PL102-10

Low Skew Output Buffer

Features

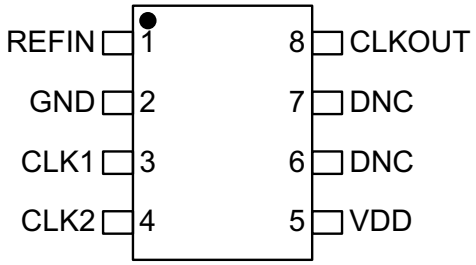
- Frequency Range:
  - 15 MHz to 170 MHz @ 3.3V
  - 15 MHz to 145 MHz @ 2.5V
- Internal Phase Locked Loop Allows Spread Spectrum Modulation on Reference Clock to Pass to Outputs
- Zero Input-to-Output Delay
- Less than 700 ps Device-to-Device Skew
- Less than 200 ps Skew between Outputs
- Less than 100 ps Cycle-to-Cycle Jitter
- 2.5V or 3.3V Power Supply
- Available in 8-Lead SOIC or 6-Lead SOT23 GREEN/RoHS-Compliant Packages

General Description

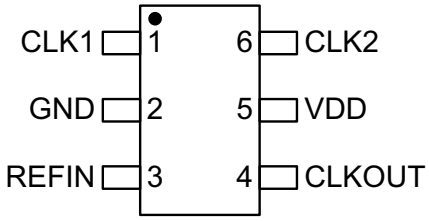
The PL102-10 is a high performance, low skew, low jitter zero delay buffer designed to distribute high speed clocks and is available in 8-lead SOIC or 6-lead SOT23 package. It has two outputs that are synchronized with the input. The synchronization is established via CLKOUT feed back to the input of the PLL. Because the skew between the input and output is less than ±350 ps, the device acts as a zero delay buffer.

Package Types

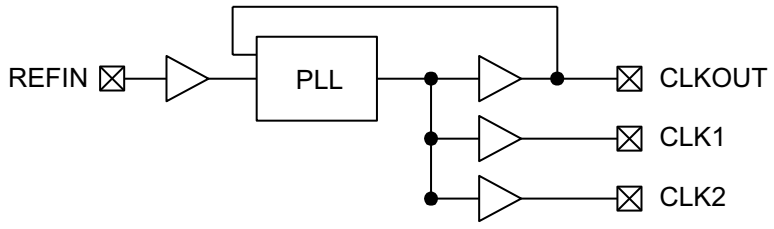
PL102-10
8-Lead SOIC (S)
(Top View)



PL102-10
6-Lead SOT23 (T)
(Top View)



Block Diagram



© 2020 Microchip Technology Inc.

1.0 ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings †

Supply Voltage (V_{DD}) ..... +4.6V
DC Input Voltage (V_I)..... –0.5V to V_{DD} + 0.5V
DC Output Voltage (V_O) ..... –0.5V to V_{DD} + 0.5V

† 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

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	V_{DD}	2.25	—	3.63	V	—
Input Low Voltage	V_{IL}	—	—	0.8	V	—
Input High Voltage	V_{IH}	2.0	—	—	V	—
Output Low Voltage	V_{OL}	—	—	0.4	V	I_{OL} = 24 mA
Output High Voltage	V_{OH}	2.4	—	—	V	I_{OH} = 24 mA
Supply Current	I_{DD}	—	22	30	mA	Unloaded outputs at 100 MHz, V_{DD} = 3.3V

SWITCHING CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Input/Output Frequency	t1	15	—	145	MHz	2.5V
		15	—	170		3.3V
Duty Cycle	DC	45	50	55	%	Measured at V_{DD}/2, C_L = 15 pF, f_{OUT} = 100 MHz
Rise Time	t_r	—	1.2	1.5	ns	Measured between 10% and 90% of V_{DD}, C_L = 15 pF
Fall Time	t_f	—	1.2	1.5	ns	Measured between 90% and 10% of V_{DD}, C_L = 15 pF
Output to Output Skew	t_{SKEW}	—	—	200	ps	All outputs equally loaded, C_L = 15 pF
Delay, REF Rising Edge to CLKOUT Rising Edge	t_{DELAY}	—	0	±350	ps	Measured at V_{DD}/2
Device to Device Skew	$t_{DSK-DSK}$	—	0	700	ps	Measured at V_{DD}/2 on the CLKOUT pins of devices
Cycle to Cycle Jitter	$t_{CYC-CYC}$	—	—	60	ps	Measured at 100 MHz
PLL Lock Time	t_{LOCK}	—	—	1.0	ms	Stable power supply, valid clock presented on REF pin
Jitter; Absolutle Jitter	t_{JABS}	—	20	50	ps	Measured 10,000 cycles, low jitter input signal
Jitter; 1-Sigma	t_{J1-S}	—	9	15	ps	Measured 10,000 cycles, low jitter input signal

© 2020 Microchip Technology Inc.

TEMPERATURE SPECIFICATIONS

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Temperature Ranges						
Ambient Operating Temperature	T_A	–40	—	+85	°C	—
Junction Operating Temperature	T_J	—	—	+125	°C	—
Storage Temperature Range	T_S	–65	—	+150	°C	—
Lead Temperature	—	—	+260	—	°C	Soldering, 10s

Switching Waveforms

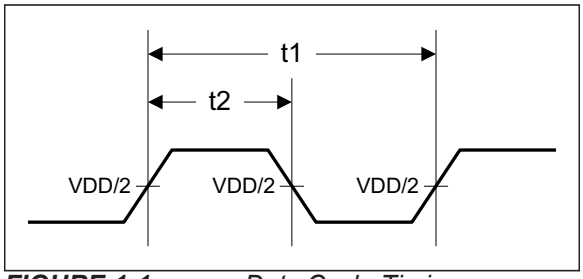


FIGURE 1-1: *Duty Cycle Timing.*

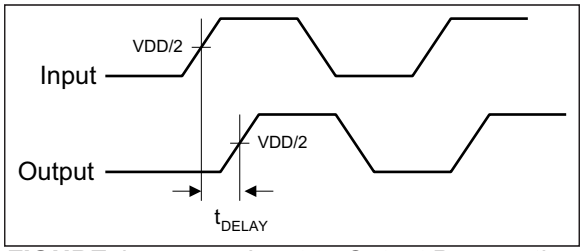


FIGURE 1-4: *Input-to-Output Propagation Delay.*

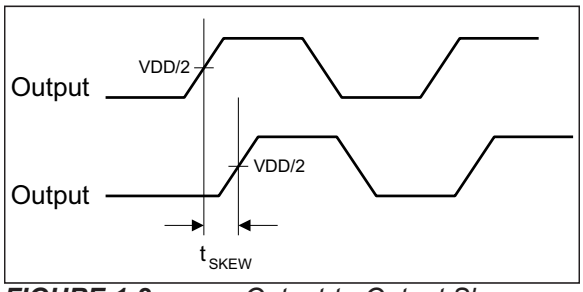


FIGURE 1-2: *Output-to-Output Skew.*

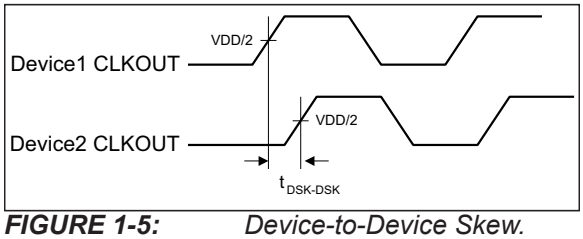


FIGURE 1-5: *Device-to-Device Skew.*

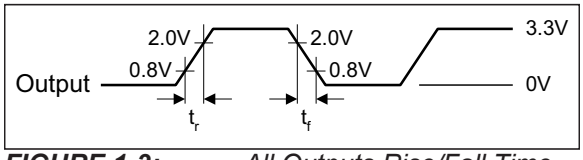


FIGURE 1-3: *All Outputs Rise/Fall Time.*

2.0 PIN DESCRIPTION

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

TABLE 2-1: PIN FUNCTION TABLE

Pin Number SOIC-8	Pin Number SOT23-6	Pin Name	Pin Type	Description
1	3	REFIN	I	Input reference frequency. Spread spectrum modulation on this signal will be passed to the output (up to 100 kHz SST modulation).
2	2	GND	P	Ground connection.
3	1	CLK1	O	Buffered clock output.
4	6	CLK2	O	Buffered clock output. If CLK2 is pulled high during startup, the device will enter test mode.
5	5	VDD	P	2.5V or 3.3V power supply connection.
6, 7	—	NC	—	Do not connect.
8	4	CLKOUT	O	Buffered clock output. Internal feedback on this pin.

© 2020 Microchip Technology Inc.

3.0 OUTPUT-TO-OUTPUT SKEW

The skew between CLKOUT and the CLK(1-2) outputs is not dynamically adjusted by the PLL. Because CLKOUT is one of the inputs to the PLL, zero phase difference is maintained from REF to CLKOUT. If all outputs are equally loaded, zero phase difference will be maintained from REF to all outputs.

If applications requiring zero output-output skew, all the outputs must be equally loaded.

If the CLK(1-2) outputs are less loaded than CLKOUT, CLK(1-2) outputs will lead it; if the CLK(1-2) is more loaded than CLKOUT, CLK(1-2) will lag the CLKOUT.

Because the CLKOUT and the CLK(1-2) outputs are identical, they all start at the same time, but difference loads cause them to have different rise times and different times crossing the measurement thresholds.

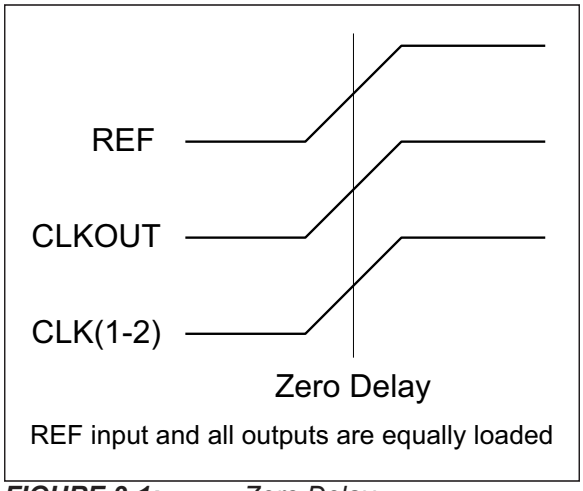


FIGURE 3-1: *Zero Delay.*

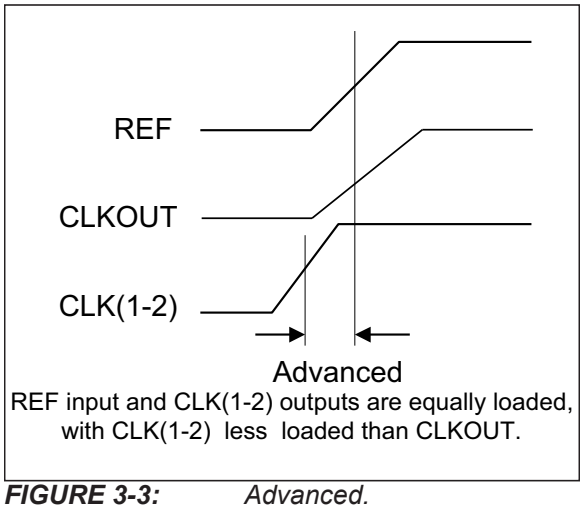


FIGURE 3-3: *Advanced.*

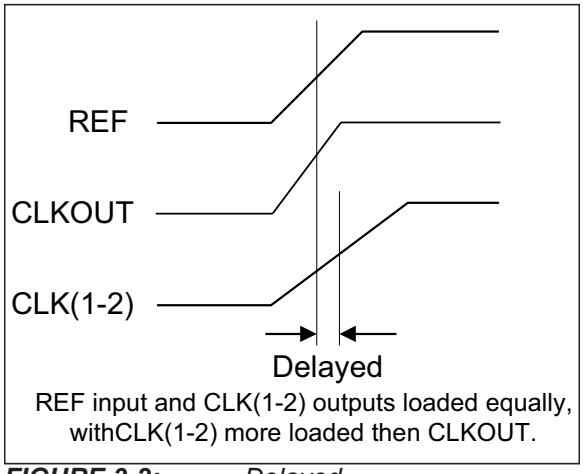


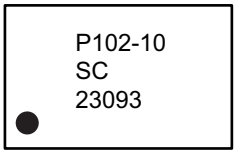
FIGURE 3-2: *Delayed.*

4.0 PACKAGING INFORMATION

4.1 Package Marking Information

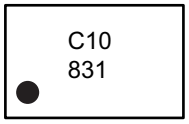
8-Lead SOIC*

Example



6-Lead SOT23*

Example



Legend:	XX...X	Product code
	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 ( ) can be found on the outer packaging for this package. (e3)
	●, ▲, ▼	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.

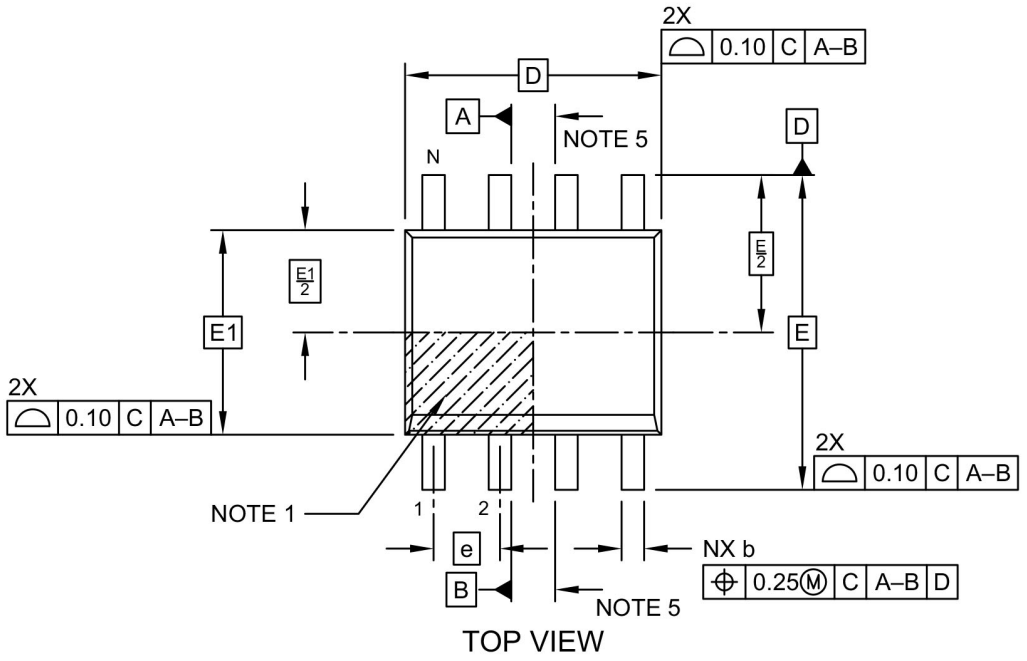
Underbar (_) and/or Overbar (¯) symbol may not be to scale.

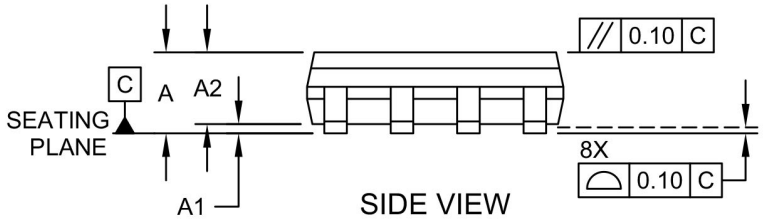
© 2020 Microchip Technology Inc.

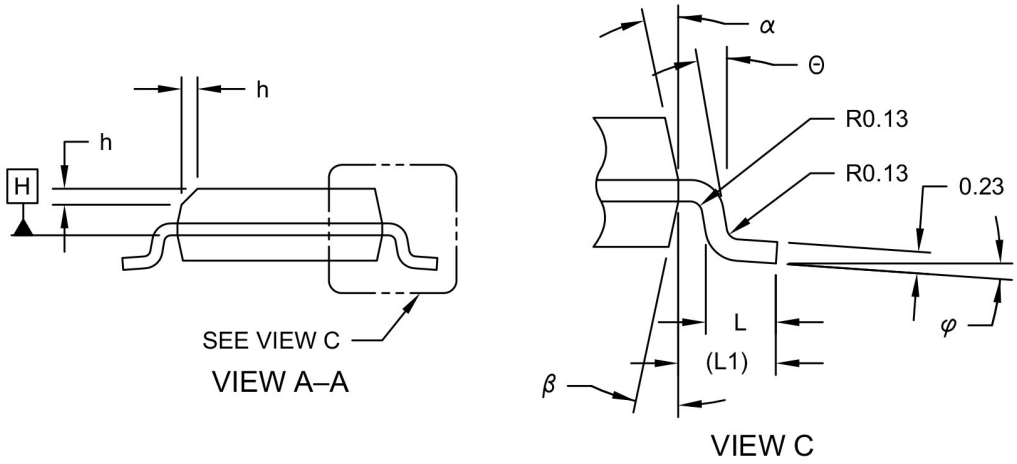
8-Lead SOIC Package Outline and Recommended Land Pattern

8-Lead Plastic Small Outline (ENA) - Narrow, 3.90 mm (.150 In.) Body [SOIC]
Micrel Legacy Package FSLOC-08L

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



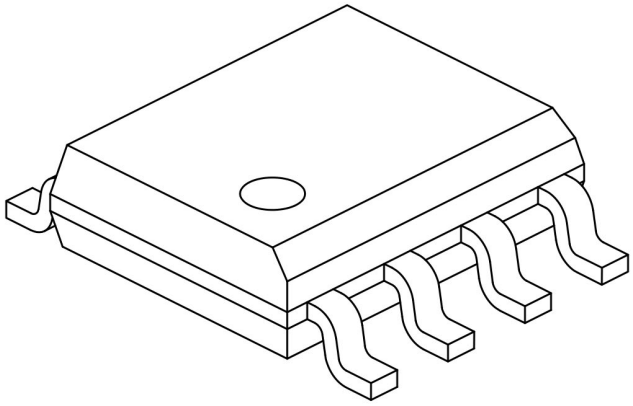




Microchip Technology Drawing No. C04-057-ENA Rev F Sheet 1 of 2

8-Lead Plastic Small Outline (ENA) - Narrow, 3.90 mm (.150 In.) Body [SOIC]
Micrel Legacy Package FSLOC-08L

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



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Pins	N		8	
Pitch	e		1.27 BSC	
Overall Height	A	-	-	1.75
Molded Package Thickness	A2	1.25	-	-
Standoff §	A1	0.10	-	0.25
Overall Width	E		6.00 BSC	
Molded Package Width	E1		3.90 BSC	
Overall Length	D		4.90 BSC	
Chamfer (Optional)	h	0.25	-	0.50
Foot Length	L	0.40	-	1.27
Footprint	L1		1.04 REF	
Foot Angle	φ	0°	-	8°
Lead Thickness	c	0.17	-	0.25
Lead Width	b	0.31	-	0.51
Mold Draft Angle Top	α	5°	-	15°
Mold Draft Angle Bottom	β	5°	-	15°

Notes:

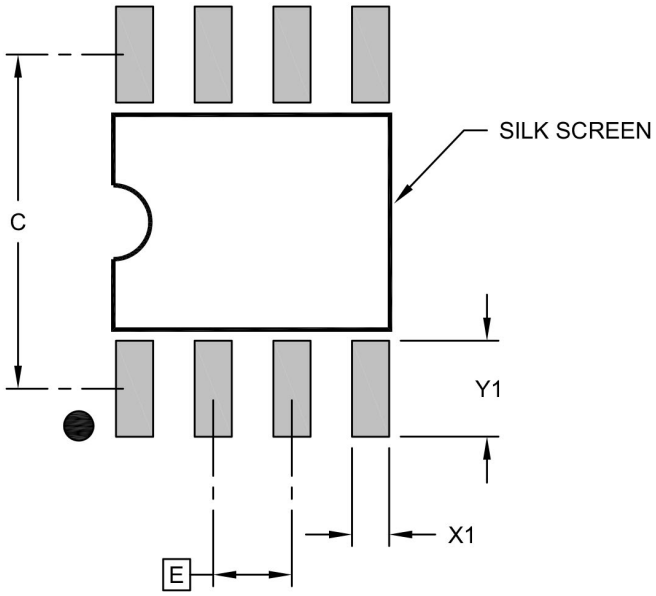
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. § Significant Characteristic
3. Dimensions D and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.15mm per side.
4. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   REF: Reference Dimension, usually without tolerance, for information purposes only.
5. Datums A & B to be determined at Datum H.

Microchip Technology Drawing No. C04-057-ENA Rev F Sheet 1 of 2

© 2020 Microchip Technology Inc.

8-Lead Plastic Small Outline (ENA) - Narrow, 3.90 mm (.150 In.) Body [SOIC]
Micrel Legacy Package FSLOC-08L

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



RECOMMENDED LAND PATTERN

Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Contact Pitch	E		1.27 BSC	
Contact Pad Spacing	C		5.40	
Contact Pad Width (X8)	X1			0.60
Contact Pad Length (X8)	Y1			1.55

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

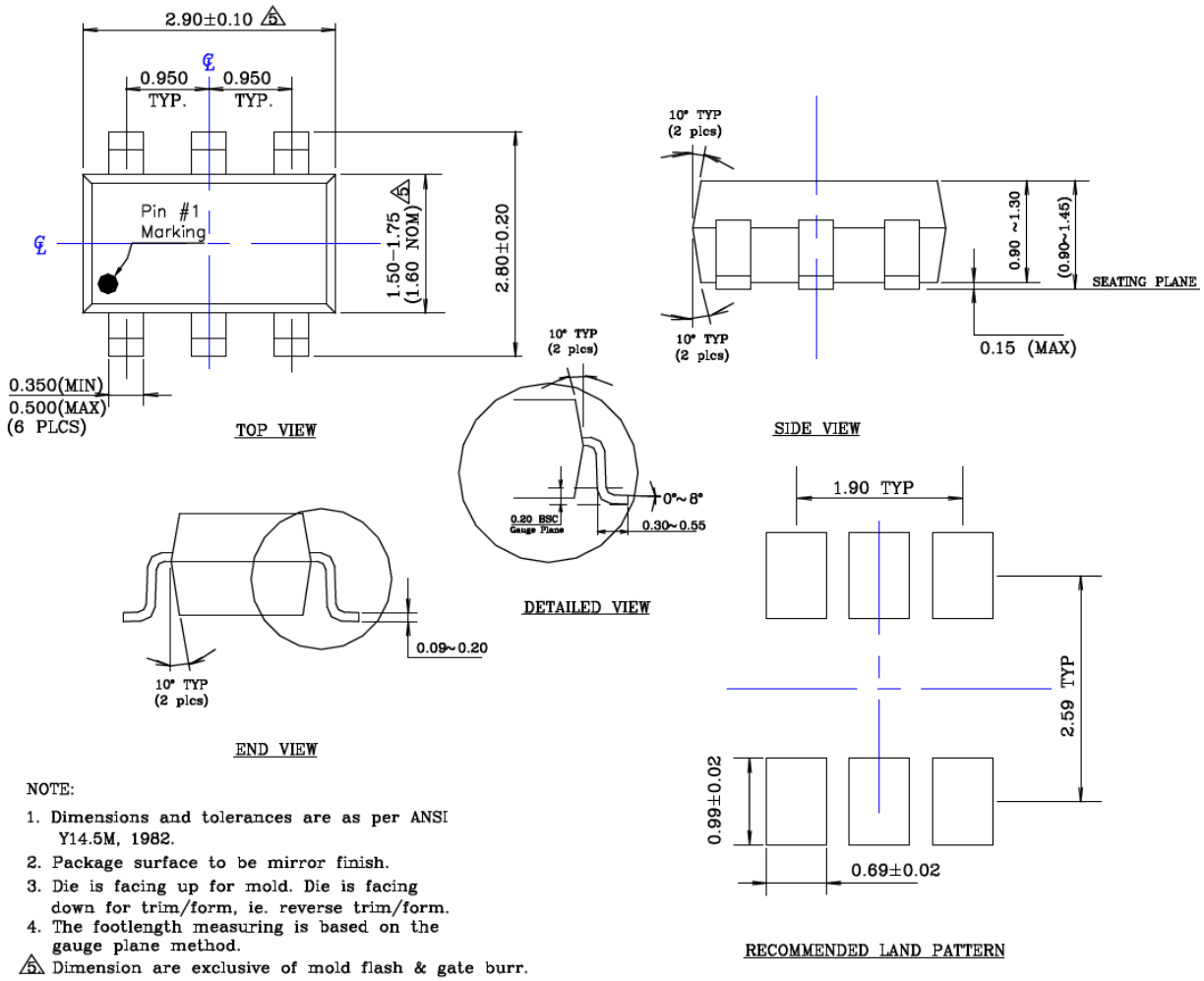
Microchip Technology Drawing C04-2057-ENA Rev F

© 2020 Microchip Technology Inc.

6-Lead SOT23 Package Outline and Recommended Land Pattern

TITLE
6 LEAD SOT23 PACKAGE OUTLINE & RECOMMENDED LAND PATTERN

DRAWING #	SOT23-6LD-PL-1	UNIT	MM



NOTE:

1. Dimensions and tolerances are as per ANSI Y14.5M, 1982.
2. Package surface to be mirror finish.
3. Die is facing up for mold. Die is facing down for trim/form, ie. reverse trim/form.
4. The footlength measuring is based on the gauge plane method.

5 Dimension are exclusive of mold flash & gate burr.

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

© 2020 Microchip Technology Inc.

APPENDIX A: REVISION HISTORY

Revision A (April 2020)

- Converted Micrel document PL102-10 to Microchip data sheet template DS20006345A.
- Minor text changes throughout.

NOTES:

© 2020 Microchip Technology Inc.

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	X	-X
Device	Package	Temperature Range	Media Type

Device:	PL102-10:	Low Skew Output Buffer	
Package:	S	=	8-Lead SOIC
	T	=	6-Lead SOT23
Temperature Range:	C	=	0°C to +70°C (Commercial)
Media Type:	<blank>=		20/Bag (SOT23 Option Only)
	R	=	3,000/Reel (SOT23 Option Only)
	R	=	2,500/Reel (SO?? Option Only)

Examples:

a) PL102-10SC-R: Low Skew Output Buffer, 8-Lead SOIC, 0°C to +70°C Temperature Range, 2,500/Reel

b) PL102-10TC: Low Skew Output Buffer, 6-Lead SOT23, 0°C to +70°C Temperature Range, 20/Bag

c) PL102-10TC-R: Low Skew Output Buffer, 6-Lead SOT23, 0°C to +70°C Temperature Range, 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:

© 2020 Microchip Technology Inc.

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE**.** Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, Adaptec, AnyRate, AVR, AVR logo, AVR Freaks, BesTime, BitCloud, chipKIT, chipKIT logo, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, HELDO, IGLOO, JukeBlox, KeeLoq, Kleer, LANCheck, LinkMD, maXStylus, maXTouch, MediaLB, megaAVR, Microsemi, Microsemi logo, MOST, MOST logo, MPLAB, OptoLyzer, PackeTime, PIC, picoPower, PICSTART, PIC32 logo, PolarFire, Prochip Designer, QTouch, SAM-BA, SenGenuity, SpyNIC, SST, SST Logo, SuperFlash, Symmetricom, SyncServer, Tachyon, TempTrackr, TimeSource, tinyAVR, UNI/O, Vectron, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

APT, ClockWorks, The Embedded Control Solutions Company, EtherSynch, FlashTec, Hyper Speed Control, HyperLight Load, IntelliMOS, Libero, motorBench, mTouch, Powermite 3, Precision Edge, ProASIC, ProASIC Plus, ProASIC Plus logo, Quiet-Wire, SmartFusion, SyncWorld, Temux, TimeCesium, TimeHub, TimePictra, TimeProvider, Vite, WinPath, and ZL are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BlueSky, BodyCom, CodeGuard, CryptoAuthentication, CryptoAutomotive, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, INICnet, Inter-Chip Connectivity, JitterBlocker, KleerNet, KleerNet logo, memBrain, Mindi, MiWi, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PowerSmart, PureSilicon, QMatrix, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

The Adaptec logo, Frequency on Demand, Silicon Storage Technology, and Symmcom are registered trademarks of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2020, Microchip Technology Incorporated, All Rights Reserved.

ISBN: 978-1-5224-5922-4

For information regarding Microchip's Quality Management Systems, please visit www.microchip.com/quality.

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
http://www.microchip.com/support
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

ASIA/PACIFIC

Australia - Sydney
Tel: 61-2-9868-6733

China - Beijing
Tel: 86-10-8569-7000

China - Chengdu
Tel: 86-28-8665-5511

China - Chongqing
Tel: 86-23-8980-9588

China - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115

China - Hong Kong SAR
Tel: 852-2943-5100

China - Nanjing
Tel: 86-25-8473-2460

China - Qingdao
Tel: 86-532-8502-7355

China - Shanghai
Tel: 86-21-3326-8000

China - Shenyang
Tel: 86-24-2334-2829

China - Shenzhen
Tel: 86-755-8864-2200

China - Suzhou
Tel: 86-186-6233-1526

China - Wuhan
Tel: 86-27-5980-5300

China - Xian
Tel: 86-29-8833-7252

China - Xiamen
Tel: 86-592-2388138

China - Zhuhai
Tel: 86-756-3210040

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444

India - New Delhi
Tel: 91-11-4160-8631

India - Pune
Tel: 91-20-4121-0141

Japan - Osaka
Tel: 81-6-6152-7160

Japan - Tokyo
Tel: 81-3-6880- 3770

Korea - Daegu
Tel: 82-53-744-4301

Korea - Seoul
Tel: 82-2-554-7200

Malaysia - Kuala Lumpur
Tel: 60-3-7651-7906

Malaysia - Penang
Tel: 60-4-227-8870

Philippines - Manila
Tel: 63-2-634-9065

Singapore
Tel: 65-6334-8870

Taiwan - Hsin Chu
Tel: 886-3-577-8366

Taiwan - Kaohsiung
Tel: 886-7-213-7830

Taiwan - Taipei
Tel: 886-2-2508-8600

Thailand - Bangkok
Tel: 66-2-694-1351

Vietnam - Ho Chi Minh
Tel: 84-28-5448-2100

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4485-5910
Fax: 45-4485-2829

Finland - Espoo
Tel: 358-9-4520-820

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-72400

Germany - Karlsruhe
Tel: 49-721-625370

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Italy - Padova
Tel: 39-049-7625286

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Norway - Trondheim
Tel: 47-7288-4388

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

Sweden - Gothenberg
Tel: 46-31-704-60-40

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820

© 2020 Microchip Technology Inc.