Product Change Notification / SYST-14WYVK424

Date:

18-Apr-2022

Product Category:

Clock and Timing - Clock and Data Distribution

PCN Type:

Document Change

Notification Subject:

Data Sheet - PL133-97 - Low Power DC to 150MHz 1:9 Fanout Buffer IC Revision

Affected CPNs:

SYST-14WYVK424_Affected_CPN_04182022.pdf
SYST-14WYVK424_Affected_CPN_04182022.csv

Notification Text:

SYST-14WYVK424

Microchip has released a new Product Documents for the PL133-97 - Low Power DC to 150MHz 1:9 Fanout Buffer IC of devices. If you are using one of these devices please read the document located at PL133-97 - Low Power DC to 150MHz 1:9 Fanout Buffer IC.

Description of Change:
1. Converted Micrel document PL133-97 to Microchip data sheet DS20006672A.
2. Minor text changes throughout.

Impacts to Data Sheet: See above details.

Reason for Change: To Improve Productivity

Change Implementation Status: Complete

Date Document Changes Effective: 18 April 2022

NOTE: Please be advised that this is a change to the document only the product has not been changed.

Markings to Distinguish Revised from Unrevised Devices: N/A

Attachments:

PL133-97 - Low Power DC to 150MHz 1:9 Fanout Buffer IC

Please contact your local Microchip sales office with questions or concerns regarding this notification.

Terms and Conditions:

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If you wish to change your PCN profile, including opt out, please go to the PCN home page select login and sign into your myMicrochip account. Select a profile option from the left navigation bar and make the applicable selections.

Affected Catalog Part Numbers (CPN)

PL133-97QC
PL133-97QI
PL133-97QC-R
PL133-97QI-R

PL133-97

Low-Power DC to 150 MHz 1:9 Fanout Buffer IC

Features

- 1:9 LVCMOS Output Fanout Buffer from DC to150 MHz
- Low Additive Phase Jitter of 60 fs RMS
- 8 mA Output Drive Strength
- Low Power Consumption for Portable Applications
- Low Input-Output Delay
- Output-Output Skew <250 ps
- 2.5V to 3.3V, ±10% Operation
- 1.8V ±5% Operation up to 67 MHz
- Operating Temperature Range:
  - Commercial: 0°C to +70°C
  - Industrial: –40°C to +85°C
- Available in 16-Pin QFN Package

General Description

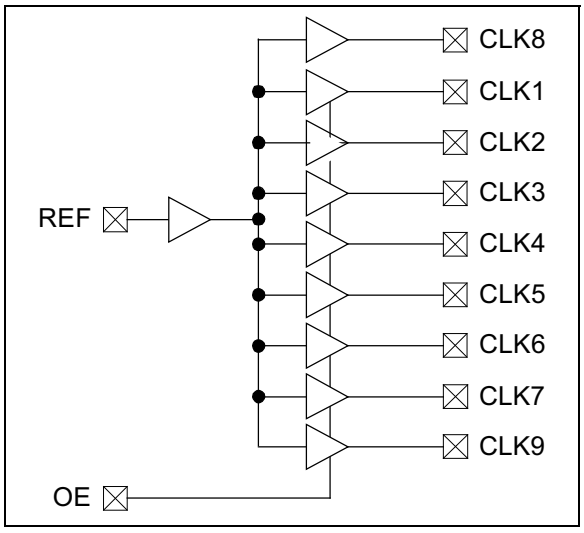
The PL133-97 is an advanced fanout buffer designed for high performance, low-power, small form factor applications. The PL133-97 accepts a reference clock input from DC to 150 MHz and provides nine outputs of the same frequency.

The PL133-97 is offered in a small 3 mm x 3 mm QFN-16L package and it offers the best phase noise, additive jitter performance, and lowest power consumption of any comparable IC.

The PL133-97 outputs can be disabled to a high impedance (tri-state) by pulling low the OE pin. When the OE pin is high, the outputs are enabled and follow the REF input signal. When the OE pin is left open, a pull-up resistor on the chip will default the OE pin to logic 1 so the outputs are enabled.

CLK8 is a free running output that remains enabled when the OE pin is pulled low.

Functional Block Diagram



1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Voltage to Ground Potential ..... –0.5V to +4.6V
DC Input Voltage ..... V_{SS} – 0.5V to +4.6V
Static Discharge Voltage
(Per MIL-STD-883, Method 3015)..... >2000V

Operating Ratings †

Supply Voltage, V_{DD}..... 1.71V to 3.63V

† Notice: Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

Electrical Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Input Low Voltage	V_{IL}	—	—	0.3xV_{DD}	V	Note 1
Input High Voltage	V_{IH}	0.7xV_{DD}	—	—	V	Note 1
Input Low Current	I_{IL}	—	—	50	µA	V_{IN} = 0V
Input High Current	I_{IH}	—	—	100	µA	V_{IN} = V_{DD}
Supply Current	I_{DD}	—	—	32	mA	66.67 MHz with unloaded outputs
Output Low Voltage	V_{OL}	—	—	0.5	V	I_O = 8 mA, V_{DD} = 3.3V
		—	—	0.5		I_O = 6 mA, V_{DD} = 2.5V
		—	—	0.5		I_O = 4 mA, V_{DD} = 1.8V
Output High Voltage	V_{OH}	V_{DD} - 0.5	—	—	V	I_O = –8 mA, V_{DD} = 3.3V
		V_{DD} - 0.5	—	—		I_O = –6 mA, V_{DD} = 2.5V
		V_{DD} - 0.5	—	—		I_O = –4 mA, V_{DD} = 1.8V
OE Pin Pull-Up Resistance	R_{PU}	—	120	—	kΩ	—
Load Capacitance	C_L	—	—	30	pF	Load Capacitance, below 100 MHz, V_{DD} > 2.25V
		—	—	10		Load Capacitance between 100 MHz and 134 MHz, V_{DD} > 2.25V
		—	—	5		Load Capacitance, above 134 MHz, V_{DD} > 2.25V
		—	—	15		Load Capacitance, below 67 MHz, 1.71V < V_{DD} < 2.25V
Input Capacitance	C_{IN}	—	—	7	pF	—
Power-Up Time	t_{PU}	0.05	—	50	ms	Power-up time for all V_{DD} to reach minimum specified voltage (power ramps must be monotonic)

Note 1: REF input has a threshold voltage of V_{DD}/2.

SWITCHING CHARACTERISTICS Note 2

Electrical Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Operating Frequency	f	DC	—	160	MHz	V_{DD} = 3.3V, 2.5V
		DC	—	67	MHz	V_{DD} = 1.8V
Duty Cycle = $t_2 \div t_1$	—	40	50	60	%	Measured at $V_{DD}/2$, Input = 50%
Rise Time	t_3	—	—	1.5	ns	Measured between 0.8V and 2.0V
Fall Time	t_4	—	—	1.5	ns	Measured between 0.8V and 2.0V
Output to Output Skew Note 1	t_5	—	—	250	ps	All outputs equally loaded
Propagation Delay, REF Rising Edge to CLKX Rising Edge Note 1	t_6	1	5	9.2	ns	Measured at $V_{DD}/2$

Note 1: Parameter is guaranteed by design and characterization.

2: All parameters are specified with loaded outputs.

NOISE CHARACTERISTICS

Electrical Characteristics:

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Additive Phase Jitter	—	—	60	—	fs	V_{DD} = 3.3V, Frequency = 100 MHz Integration range 12 kHz - 20 MHz

TEMPERATURE SPECIFICATIONS (Note 1)

Parameters	Symbol	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Ambient Operating Temperature (T_A)	T_A	0	—	+70	°C	Commercial
		–40	—	+85		Industrial
Junction Temperature	T_J	—	—	+150	°C	—
Storage Temperature Range	T_S	–65	—	+150	°C	—
Package Thermal Resistance						
16-Lead QFN	$R_{\theta JA}$	—	82.5	—	°C/W	—

Note 1: The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction to air (i.e., T_A, T_J, θ_{JA}). Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum +150°C rating. Sustained junction temperatures above +150°C can impact the device reliability.

2.0 PIN DESCRIPTIONS

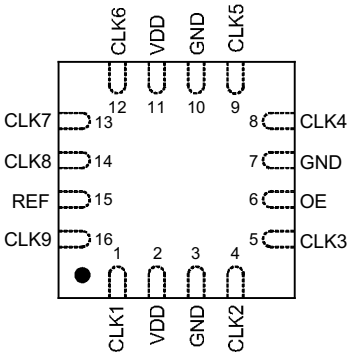


FIGURE 2-1: *Pin Configuration, 16-Lead QFN Package.*

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: PIN FUNCTION TABLE

Pin Number	P8in Name	Type	Description
15	REF	I	Input reference frequency
1	CLK1	O	Buffered clock output
4	CLK2	O	Buffered clock output
5	CLK3	O	Buffered clock output
8	CLK4	O	Buffered clock output
9	CLK5	O	Buffered clock output
12	CLK6	O	Buffered clock output
13	CLK7	O	Buffered clock output
14	CLK8	O	Buffered clock output, free running, does not disable with OE
16	CLK9	O	Buffered clock output
2, 11	VDD	P	VDD connection
3, 7, 10	GND	P	GND connection
6	OE	I	Output enable control input with 130 kΩ pull-up
ePAD	—	—	Center Pad for thermal relief. Connect to GND

3.0 NOMINAL PERFORMANCE CHARACTERISTICS

Note:	The graphs and tables provided following this note are a statistical summary based on a limited number of samples and are provided for informational purposes only. The performance characteristics listed herein are not tested or guaranteed. In some graphs or tables, the data presented may be outside the specified operating range (e.g., outside specified power supply range) and therefore outside the warranted range.

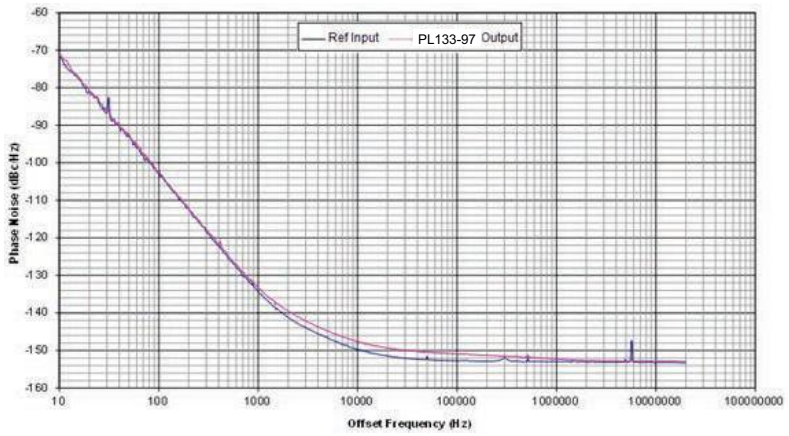


FIGURE 3-1: *PL133-97 Additive Phase Jitter: V_{DD} = 3.3V, CLK-100 MHz, Integration Range 12 kHz - 20 MHz.*

When a buffer is used to pass a signal then the buffer will add a little bit of its own noise. The phase noise on the output of the buffer will be a little bit more than the phase noise in the input signal. The noise added by the buffer to the input signal is quantified by the additive phase jitter defined by the following formula:

EQUATION 3-1:

$$AdditivePhaseJitter = \sqrt{(OutputPhaseJitter)^2 - (InputPhaseJitter)^2}$$

4.0 SWITCHING WAVEFORMS

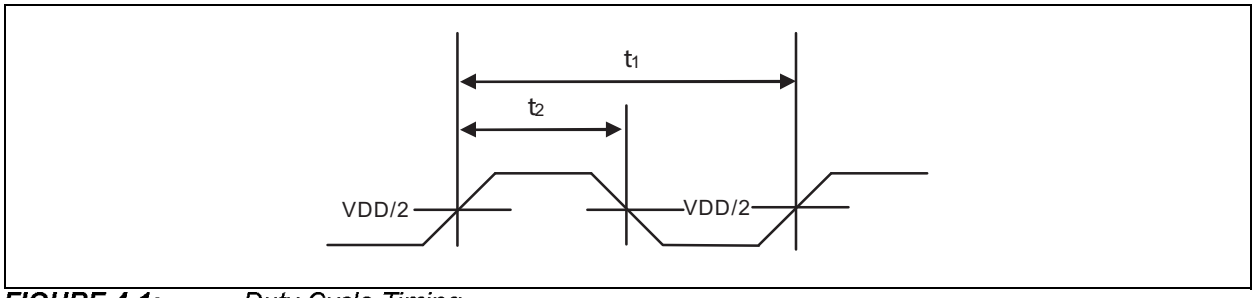


FIGURE 4-1: *Duty Cycle Timing.*

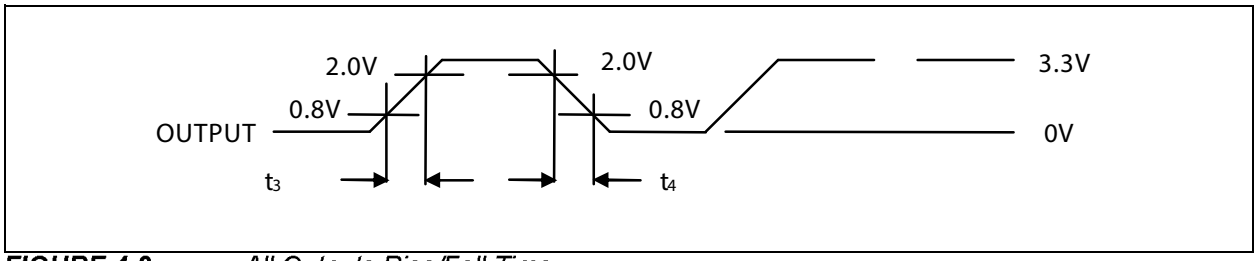


FIGURE 4-2: *All Outputs Rise/Fall Time.*

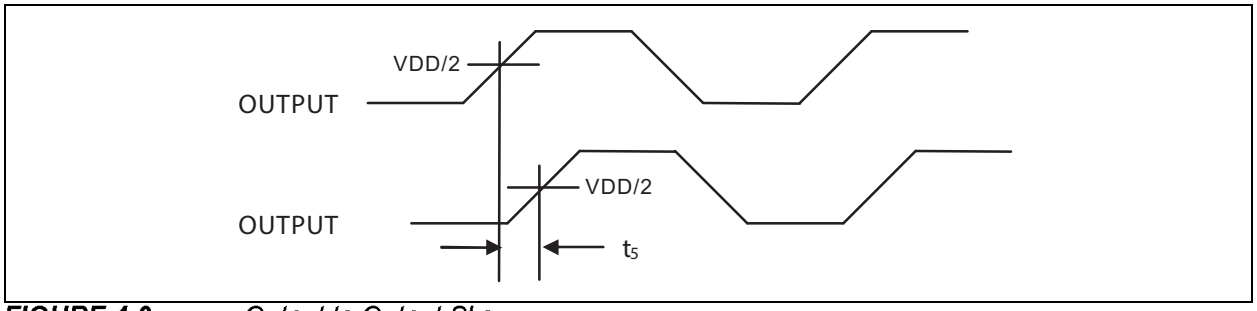


FIGURE 4-3: *Output to Output Skew.*

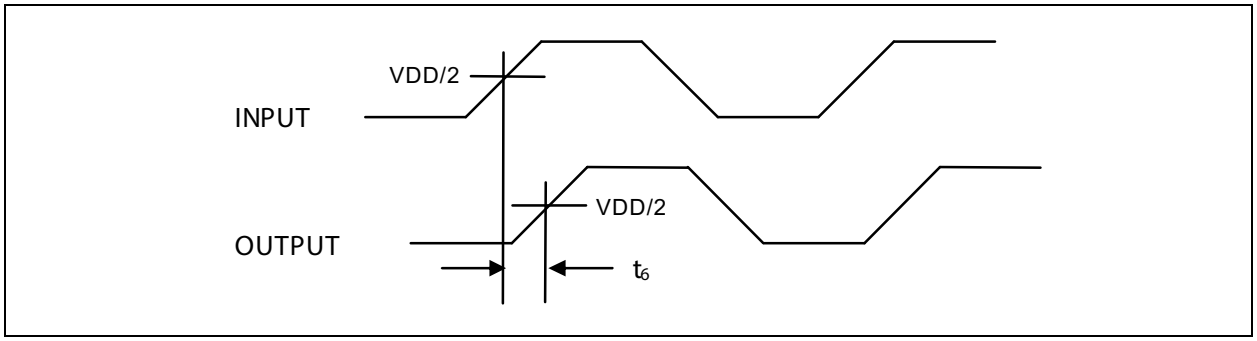


FIGURE 4-4: *Input-Output Propagation Delay.*

5.0 TEST CIRCUIT

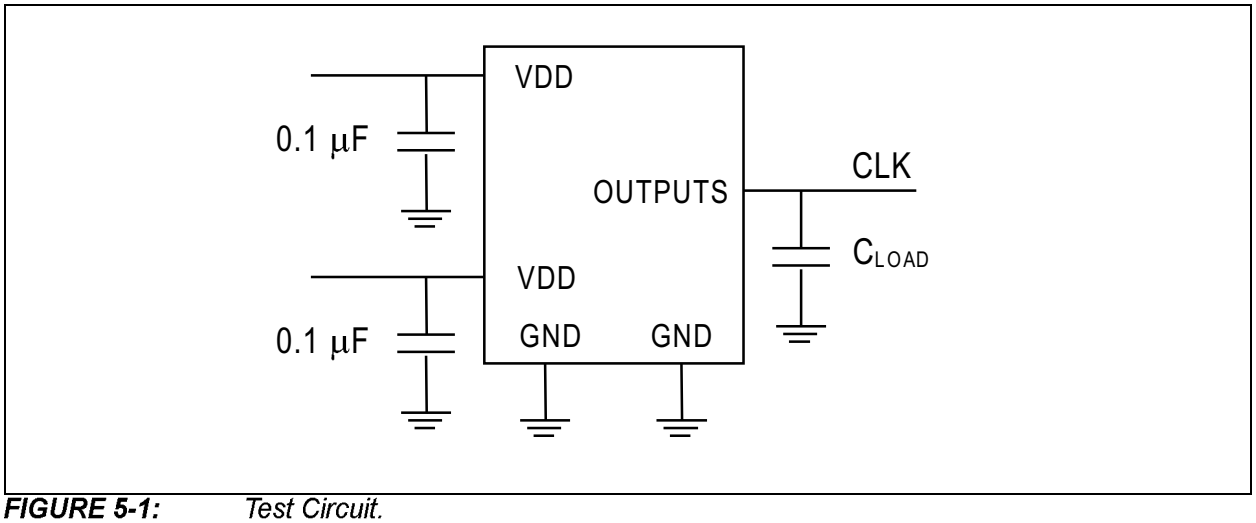


FIGURE 5-1: *Test Circuit.*

6.0 LAYOUT RECOMMENDATIONS

The following guidelines are to assist you with a performance optimized PCB design:

6.1 Signal Integrity and Termination Considerations

- Keep traces short
- Trace = Inductor. With a capacitive load this equals ringing
- Long trace = Transmission Line. Without proper termination this will cause reflections ringing and waveforms degradations.
- Use stripline or microstrip with defined impedance for long traces (> 1 inch)
- Match traces on one side of the board to avoid reflections bouncing back and forth.

6.2 Decoupling and Power Supply Considerations

- Place decoupling capacitors as close as possible to the VDD pin(s) to limit noise from the power supply
- Addition of a ferrite bead in series with VDD can help prevent noise from other board sources
- Value of decoupling capacitor is frequency dependant. Typical values to use are 0.1 µF for designs using frequencies <50 MHz and 0.01 µF for designs using frequencies >50 MHz

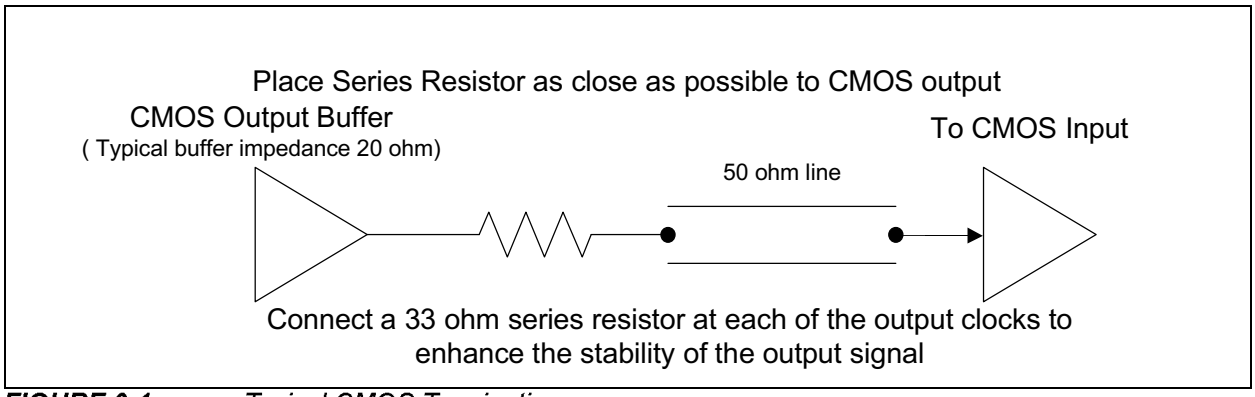
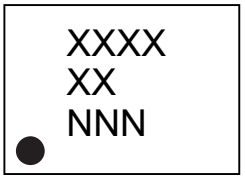


FIGURE 6-1: *Typical CMOS Termination.*

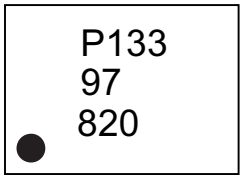
7.0 PACKAGING INFORMATION

7.1 Package Marking Information

16-Lead QFN*



Example

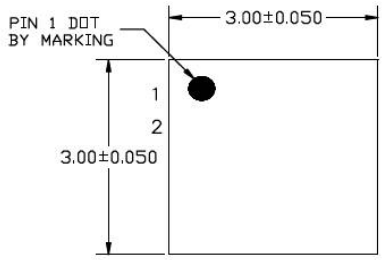


Legend:	XX...X	Product code, customer-specific information, or frequency in MHz without printed decimal point
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	NNN	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator ((e3)) can be found on the outer packaging for this package.
	●, ▲, ▼	Pin one index is identified by a dot, delta up, or delta down (triangle mark).
Note:	In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.	
	Underbar (_) and/or Overbar (¯) symbol may not be to scale.	

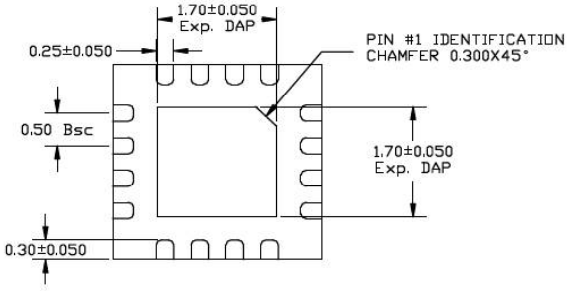
16-Lead QFN Package Outline and Recommended Land Pattern

TITLE
16 LEAD QFN 3x3mm PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

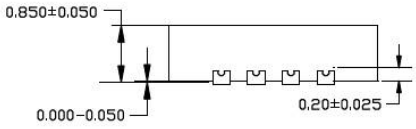
DRAWING #	QFN33-16LD-PL-3	UNIT	MM
Lead Frame	NiPdAu	Lead Finish	NiPdAu



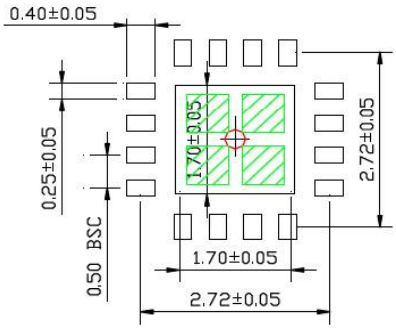
TOP VIEW
NOTE: 1, 2, 3



BOTTOM VIEW
NOTE: 1, 2, 3



SIDE VIEW
NOTE: 1, 2, 3



RECOMMENDED LAND PATTERN
NOTE: 4, 5

NOTE:
1. MAX PACKAGE WARPAGE IS 0.05mm.
2. MAX ALLOWABLE BURR IS 0.076mm IN ALL DIRECTIONS
3. PIN #1 IS ON TOP WILL BE LASER MARKED.
4. RED CIRCLE IN LAND PATTERN INDICATES THERMAL VIA. SIZE SHOULD BE 0.30-0.35mm IN DIAMETER AND SHOULD BE CONNECTED TO GND FOR MAX THERMAL PERFORMANCE.
5. GREEN RECTANGLES (SHADED AREA) indicate SOLDER STENCIL OPENING ON EXPOSED PAD AREA. SIZE SHOULD BE 0.60x0.60mm IN SIZE, 0.20mm SPACING.

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging.

NOTES:

APPENDIX A: REVISION HISTORY

Revision A (April 2022)

- Converted Micrel document PL133-97 to Microchip data sheet DS20006672A.
- Minor text changes throughout.

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

PART NO.	X	XX	X
Device	Package	Temperature Range	Media Type

Device:	PL133-97:	Low-Power DC to 150 MHz 1:9 Fanout Buffer IC	
Package:	Q	=	16-Lead QFN Package (RoHS Compliant)
Temperature Range:	C	=	0°C to +70°C (Commercial)
	I	=	–40°C to +85°C (Industrial)
Media Type:	(blank)	=	20/Bag
	R	=	3,000/Reel

Examples:

a) PL133-97QC	Low-Power DC to 150 MHz 1:9 Fanout Buffer IC, QFN Package, 0°C to +70°C, 20/Bag
b) PL133-97QC-R	Low-Power DC to 150 MHz 1:9 Fanout Buffer IC, QFN Package, 0°C to +70°C, 3,000/Reel
c) PL133-97QI	Low-Power DC to 150 MHz 1:9 Fanout Buffer IC, QFN Package, –40°C to +85°C, 20/Bag
b) PL133-97QI-R	Low-Power DC to 150 MHz 1:9 Fanout Buffer IC, QFN Package, –40°C to +85°C, 3,000/Reel

Note 1: Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.

NOTES:

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Fax: 34-91-708-08-91

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