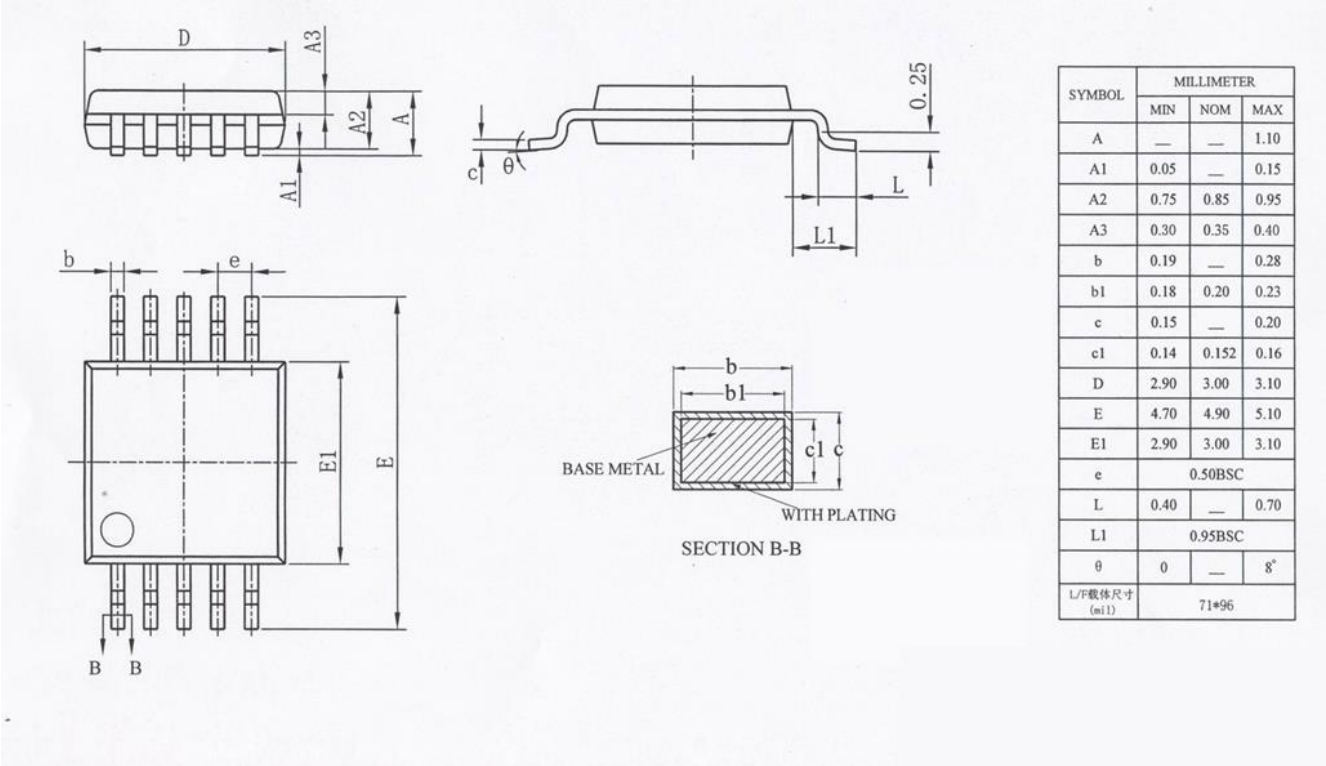


Figure8. -3dB Bandwidth (f_{3dB})

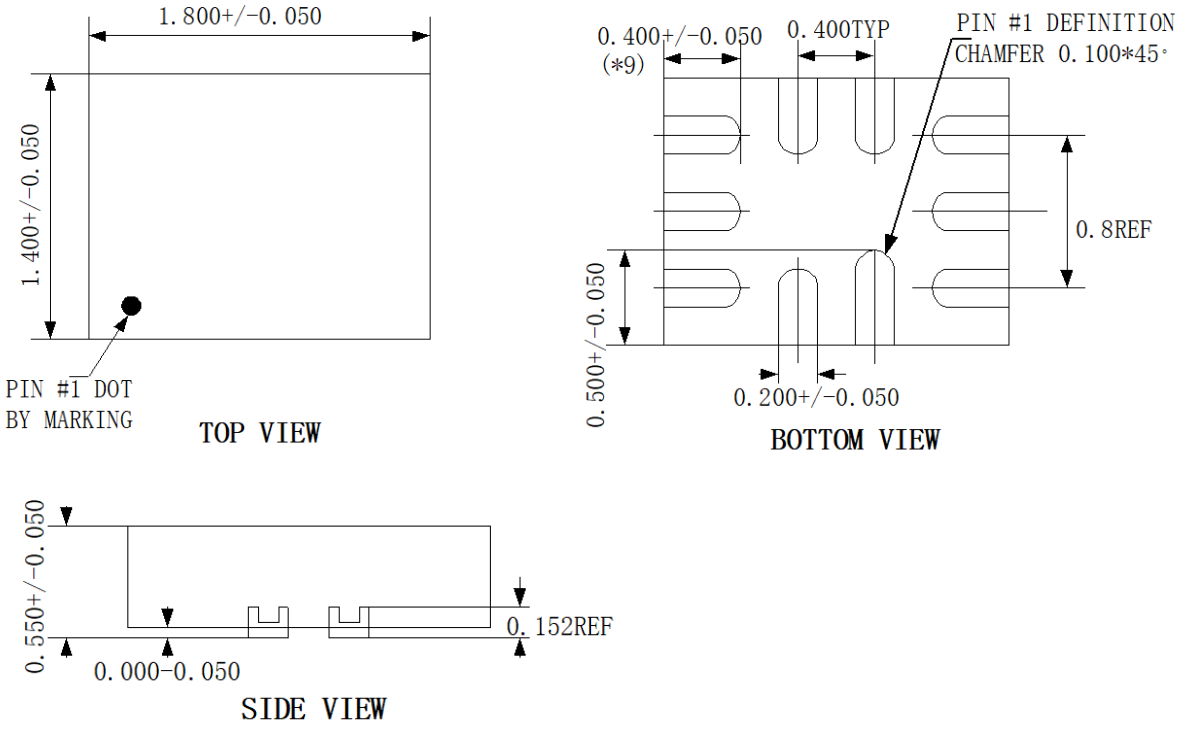
PACKAGE OUTLINE DIMENSIONS

MSOP10



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.10
A1	0.05	—	0.15
A2	0.75	0.85	0.95
A3	0.30	0.35	0.40
b	0.19	—	0.28
b1	0.18	0.20	0.23
c	0.15	—	0.20
c1	0.14	0.152	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.50BSC		
L	0.40	—	0.70
L1	0.95BSC		
θ	0	—	8°
L/F载体尺寸 (mil)	71*96		

QFN1.8×1.4-10L



NOTE: All linear dimensions are in millimeters.