Low–Voltage, 4:1 Mux/Demux with Low-Swing Control Inputs

Features

- CMOS Technology for Analog Applications
- Low-swing control inputs
- Low On-Resistance
- Wide V_{DD} Range: 1.8V to 3.3V
- Rail-to-Rail Signal Range
- Near zero propagation delay
- Fast Switching Speed
- Ultra-low quiescent power
- High Off Isolation: -95dB @ 100kHz
- Crosstalk Rejection Reduces Signal Distortion: -90dB @ 100kHz
- Packaging (Pb-free & Green):
  - –12-contact TQFN (3.0×3.0)
  - –10-contact TQFN (1.6×1.3)

Description

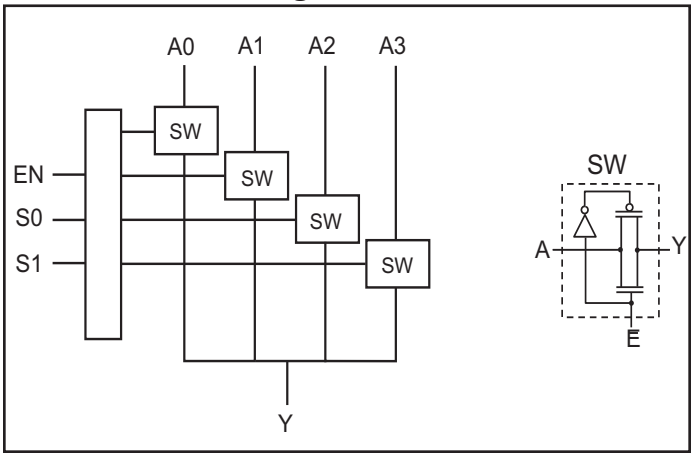
Pericom Semiconductor's PI3A114-A is a one-to-four bidirectional multiplier-demultiplier. Specified over a wide operating power supply voltage of 1.8 to 3.3V, the PI3A114-A offer good signal linearity.

The PI3A114-A offers low-swing input voltage on the EN, S1 and S0 inputs allowing the device to operate at 3.3V, and pass 3.3V channel data, while being controlled from a 1.8V device.

Truth Table(1)

Enable	Select		Function
EN	S_1	S_0	
L	X	X	Y=A_x, Hi-Z
H	L	L	Y = A_0; A_1, A_2, A_3 = Hi-Z
H	L	H	Y = A_1; A_0, A_2, A_3 = Hi-Z
H	H	L	Y = A_2; A_0, A_1, A_3 = Hi-Z
H	H	H	Y = A_3; A_0, A_1, A_2 = Hi-Z

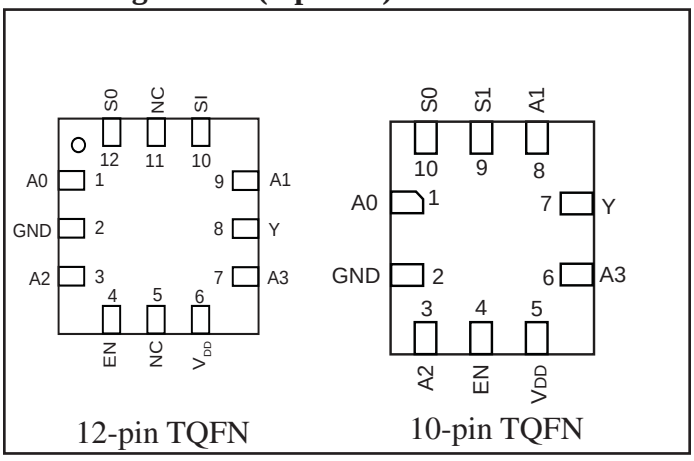
Functional Block Diagram



Pin Description

Pin Name	Description
A_N	Data I/O
S_{0-1}	Select Inputs
EN	Enable
Y	Data I/O Common
GND	Ground
V_{DD}	Power

Pin Configuration (top view)



Absolute Maximum Ratings(1)

Supply Voltage V_{DD} ..... –0.5V to 4.6V
Control Input Voltage (VINx) ..... 0V to 5V
DC Input Voltage (V_{INPUT})(2) ..... –0.5V to 4.6V
Continuous Current NO_NC_COM_ ..... ±300mA
Peak Current NO_NC_COM_
(pulsed at 1ms 50% duty cycle) ..... ±400mA
Peak Current NO_NC_COM_
(pulsed at 1ms 10% duty cycle) ..... ±500mA
Storage Temperature Range (T_{STG}) ..... –65°C to +150°C
Junction Temperature under Bias (T_J) ..... 150°C
Junction Lead Temperature (T_L)
(Soldering, 10 seconds) ..... 260°C
Power Dissipation (P_D) @ +85°C 250mW

Recommended Operating Conditions(3)

Supply Voltage Operating (V_{DD}) . . . . . 1.8V to 3.3V ±5%
Control Input Voltage (V_{IN}) . . . . . 0V to V_{DD}
Switch Input Voltage (V_{INPUT}) . . . . . -0.3V to V_{DD}
Operating Temperature (T_A) . . . . . –40°C to +85°C
Input Rise and Fall Time (t_r,t_f)
Control Input V_{DD} = 2.3V - 3.6V . . . . . 0ns/V to 10ns/V
Thermal Resistance (θ_{JA}) . . . . . 350°C/W

Notes:

1. "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied.
2. The input and output negative voltage ratings may be exceeded if the input and output diode current ratings are observed.
3. Control input must be held HIGH or LOW; it must not float.

DC Electrical Characteristics +1.8V Supply

(V_{DD} = 1.8V, T_A = –40°C to 85°C, unless otherwise noted.)

Parameter	Description	Test Conditions	Min.	Typ.(2)	Max.	Units
Analog Switch						
Y, Ax	Analog Signal Range		-0.3		V_{DD}	V
R_{ON}	On-Resistance	I_Y = 100mA, V_{IN} = 0 to V_{DD}			9	Ω
ΔR_{ON}	On-Resistance Match Between Channels	I_Y = 100mA, V_{IN} = 0.5V_{DD}			0.6	
R_{ONF}	On-Resistance Flatness	I_Y = 100mA, V_{IN} = 0 to V_{DD}			5	
THD	Total Harmonic Distortion	Load = 100KΩ , V_{IN} = 0.5V_{DD} , Frequency = 20Hz to 20KHz		0.03		%
Control Inputs(1)						
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level	1.5			V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level	–0.5		0.8	
I_{IH}	Input HIGH Current	V_{DD} = Max., V_{IN} = V_{DD}			±1	µA
I_{IL}	Input LOW Current	V_{DD} = Max., V_{IN} = GND			±1	
I_{OZH}	High Impedance Output Current	0 ≤ I_N, Y_N ≤ V_{DD}			±1	
V_{IK}	Clamp Diode Voltage	V_{DD} = Min., I_{IN} = –18mA			–1.2	V

Notes:
1. For digital control inputs EN, S0, S1.
2. Typical values are at V_{DD} = 1.8V, T_A = 25°C ambient and maximum loading.
3. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
4. Measured by the voltage drop between A and Y pin at indicated current through the switch. On-Resistance is determined by the lower of the voltages on the two (I,Y) pins.

Power Supply Characteristics +1.8V Supply

Parameters	Description	Test Conditions(1)		Min.	Typ.(2)	Max.	Units
I_{CC}	Quiescent Power Supply Current	V_{DD} = Max.	V_{IN} = GND or V_{DD}		0.1	9.0	µA

Notes:
1. Control inputs only; A and Y pins do not contribute to I_{CC}.
2. Typical values are at V_{DD} = 1.8V, T_A = 25°C ambient and maximum loading.
3. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.

DC Electrical Characteristics +3.3V Supply

(V_{DD} = 3.3V, T_A = –40°C to 85°C, unless otherwise noted.)

Parameter	Description	Test Conditions	Min.	Typ(2)	Max.	Units
Analog Switch						
Y, Ax	Analog Signal Range		-0.3		V_{DD}	V
R_{ON}	On-Resistance	I_Y = 100mA, V_{IN} = 0 to V_{DD}			5	Ω
ΔR_{ON}	On-Resistance Match Between Channels	I_Y = 100mA, V_{IN} = 0.5V_{DD}			0.2	
R_{ONF}	On-Resistance Flatness	I_Y = 100mA, V_{IN} = 0 to V_{DD}			0.6	
THD	Total Harmonic Distortion	Load = 100KΩ , V_{IN} = 0.5V_{DD} , Frequency = 20Hz to 20KHz		0.03		%
Control Inputs(1)						
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level	1.5			V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level	–0.5		0.8	
I_{IH}	Input HIGH Current	V_{DD} = Max., V_{IN} = V_{DD}			±1	µA
I_{IL}	Input LOW Current	V_{DD} = Max., V_{IN} = GND			±1	
I_{OZH}	High Impedance Output Current	0 ≤ I_N, Y_N ≤ V_{DD}			±1	
V_{IK}	Clamp Diode Voltage	V_{DD} = Min., I_{IN} = –18mA			–1.2	V

Notes:
1. For digital control inputs EN, S0, S1.
2. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at V_{DD} = 3.3V, T_A = 25°C ambient and maximum loading.
3. Measured by the voltage drop between A and Y pin at indicated current through the switch. On-Resistance is determined by the lower of the voltages on the two (I,Y) pins.

Power Supply Characteristics, 3.3V Supply

Parameters	Description	Test Conditions(1)		Min.	Typ.(2)	Max.	Units
I_{CC}	Quiescent Power Supply Current	V_{DD} = Max.	V_{IN} = GND or V_{DD}		0.1	9.0	µA

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at V_{DD} = 3.3V, +25°C ambient.
3. Control inputs only; A and Y pins do not contribute to I_{CC}.

Switch and AC Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
t_{ON}	Turn-On Time	V_{DD} = 2.7V, V_{IN} = 1.5V, R_L = 50Ω, C_L = 35pF, *See Test Circuit Figure 1 & 2.*		5	15	ns
t_{OFF}	Turn-Off Time	V_{DD} = 2.7V, V_{IN} = 1.5V, R_L = 50Ω, C_L = 35pF, *See Test Circuit Figure 1 & 2.*		35	50	
Q	Charge Injection	COM = 0, R_S = 0, C_L = 1nF, V_{DD} = 3.3V *See Test Circuit Figure 4.*		15		pC
O_{IRR}	Off-Isolation	C_L = 5pF, R_L = 50Ω, f = 100kHz, V_{IN} = 1 V_{RMS}, V_{DD} = 3.3V *See Test Circuit Figure 5.*		-95		dB
X_{TALK}	Crosstalk	C_L = 5pF, R_L = 50Ω, f = 100kHz, V_{IN} = 1 V_{RMS}, V_{DD} = 3.3V *See Test Circuit Figure 6.*		-90		
f_{3dB}	3dB Bandwidth	*See Test Circuit Figure 9.*, V_{DD} = 3.3V		250		MHz
t_{pd}(1)	Propogation delay	C_L = 5pF, R_L = 500km			0.25	ns

Note:
1. This Parameter is not production tested.

Capacitance

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$C_{NC\ (OFF)}$	Off Capacitance	f = 1MHz, *See Test Circuit Figure 7.*		15		pF
$C_{NC\ (ON)}$	On Capacitance	f = 1MHz, *See Test Circuit Figure 8.*		25		

Test Circuits and Timing Diagrams

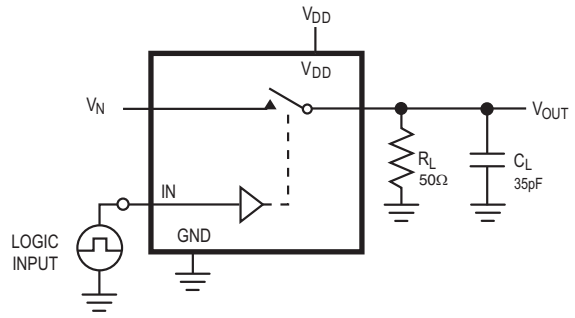


Figure 1. AC Test Circuit

Notes:
1. Unused input (NC or NO) must be grounded.

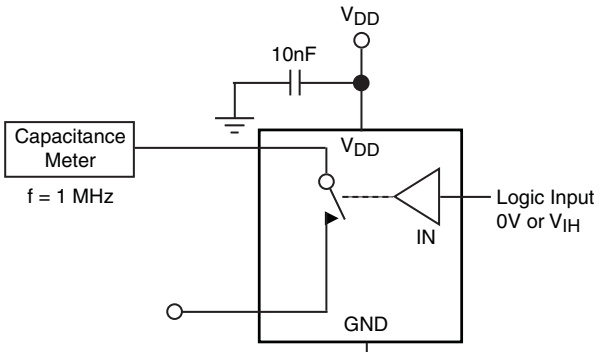


Figure 2. AC Waveforms

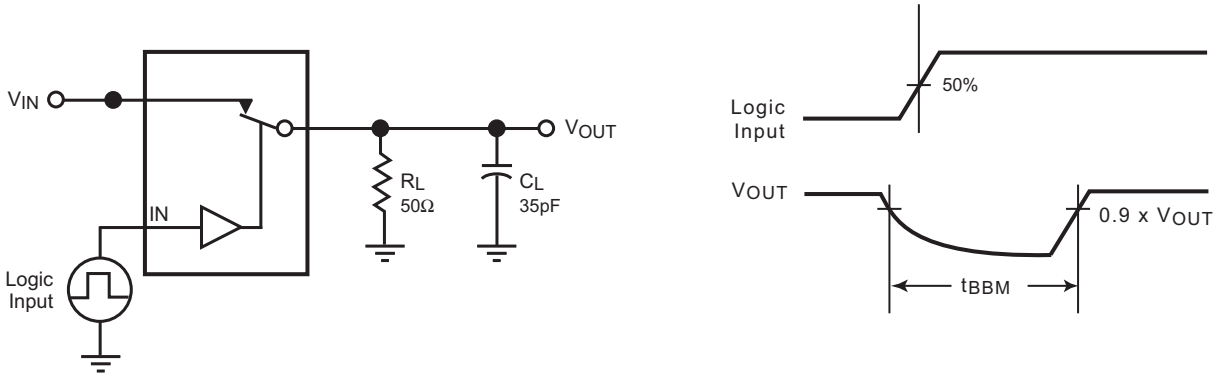


Figure 3. Break Before Make Interval Timing

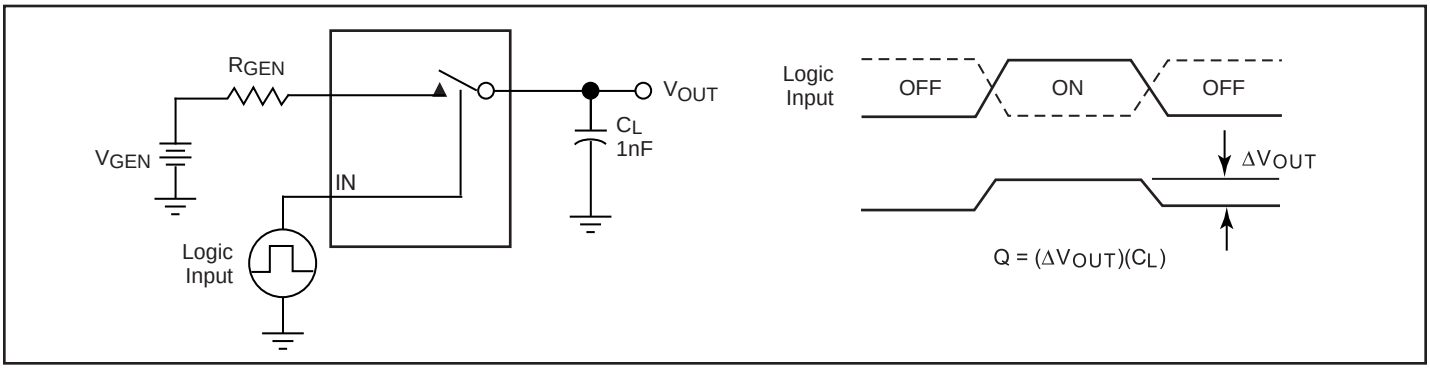


Figure 4. Charge Injection Test

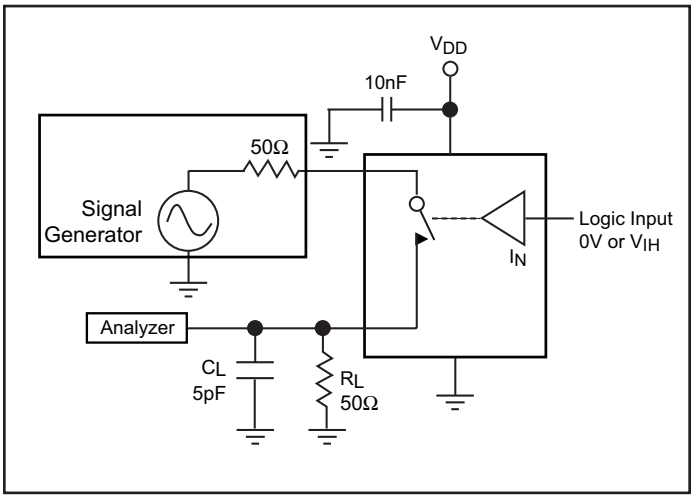


Figure 5. Off Isolation

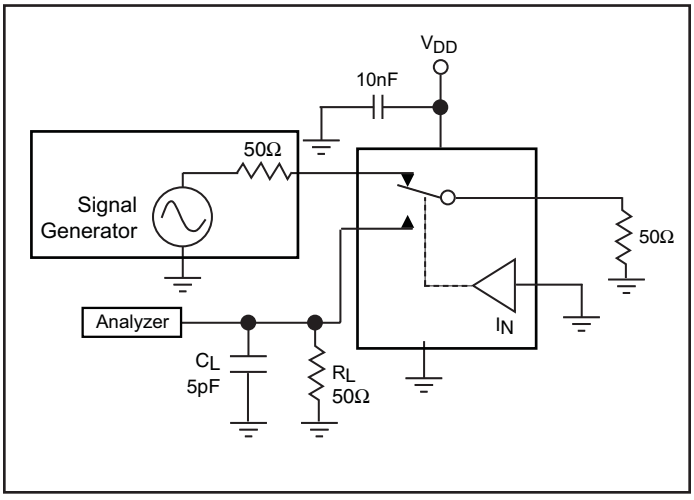


Figure 6. Crosstalk

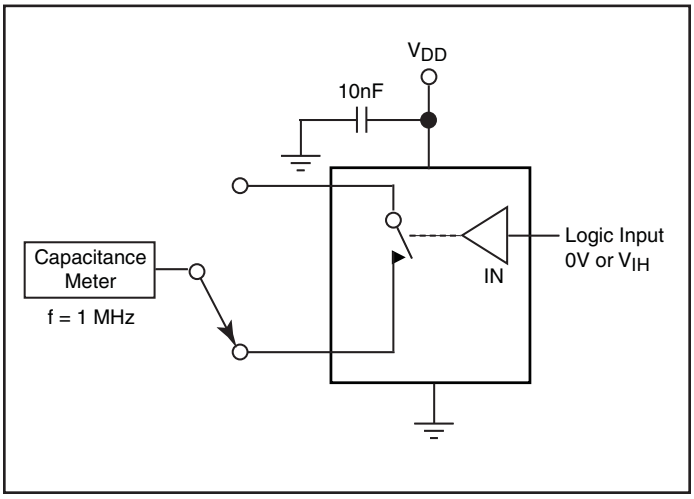


Figure 7. Channel Off Capacitance

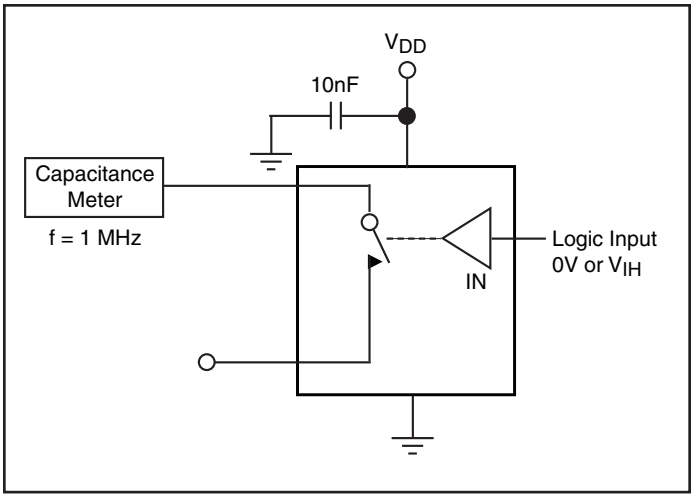


Figure 8. Channel On Capacitance

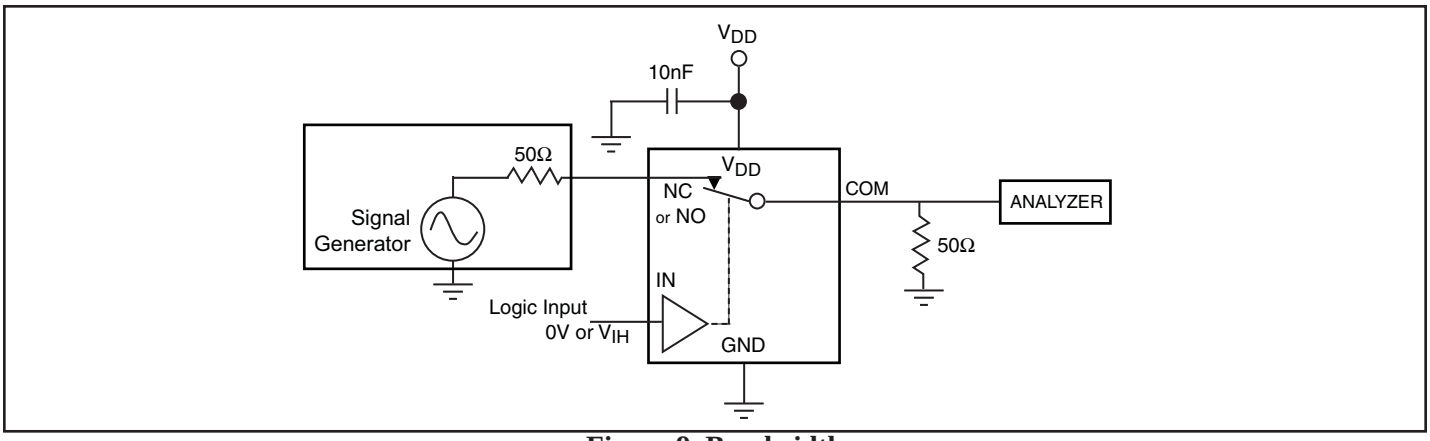
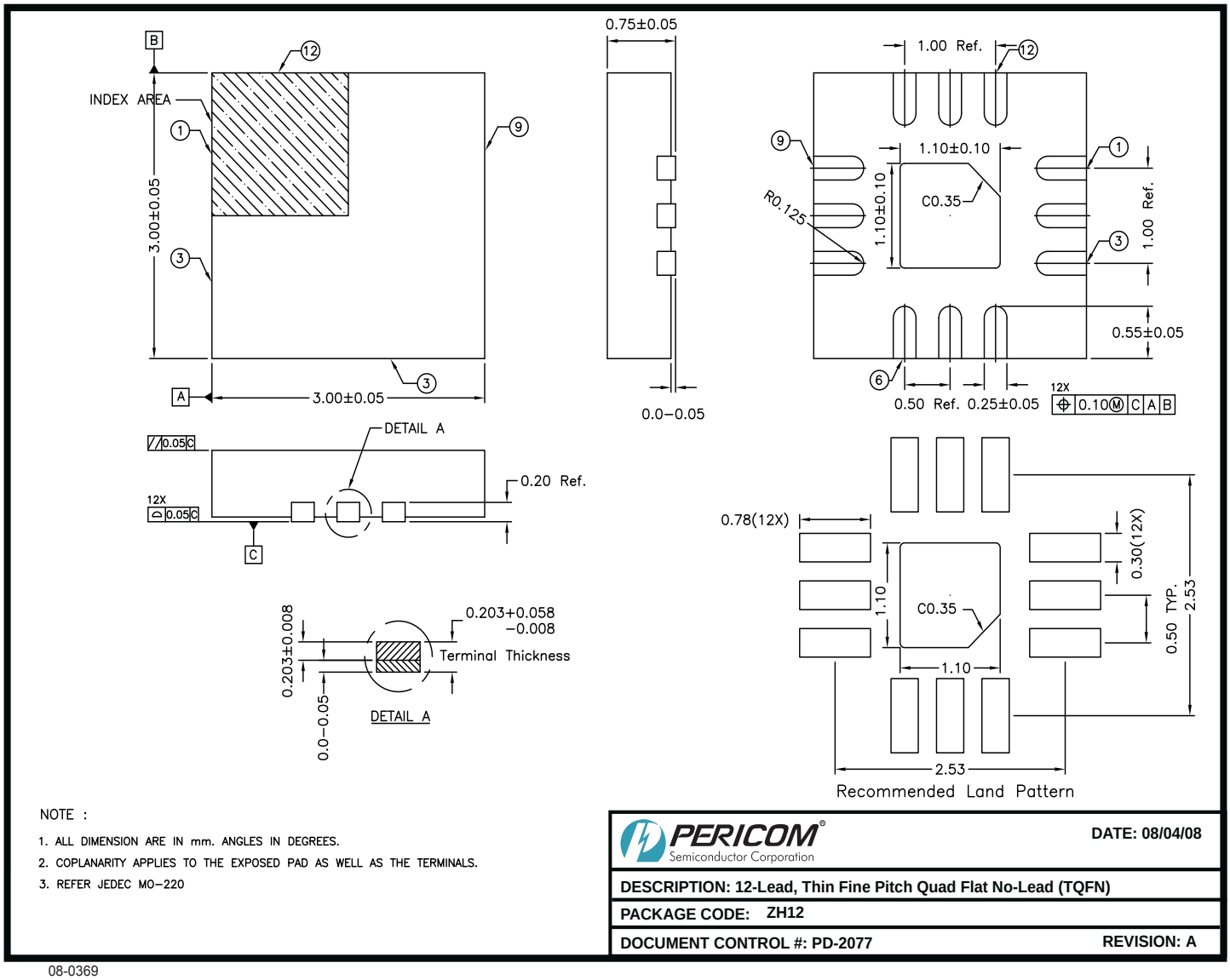


Figure 9. Bandwidth

Packaging Mechanical: 12-pin TQFN (ZH)



NOTE :

1. ALL DIMENSION ARE IN mm. ANGLES IN DEGREES.
2. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
3. REFER JEDEC MO−220

PERICOM Semiconductor Corporation

DATE: 08/04/08

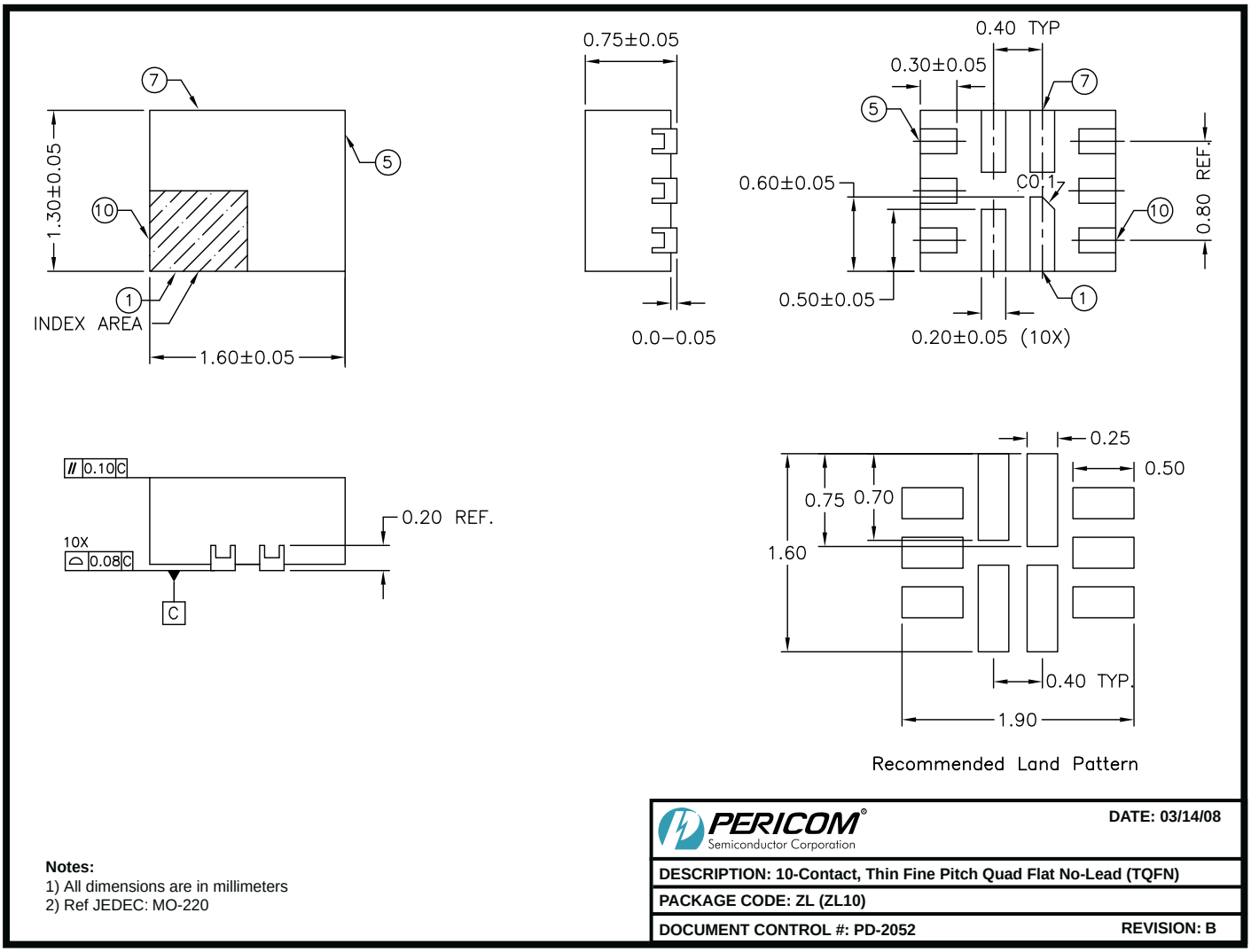
DESCRIPTION: 12-Lead, Thin Fine Pitch Quad Flat No-Lead (TQFN)

PACKAGE CODE: ZH12

DOCUMENT CONTROL #: PD-2077 **REVISION: A**

08-0369

Packaging Mechanical: 10-pin TQFN (ZL)



Notes:
1) All dimensions are in millimeters
2) Ref JEDEC: MO-220

Ordering Information

Ordering Code	Packaging Code	Package Type	Top Mark
PI3A114-AZHE	ZH	Pb-Free & Green, 12-contact TQFN (3.0 × 3.0)	CR
PI3A114-AZLE	ZL	Pb-Free & Green, 10-contact TQFN (1.6 × 1.3)	CR

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free & Green
- X suffix = Tape/Reel