



DESCRIPTION

The A4716 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.

The A4716 is available in MSOP10 package

ORDERING INFORMATION

Package Type	Part Number	
MSOP10 SPQ: 3,000pcs/Reel	MS10	A4716MS10R
		A4716MS10VR
Note	V: Halogen free package R: Tape & Reel	
AiT provides all RoHS products,		

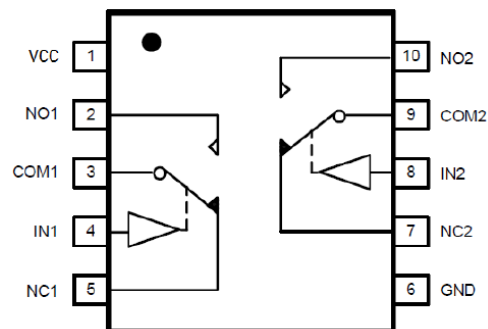
FEATURES

- Wide Power Supply Range: 1.65V to 5.5V
- Low On-Resistance:
 $R_{ON(NC)} = 0.3\Omega(V_{CC}=5V)$
 $R_{ON(NO)} = 0.3\Omega(V_{CC}=5V)$
- Low On-Resistance Flatness:
 $R_{FLAT(NC)} = 0.08\Omega(V_{CC}=5V)$
 $R_{FLAT(NO)} = 0.08\Omega(V_{CC}=5V)$
- -3dB Bandwidth: 33MHz
- Rail-to-Rail Signal Range
- High Off-Isolation: -66dB (f=100kHz)
- Crosstalk Rejection: -74dB
- Low Total Harmonic Distortion: 0.035%
- Available in MSOP10 package

APPLICATION

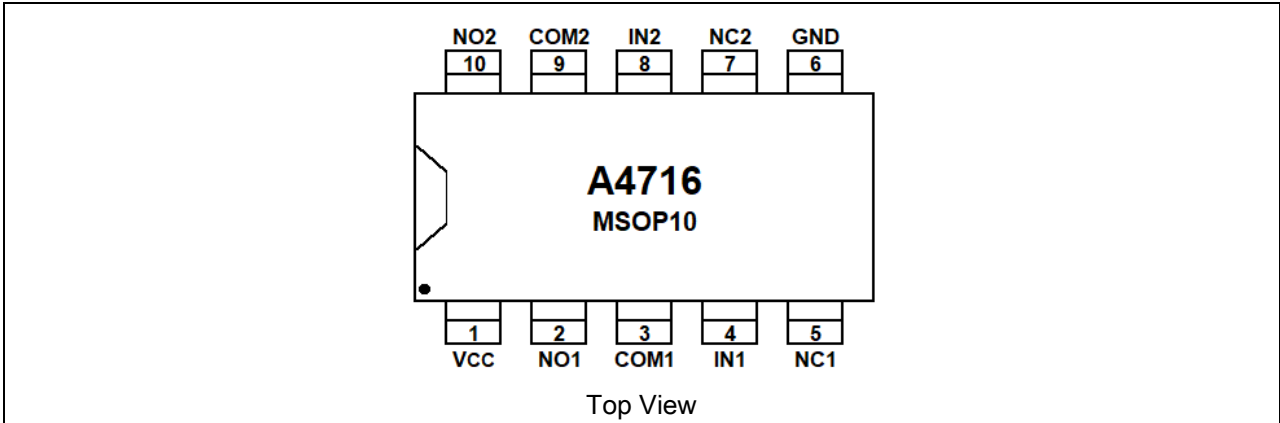
- Wireless Handsets
- Portable Electronic Devices
- Relay Replacement
- PDAs
- Audio & Video Signal Routing
- PCMCIA Cards
- Computer Peripherals
- Modems

TYPICAL APPLICATION





PIN DESCRIPTION



Pin #	Symbol	Type	Function
1	V _{cc}	PWR	Power Supply
2,10	NO _x	Input/Output	Data Port
3,9	COM _x	Input/Output	Data Port
4,8	IN _x	Input	Logic Control Signal
5,7	NC _x	Input/Output	Data Port
6	GND	Ground	Ground

NOTE: x = 1or 2

FUNCTION TABLE

IN _x	Function
0	NC _x Connected to COM _x
1	NO _x Connected to COM _x



ABSOLUTE MAXIMUM RATINGS

V _{CC} , DC Supply Voltage	-0.5V ~ 6V
V _{NOX} / V _{NCX} / V _{COMX} , DC Switch Voltage	-0.5V ~ V _{SUP} +0.3V
V _{INX} , DC Input Voltage	-0.5V ~ 6V
I _(NOX/NCX/COMX) , Continuous Current	-250mA ~ +250mA
I _{PEAK(NOX/NCX/COMX)} , Peak Current ^{NOTE1}	-500mA ~ +500mA
T _{STG} , Storage Temperature Range	-65°C ~ 150°C

Stresses above 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 Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

NOTE1: Pulsed at 1ms, 50% duty circle

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
DC Supply Voltage	V _{CC}		1.65	-	5.5	V
Switch Input Voltage	V _S		0	-	V _{CC}	V
Control Input Voltage	V _{IN}		0	-	V _{CC}	V
Operation Temperature	T _A		-40	-	+125	°C



DC ELECTRICAL CHARACTERISTICS

V_{CC}=5V, T_A=+25°C, 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 ^{NOTE1}	R _{FLAT(NC)}	V _{CC} = 5V; I _{COM} = 100mA; V _{NC} = 0 to V _{CC}	-	0.08	0.2	Ω
NO On-Resistance Flatness ^{NOTE1}	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 ^{NOTE2}	ΔR _{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, 3V	-	4	-	nA
COM On Leakage Current	I _{ON(COM)}	V _{CC} = 5V; V _{NO} or V _{NC} = 3V, 0.3V; V _{COM} = 0.3V, 3V 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 V _{CC}	-1	-	1	uA



V_{CC}=2.7V, T_A=+25°C, 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 ^{NOTE1}	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 ^{NOTE1}	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 ^{NOTE2}	ΔR _{ON}	V _{CC} = 2.7V; I _{COM} = 100mA; V _{NC} / V _{NO} = 1.5	-	0.05	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 V _{CC}	-1	-	1	uA

NOTE1: Flatness is defined as the difference between the maximum and minimum value of on resistance as measured over the specified analog signal ranges.

NOTE2: ΔR_{ON} = R_{ON(MAX)} - R_{ON(MIN)}, between NC1 and NC2 or between NO1 and NO2.



DYNAMIC CHARACTERISTICS

V_{CC}=3.3V, T_A=+25°C, 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, Figure 1	-	42	-	ns
		V _{CC} = 3.3; V _{NO} or V _{NC} = 1.5V, R _L = 50Ω; C _L = 35pF, Figure 1	-	43	-	
Turn-Off Time	t _{OFF}	V _{CC} = 5V; V _{NO} or V _{NC} = 1.5V, R _L = 50Ω; C _L = 35pF, Figure 1	-	25	-	ns
		V _{CC} = 3.3; V _{NO} or V _{NC} = 1.5V, R _L = 50Ω; C _L = 35pF, Figure 1	-	30	-	
Break-Before-Make Time	t _{BBM}	V _{CC} = 5V; V _{NO} or V _{NC} = 1.5V, R _L = 50Ω; C _L = 35pF, Figure 2	-	22	-	ns
		V _{CC} = 3.3V; V _{NO} or V _{NC} = 1.5V, R _L = 50Ω; C _L = 35pF, Figure 2	-	22	-	
NC OFF Capacitance	C _{OFF(NC)}	f = 1MHz, Figure 6	-	82	-	pF
NO OFF Capacitance	C _{OFF(NO)}	f = 1MHz, Figure 6	-	70	-	pF
NC ON Capacitance	C _{ON(NC)}	f = 1MHz, Figure 7	-	255	-	pF
NO ON Capacitance	C _{ON(NO)}	f = 1MHz, Figure 7	-	245	-	pF
ADDITIONAL APPLICATION CHARACTERISTICS						
3dB Bandwidth	f _{3dB}	Figure 8	-	33	-	MHz
Charge Injection	Q	V _{CC} =5V; V _{GEN} = 0V; R _{GEN} = 0Ω; C _L = 1nF; Figure 3	-	58	-	pC
		V _{CC} =3.3V; V _{GEN} = 0V; R _{GEN} = 0Ω; C _L = 1nF; Figure 3	-	45	-	
Off Isolation ^{NOTE1}	V _{Iso}	V _{CC} =5V; f = 100kHz; R _L = 50Ω; C _L = 5pF; V _{COM} = 1 V _{RMS} ; Figure 4	-	-66	-	dB
Crosstalk ^{NOTE2}	V _{CT}	V _{CC} =5V; f = 100kHz; R _L = 50Ω; C _L = 5pF; V _{COM} = 1 V _{RMS} ; Figure 5	-	-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

NOTE1: Off Channel Isolation = 20log₁₀ [(V_{NO(NC)})/V_{COM}]

NOTE2: Between any two switches



TEST SETUP CIRCUITS

Figure 1. AC Test Circuit & Waveforms

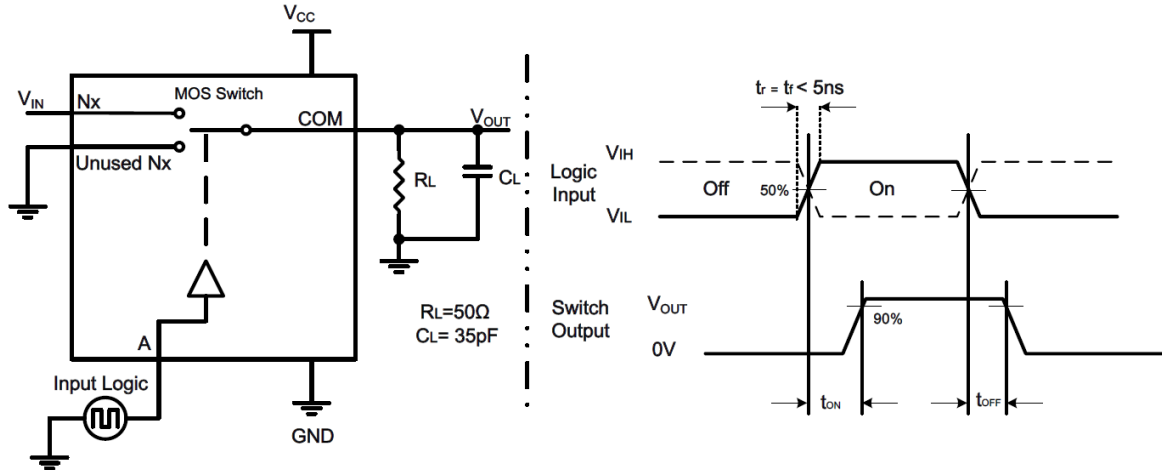


Figure 2. Break-Before-Make Time (t_{BBM})

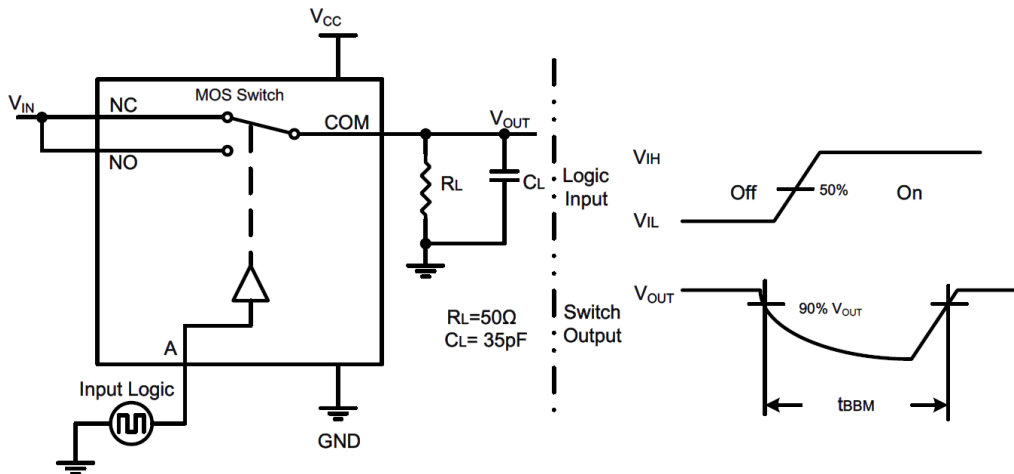


Figure 3. Charge Injection (Q)

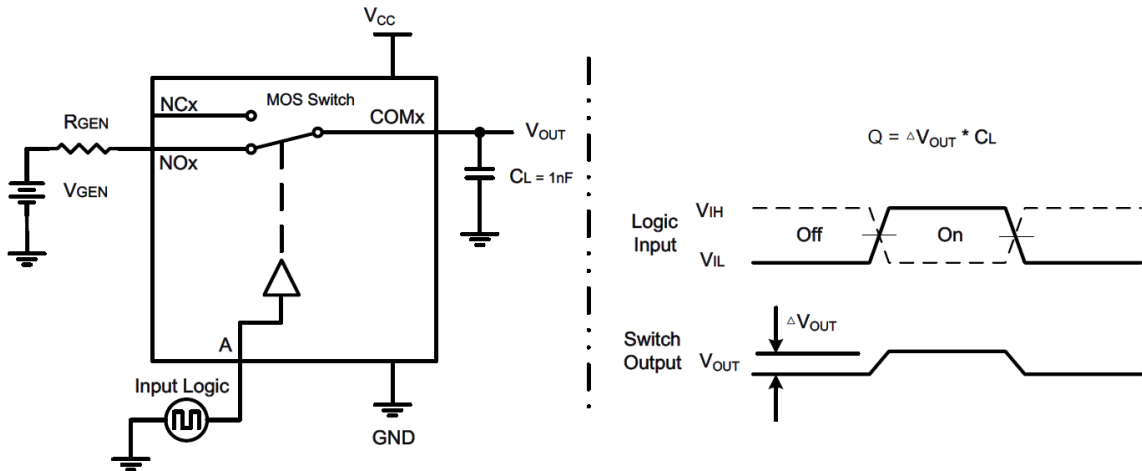




Figure 4. Off Isolation (V_{iso})

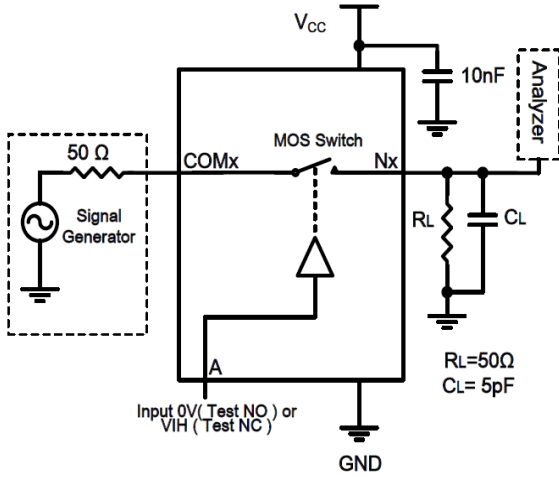


Figure 5. Cross Talk (V_{ct})

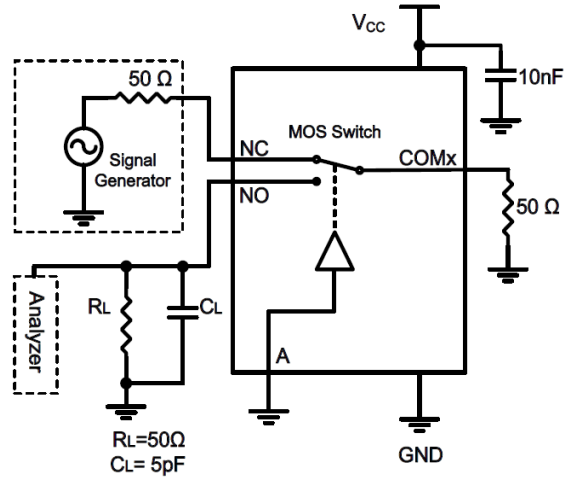


Figure 6. Channel Off Capacitance ($C_{OFF(NX)}$)

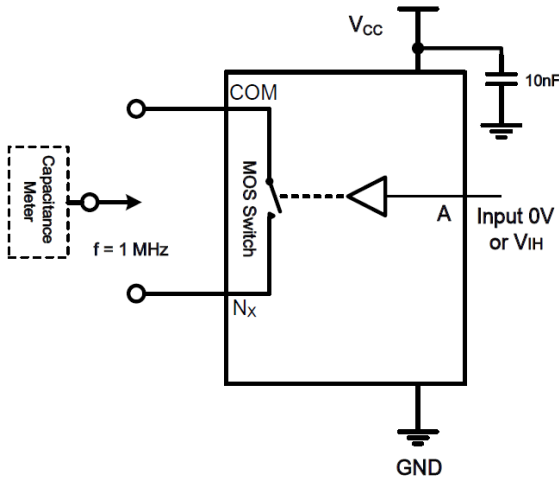


Figure 7. Channel On Capacitance ($C_{ON(NX)}$)

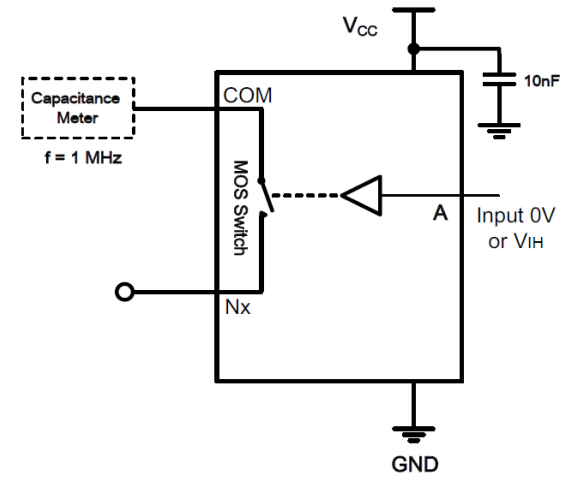
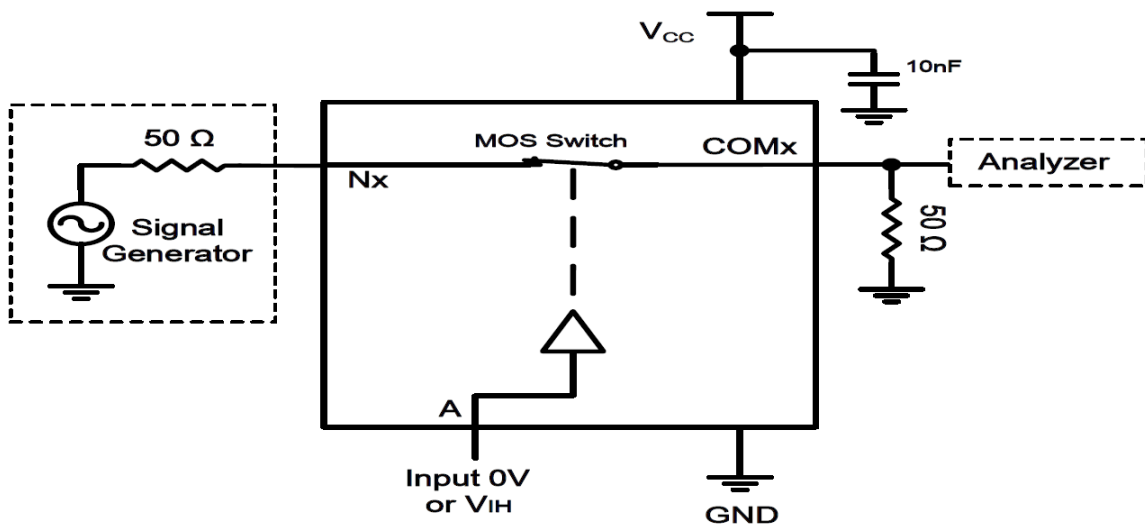


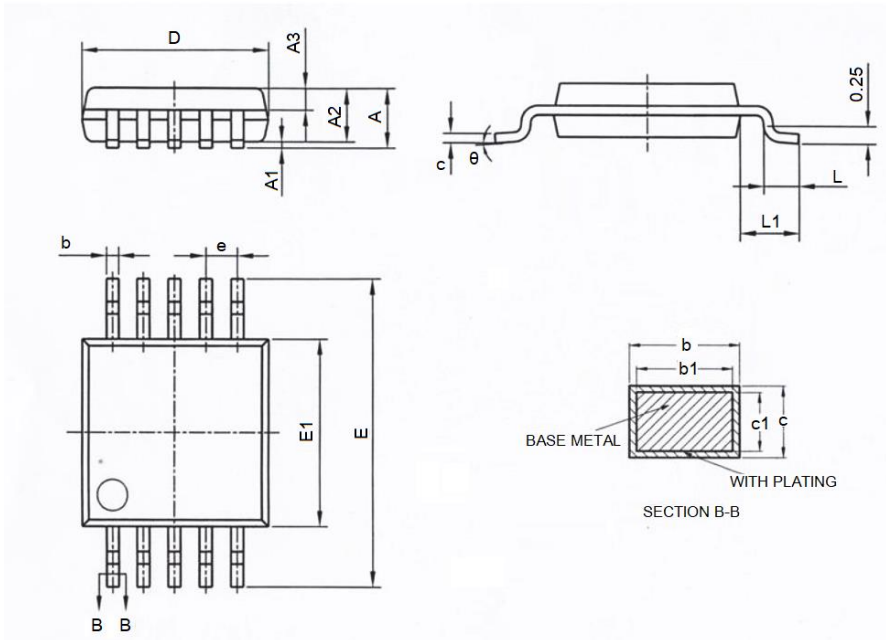
Figure 8. -3dB Bandwidth (f_{3dB})





PACKAGE INFORMATION

Dimension in MSOP10 (Unit: mm)



Symbol	Min	Max
A	-	1.10
A1	0.05	0.15
A2	0.75	0.95
A3	0.30	0.40
b	0.19	0.28
b1	0.18	0.23
c	0.15	0.20
c1	0.14	0.16
D	2.90	3.10
E	4.70	5.10
E1	2.90	3.10
e	0.50 BSC	
L	0.40	0.70
L1	0.95 BSC	
θ	0°	8°
L/F (Mil)	71 x 96	



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