

LMK1C110x 1.8-V, 2.5-V, and 3.3-V LVCMOS Clock Buffer Family

1 Features

- High-performance 1:6 and 1:8 LVCMOS clock buffer
- Very low output skew < 55 ps
- Extremely low additive jitter < 25-fs nominal
 - 12-fs typical at $V_{DD} = 3.3\text{ V}$
 - 15-fs typical at $V_{DD} = 2.5\text{ V}$
 - 28-fs typical at $V_{DD} = 1.8\text{ V}$
- Very low propagation delay < 3 ns
- Synchronous output enable
- Supply voltage: 3.3 V, 2.5 V, or 1.8 V
 - 3.3-V tolerant input at all supply voltages
 - Fail-safe inputs
- Industry high ESD rating of 9000 V HBM
- $f_{max} = 250\text{ MHz}$ for 3.3 V
- $f_{max} = 200\text{-MHz}$ for 2.5 V and 1.8 V
- Operating temperature range: -40°C to 125°C
- Available in 14-pin and 16-pin TSSOP package

2 Applications

- [Factory automation & control](#)
- [Telecommunications equipment](#)
- [Data center & enterprise computing](#)
- [Grid infrastructure](#)
- [Motor drives](#)
- [Medical imaging](#)

3 Description

The LMK1C110x is a modular, high-performance, low-skew, general-purpose clock buffer family from Texas Instruments. The entire family is designed with a modular approach in mind. Five different fan-out variations, 1:2, 1:3, 1:4, 1:6 and 1:8 are available.

All of the devices within this family are pin-compatible to each other and backwards compatible to the CDCLVC110x family for easy handling.

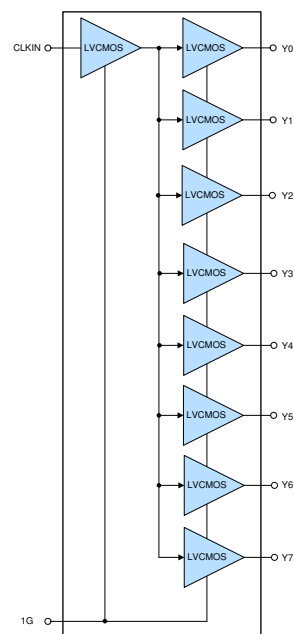
All family members share the same high performing characteristics such as low additive jitter, low skew, and wide operating temperature range.

The LMK1C110x supports a synchronous output enable control (1G) which switches the outputs into a low state when 1G is low. These devices have a fail-safe input that prevents oscillation at the outputs in the absence of an input signal and allows for input signals before VDD is supplied.

The LMK1C110x family operates in a 1.8-V, 2.5-V and 3.3-V environment and are characterized for operation from -40°C to 125°C .

Device Information

PART NUMBER	PACKAGE	BODY SIZE (NOM)
LMK1C1106	TSSOP (14)	5.00 mm x 4.40 mm
LMK1C1108	TSSOP (16)	5.00 mm x 4.40 mm



Functional Block Diagram



Table of Contents

1 Features	1	8.4 Device Functional Modes.....	11
2 Applications	1	9 Application and Implementation	12
3 Description	1	9.1 Application Information.....	12
4 Revision History	2	9.2 Typical Application.....	12
5 Pin Configuration and Functions	3	10 Power Supply Recommendations	14
6 Specifications	4	11 Layout	15
6.1 Absolute Maximum Ratings.....	4	11.1 Layout Guidelines.....	15
6.2 ESD Ratings.....	4	11.2 Layout Example.....	15
6.3 Recommended Operating Conditions.....	4	12 Device and Documentation Support	16
6.4 Thermal Information.....	4	12.1 Documentation Support.....	16
6.5 Electrical Characteristics.....	5	12.2 Receiving Notification of Documentation Updates..	16
6.6 Timing Requirements.....	6	12.3 Support Resources.....	16
6.7 Typical Characteristics.....	7	12.4 Trademarks.....	16
7 Parameter Measurement Information	8	12.5 Electrostatic Discharge Caution.....	16
8 Detailed Description	10	12.6 Glossary.....	16
8.1 Overview.....	10	13 Mechanical, Packaging, and Orderable	
8.2 Functional Block Diagram.....	10	Information	16
8.3 Feature Description.....	11		

4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision * (December 2020) to Revision A (January 2022)	Page
• Added fail-safe input details to <i>Description</i> section.....	1
• Changed the key graphic on the first page.....	1
• Changed part-to-part skew maximum from 950 ps to 280 ps.....	5
• Added the <i>Fail-Safe Inputs</i> section.....	11

5 Pin Configuration and Functions

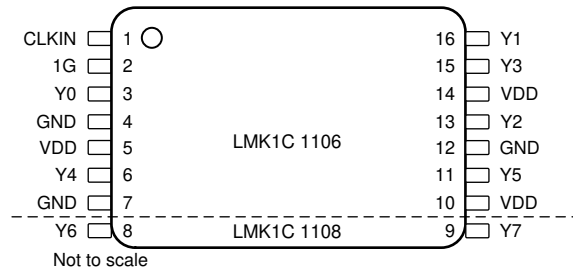


Figure 5-1. LMK1C1106 and LMK1C1108 PW Package 14-Pin TSSOP and 16-Pin TSSOP Top View

Table 5-1. Pin Functions

NAME	PIN		TYPE	DESCRIPTION
	LMK1C 1106	LMK1C 1108		
LVC MOS CLOCK INPUT				
CLKIN	1	1	Input	Single-ended clock input with internal 300-kΩ (typical) pulldown resistor to GND. Typically connected to a single-ended clock input.
CLOCK OUTPUT ENABLE				
1G	2	2	Input	Global Output Enable with internal 300-kΩ (typical) pulldown resistor to GND. Typically connected to VDD with external pullup resistor. HIGH: outputs enabled LOW: outputs disabled
LVC MOS CLOCK OUTPUT				
Y0	3	3	Output	LVC MOS output. Typically connected to a receiver. Unused outputs can be left floating.
Y1	14	16		
Y2	11	13		
Y3	13	15		
Y4	6	6		
Y5	9	11		
Y6	–	8		
Y7	–	9		
SUPPLY VOLTAGE				
VDD	5	5	Power	Power supply terminal. Typically connected to a 3.3-V, 2.5-V, or 1.8-V supply. The VDD pin is typically connected to an external 0.1-μF capacitor near the pin.
	8	10		
	12	14		
GROUND				
GND	4	4	GND	Device ground.
	7	7		
	10	12		

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)⁽¹⁾

		MIN	MAX	UNIT
V _{DD}	Supply voltage	-0.5	3.6	V
V _{CLKIN}	Input voltage (CLKIN)			
V _{IN}	Input voltage (1G)			
V _{Yn}	Output pins (Yn)	-0.5	V _{DD} + 0.3	
I _{IN}	Input current	-20	20	mA
I _O	Continuous output current	-50	50	mA
T _{stg}	Storage temperature	-65	150	°C

- (1) Operation outside the *Absolute Maximum Ratings* may cause permanent device damage. *Absolute Maximum Ratings* do not imply functional operation of the device at these or any other conditions beyond those listed under *Recommended Operating Conditions*. If used outside the *Recommended Operating Conditions* but within the *Absolute Maximum Ratings*, the device may not be fully functional, and this may affect device reliability, functionality, performance, and shorten the device lifetime.

6.2 ESD Ratings

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/ JEDEC JS-001, all pins ⁽¹⁾	±9000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾	±1500	

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
 (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

			MIN	NOM	MAX	UNIT
V _{DD}	Core supply voltage	3.3-V supply	3.135	3.3	3.465	V
		2.5-V supply	2.375	2.5	2.625	
		1.8-V supply	1.71	1.8	1.89	
T _A	Operating free-air temperature		-40		125	°C
T _J	Operating junction temperature		-40		150	°C

6.4 Thermal Information

THERMAL METRIC ⁽¹⁾		LMK1C1106	LMK1C1108	UNIT
		PW (TSSOP)	PW(TSSOP)	
		14 PINS	16 PINS	
R _{qJA}	Junction-to-ambient thermal resistance	114.4	123.4	°C/W
R _{qJC(top)}	Junction-to-case (top) thermal resistance	45.2	53.1	°C/W
R _{qJB}	Junction-to-board thermal resistance	60.6	66.4	°C/W
Y _{JT}	Junction-to-top characterization parameter	5.9	8.9	°C/W
Y _{JB}	Junction-to-board characterization parameter	60	65.8	°C/W

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

6.5 Electrical Characteristics

V_{DD} = 3.3 V ± 5 %, –40°C ≤ TA ≤ 125°C. Typical values are at V_{DD} = 3.3 V, 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
CURRENT CONSUMPTION						
I _{DD}	Core supply current, static	All-outputs disabled, f _{IN} = 0 V		25	45	μA
I _{DD}	Core supply current	All-outputs disabled, f _{IN} = 100 MHz, V _{DD} = 1.8 V		2	6	mA
I _{DD}	Core supply current	All-outputs disabled, f _{IN} = 100 MHz, V _{DD} = 2.5 V		6.5	10	mA
I _{DD}	Core supply current	All-outputs disabled, f _{IN} = 100 MHz, V _{DD} = 3.3 V		15	21	mA
I _{DD}	Output current	Per output, f _{IN} = 100 MHz, C _L = 5pF, V _{DD} = 1.8 V		3.2	3.5	
		Per output, f _{IN} = 100 MHz, C _L = 5pF, V _{DD} = 2.5 V		4.6	5.5	
		Per output, f _{IN} = 100 MHz, C _L = 5pF, V _{DD} = 3.3 V		6	7	
CLOCK INPUT						
f _{IN_SE}	Input frequency	V _{DD} = 3.3 V	DC		250	MHz
		V _{DD} = 2.5 V and 1.8 V	DC		200	
V _{IH}	Input high voltage		0.7 x V _{DD}			V
V _{IL}	Input low voltage		0.3 x V _{DD}			
dV _{IN} /dt	Input slew rate	20% - 80% of input swing	0.1			V/ns
I _{IN_LEAK}	Input leakage current		–50		50	uA
C _{IN_SE}	Input capacitance	at 25°C		7		pF
CLOCK OUTPUT FOR ALL V_{DD} LEVELS						
f _{OUT}	Output frequency	V _{DD} = 3.3 V			250	MHz
		V _{DD} = 2.5 V and 1.8 V			200	
ODC	Output duty cycle	With 50% duty cycle input	45		55	%
t _{1G_ON}	Output enable time	See (1)			5	cycles
t _{1G_OFF}	Output disable time	See (2)			5	cycles
CLOCK OUTPUT FOR V_{DD} = 3.3 V ± 5%						
V _{OH}	Output high voltage	I _{OH} = 1 mA	2.8			V
V _{OL}	Output low voltage	I _{OL} = 1 mA			0.2	
t _{RISE-FALL}	Output rise and fall time	20/80%, C _L = 5 pF, f _{IN} = 156.25 MHz		0.3	0.7	ns
t _{OUTPUT-SKEW}	Output-output skew	See (3)		35	55	ps
t _{PART-SKEW}	Part-to-part skew				280	
t _{PROP-DELAY}	Propagation delay	See (4)		1.3	2.2	ns
t _{JITTER-ADD}	Additive Jitter	f _{IN} = 156.25 MHz, Input slew rate = 1.6 V/ns, Integration range = 12 kHz - 20 MHz		12	20	fs, RMS
R _{OUT}	Output impedance			50		Ω
CLOCK OUTPUT FOR V_{DD} = 2.5 V ± 5%						
V _{OH}	Output high voltage	I _{OH} = 1 mA	0.8 x V _{DD}			V
V _{OL}	Output low voltage	I _{OL} = 1 mA			0.2 x V _{DD}	
t _{RISE-FALL}	Output rise and fall time	20/80%, C _L = 5 pF, f _{IN} = 156.25 MHz		0.33	0.8	ns
t _{OUTPUT-SKEW}	Output-output skew	See (3)			55	ps
t _{PART-SKEW}	Part-to-part skew				450	
t _{PROP-DELAY}	Propagation delay	See (4)		1.5	2.5	ns

LMK1C1106, LMK1C1108

SNAS814A – DECEMBER 2020 – REVISED JANUARY 2022

VDD = 3.3 V ± 5 %, –40°C ≤ TA ≤ 125°C. Typical values are at VDD = 3.3 V, 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{JITTER-ADD}	Additive Jitter	f _{IN} = 156.25 MHz, Input slew rate = 1.2 V/ns, Integration range = 12 kHz - 20 MHz		15	27	fs, RMS
R _{OUT}	Output impedance			55		Ω
CLOCK OUTPUT FOR V_{DD} = 1.8 V ± 5%						
V _{OH}	Output high voltage	I _{OH} = 1 mA	0.8 x V _{DD}			V
V _{OL}	Output low voltage	I _{OL} = 1 mA	0.2 x V _{DD}			
t _{RISE-FALL}	Output rise and fall time	20/80%, C _L = 5 pF, f _{IN} = 156.25 MHz		0.38	1	ns
t _{OUTPUT-SKEW}	Output-output skew	See (3)			55	ps
t _{PART-SKEW}	Part-to-part skew				930	ps
t _{PROP-DELAY}	Propagation delay	See (4)		1.5	3	ns
t _{JITTER-ADD}	Additive Jitter	f _{IN} = 156.25 MHz, Input slew rate = 1.2 V/ns, Integration range = 12 kHz - 20 MHz		28	60	fs, RMS
R _{OUT}	Output impedance			64		Ω
GENERAL PURPOSE INPUT (1G)						
V _{IH}	High-level input voltage		0.75 x V _{DD}			V
V _{IL}	Low-level input voltage				0.25 x V _{DD}	
I _{IH}	Input high-level current	V _{IH} = V _{DD_REF}	–50		50	μA
I _{IL}	Input low-level current	V _{IL} = GND	–50		50	

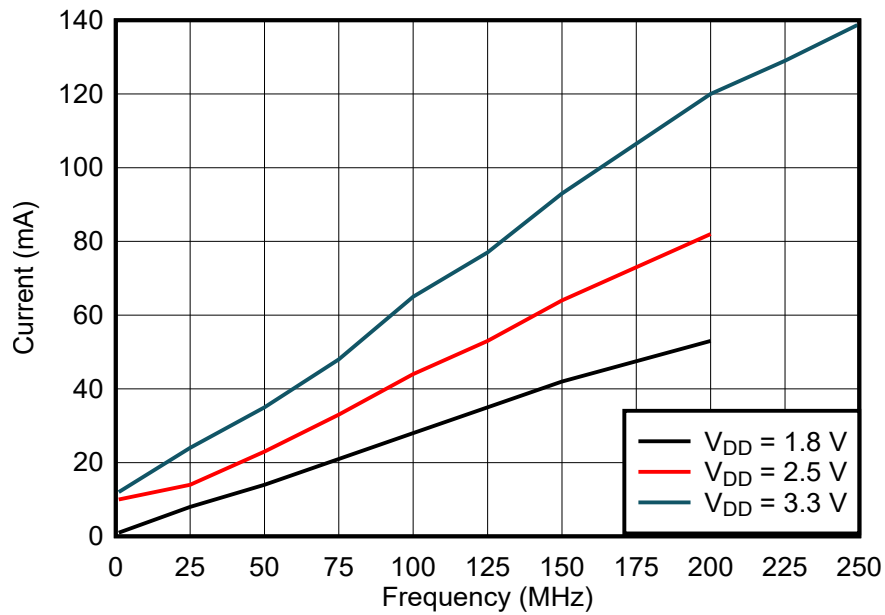
- (1) Measured from 1G rising edge crossing V_{IH} to first rising edge of Y_n.
- (2) Measured from 1G falling edge crossing V_{IL} to last falling edge of Y_n.
- (3) Measured from rising edge of any Y_n output to any other Y_m output.
- (4) Measured from rising edge of CLKIN to any Y_n output.

6.6 Timing Requirements

VDD = 3.3 V ± 5 %, –40°C ≤ TA ≤ 125°C

		MIN	NOM	MAX	UNIT
POWER SUPPLY					
V/t _{RAMP}	V _{DD} ramp rate	0.1		50	V/ms

6.7 Typical Characteristics



Device Power Consumption vs. Clock Frequency (Load 5 pF)

7 Parameter Measurement Information

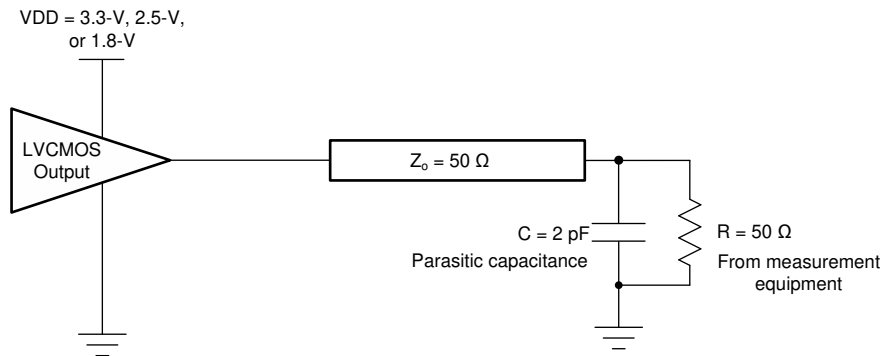


Figure 7-1. Test Load Circuit

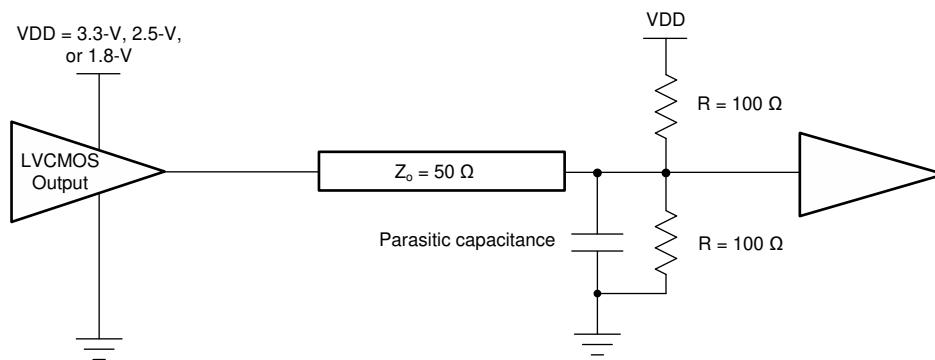


Figure 7-2. Application Load With 50-ohm Termination

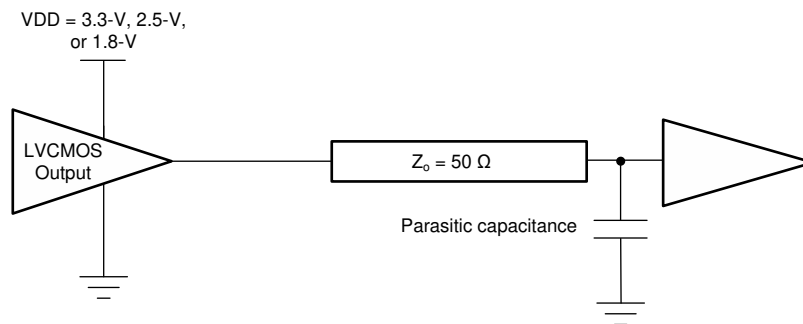


Figure 7-3. Application Load With Termination

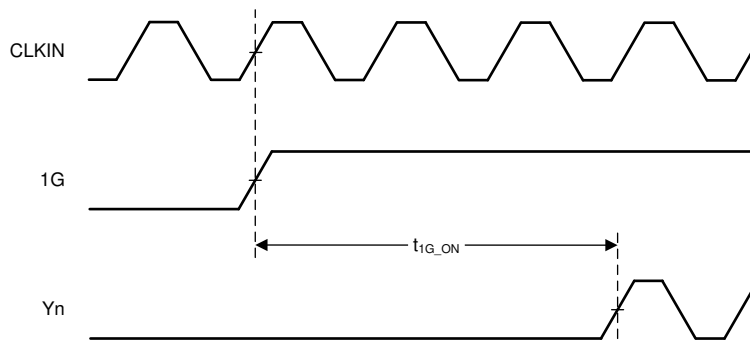


Figure 7-4. t_{1G_ON} Output Enable Time

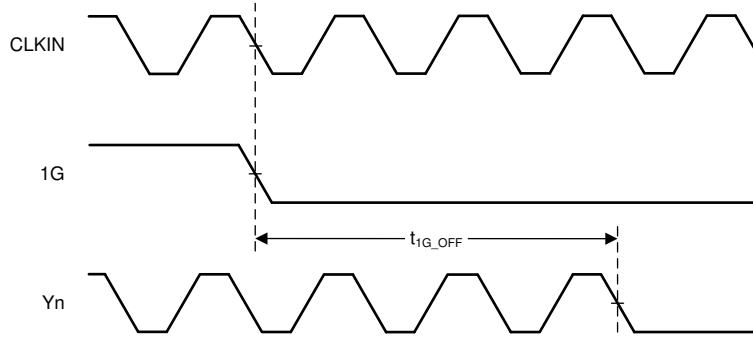


Figure 7-5. t_{1G_OFF} Output Disable Time

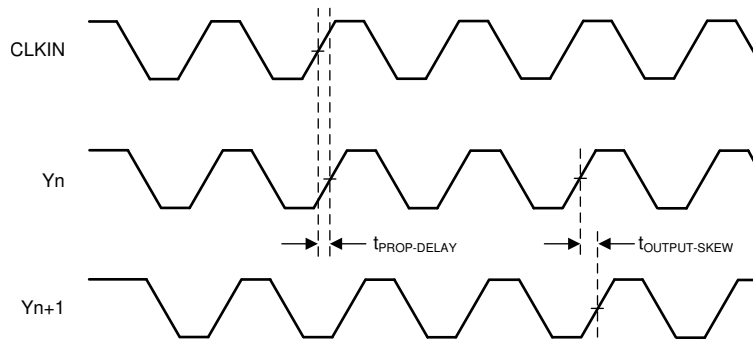


Figure 7-6. Propagation Delay $t_{PROP-DELAY}$ and Output Skew $t_{OUTPUT-SKEW}$

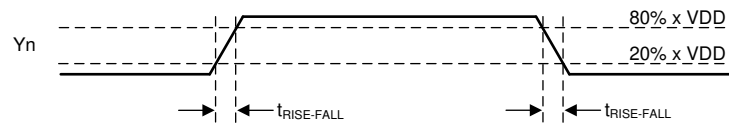


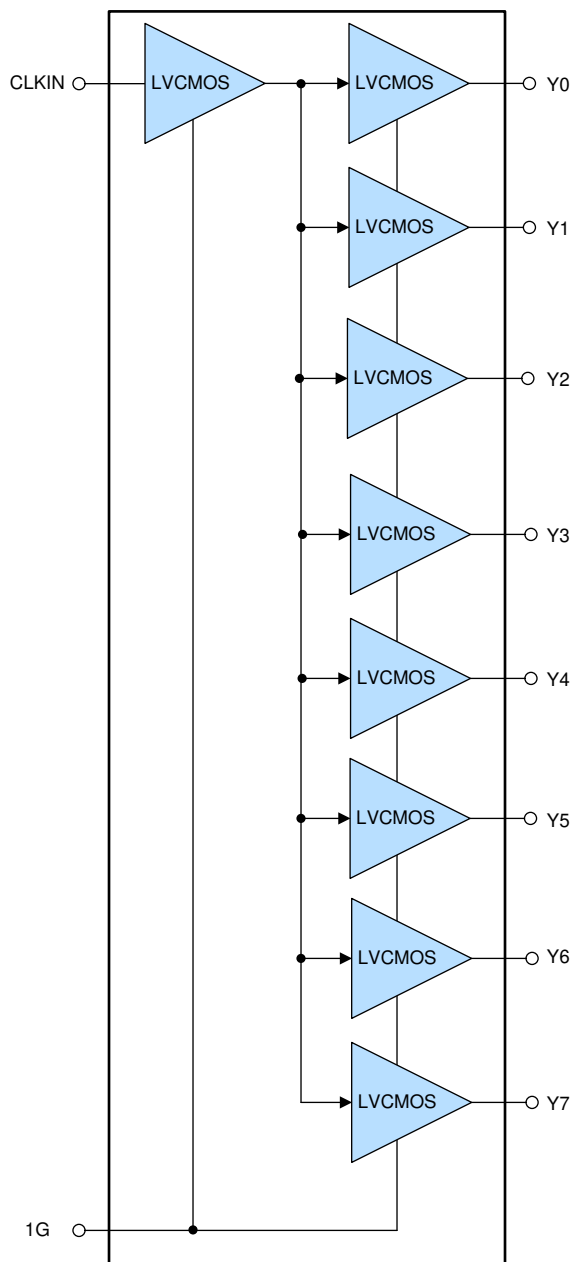
Figure 7-7. Rise and Fall Time $t_{RISE-FALL}$

8 Detailed Description

8.1 Overview

The LMK1C110x family of devices is part of a low-jitter and low-skew LVCMOS fan-out buffer solution. For best signal integrity, it is important to match the characteristic impedance of the LMK1C110x's output driver with that of the transmission line.

8.2 Functional Block Diagram



8.3 Feature Description

The outputs of the LMK1C110x can be disabled by driving the synchronous output enable pin (1G) low. Unused output can be left floating to reduce overall system component cost. Supply and ground pins must be connected to V_{DD} and GND, respectively.

8.3.1 Fail-Safe Inputs

The LMK1C110x family of devices is designed to support fail-safe input operation. This feature allows the user to drive the device inputs before VDD is applied without damaging the device. Refer to [Absolute Maximum Ratings](#) for more information on the maximum input supported by the device. The device also incorporates an input hysteresis that prevents random oscillation in absence of an input signal, allowing the input pins to be left open.

8.4 Device Functional Modes

The LMK1C110x operates from 1.8-V, 2.5-V, or 3.3-V supplies. [Table 8-1](#) shows the output logics of the LMK1C110x.

Table 8-1. Output Logic Table

INPUTS		OUTPUTS
CLKIN	1G	Yn
X	L	L
L	H	L
H	H	H

9 Application and Implementation

Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

9.1 Application Information

The LMK1C110x family is a low additive jitter LVCMOS buffer solution that can operate up to 250-MHz at $V_{DD} = 3.3\text{ V}$ and 200 MHz at $V_{DD} = 2.5\text{ V}$ to 1.8 V. Low output skew as well as the ability for synchronous output enable is featured to simultaneously enable or disable buffered clock outputs as necessary in the application.

9.2 Typical Application

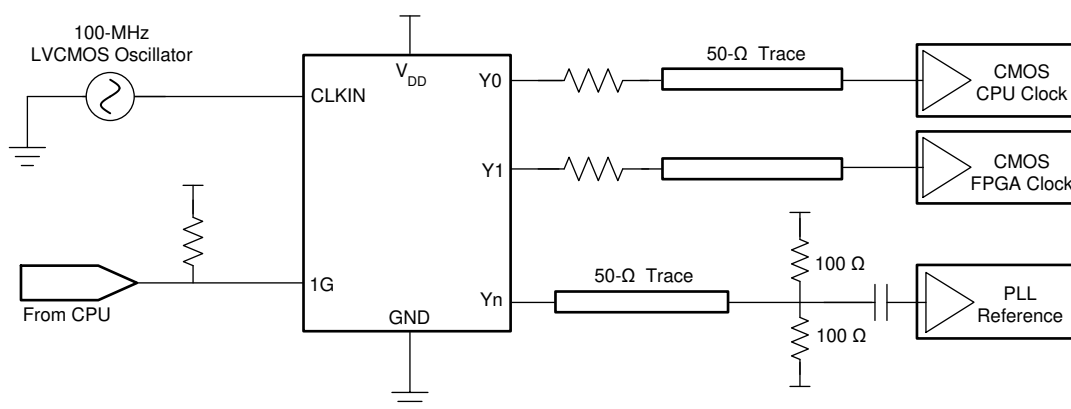


Figure 9-1. System Configuration Example

9.2.1 Design Requirements

The LMK1C110x shown in [Figure 9-1](#) is configured to fan out a 100-MHz signal from a local LVCMOS oscillator. The CPU is configured to control the output state through 1G.

The configuration example is driving three LVCMOS receivers in a backplane application with the following properties:

- The CPU clock can accept a full swing DC-coupled LVCMOS signal. A series resistor is placed near the LMK1C110x to closely match the characteristic impedance of the trace to minimize reflections.
- The FPGA clock is similarly DC-coupled with an appropriate series resistor placed near the LMK1C110x.
- The PLL in this example can accept a lower amplitude signal, so a Thevenin's equivalent termination is used. The PLL receiver features internal biasing, so AC coupling can be used when common-mode voltage is mismatched.

9.2.2 Detailed Design Procedure

Unused outputs can be left floating. See [Power Supply Recommendations](#) for recommended filtering techniques.

9.2.3 Application Curves

The low additive jitter of the LMK1C110x is shown in [Figure 9-2](#).

[Figure 9-3](#) shows the low-noise 156.25-MHz reference source with 24.8-fs RMS jitter driving the LMK1C110x, resulting in 27.3-fs RMS jitter when integrated from 12 kHz to 20 MHz at 3.3-V supply. The resultant additive jitter measured is a low 11.4-fs RMS for this configuration.

Figure 9-4 shows the low-noise 156.25-MHz reference source with 24.8-fs RMS jitter driving the LMK1C110x, resulting in 29-fs RMS jitter when integrated from 12 kHz to 20 MHz at 2.5-V supply. The resultant additive jitter measured is a low 15-fs RMS for this configuration.

Figure 9-5 shows the low-noise 156.25-MHz reference source with 24.8-fs RMS jitter driving the LMK1C110x, resulting in 34-fs RMS jitter when integrated from 12 kHz to 20 MHz at 1.8-V supply. The resultant additive jitter measured is a low 23.25-fs RMS for this configuration.

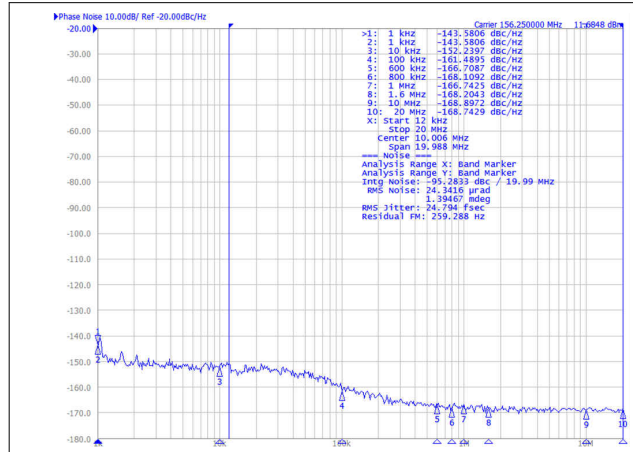


Figure 9-2. LMK1C110x Reference Phase Noise 24.8-fs (12 kHz to 20 MHz)

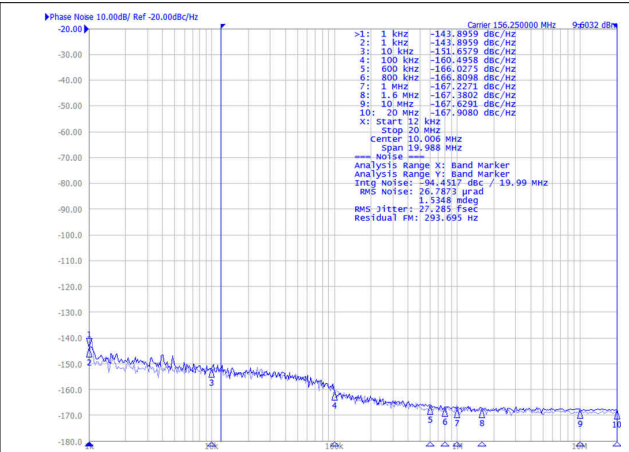


Figure 9-3. LMK1C110x 3.3-V Output Phase Noise 27.3-fs (12 kHz to 20 MHz)

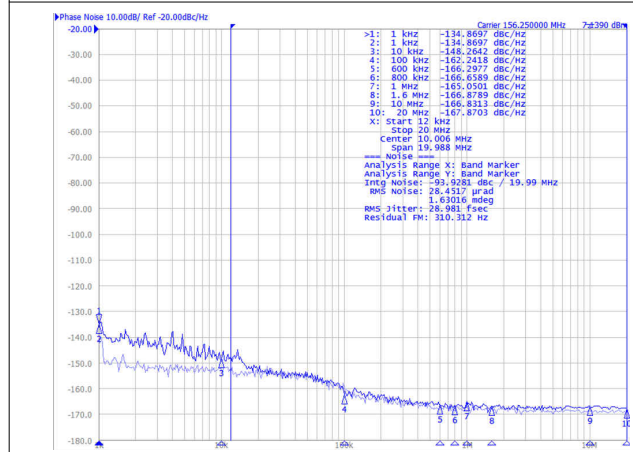


Figure 9-4. LMK1C110x 2.5-V Output Phase Noise 29-fs (12 kHz to 20 MHz)

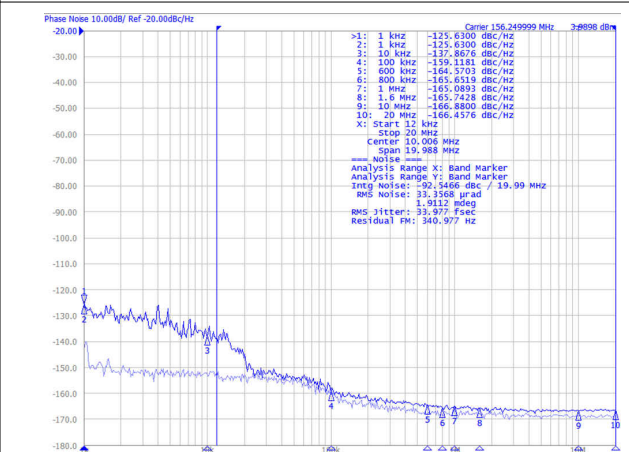


Figure 9-5. LMK1C110x 1.8-V Output Phase Noise 34-fs (12 kHz to 20 MHz)

10 Power Supply Recommendations

High-performance clock buffers can be sensitive to noise on the power supply, which may dramatically increase the additive jitter of the buffer. Thus, it is essential to manage any excessive noise from the system power supply, especially for applications where the jitter and phase noise performance is critical.

Filter capacitors are used to eliminate the low-frequency noise from the power supply, where the bypass capacitors provide the very low impedance path for high-frequency noise and guard the power supply system against induced fluctuations. These bypass capacitors also provide instantaneous current surges as required by the device and should have low equivalent series resistance (ESR). To properly bypass the supply, the decoupling capacitors must be placed very close to the power-supply terminals, be connected directly to the ground plane, and laid out with short loops to minimize inductance. TI recommends adding as many high-frequency (for example, 0.1 μF) bypass capacitors, as there are supply terminals in the package. TI recommends, but does not require, inserting a ferrite bead between the board power supply and the chip power supply that isolates the high-frequency switching noises generated by the clock buffer; these beads prevent the switching noise from leaking into the board supply. It is imperative to choose an appropriate ferrite bead with very low DC resistance to provide adequate isolation between the board supply and the chip supply, as well as to maintain a voltage at the supply terminals that is greater than the minimum voltage required for proper operation.

Figure 10-1 shows this recommended power supply decoupling method.

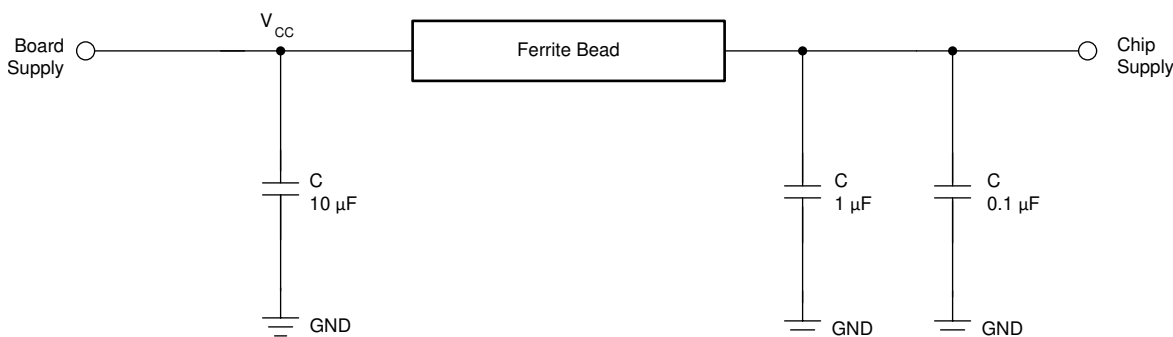


Figure 10-1. Power Supply Decoupling

11 Layout

11.1 Layout Guidelines

Figure 11-1 shows a conceptual layout detailing recommended placement of power supply bypass capacitors. For component side mounting, use 0402 body size capacitors to facilitate signal routing. Keep the connections between the bypass capacitors and the power supply on the device as short as possible. Ground the other side of the capacitor using a low-impedance connection to the ground plane.

11.2 Layout Example

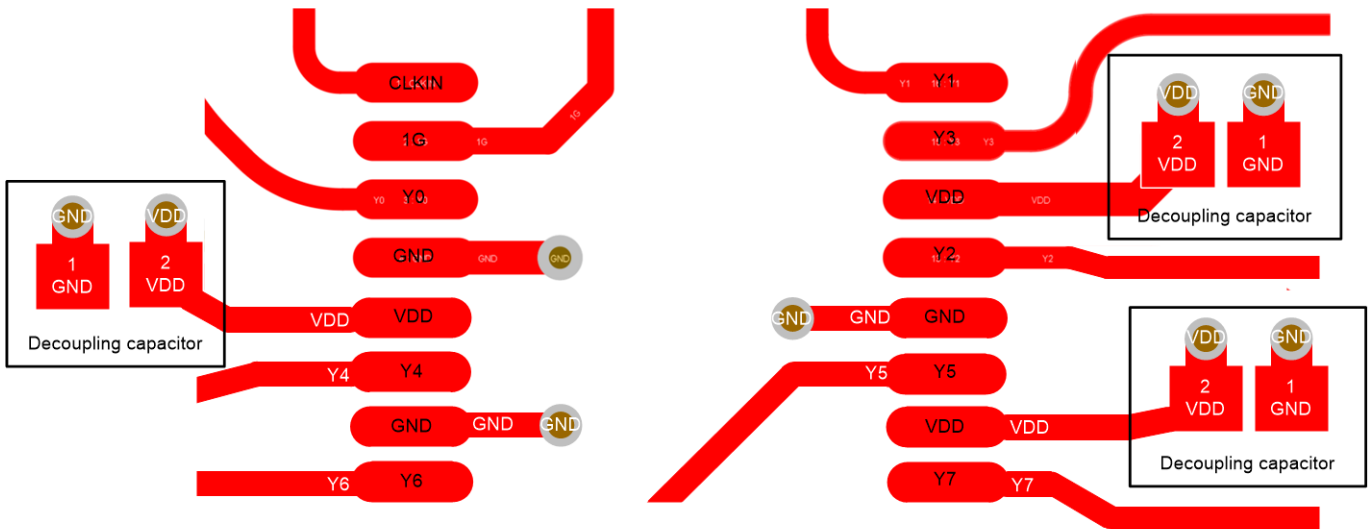


Figure 11-1. PCB Conceptual Layout

12 Device and Documentation Support

12.1 Documentation Support

12.1.1 Related Documentation

For related documentation, see the following:

[LMK1C1108EVM User Guide](#)

12.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](#). Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

12.3 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

12.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

12.5 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

12.6 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
LMK1C1106PWR	Active	Production	TSSOP (PW) 14	3000 LARGE T&R	Yes	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	LMK1C6
LMK1C1106PWR.A	Active	Production	TSSOP (PW) 14	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMK1C6
LMK1C1108PWR	Active	Production	TSSOP (PW) 16	3000 LARGE T&R	Yes	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	LMK1C8
LMK1C1108PWR.A	Active	Production	TSSOP (PW) 16	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMK1C8
LMK1C1108PWRG4	Active	Production	TSSOP (PW) 16	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMK1C8
LMK1C1108PWRG4.A	Active	Production	TSSOP (PW) 16	3000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	LMK1C8

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

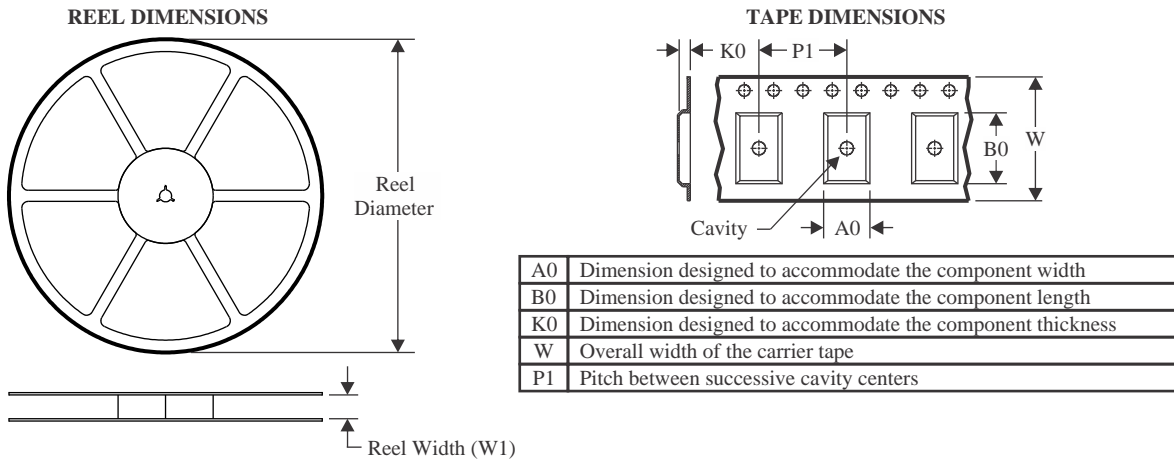
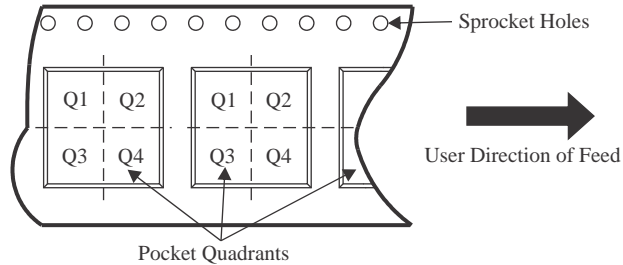
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

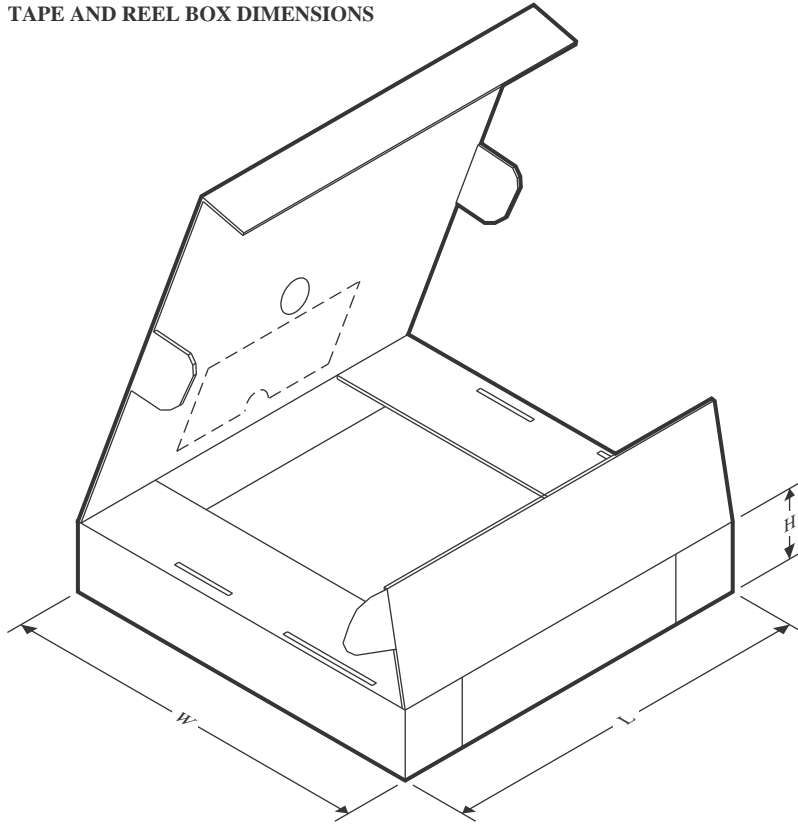
Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


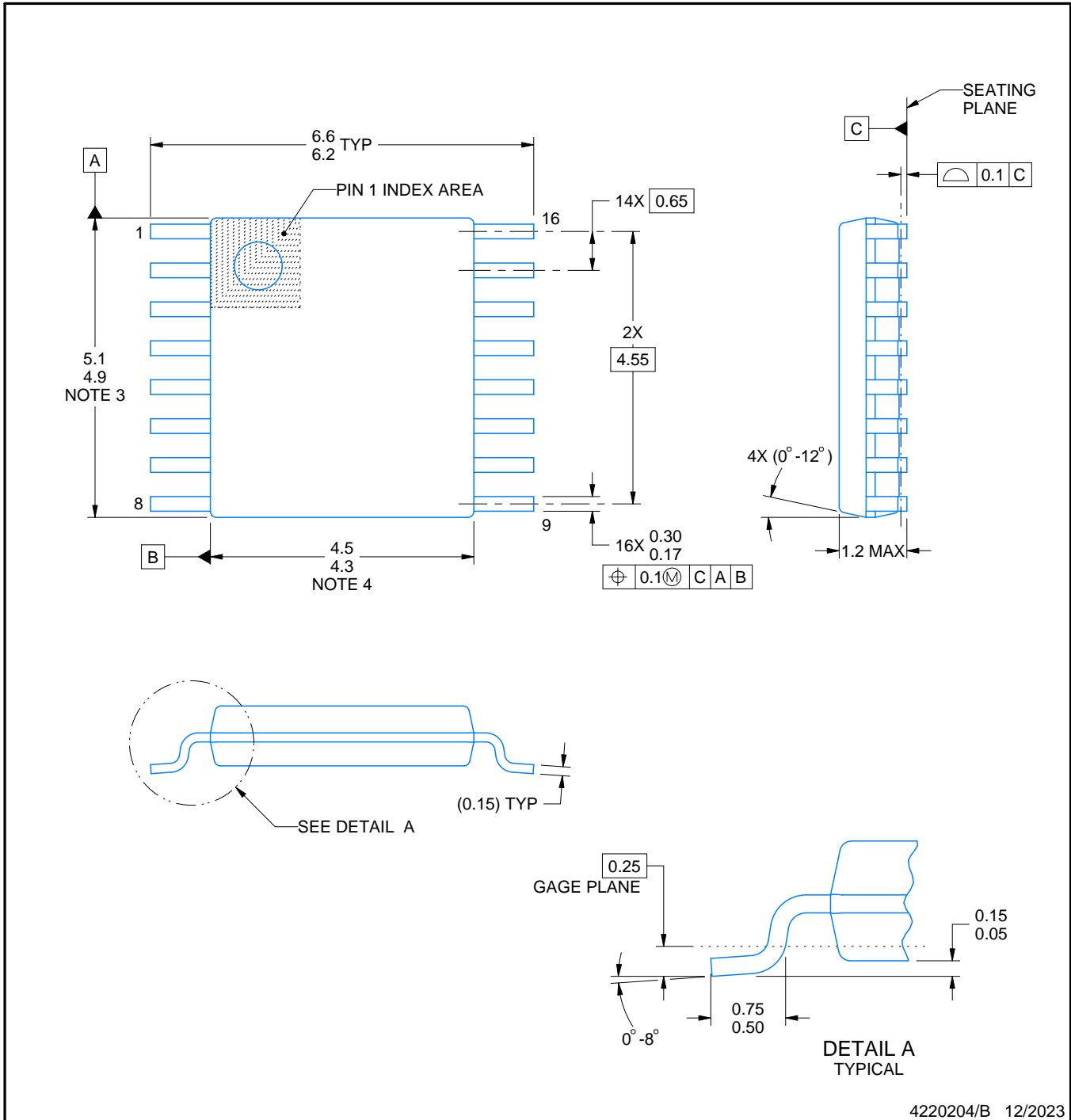
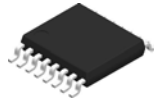
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LMK1C1106PWR	TSSOP	PW	14	3000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LMK1C1108PWR	TSSOP	PW	16	3000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LMK1C1108PWR	TSSOP	PW	16	3000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
LMK1C1108PWRG4	TSSOP	PW	16	3000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LMK1C1106PWR	TSSOP	PW	14	3000	356.0	356.0	35.0
LMK1C1108PWR	TSSOP	PW	16	3000	353.0	353.0	32.0
LMK1C1108PWR	TSSOP	PW	16	3000	356.0	356.0	35.0
LMK1C1108PWRG4	TSSOP	PW	16	3000	353.0	353.0	32.0



4220204/B 12/2023

NOTES:

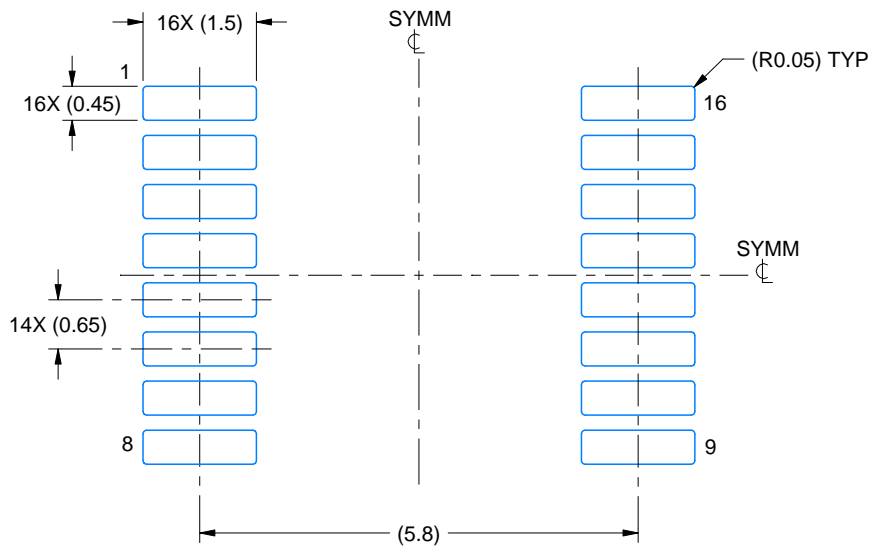
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

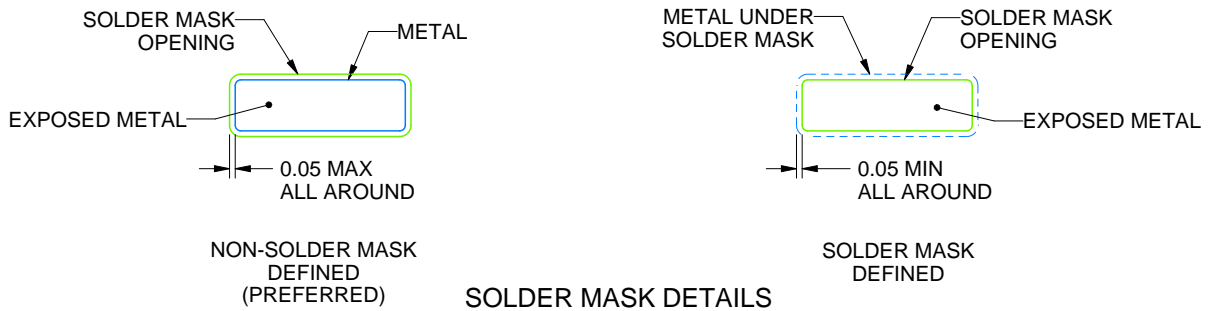
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

4220204/B 12/2023

NOTES: (continued)

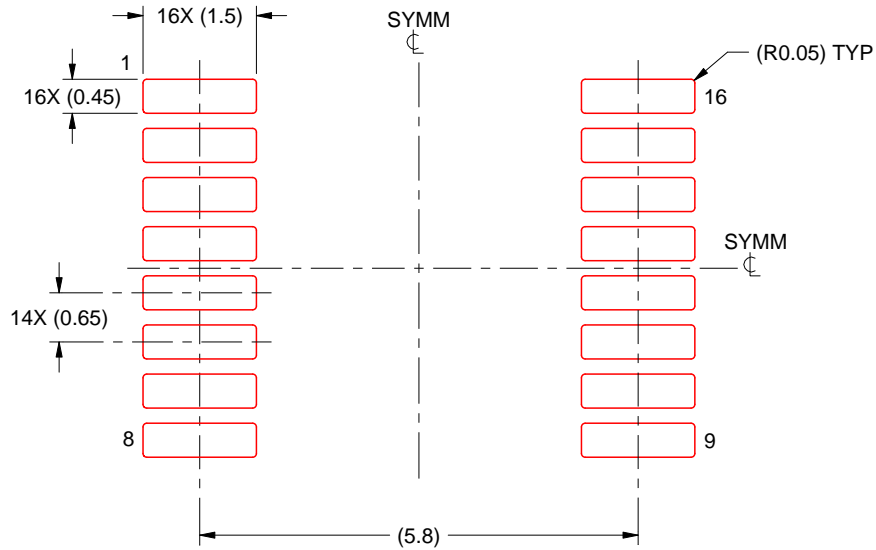
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



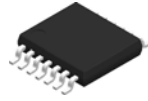
SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220204/B 12/2023

NOTES: (continued)

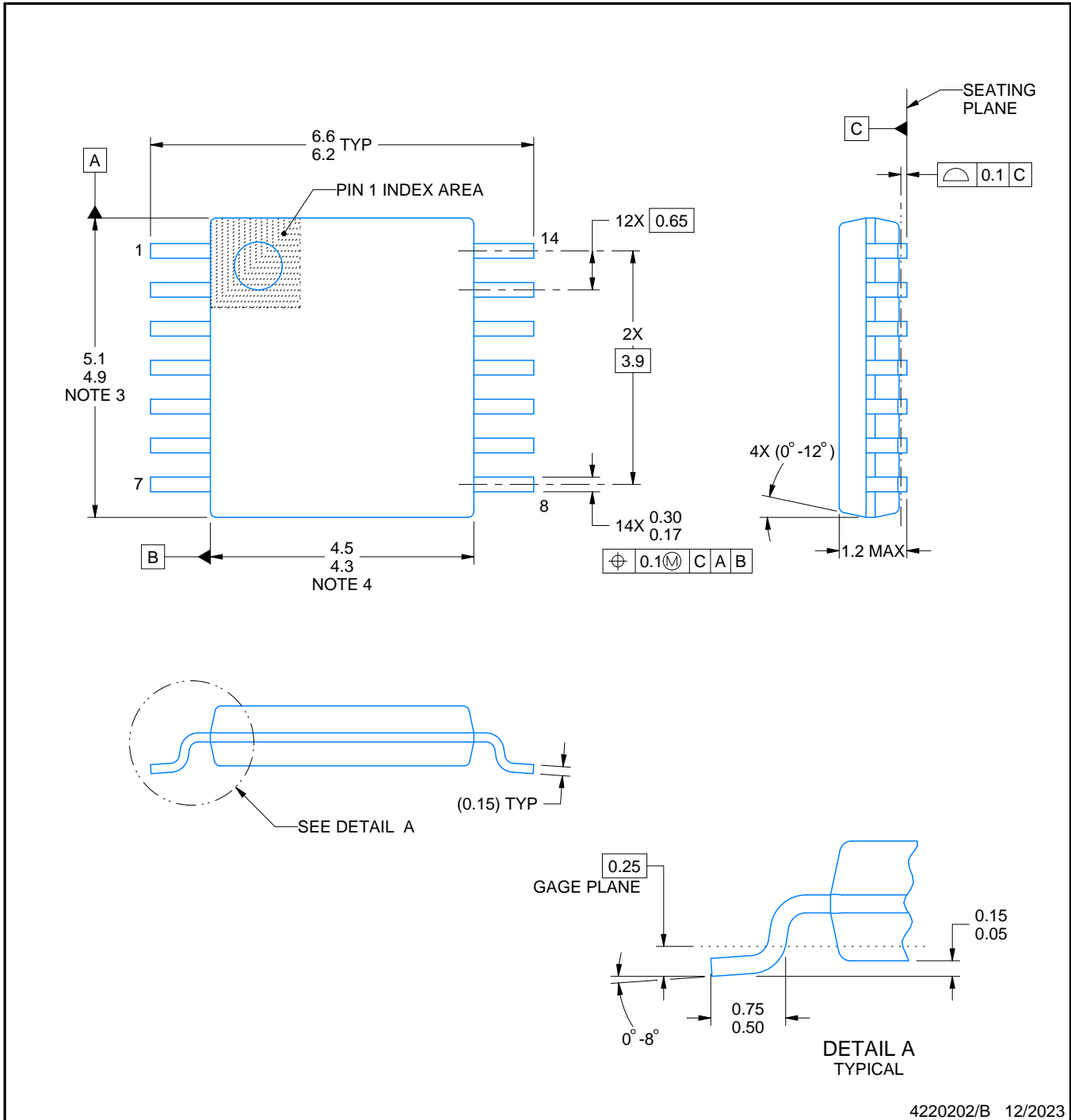
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

PW0014A



PACKAGE OUTLINE
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



NOTES:

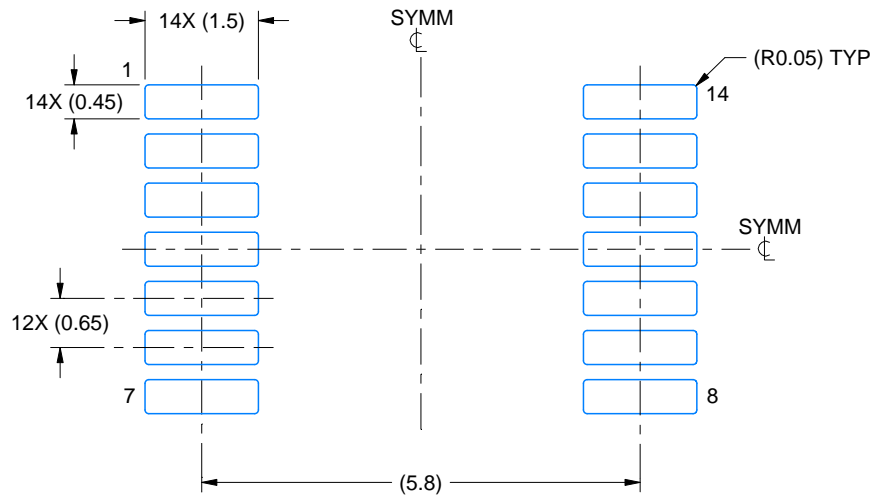
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

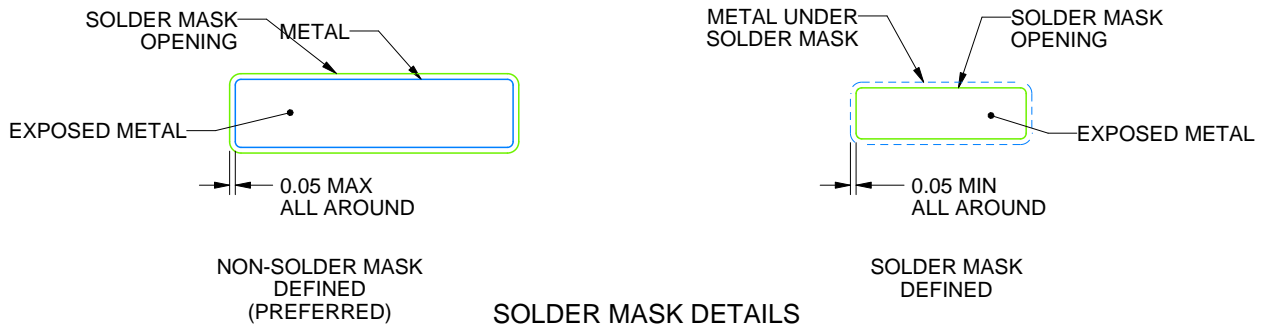
PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220202/B 12/2023

NOTES: (continued)

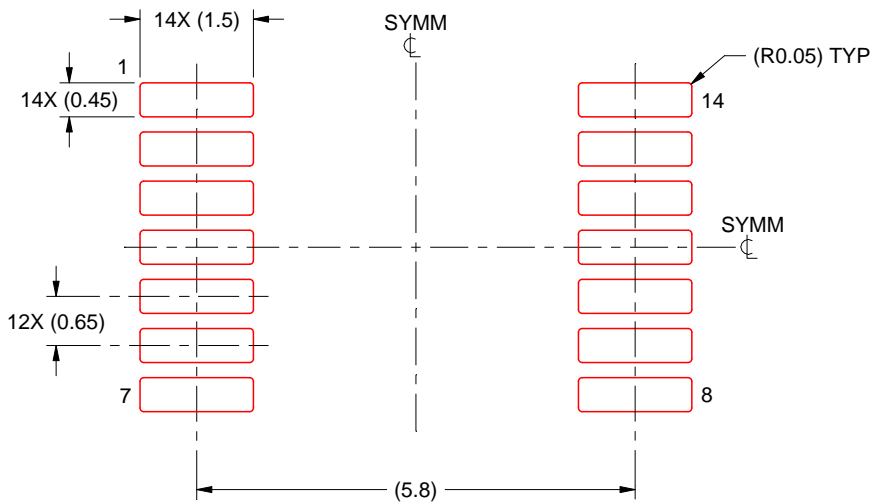
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220202/B 12/2023

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you fully indemnify TI and its representatives against any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#), [TI's General Quality Guidelines](#), or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products. Unless TI explicitly designates a product as custom or customer-specified, TI products are standard, catalog, general purpose devices.

TI objects to and rejects any additional or different terms you may propose.

Copyright © 2026, Texas Instruments Incorporated

Last updated 10/2025