

GT4157

2.2 Ω Low Voltage SPDT Analog Switch

1 Features	2 Application
- High bandwidth: 300 MHz - Supply range: +1.65 V to +5.5 V - Low on-state resistance: 2.2 Ω @ 4.5 V - Break-before-make switching - Rail-to-Rail signal range - TTL/CMOS compatible - Operation temperature range: -40°C to +85°C - Micro size packages: SOT23-6, SC70-6, DFN1.1*0.9-6L	- Cell phones - PADs - Portable instrumentation - Battery powered communications - Computer peripherals

3 Description	Circuit Diagram
The GT4157 is a single-pole double-throw (SPDT) analog switch that is designed to operate from 1.65V to 5.5V. The GT4157 device can handle both analog and digital signals. It features high-bandwidth (300 MHz) and low on-resistance (2.2 Ω @ 4.5 V). Applications: signal gating, chopping, modulation or demodulation(modem), and signal multiplexing for analog-to-digital and digital-to-analog conversion systems.	

4 Device Summary, Pin and Packages

Table 4-1. Device Summary⁽¹⁾

Serial Name	Part Name	Package	Body Size (Nom)	Marking ⁽²⁾⁽⁴⁾	MSL ⁽³⁾	Package Qty
GT4157	GT4157S6	SOT23-6	2.92mm×1.65mm×1.10mm	GT4157 XXXXX	3	Tape and Reel,3000
	GT4157C6	SC70-6	2.10mm×1.25mm×1.00mm	4157 XXXX	3	Tape and Reel,3000
	GT4157D6	DFN1.1*0.9-6L	1.10mm×0.90mm×0.45mm	4157 XXXX	3	Tape and Reel,10000

(1) For all available packages, please contact product.

(2) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.

(3) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

(4) "XXXXX" in Marking will be appeared as the batch code.

4 Device Summary, Pin and Packages(Continued)

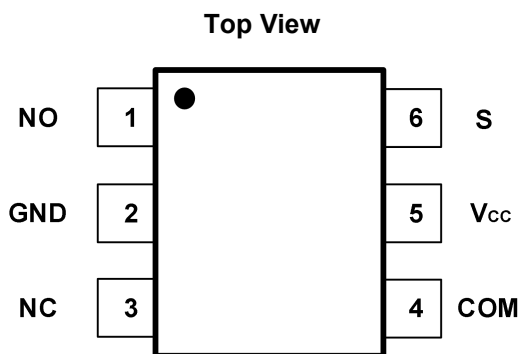


Fig.4-1. GT4157: S6 (SOT23-6) Package
GT4157: C6 (SC70-6) Package

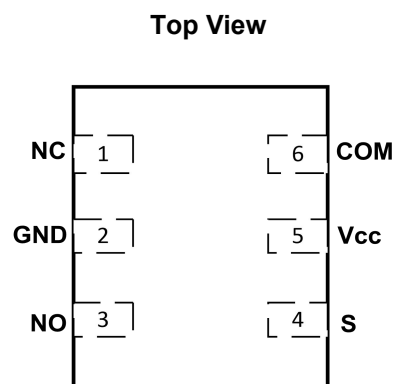


Fig.4-2. GT4157: D6 (DFN1.1*0.9-6L) Package

Table 4-2 Pin definition

Pin			Description
Name	S6 C6	D6	
NO	1	3	Data port
GND	2	2	Ground
NC	3	1	Data port (normally closed)
COM	4	6	Common output data port
V _{cc}	5	5	Power input
S	6	4	Logic control

Table 4-3 Function Table

LOGIC	Function
0	NC connected to COM
1	NO connected to COM

5 Voltage, Temperature, ESD and Thermal Ratings

5.1 Absolute Maximum Ratings⁽¹⁾

Parameters		Min.	Max.	Unit
V _{CC}	Supply voltage range	-0.3	6.0	V
V _{IN}	Input voltage	-0.3	6.0	V
	Analog,digital voltage range ⁽²⁾	-0.3	(V _{CC})+0.3	V
	Continuous current NO,NC or COM	-100	+100	mA
I _{PEAK}	Continuous channel current	-160	+160	mA
T _J	Junction temperature under bias	-65	150	°C
T _{stg}	Storage temperature range	-65	150	°C

(1) 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 under "Recommended Operating Conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

5.2 ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic discharge	Human-Body Model (HBM) ⁽¹⁾	2.5 K	V
		Charged-Device Model (CDM) ⁽²⁾	2 K	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

5.3 Recommended Operating Conditions⁽¹⁾

Over operating free-air temperature range (unless otherwise noted)

Symbol	Parameter	Min	Max	Units
V _{CC}	Supply voltage	1.65	5.5	V
V _{IN}	Control input voltage	0	V _{CC}	V
	Switch input voltage	0	V _{CC}	V
V _{OUT}	Output voltage	0	V _{CC}	V
T _A	Ambient temperature	-40	85	°C

(1) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

5.4 Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT23-6	187.3	126.5	°C/W
SC70-6	214.7	127.1	°C/W

6 Electrical Specifications

6.1 DC Electrical Characteristics

$V_{CC}=1.65V$ to $5.5V$, FULL= $-40^{\circ}C$ to $+125^{\circ}C$. Typical values are at $T_A=+25^{\circ}C$ (unless otherwise noted)

Parameter	Symbol	Conditions	V_{CC}	Temp	Min	Typ	Max	Units
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}				0		V_{CC}	V
On-Resistance	R_{ON}	V_{NO} or $V_{NC}=1.5V$ $I_{COM}=-100mA$	4.5V	$+25^{\circ}C$		2.2	4.5	Ω
			3V	$+25^{\circ}C$		3.8	7	
			2.3V	$+25^{\circ}C$		6.9	12	
			1.65V	$+25^{\circ}C$		12	20	
On-Resistance Match Between Channels	ΔR_{ON}	$0 \leq V_{NO}$ or $V_{NC} \leq V_{CC}$, $I_{COM}=-100mA$	4.5V	$+25^{\circ}C$		0.04		Ω
			3V	$+25^{\circ}C$		0.08		
			2.3V	$+25^{\circ}C$		0.01		
			1.65V	$+25^{\circ}C$		0.02		
On-Resistance Flatness	RFLAT (ON)	$0 \leq V_{NO}$ or $V_{NC} \leq V_{CC}$, $I_{COM}=-100mA$	4.5V	$+25^{\circ}C$		0.6	1	Ω
			3V	$+25^{\circ}C$		1.7	3	
			2.3V	$+25^{\circ}C$		4.5	7	
			1.65V	$+25^{\circ}C$		8	15	
NC, NO Off Leakage Current	$I_{NC(OFF)}, I_{NO(OFF)}$	V_{NO} or $V_{NC}=1V, 4.5V, V_{COM}=4.5V, 1V$	5.5 V	Full			1	μA
NC, NO, COM On Leakage Current	$I_{NC(ON)}, I_{NO(ON)}, I_{COM(ON)}$	$V_{COM}=1V, 4.5V, V_{NO}$ or $V_{NC}=1V, 4.5V$, or floating	5.5 V	Full			1	μA
Input High Voltage	V_{INH}		3V	Full	1.7			V
Input Low Voltage	V_{INL}		3V	Full			0.5	V
Input Leakage Current	I_{IN}	$V_S=V_{CC}$ or 0	5.5 V	Full			1	μA
Power Supply Current	I_{CC}	$V_S=GND$ or V_{CC}	5.5 V	Full			1	μA

6 Electrical Specifications(Continued)

6.2 Switch And AC Characteristics

$V_{CC}=1.65V$ to $5.5V$, FULL= $-40^{\circ}C$ to $+125^{\circ}C$. Typical values are at $T_A=+25^{\circ}C$ (unless otherwise noted)

Parameter	Symbol	Conditions	V_{CC}	Temp	Min	Typ	Max	Units
Turn-On Time	t_{ON}	$V_{COM}=V_{CC}$, $R_L=300\Omega$, $C_L=35pF$	5V	$+25^{\circ}C$		6		ns
			3.3V			11		
Turn-Off Time	t_{OFF}	$V_{COM}=V_{CC}$, $R_L=300\Omega$, $C_L=35pF$	5V	$+25^{\circ}C$		7		ns
			3.3V			8		
Break-Before-Make Time Delay	t_{BBM}	$V_{NO1}=V_{NC1}=V_{NO2}=V_{NC2}=3V$ $R_L=300\Omega$, $C_L=35pF$	5V	$+25^{\circ}C$		6		ns
			3.3V			9		
Off Isolation	O_{ISO}	$R_L=50\Omega$, Switch OFF	5V	$+25^{\circ}C$		-47		dB
						-66		
Crosstalk Isolation	X_{TALK}	$R_L=50\Omega$, Switch OFF, $f=10MHz$	5V	$+25^{\circ}C$		-53		dB
-3dB Bandwidth	BW	$R_L=50\Omega$, Switch ON	5V	$+25^{\circ}C$		300		MHz
Charge Injection	Q	$C_L=1nF$, $V_{GEN}=0V$, $R_{GEN}=0\Omega$	5V	$+25^{\circ}C$		10		pC
NC,NO Off Capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	$f=1MHz$	5V	$+25^{\circ}C$		7	9	pF
NC,NO,COM On Capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$, $C_{COM(ON)}$	$f=1MHz$	5V	$+25^{\circ}C$		18	20	pF

7 Typical Characteristics

$V_{CC}=1.65V$ or $5.5V$, FULL= $-40^{\circ}C$ to $+125^{\circ}C$. Typical values are at $T_A=+25^{\circ}C$ (unless otherwise noted)

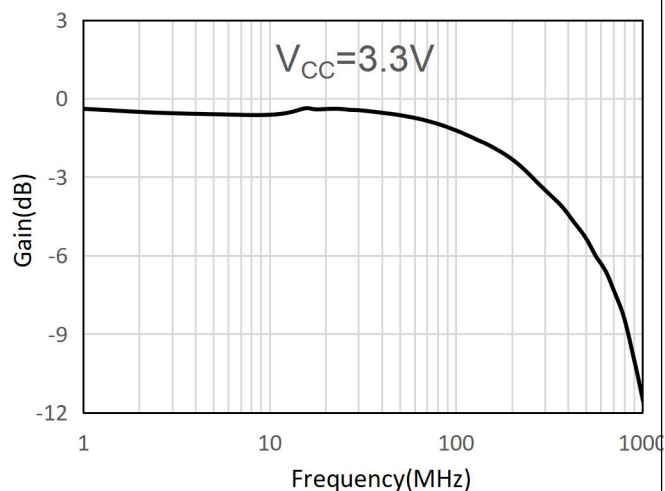


Fig.7-1. Bandwidth vs Frequency at 3.3V V_{CC}

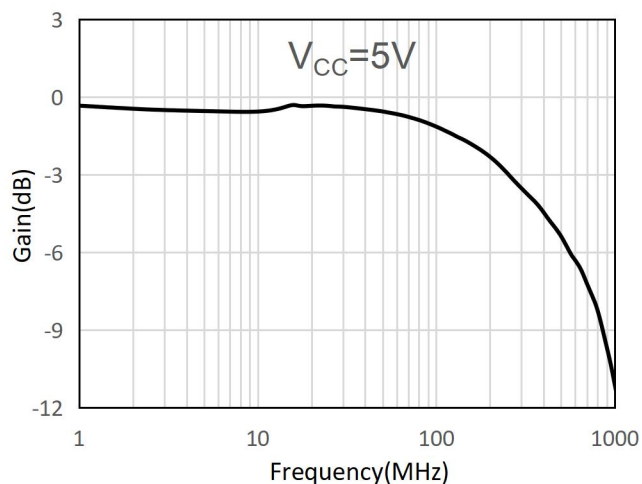


Fig.7-2. Bandwidth vs Frequency at 5V V_{CC}

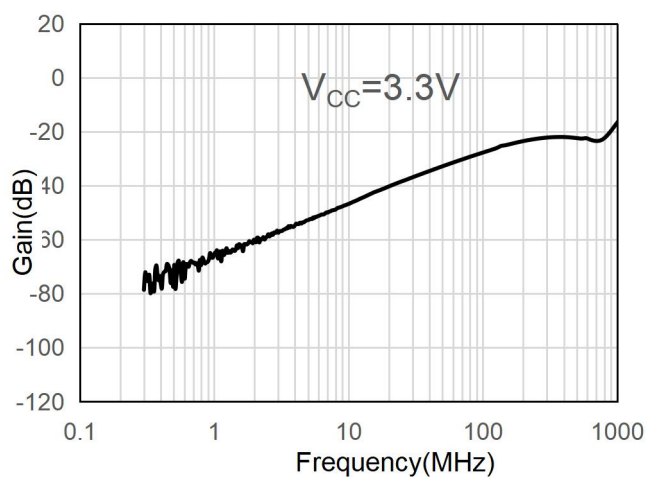


Fig.7-3. Off Isolation vs Frequency at 3.3V V_{CC}

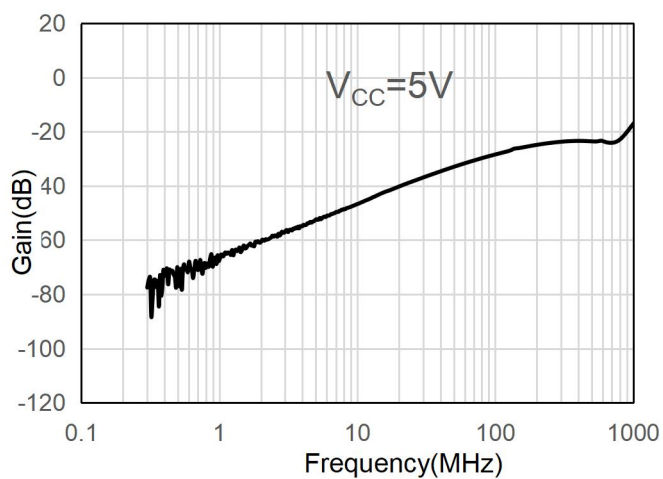


Fig.7-4. Off Isolation vs Frequency at 5V V_{CC}

8 Measurement Information

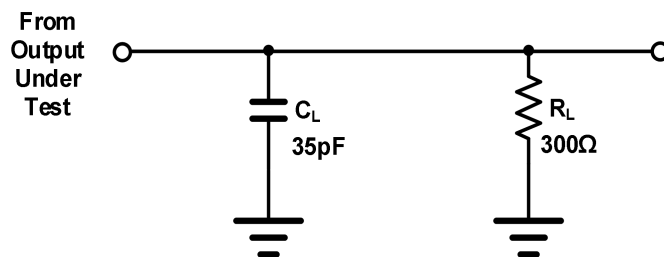


Fig.8-1. AC Test Circuit

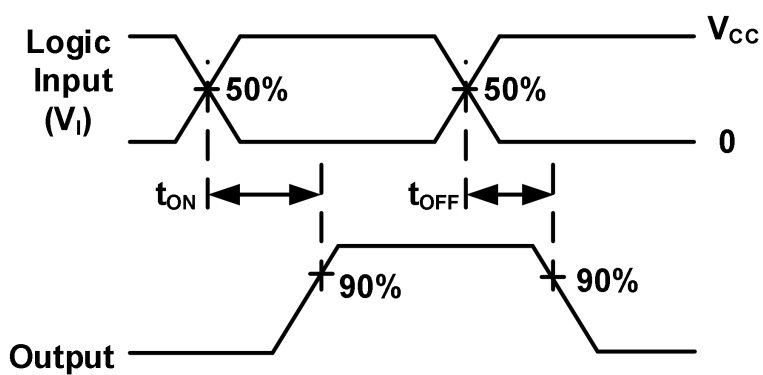


Fig.8-2. Switching Time

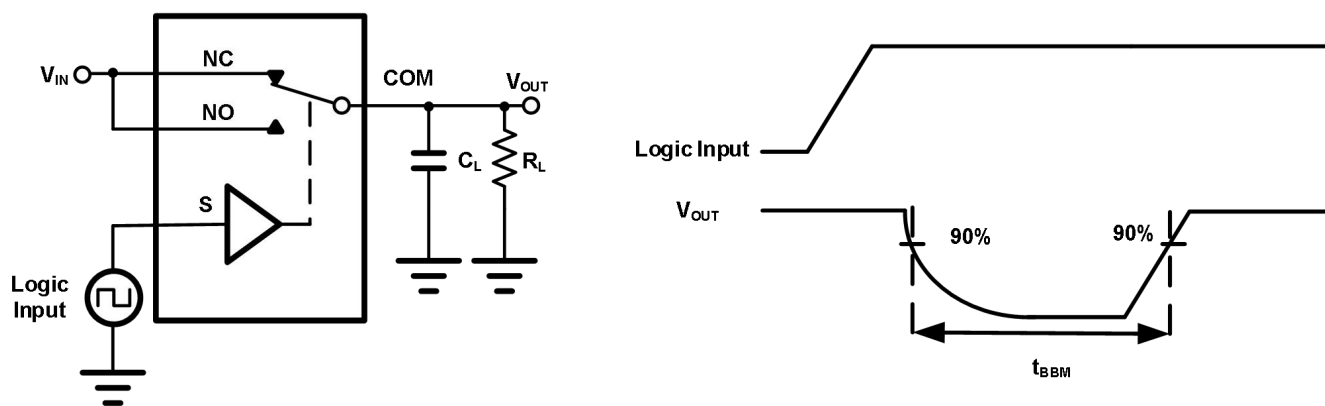


Fig.8-3. Break-Before-Make Time(t_{BBM})

8 Measurement Information(Continued)

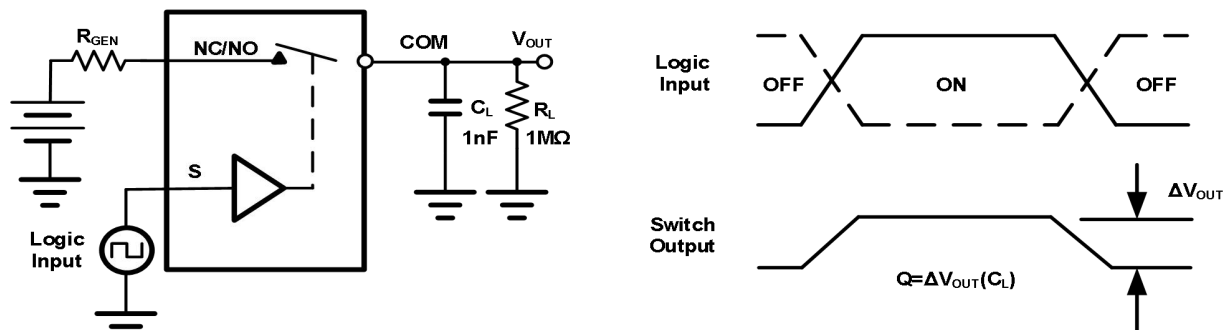


Fig.8-4. Charge Injection Test

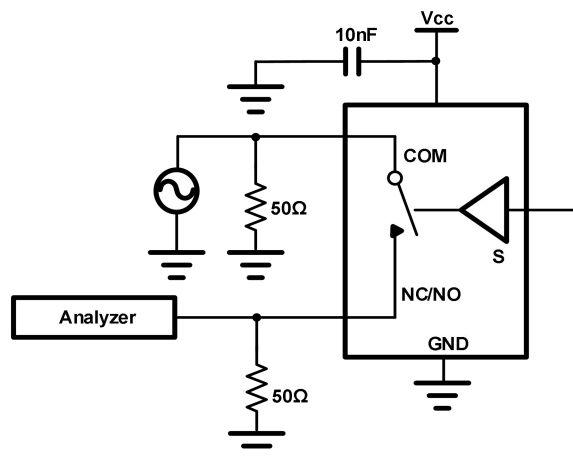


Fig.8-5. OFF Isolation (O_{iso})

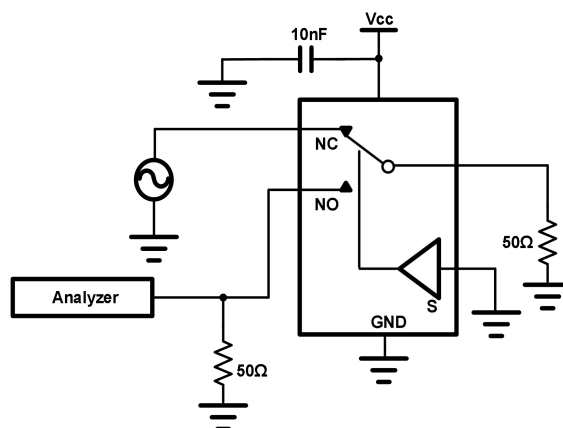


Fig.8-6. Crosstalk(X_{TALK})

8 Measurement Information(Continued)

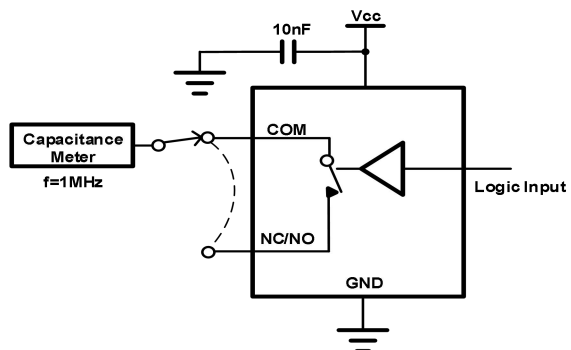


Fig.8-7. Channel Off Capacitance

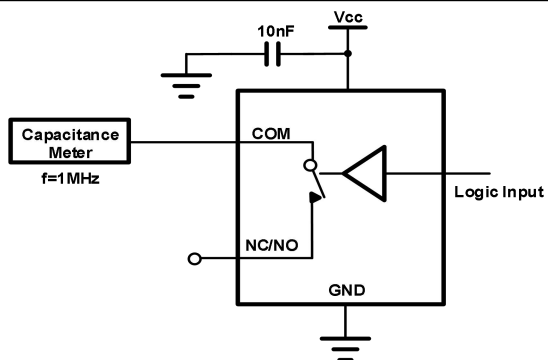


Fig.8-8. Channel On Capacitance

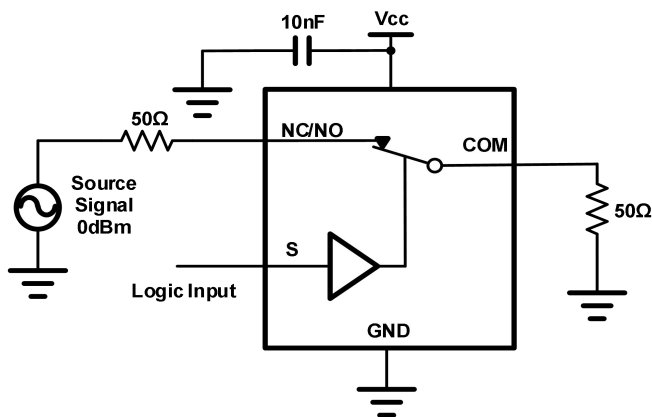
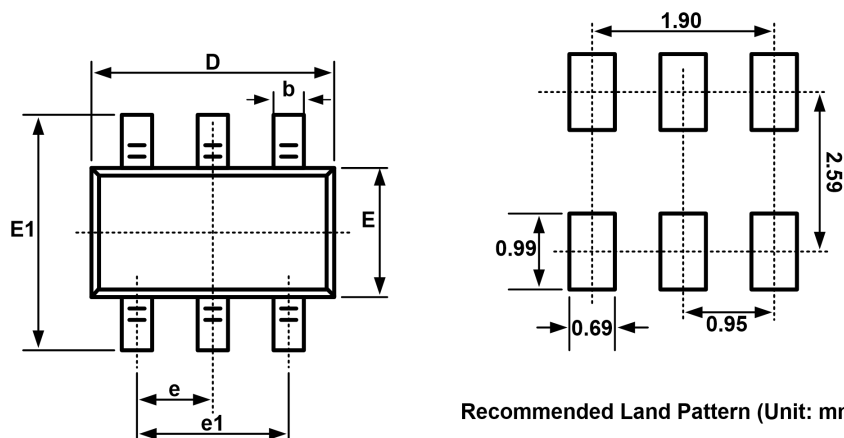


Fig.8-9. Bandwidth

9 Package Outline Dimension

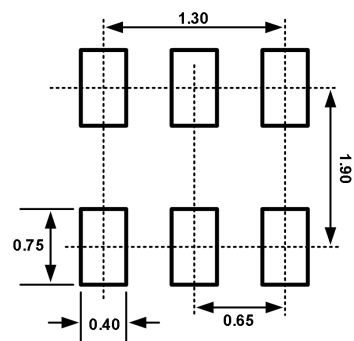
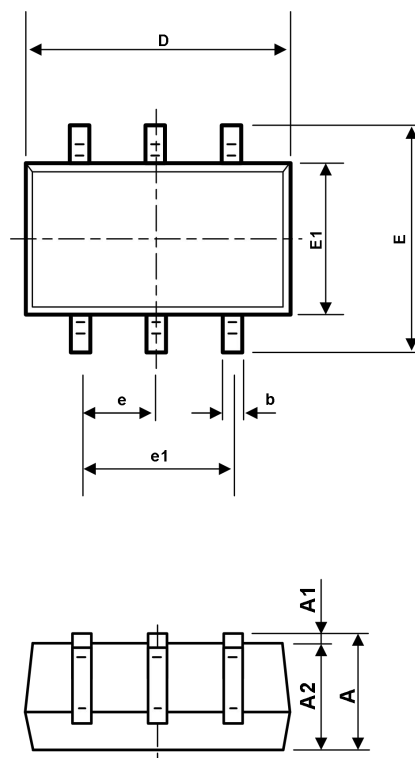
SOT23-6



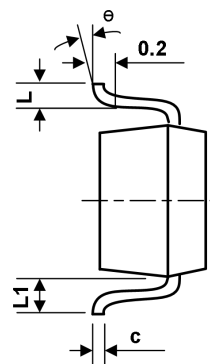
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950BSC		0.037BSC	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

9 Package Outline Dimension(Continued)

SC70-6



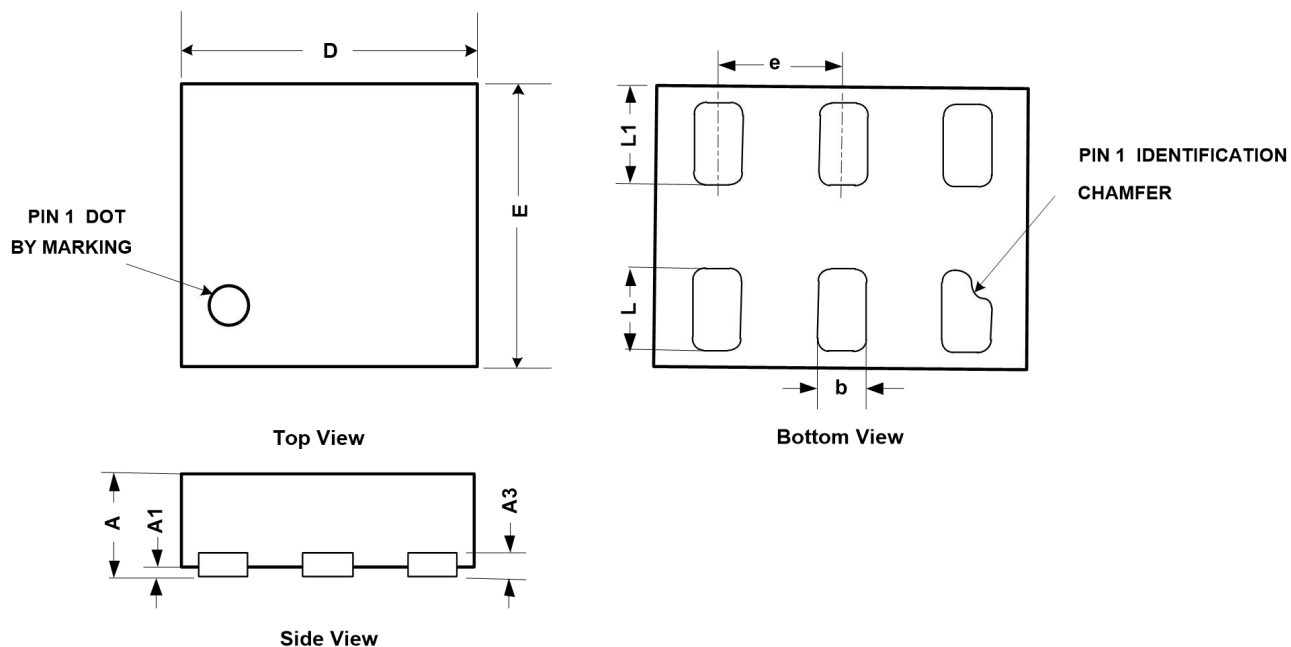
Recommended Land Pattern (Unit: mm)



symbol	Dimension In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.110	0.175	0.004	0.007
D	2.000	2.200	0.079	0.087
E	2.150	2.450	0.085	0.096
E1	1.150	1.350	0.045	0.053
e	0.650TYP		0.026TYP	
e1	1.200	1.400	0.047	0.055
L	0.260	0.460	0.010	0.018
L1	0.525REF		0.021REF	
θ	0°	8°	0°	8°

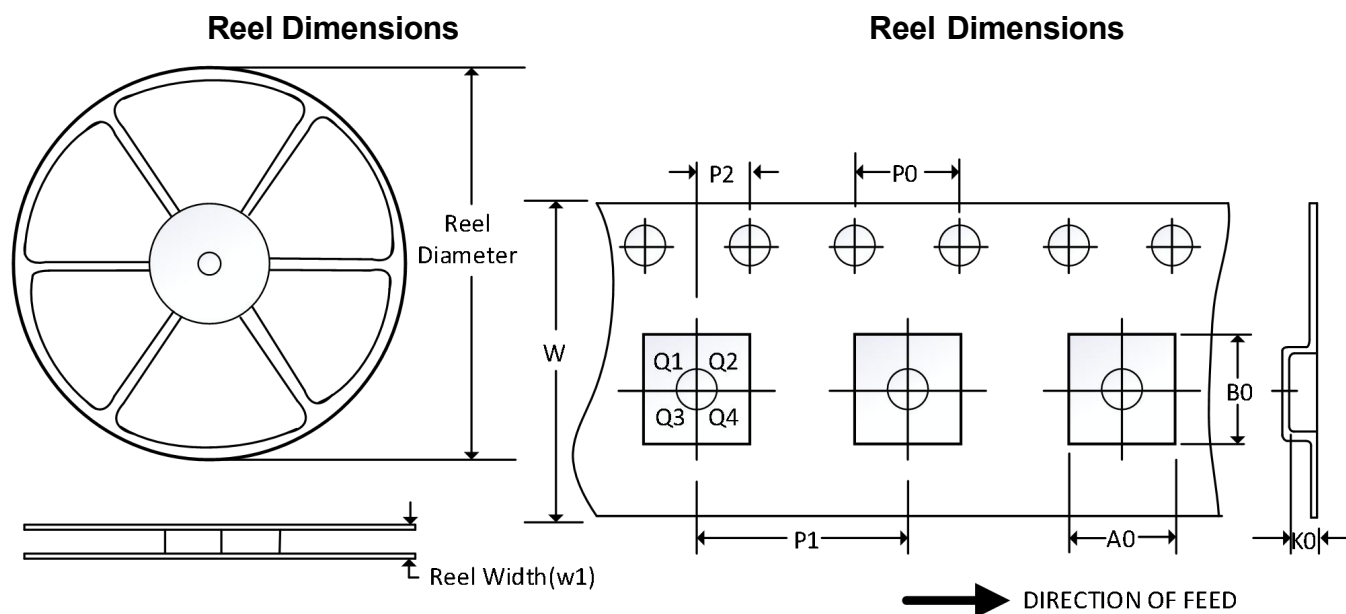
9 Package Outline Dimension(Continued)

DFN1.1*0.9-6L



symbol	Dimension In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.400	0.500	0.016	0.020
A1	0.000	0.050	0.000	0.002
A3	0.125REF		0.005REF	
D	1.050	1.150	0.041	0.045
E	0.850	0.950	0.033	0.037
b	0.150	0.250	0.006	0.010
L	0.250	0.350	0.010	0.014
L1	0.300	0.400	0.012	0.016
e	0.400BSC		0.016BSC	

10 Tape and Reel Information



NOTE: The picture is only for reference. Please make the object as the standard.

Key Parameter List of Tape and Reel

Package Type	Reel Diameter	Reel Width(mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT23-6	7"	9.5	3.17	3.23	1.37	4.0	4.0	2.0	8.0	Q3
SC70-6	7"	9.5	2.40	2.50	1.20	4.0	4.0	2.0	8.0	Q3
DFN1.1*0.9-6L	7"	9.5	1.03	1.25	0.60	4.00	2.00	2.00	8.00	Q3

NOTE:

1. All dimensions are nominal.
2. Plastic or metal protrusions of 0.15mm maximum per side are not included.