NLAS4717

Analog Switch, High Bandwidth, Dual SPDT

The NLAS4717 is an advanced CMOS analog switch fabricated in sub-micron silicon gate CMOS technology. The device is a dual independent Single Pole Double Throw (SPDT) switch featuring two low $R_{DS(on)}$ of 4.5 Ω at 3.0 V.

The device also features guaranteed Break-Before-Make (BBM) switching, assuring the switches never short the driver.

The NLAS4717 is available in two small size packages:

- Micro10: 3.0 x 5.0 mm
- Flip-Chip-10: 2.0 x 1.5 mm

Features

- Low $R_{DS(on)}$: 4.5 Ω @ 3.0 V
- Matching Between the Switches ±0.5 Ω
- Wide Low Voltage Range: 1.8 V to 5.5 V
- High Bandwidth > 40 MHz
- 1.65 V to 5.5 V Operating Range
- Low Threshold Voltages on Pins 4 and 8 (CTRL Pins)
- Ultra-Low Charge Injection ≤ 6.0 pC
- Low Standby Current – I_{CC} = 1.0 nA (Max) @ T_A = 25°C
- OVT* on Pins 4 and 8 (CTRL Logic Pins)
- Pb-Free Packages are Available

Typical Applications

- Cell Phones
- PDAs
- MP3s
- Digital Still Cameras

Important Information

- ESD Protection:
  HBM = 2000 V, MM = 200 V
- Latchup Max Rating: 200 mA (Per JEDEC EIA/JESD78)
- Pin-to-Pin Compatible with MAX4717

*OVT

- Overvoltage Tolerance (OVT) specific pins to operate higher than normal supply voltages, with no damage to the devices or to signal integrity.

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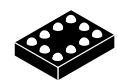
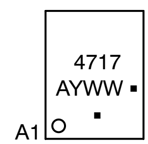
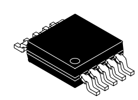
MARKING DIAGRAMS



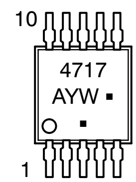
A1

FLIP-CHIP-10
CASE 489AA





Micro10
CASE 846B



A = Assembly Location
Y = Year
W, WW = Work Week
▪ = Pb-Free Package

FUNCTION TABLE

IN_	NO_	NC_
0	OFF	ON
1	ON	OFF

ORDERING INFORMATION

Device	Package	Shipping†
NLAS4717FCT1	Flip-Chip-10	3000 / Tape & Reel
NLAS4717FCT1G	Flip-Chip-10 (Pb-Free)	3000 / Tape & Reel
NLAS4717MR2	Micro10	4000 / Tape & Reel
NLAS4717MR2G	Micro10 (Pb-Free)	4000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

May, 2007 - Rev. 9

Publication Order Number:
NLAS4717/D

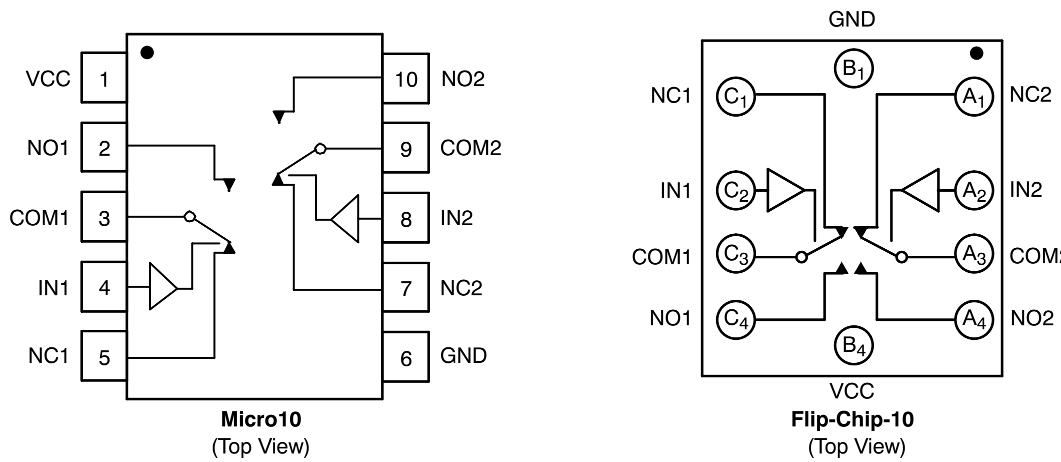


Figure 1. Device Circuit Diagrams and Pin Configurations

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V+	Positive DC Supply Voltage	−0.5 to +7.0	V
V_{IS}	Analog Input Voltage (V_{NO}, V_{NC}, or V_{COM}) (Note 1)	$-0.5 \le V_{IS} \le V_{CC} + 0.5$	V
V_{IN}	Digital Select Input Voltage	$-0.5 \le V_I \le +7.0$	V
I_{IK}	DC Current, Into or Out of Any Pin (Continuous)	±100	mA
I_{PK}	Peak Current (10% Duty Cycle)	±200	mA

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Signal voltage on NC, NO, and COM exceeding VCC or GND are clamped by the internal diodes. Limit forward diode current to maximum current rating.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V+	DC Supply Voltage		1.8	5.5	V
V_{IN}	Digital Select Input Voltage		GND	5.5	V
V_{IS}	Analog Input Voltage (NC, NO, COM)		GND	V_{CC}	V
T_A	Operating Temperature Range		-40	+85	°C
t_r, t_f	Input Rise or Fall Time, SELECT	V_{CC} = 3.3 V ± 0.3 V V_{CC} = 5.0 V ± 0.5 V	0 0	100 20	ns/V

ANALOG SWITCH DC CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	-40 °C to +85°C		Unit
				Min	Max	
V_{IH}	Input Logic High Voltage	V_{OUT} = 0.1 V $I_{OUT} \le 20\ \mu A$	1.65 to 2.2 2.7 to 3.6 4.5 to 5.5	V_{CC} x 0.55 V_{CC} x 0.5 2.0	- - -	V
V_{IL}	Input Logic Low Voltage	V_{OUT} = -V_{CC} - 0.1 V $I_{OUT} \le 20\ \mu A$	1.65 to 2.2 2.7 to 3.6 4.5 to 5.5	- - -	V_{CC} x 0.2 V_{CC} x 0.2 0.8	V
I_{IN}	Input Leakage Current	V_{IN} – V_{CC} or GND	5.0	-100	+100	nA
V_{CC}	Power Supply Range	All	-	1.65	5.5	V
I_{CC}	Supply Current	V_{IN} = V_{CC} or GND I_{OUT} = 0 μA	1.8 3.3 5.0	- - -	1.0 1.0 1.0	μA
V_{IS}	Analog Signal Range	Key parameter	-	0	V_{CC}	V

ANALOG SWITCH CHARACTERISTICS - Digital Section (Voltages Referenced to GND)

Symbol	Parameter	Condition	V_{CC} (V)	-40 °C to +85°C			Unit
				Min	Typ	Max	
R_{ON}	ON Resistance (Note 2)	V_{CC} = 3.0 V I_{COM} = 10 mA V_{NO} or V_{NC} = V_{IH} or V_{IL}	3.0	-		4.5	Ω
		V_{CC} = 5.0 V I_{COM} = 10 mA V_{NO} or V_{NC} = V_{IH} or V_{IL}	5.0	-		3.5	
ΔR_{ON}	ON Resistance Match Between Channels (Note 2 and 3)	V_{CC} = 3.6 V I_{COM} = 10 mA V_{NO} or V_{NC} = V_{IH} or V_{IL}	3.6	-	0.1	0.4	Ω
		V_{CC} = 5.5 V I_{COM} = 10 mA V_{NO} or V_{NC} = V_{IH} or V_{IL}	5.5				
$R_{FLAT[ON]}$	ON Resistance Flatness (Note 4)	I_{COM} = 10 mA V_{IS} = 0 to V_{CC}	3.0	-		1.5	Ω
		I_{COM} = 10 mA V_{IS} = 0 to V_{CC}	5.5	-		1.36	
$I_{NO\_[OFF]}$ $I_{NC\_[OFF]}$	NO_, NC_ Off-Leakage Current (Note 5)	V_{CC} = 3.6 V V_{COM} = 0.3 V or 3.3 V V_{NO} or V_{NC} = 0.3 V or 3.3 V	3.6	-1.0	0.01	+1.0	nA
		V_{CC} = 5.5 V V_{COM} = 0 V or 5.0 V V_{NO} or V_{NC} = 0 V or 5.0 V	5.5	-1.0	0.01	+1.0	
$I_{COM\_[ON]}$	COM_ On-Leakage Current (Note 5)	V_{CC} = 3.6 V V_{COM} = 0.3 V or 3.3 V V_{NO} or V_{NC} = 0.3 V or 3.3 V	3.6	-2.0	0.01	+2.0	nA
		V_{CC} = 5.5 V V_{COM} = 0 V or 5.0 V V_{NO} or V_{NC} = 0 V or 5.0 V	5.5	-2.0	0.01	+2.0	

ANALOG SWITCH AC CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	-40 °C to +85°C			Unit
				Min	Typ	Max	
t_{ON}	Turn-On Time	$V_{NC\_}$, $V_{NO\_}$ = V_{IH} or V_{IL} R_L = 300 Ω, C_L = 35 pF $V_{IN[x]}$ = V_{IH} or V_{IL}	1.8 to 5.5	-	-	30	nS
t_{OFF}	Turn-Off Time	$V_{NC\_}$, $V_{NO\_}$ = V_{IH} or V_{IL} R_L = 300 Ω, C_L = 35 pF $V_{IN[x]}$ = V_{IH} or V_{IL}	1.8 to 5.5	-	-	40	nS
t_{BBM}	Break-Before-Make Time Delay (Note 5)	$V_{NC\_}$, $V_{NO\_}$ = 1.5 V R_L = 300 Ω, C_L = 35 pF	-	-	8.0	-	nS
t_{SKEW}	Skew (Note 5)	R_S = 39 Ω, C_L = 50 pF	-	-	0.15	2.0	nS

2. R_{ON} characterized for V_{CC} range (1.65 V to 5.5 V).
3. $\Delta R_{ON} = R_{ON}(MAX) - R_{ON}(MIN)$.
4. $R_{FLAT[ON]} = R_{ON}(MAX) - R_{ON}(MIN)$, measured over V_{CC} range.
5. Guaranteed by design.

ANALOG SWITCH APPLICATION CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	-40 °C to +85°C			Unit
				Min	Typ	Max	
Q	Charge Injection	$V_{IN} = V_{CC}$ to GND $R_{In} = 0\ \Omega$, $C_L = 1.0$ nF $Q = C_L - \Delta V_{OUT}$	3.0 5.0		6.0 9.0		pC
VISO	Off-Isolation	f = 10 MHz $V_{NO\_}$, $V_{NC\_}$ = 1.0 Vp-p $R_L = 50\ \Omega$, $C_L = 5.0$ pF	1.65 to 5.5		-50		dB
		f = 1.0 MHz $V_{NO\_}$, $V_{NC\_}$ = 1.0 Vp-p $R_L = 50\ \Omega$, $C_L = 5.0$ pF			-75		
VCT	Cross-Talk	f = 10 MHz $V_{NO\_}$, $V_{NC\_}$ = 1.0 Vp-p $R_L = 50\ \Omega$, $C_L = 5.0$ pF	1.65 to 5.5		-80		dB
		f = 1.0 MHz $V_{NO\_}$, $V_{NC\_}$ = 1.0 Vp-p $R_L = 50\ \Omega$, $C_L = 5.0$ pF			-110		
BW	On-Channel -3.0 db Bandwidth	Signal = 0 dB $R_L = 50\ \Omega$, $C_L = 5.0$ pF	1.8 to 5.0		40		MHz
THD	Total Harmonic Distortion	V_{COM} = 2.0 Vp-p, RL = 600 Ω, T_A = 25°C	-		0.02		%
$C_{NO\_[OFF]}$ $C_{NC\_[OFF]}$	NO_, NC_ OFF-Capacitance	F = 10 MHz	-		30		pF
$C_{NO\_[ON]}$ $C_{NC\_[ON]}$	NO_, NC_ ON-Capacitance	F = 10 MHz	-		110		pF

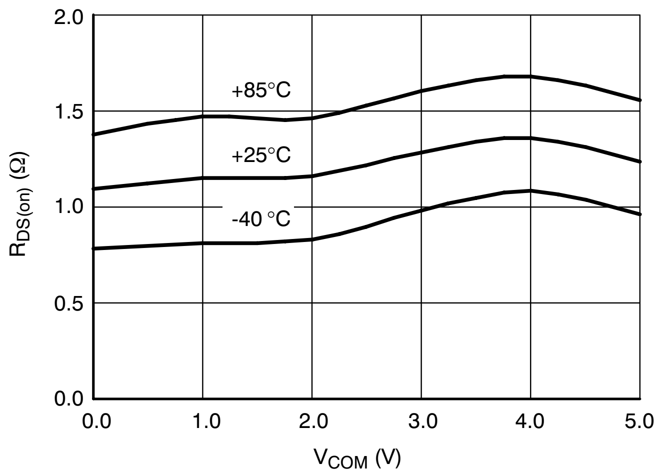


Figure 2. Low $R_{DS(on)}$ @ V_{CC} = 5.0 V

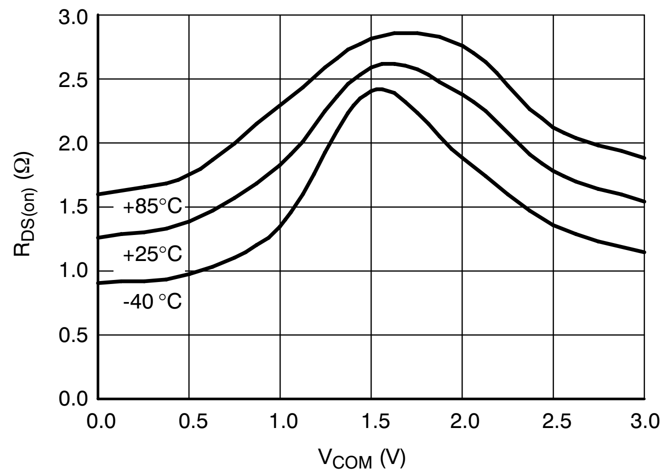


Figure 3. Low $R_{DS(on)}$ @ V_{CC} = 3.0 V

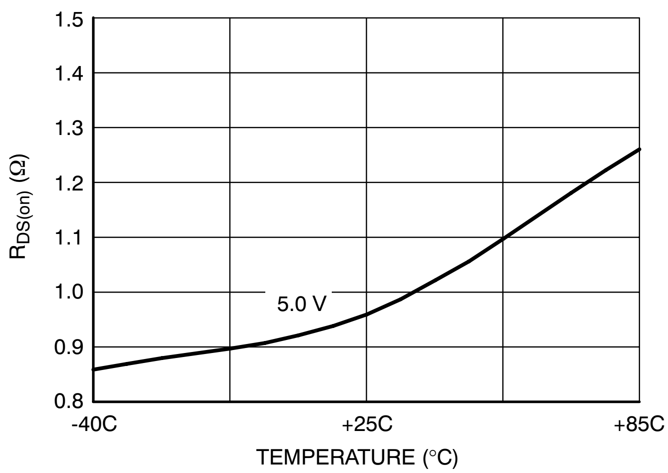


Figure 4. Delta $R_{DS(on)}$ @ V_{CC} = 5.0 V

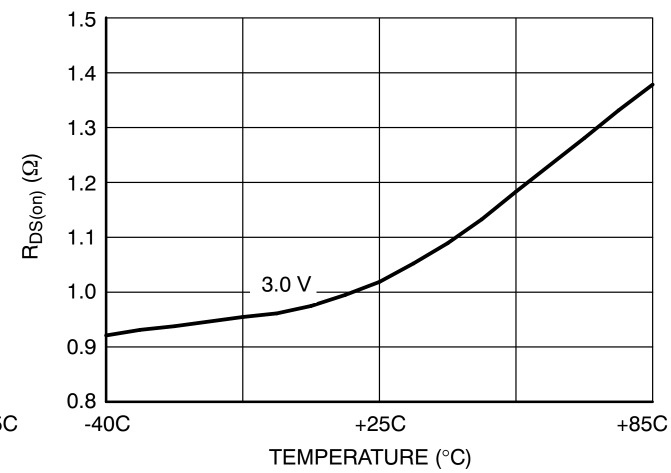


Figure 5. Delta $R_{DS(on)}$ @ V_{CC} = 3.0 V

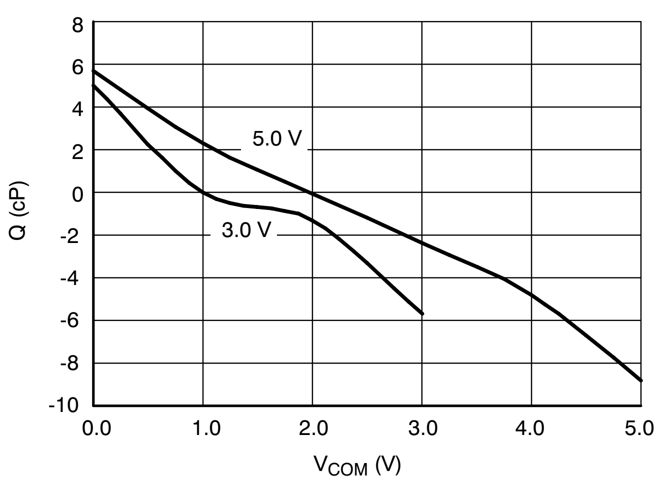


Figure 6. Charge Injection

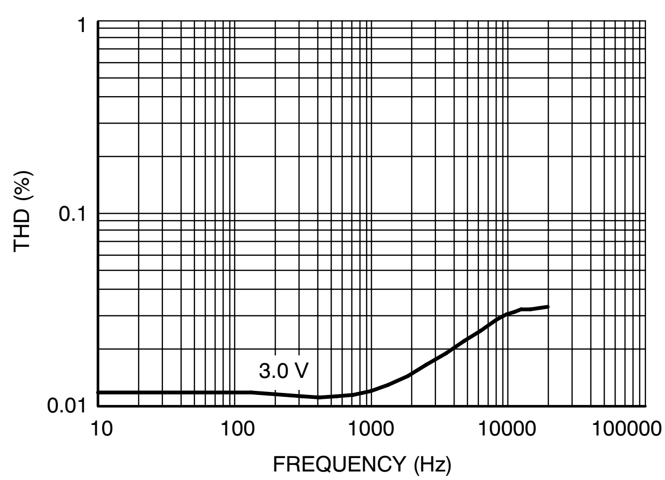


Figure 7. Total Harmonic Distortion

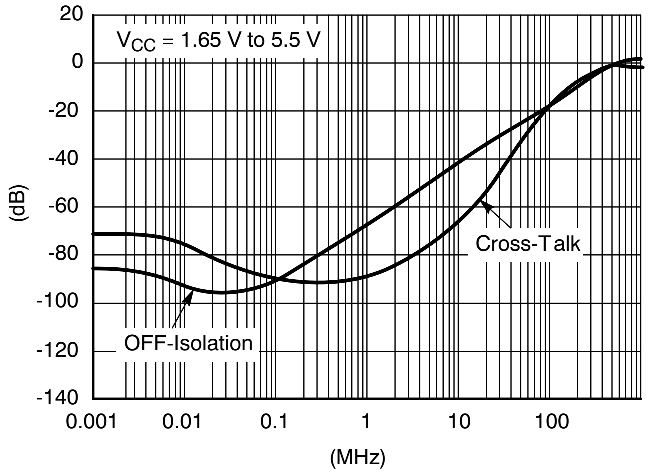


Figure 8. Frequency Response

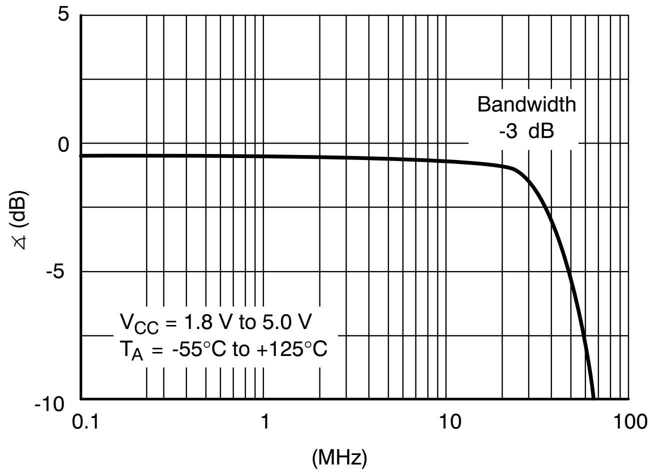


Figure 9. Bandwidth and Phase

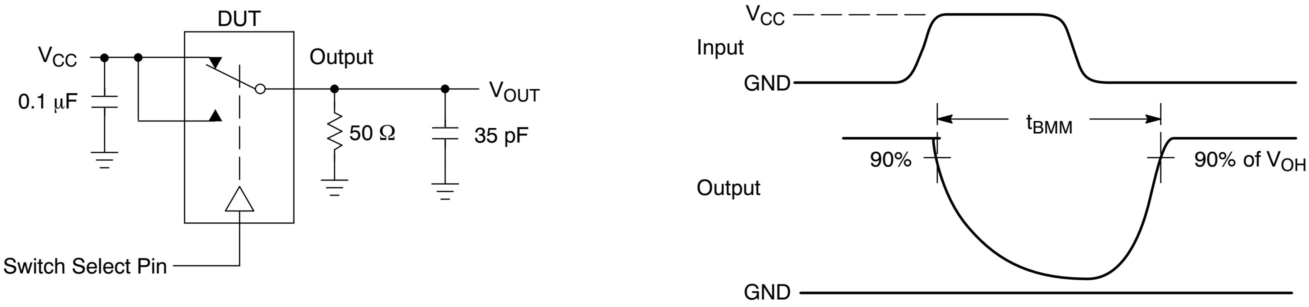


Figure 10. t_{BBM} (Time Break-Before-Make)

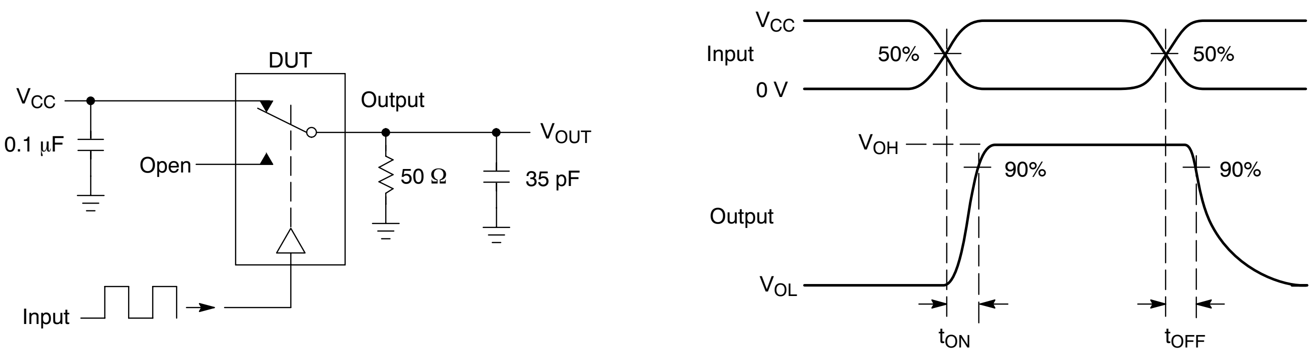


Figure 11. t_{ON}/t_{OFF}

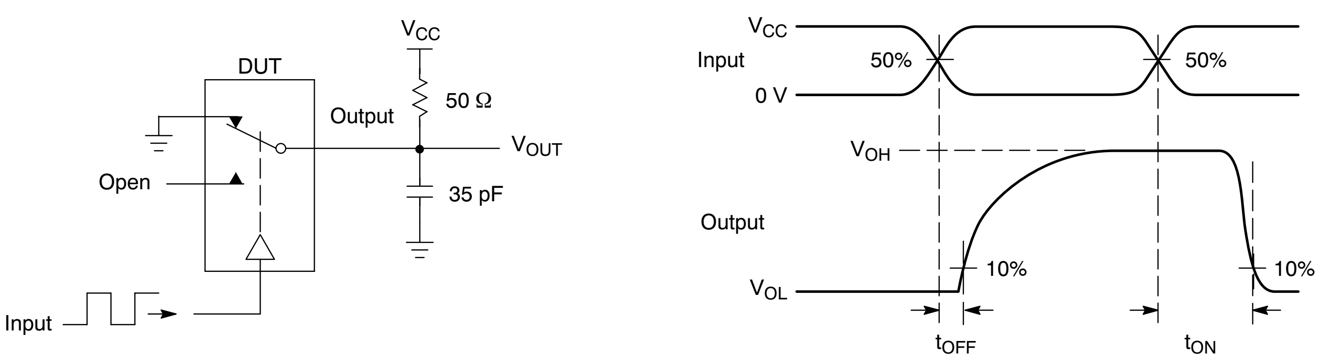
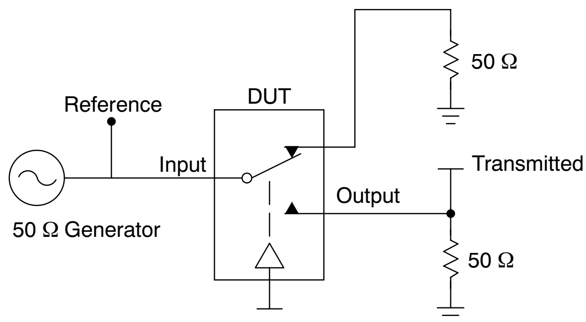


Figure 12. t_{ON}/t_{OFF}



Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. On loss is the bandwidth of an On switch. V_{ISO}, Bandwidth and V_{ONL} are independent of the input signal direction.

V_{ISO} = Off Channel Isolation = $20 \text{ Log}\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz

V_{ONL} = On Channel Loss = $20 \text{ Log}\left(\frac{V_{OUT}}{V_{IN}}\right)$ for V_{IN} at 100 kHz to 50 MHz

Bandwidth (BW) = the frequency 3.0 dB below V_{ONL}
V_{CT} = Use V_{ISO} setup and test to all other switch analog input/outputs terminated with 50 Ω

Figure 13. Off Channel Isolation/On Channel Loss (BW)/Crosstalk (On Channel to Off Channel)/V_{ONL}

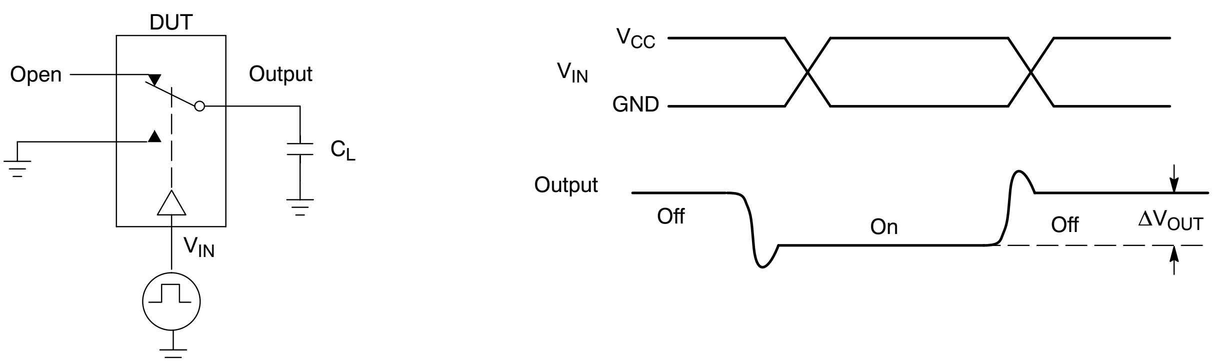
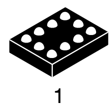


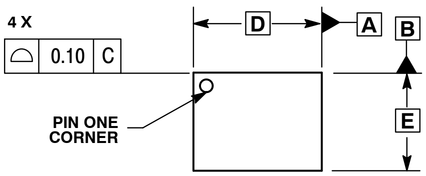
Figure 14. Charge Injection: (Q)

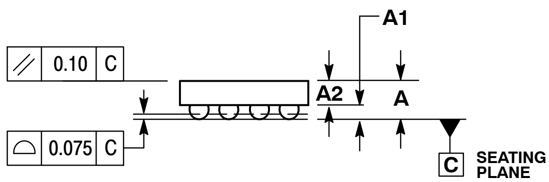
10 PIN FLIP−CHIP
CASE 489AA−01
ISSUE A

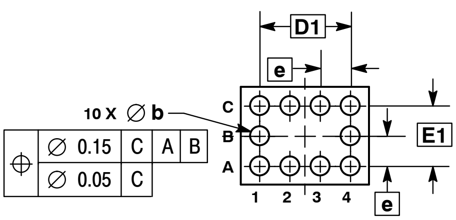


DATE 04 MAY 2004

SCALE 4:1



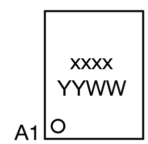




NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. COPLANARITY APPLIES TO SPHERICAL CROWNS OF SOLDER BALLS.

	MILLIMETERS	
DIM	MIN	MAX
A	−−−	0.650
A1	0.210	0.270
A2	0.280	0.380
D	1.965 BSC	
E	1.465 BSC	
b	0.250	0.350
e	0.500 BSC	
D1	1.500 BSC	
E1	1.000 BSC	

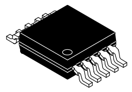
GENERIC MARKING DIAGRAM*



xxxx = Specific Device Code
YY = Year
WW = Work Week

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “ ▪”, may or may not be present.

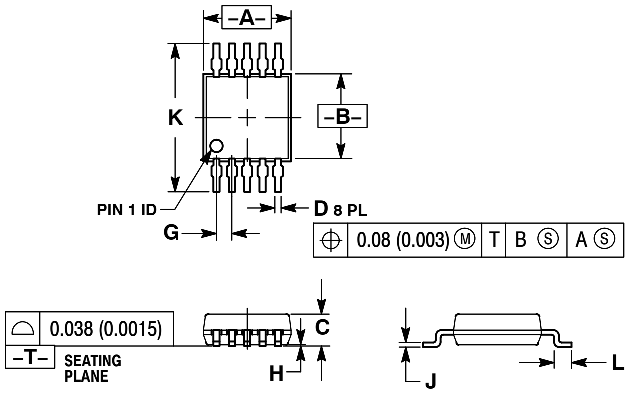
DOCUMENT NUMBER:	98AON12946D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	10 PIN FLIP−CHIP	PAGE 1 OF 1



SCALE 2:1

Micro10
CASE 846B−03
ISSUE D

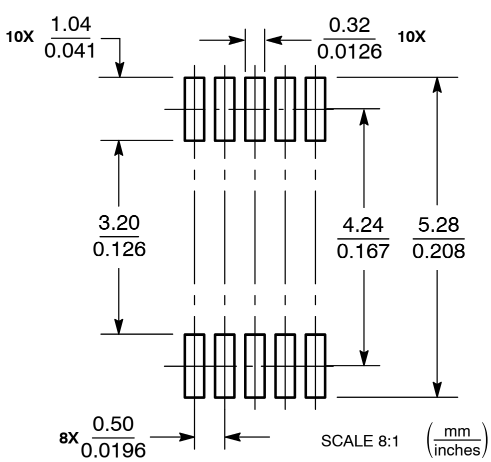
DATE 07 DEC 2004



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION “A” DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION “B” DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. 846B−01 OBSOLETE. NEW STANDARD 846B−02

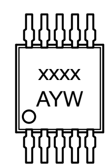
	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	0.95	1.10	0.037	0.043
D	0.20	0.30	0.008	0.012
G	0.50 BSC		0.020 BSC	
H	0.05	0.15	0.002	0.006
J	0.10	0.21	0.004	0.008
K	4.75	5.05	0.187	0.199
L	0.40	0.70	0.016	0.028

SOLDERING FOOTPRINT



Micro10

GENERIC MARKING DIAGRAM*



xxxx = Device Code
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb−Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	Micro10	PAGE 1 OF 1

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

onsemi Website: www.onsemi.com

TECHNICAL SUPPORT
North American Technical Support:
Voice Mail: 1 800−282−9855 Toll Free USA/Canada
Phone: 011 421 33 790 2910

Europe, Middle East and Africa Technical Support:
Phone: 00421 33 790 2910
For additional information, please contact your local Sales Representative

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