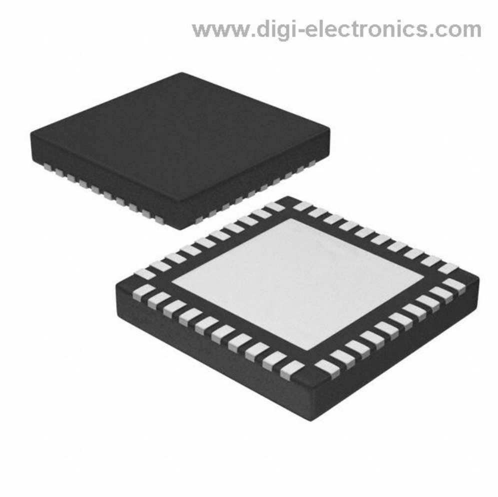
CDCU877ARHARG4 Datasheet



https://www.DiGi-Electronics.com

DiGi Electronics Part Number	CDCU877ARHARG4-DG
Manufacturer	Texas Instruments
Manufacturer Product Number	CDCU877ARHARG4
Description	IC PLL CLOCK DRIVER 1.8V 40VQFN
Detailed Description	Memory, DDR2 Clock Buffer/Driver, Multiplexer IC 400MHz 1 Output 40-VQFN (6x6)

Tel: +00 852-30501935

RFQ Email: Info@DiGi-Electronics.com

DiGi is a global authorized distributor of electronic components.

Purchase and inquiry

Manufacturer Product Number:	CDCU877ARHARG4	Manufacturer:	Texas Instruments
Series:	-	Product Status:	Discontinued at Digi-Key
DiGi-Electronics Programmable:	Not Verified	PLL:	Yes
Main Purpose:	Memory, DDR2	Input:	SSTL-18
Output:	SSTL-18	Number of Circuits:	1
Ratio - Input:Output:	1:10	Differential - Input:Output:	Yes/Yes
Frequency - Max:	400MHz	Voltage - Supply:	1.7V ~ 1.9V
Operating Temperature:	-40°C ~ 85°C	Mounting Type:	Surface Mount
Package / Case:	40-VFQFN Exposed Pad	Supplier Device Package:	40-VQFN (6x6)
Base Product Number:	CDCU877		

Environmental & Export classification

RoHS Status:	ROHS3 Compliant	Moisture Sensitivity Level (MSL):	3 (168 Hours)
REACH Status:	REACH Unaffected	ECCN:	EAR99
HTSUS:	8542.39.0001		

www.ti.com

CDCU877, CDCU877A

1.8-V PHASE LOCK LOOP CLOCK DRIVER

SCAS688D–JUNE 2005–REVISED JULY 2007

FEATURES

- **1.8-V Phase Lock Loop Clock Driver for Double Data Rate (DDR II) Applications**
- **Spread Spectrum Clock Compatible**
- **Operating Frequency: 10 MHz to 400 MHz**
- **Low Current Consumption: <135 mA**
- **Low Jitter (Cycle-Cycle): ±30 ps**
- **Low Output Skew: 35 ps**
- **Low Period Jitter: ±20 ps**
- **Low Dynamic Phase Offset: ±15 ps**
- **Low Static Phase Offset: ±50 ps**
- **Distributes One Differential Clock Input to Ten Differential Outputs**
- **52-Ball µBGA (MicroStar™ Junior BGA, 0,65-mm pitch) and 40-Pin MLF**
- **External Feedback Pins (FBIN, $\overline{\text{FBIN}}$) are Used to Synchronize the Outputs to the Input Clocks**
- **Meets or Exceeds JESD82-8 PLL Standard for PC2-3200/4300**
- **Fail-Safe Inputs**

DESCRIPTION

The CDCU877 is a high-performance, low-jitter, low-skew, zero-delay buffer that distributes a differential clock input pair (CK, $\overline{\text{CK}}$) to ten differential pairs of clock outputs (Yn, $\overline{\text{Yn}}$) and to one differential pair of feedback clock outputs (FBOUT, $\overline{\text{FBOUT}}$). The clock outputs are controlled by the input clocks (CK, $\overline{\text{CK}}$), the feedback clocks (FBIN, $\overline{\text{FBIN}}$), the LVCMOS control pins (OE, OS), and the analog power input (AV_{DD}). When OE is low, the clock outputs, except FBOUT/$\overline{\text{FBOUT}}$, are disabled while the internal PLL continues to maintain its locked-in frequency. OS (output select) is a program pin that must be tied to GND or V_{DD}. When OS is high, OE functions as previously described. When OS and OE are both low, OE has no affect on Y7/$\overline{\text{Y7}}$, they are free running. When AV_{DD} is grounded, the PLL is turned off and bypassed for test purposes.

When both clock inputs (CK, $\overline{\text{CK}}$) are logic low, the device enters in a low power mode. An input logic detection circuit on the differential inputs, independent from input buffers, detects the logic low level and performs in a low power state where all outputs, the feedback, and the PLL are off. When the clock inputs transition from being logic low to being differential signals, the PLL turns back on, the inputs and the outputs are enabled, and the PLL obtains phase lock between the feedback clock pair (FBIN, $\overline{\text{FBIN}}$) and the clock input pair (CK, $\overline{\text{CK}}$) within the specified stabilization time.

The CDCU877 is able to track spread spectrum clocking (SSC) for reduced EMI. This device operates from —40°C to 85°C.

ORDERING INFORMATION

T_A	52-BALL BGA (1)	40-Pin MLF
-40°C to 85°C	CDCU877ZQL	CDCU877RHA
	CDCU877AZQL	CDCU877ARHA
	CDCU877GQL	CDCU877RTB
	CDCU877AGQL	CDCU877ARTB

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of the Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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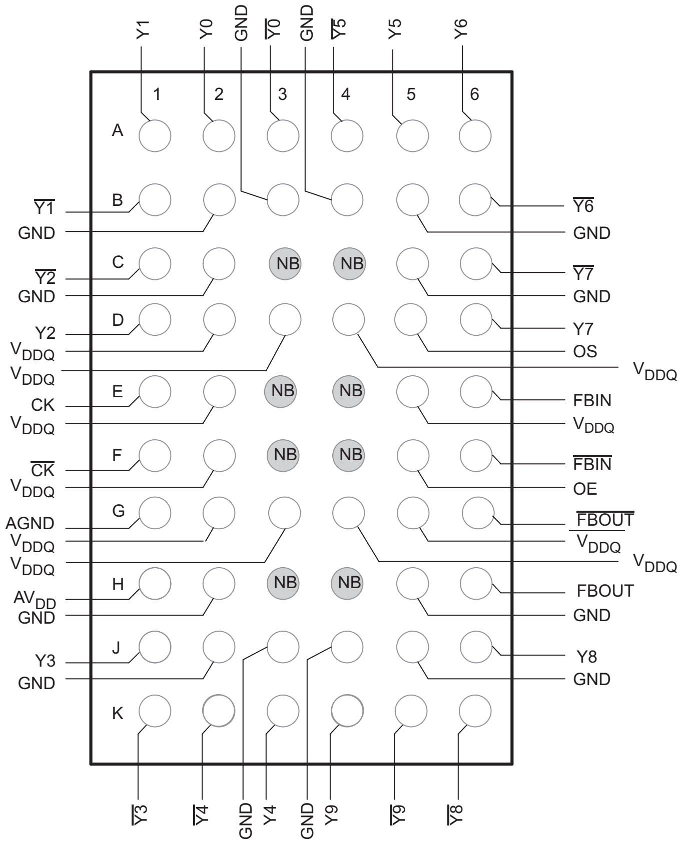
These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

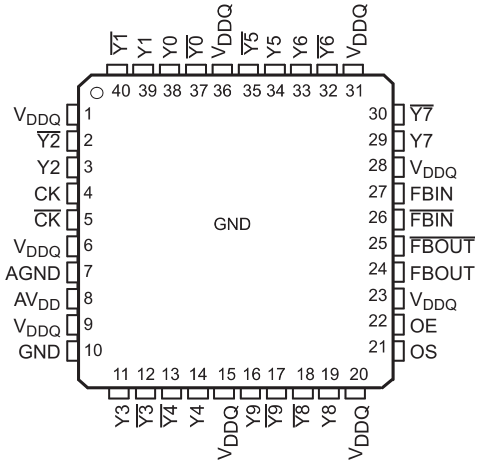
MicroStar Junior (ZQL) Package
(TOP VIEW)



A. NC = No Connection

B. NB = No Ball

RHA/RTB Package (MLF PAckage
(TOP VIEW)



40-pin HP-VFQFP-N (6,0 x 6,0 mm Body Size,
0,5 mm Pitch, M0#220, Variation VJJD-2,
E2 = D2 = 2,9 mm ± 0,15 mm) Package Pinouts

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TERMINAL FUNCTIONS

TERMINAL			I/O	DESCRIPTION
NAME	GQL/ZQL	RHA/RTB		
AGND	G1	7		Analog ground
AV_{DD}	H1	8		Analog power
CK	E1	4	I	Clock input with a (10 kΩ to 100 kΩ) pulldown resistor
$\overline{CK}$	F1	5	I	Complementary clock input with a (10 kΩ to 100 kΩ) pulldown resistor
FBIN	E6	27	I	Feedback clock input
$\overline{FBIN}$	F6	26	I	Complementary feedback clock input
FBOUT	H6	24	O	Feedback clock output
$\overline{FBOUT}$	G6	25	O	Complementary feedback clock output
OE	F5	22	I	Output enable (asynchronous)
OS	D5	21	I	Output select (tied to GND or V_{DD})
GND	B2, B3, B4, B5, C2, C5, H2, H5, J2, J3, J4, J5	10		Ground
V_{DDQ}	D2, D3, D4, E2, E5, F2, G2, G3, G4, G5	1, 6, 9, 15, 20, 23, 28, 31, 36		Logic and output power
Y[0:9]	A2, A1, D1, J1, K3, A5, A6, D6, J6, K4	3, 11, 14, 16, 19, 29, 33, 34, 38, 39	O	Clock outputs
$\overline{Y[0:9]}$	A3, B1, C1, K1, K2, A4, B6, C6, K6, K5	2, 12, 13, 18, 17, 30, 32, 35, 37, 40	O	Complementary clock outputs

FUNCTION TABLE

INPUTS					OUTPUTS				
AVDD	OE	OS	CK	$\overline{CK}$	Y	$\overline{Y}$	FBOUT	$\overline{FBOUT}$	PLL
GND	H	X	L	H	L	H	L	H	Bypassed/Off
GND	H	X	H	L	H	L	H	L	Bypassed/Off
GND	L	H	L	H	L_Z	L_Z	L	H	Bypassed/Off
GND	L	L	H	L	L_Z Y7 Active	L_Z $\overline{Y7}$ Active	H	L	Bypassed/Off
1.8 V Nominal	L	H	L	H	L_Z	L_Z	L	H	On
1.8 V Nominal	L	L	H	L	L_Z Y7 Active	L_Z $\overline{Y7}$ Active	H	L	On
1.8 V Nominal	H	X	L	H	L	H	L	H	On
1.8 V Nominal	H	X	H	L	H	L	H	L	On
1.8 V Nominal	X	X	L	L	L_Z	L_Z	L_Z	L_Z	Off
X	X	X	H	H	Reserved				

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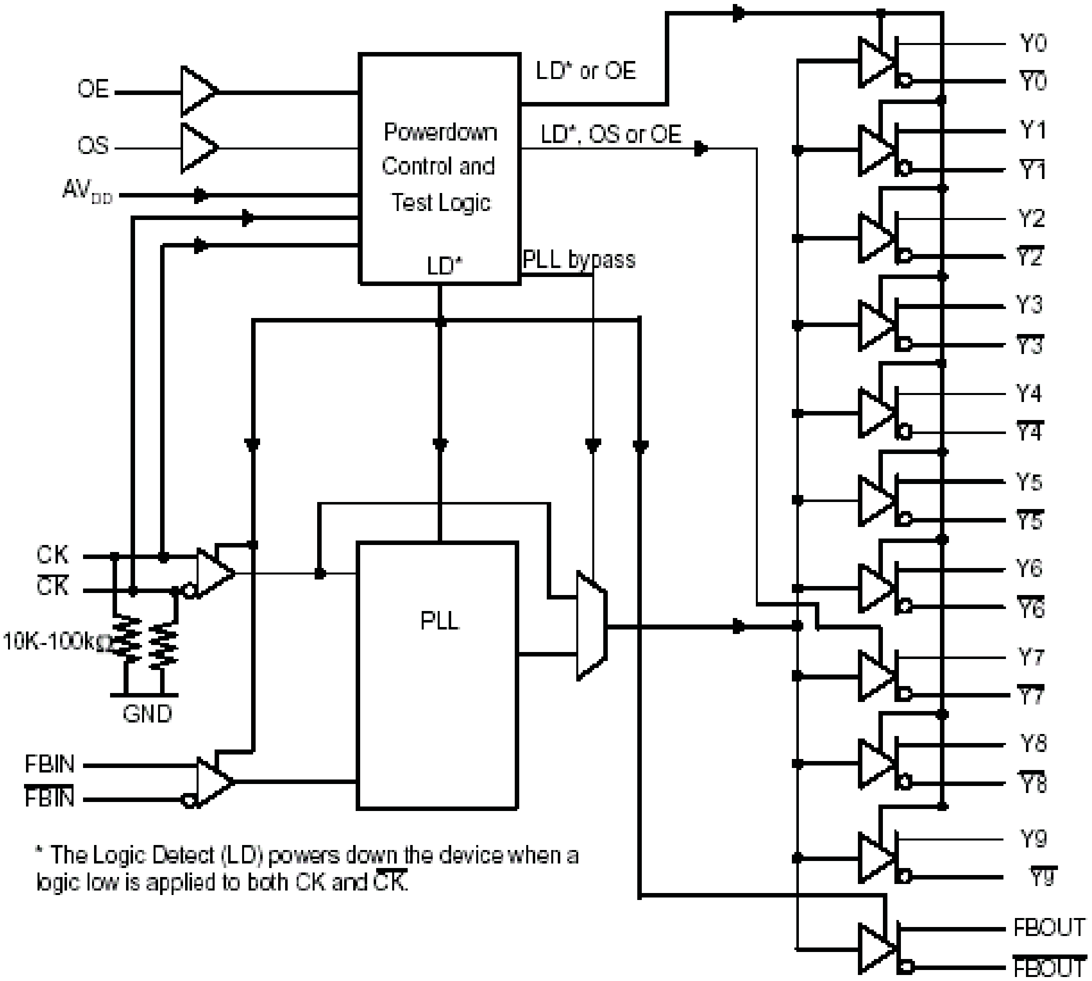

* The Logic Detect (LD) powers down the device when a logic low is applied to both CK and $\overline{CK}$.

Figure 1. LOGIC DIAGRAM (POSITIVE LOGIC)

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Absolute Maximum Ratings[1]

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage range	V_{DDQ} or AV_{DD}	–0.5	2.5	V
V_I	Input voltage range[2][3]		–0.5	V_{DDQ} + 0.5	V
V_O	Output voltage range[2][3]		–0.5	V_{DDQ} + 0.5	V
I_{IK}	Input clamp current	$V_I < 0$ or $V_I > V_{DDQ}$		±50	mA
I_{OK}	Output clamp current	$V_O < 0$ or $V_O > V_{DDQ}$		±50	mA
I_O	Continuous output current	$V_O = 0$ to V_{DDQ}		±50	mA
	Continuous current through each V_{DDQ} or GND			±100	mA
T_{stg}	Storage temperature range		–65	150	°C

(1) Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
(3) This value is limited to 2.5 V maximum.

Recommended Operating Conditions

			MIN	NOM	MAX	UNIT
V_{CC}	Output supply voltage, V_{DDQ}		1.7	1.8	1.9	V
	Supply Voltage, AV_{DD}[1]			V_{DDQ}		V
V_{IL}	Low-level input voltage[2]	OE, OS			0.35 x V_{DDQ}	V
V_{IH}	High-level input voltage[2]	CK, $\overline{CK}$	0.65 x V_{DDQ}			V
I_{OH}	High-level output current (see Figure 2)				-9	mA
I_{OL}	Low-level output current (see Figure 2)				9	mA
V_{IX}	Input differential-pair cross voltage		(V_{DDQ}/2) - 0.15		(V_{DDQ}/2) + 0.15	V
V_I	Input voltage level		-0.3		V_{DDQ} + 0.3	V
V_{ID}	Input differential voltage[2] (see Figure 9)	DC	0.3		V_{DDQ} + 0.4	V
		AC	0.6		V_{DDQ} + 0.4	V
T_A	Operating free-air temperature		-40		85	°C

(1) The PLL is turned off and bypassed for test purposes when AV_{DD} is grounded. During this test mode, V_{DDQ} remains within the recommended operating conditions and no timing parameters are specified.
(2) V_{ID} is the magnitude of the difference between the input level on CK and the input level on $\overline{CK}$, see Figure 9 for definition. The CK and $\overline{CK}$, V_{IH} and V_{IL} limits define the dc low and high levels for the logic detect state.

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Electrical Characteristics

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

PARAMETER			TEST CONDITIONS	AV_{DD} , V_{DDQ}	MIN	TYP(1)	MAX	UNIT
V_{IK}	Input		I_I = 18 mA	1.7			-1.2	V
V_{OH}	High-level output voltage		I_{OH} = –100 µA	1.7 to 1.9	V_{DDQ} – 0.2			V
			I_{OH} = –9 mA	1.7	1.1			
V_{OL}	Low-level output voltage		I_{OL} = 100 µA				0.1	V
			I_{OL} = 9 mA	1.7			0.6	
$I_{O(DL)}$	Low-level output current, dissabled		$V_{O(DL)}$ = 100 mV, OE = L	1.7	100			µA
V_{OD}	Differential output voltage(1)			1.7	0.5			V
I_I	Input current	CK, $\overline{CK}$		1.9			±250	µA
		OE, OS, FBIN, $\overline{FBIN}$		1.9			±10	
$I_{DD(LD)}$	Supply current, static (I_{DDQ} + I_{ADD})		CK and $\overline{CK}$ = L	1.9			500	µA
I_{DD}	Supply current, dynamic (I_{DDQ} + I_{ADD}) (see Note (2) for CPD calculation)		CK and $\overline{CK}$ = 270 MHz. All outputs are open (not connected to a PCB)	1.9			135	mA
			All outputs are loaded with 2 pF and 120-Ω termination resistor	1.9			235	
C_I	Input capacitance	CK, $\overline{CK}$	V_I = V_{DD} or GND	1.8	2		3	pF
		FBIN, $\overline{FBIN}$		1.8	2		3	
$C_{I(\Delta)}$	Change in input current	CK, $\overline{CK}$	V_I = V_{DD} or GND	1.8			0.25	
		FBIN, $\overline{FBIN}$		1.8			0.25	

(1) V_{OD} is the magnitude of the difference between the true and complimentary outputs. See Figure 9 for a definition.
(2) Total $I_{DD} = I_{DDQ} + I_{ADD} = f_{CK} \times C_{PD} \times V_{DDQ}$, solving for $C_{PD} = (I_{DDQ} + I_{ADD})/(f_{CK} \times V_{DDQ})$ where f_{CK} is the input frequency, V_{DDQ} is the power supply, and C_{PD} is the power dissipation capacitance.

Timing Requirements

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

PARAMETER		TEST CONDITIONS	MIN	MAX	UNIT
f_{CK}	Clock frequency (operating)(1)(2)	AV_{DD}, V_{DD} = 1.8 V ±0.1 V	10	400	MHz
	Clock frequency (application)(1)(3)		160	340	MHz
t_{DC}	Duty cycle, input clock		40%	60%	
t_L	Stabiliztion time (4)			12	µs

(1) The PLL must be able to handle spread spectrum induced skew.
(2) Operating clock frequency indicates a range over which the PLL must be able to lock, but in which it is not required to meet the other timing parameters (used for low speed system debug).
(3) Application clock frequency indicates a range over which the PLL must meet all timing parameters.
(4) Stabilization time is the time required for the integrated PLL circuit to obtain phase lock of its feedback signal to its reference signal after power up. During normal operation, the stabilization time is also the time required for the integrated PLL circuit to obtain phase lock of its feedback signal to its reference signal when CK and $\overline{CK}$ go to a logic low state, enter the power-down mode and later return to active operation. CK and $\overline{CK}$ may be left floating after they have been driven low for one complete clock cycle.

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Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see (1)) AV_{DD}, V_{DD} = 1.8 V ± 0.1 V

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{en}	Enable time, OE to any Y/$\overline{Y}$	See Figure 11			8	ns
t_{dis}	Disable time, OE to any Y/$\overline{Y}$	See Figure 11			8	ns
$t_{jit(cc+)}$	Cycle-to-cycle period jitter[2]	160 MHz to 190 MHz, see Figure 4	0		40	ps
$t_{jit(cc-)}$			0		-40	
$t_{jit(cc+)}$	Cycle-to-cycle period jitter[2]	160 MHz to 340 MHz, see Figure 4	0		30	ps
$t_{jit(cc-)}$			0		-30	
$t_{(\omega)}$	Static phase offset time[3]	See Figure 5	-50		50	ps
$t_{(\omega)dyn}$	Dynamic phase offset time	See Figure 10	-15		15	ps
$t_{sk(o)}$	Output clock skew	See Figure 6			35	ps
$t_{jit(per)}$	Period jitter [4][2]	160 MHz to 190 MHz, see Figure 7	-30		30	ps
		190 MHz to 340 MHz, see Figure 7	-20		20	
$t_{jit(hper)}$	Half-period jitter[4][2]	160 MHz to 190 MHz, see Figure 8	-115		115	ps
		190 MHz to 250 MHz, see Figure 8	-70		70	
		250 MHz to 300 MHz, see Figure 8	-40		40	
		300 MHz to 340 MHz, see Figure 8	-60		60	
SR	Slew rate, OE	See Figure 3 and Figure 9	0.5			V/ns
	Input clock slew rate	See Figure 3 and Figure 9	1	2.5	4	
	Output clock slew rate[5][6] (no load)	See Figure 3 and Figure 9	1.5	2.5	3	
V_{OX}	Output differential-pair cross voltage [7]	CDCU877, See Figure 2	(V_{DDQ}/2) - 0.1		(V_{DDQ}/2) + 0.1	V
		CDCU877A[8], See Figure 2 (0 - 85°C)	(V_{DDQ}/2) - 0.1		(V_{DDQ}/2) + 0.1	
	SSC modulation frequency		30		33	kHz
	SSC clock input frequency deviation		0%		-0.5%	
	PLL loop bandwidth		2			MHz

(1) There are two different terminations that are used with the following tests. The load/board in Figure 2 is used to measure the input and output differential-pair cross voltage only. The load/board in Figure 3 is used to measure all other tests. For consistency, equal length cables must be used.

(2) This parameter is specifieded by design and characterization.

(3) Phase static offset time does not include jitter.

(4) Period jitter, half-period jitter specifications are separate specifications that must be met independently of each other.

(5) The output slew rate is determined from the IBIS model with a 120-Ω load only.

(6) To eliminate the impact of input slew rates on static phase offset, the input skew rates of reference clock input CK and $\overline{CK}$ and feedback clock inputs FBIN and $\overline{FBIN}$ are recommended to be nearly equal. The 2.5-V/ns skew rates are shown as a recommended target. Compliance with these typical values is not mandatory if it can adequately shown that alternative characteristics meet the requirements of the registered DDR2 DIMM application.

(7) Output differential-pair cross voltage specified at the DRAM clock input or the test load.

(8) V_{OX} of CDCU877A is on average 30 mV lower than that of CDCU877 for the same application.

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PARAMETER MEASUREMENT INFORMATION

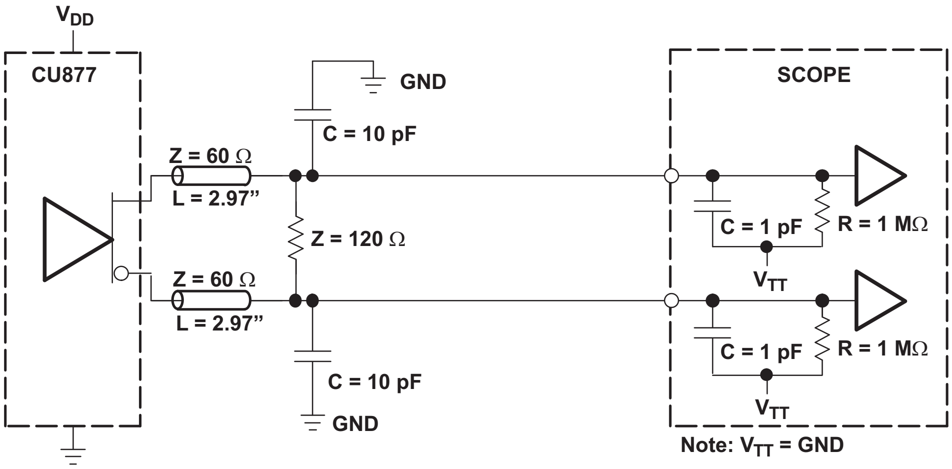

Figure 2. Output Load Test Circuit 1

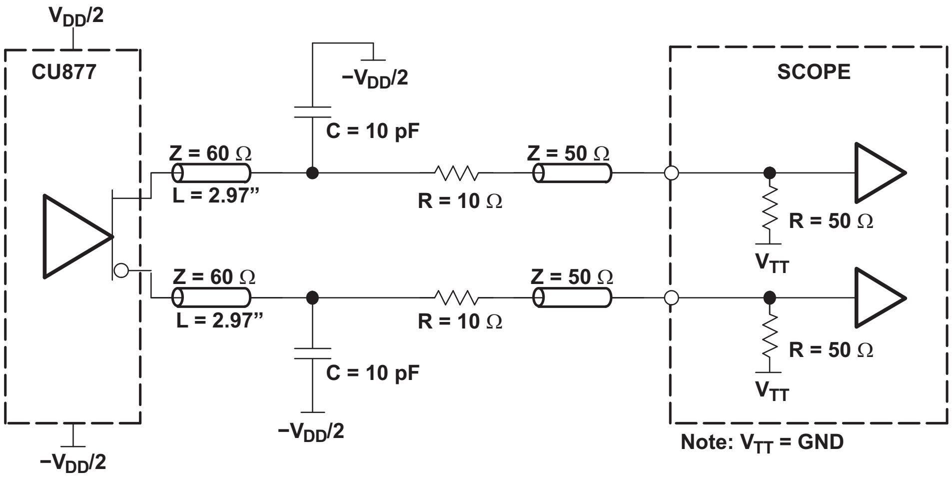

Figure 3. Output Load Test Circuit 2

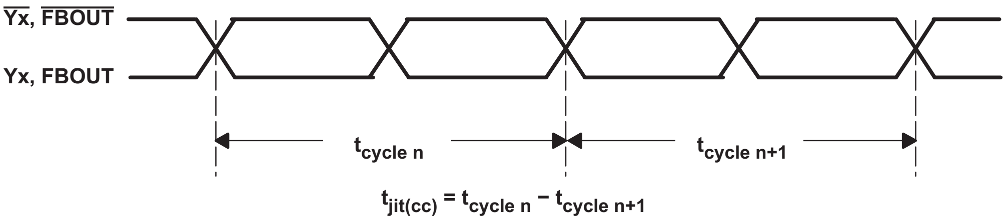

Figure 4. Cycle-To-Cycle Period Jitter

PARAMETER MEASUREMENT INFORMATION (continued)

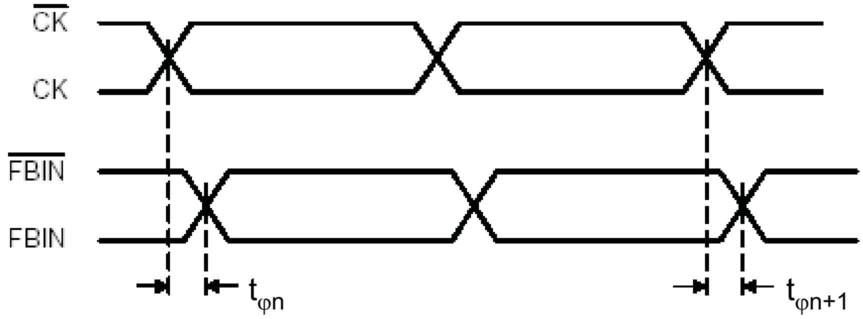

Figure 5. Static Phase Offset

$$t_\varphi = \frac{\sum_{1}^{n = N} t_{\varphi n}}{N}$$

(N is the large number of samples)

(N > 1000 samples) (1)

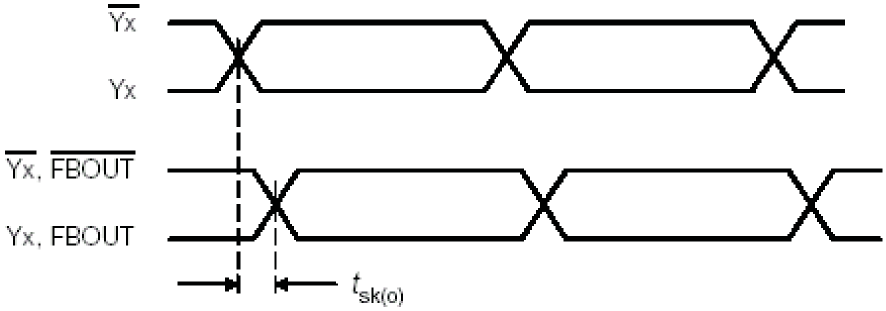

Figure 6. Output Skew

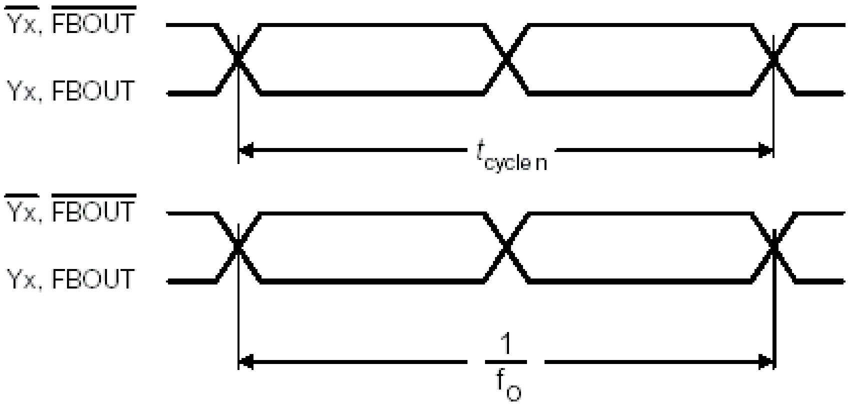

Figure 7. Period Jitter

$$t_{jit(per)} = t_{\text{cycle n}} - \frac{1}{f_O}$$

(f_O average input frequency measured at CK/$\overline{\text{CK}}$ (2)

CDCU877ARHARG4 Texas Instruments IC P

PARAMETER MEASUREMENT INFORMATION (continued)

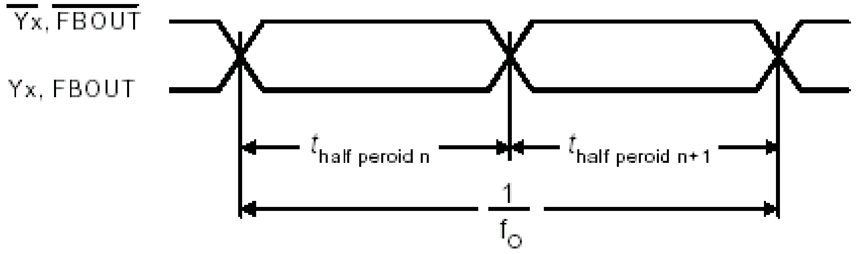

Figure 8. Half-Period Jitter

$$t_{jit(hper)} = t_{half\ period\ n} - \frac{1}{2 \times f_O}$$

n = any half cycle

(f_O average input frequency measured at CK/$\overline{CK}$

(3)

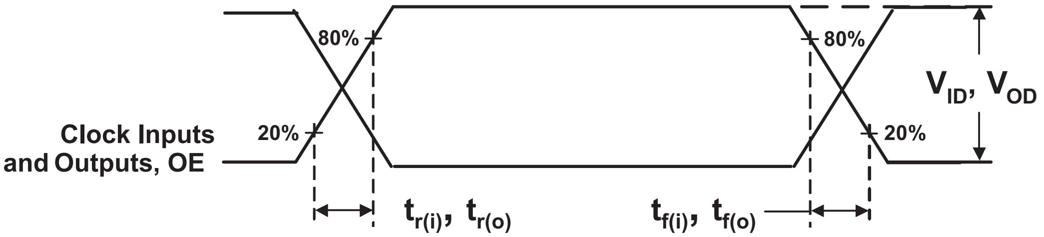

Figure 9. Input and Output Slew Rates

$$slrr_{(i/o)} = \frac{V_{80\%} - V_{20\%}}{t_{r(i/o)}} \qquad slrf_{(i/o)} = \frac{V_{80\%} - V_{20\%}}{t_{f(i/o)}}$$

(4)

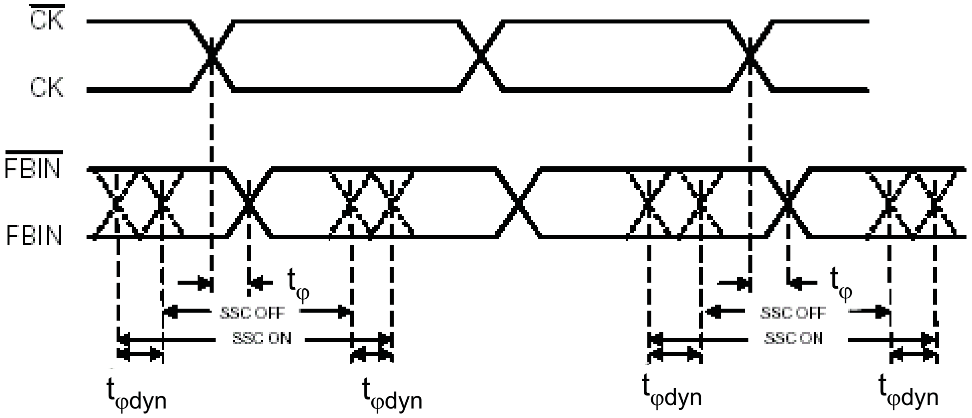

Figure 10. Dynamic Phase Offset

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PARAMETER MEASUREMENT INFORMATION (continued)

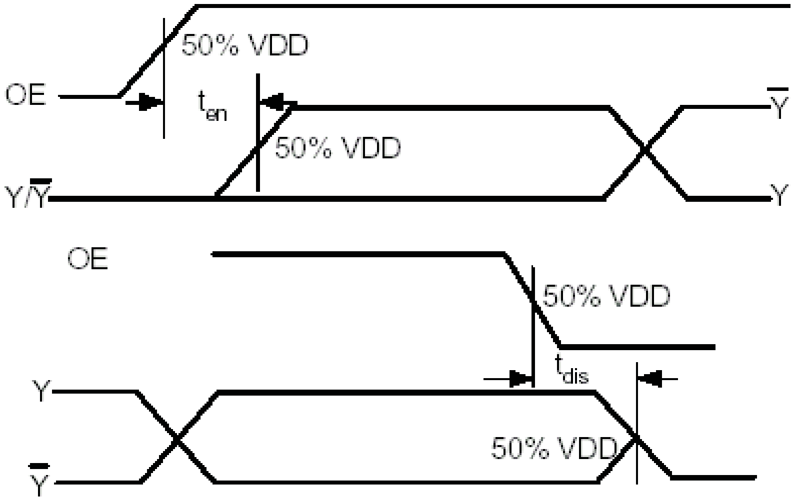
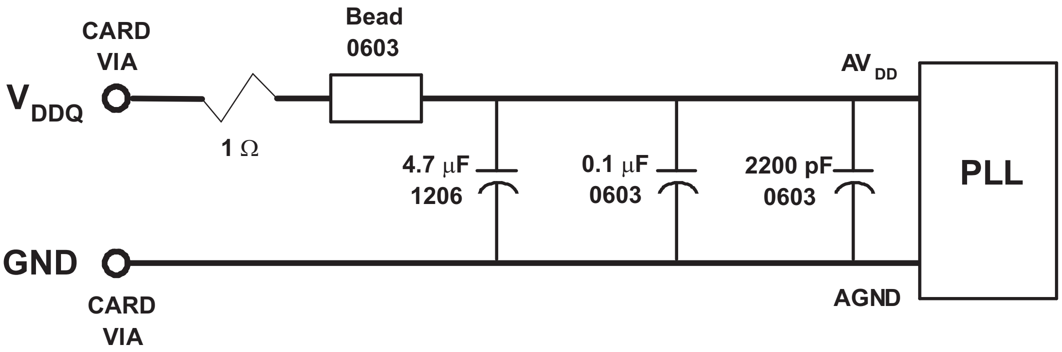


Figure 11. Time Delay Between OE and Clock Output (Y, $\overline{Y}$)

RECOMMENDED AV_{DD} FILTERING



A. Place the 2200-pF capacitor close to the PLL.

B. Use a wide trace for the PLL analog power and ground. Connect PLL and capacitors to AGND trace and connect trace to one GND via (farthest from the PLL).

C. Recommended bead: Fair-Rite PN 2506036017Y0 or equilvalent (0.8 Ω dc maximum, 600 Ω at 100 MHz).

Figure 12. Recommended AV_{DD} Filtering

CDCU877ARHAHRG4 Texas Instruments IC P

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CDCU877ANMKR	ACTIVE	NFBGA	NMK	52	1000	RoHS & Green	SNAGCU	Level-3-260C-168 HR	-40 to 85	CDCU877A	Samples
CDCU877ANMKT	ACTIVE	NFBGA	NMK	52	250	RoHS & Green	SNAGCU	Level-3-260C-168 HR	-40 to 85	CDCU877A	Samples
CDCU877ARHAR	ACTIVE	VQFN	RHA	40	2500	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 85	CDCU877A	Samples
CDCU877ARHARG4	ACTIVE	VQFN	RHA	40	2500	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 85	CDCU877A	Samples
CDCU877ARHAT	ACTIVE	VQFN	RHA	40	250	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 85	CDCU877A	Samples
CDCU877RHAR	ACTIVE	VQFN	RHA	40	2500	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 85	CDCU877	Samples
CDCU877RHAT	ACTIVE	VQFN	RHA	40	250	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 85	CDCU877	Samples
CDCU877RHATG4	ACTIVE	VQFN	RHA	40	250	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 85	CDCU877	Samples
CDCU877RTBR	ACTIVE	VQFN	RHA	40	2500	RoHS & Green	NIPDAU	Level-3-260C-168 HR	-40 to 85	CDCU877	Samples

[1] The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

[2] **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

[3] MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

[4] There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

[5] Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

[6] Lead finish/Ball material - Orderable Devices 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.

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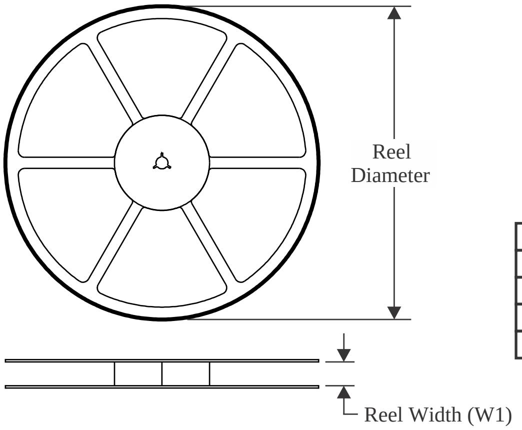
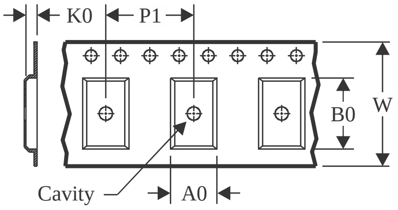
PACKAGE MATERIALS INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS

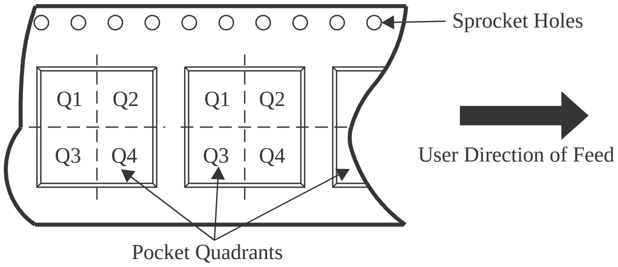


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE

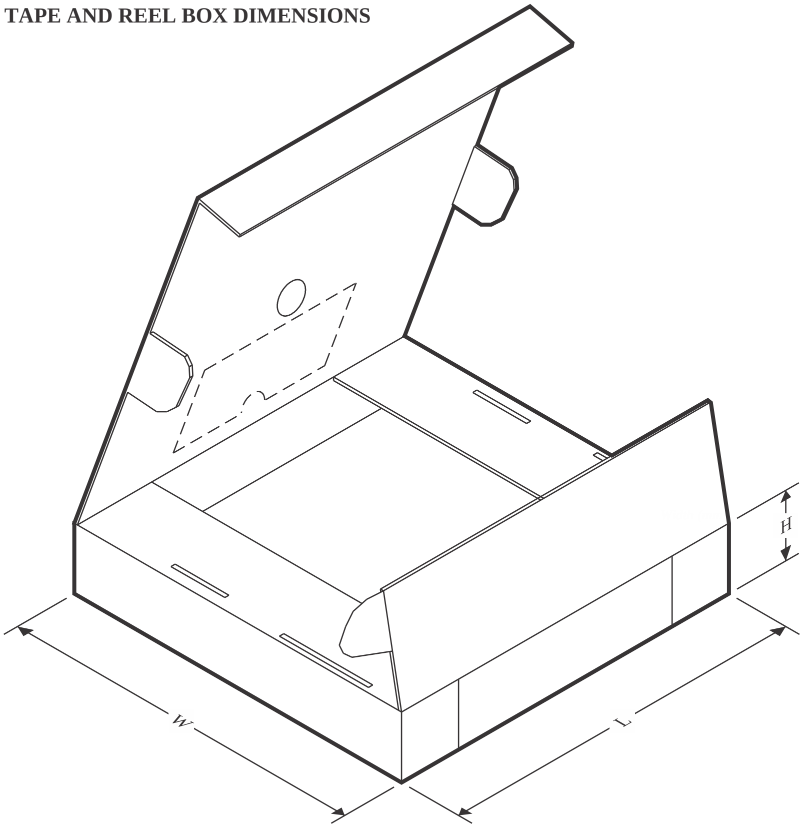


*All dimensions are nominal

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
CDCU877ANMKR	NFBGA	NMK	52	1000	330.0	16.4	4.8	7.3	1.5	8.0	16.0	Q1
CDCU877ARHAR	VQFN	RHA	40	2500	330.0	16.4	6.3	6.3	1.1	12.0	16.0	Q2
CDCU877ARHAT	VQFN	RHA	40	250	180.0	16.4	6.3	6.3	1.1	12.0	16.0	Q2
CDCU877RHAR	VQFN	RHA	40	2500	330.0	16.4	6.3	6.3	1.1	12.0	16.0	Q2
CDCU877RHAT	VQFN	RHA	40	250	180.0	16.4	6.3	6.3	1.1	12.0	16.0	Q2

PACKAGE MATERIALS INFORMATION

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CDCU877ANMKR	NFBGA	NMK	52	1000	336.6	336.6	28.6
CDCU877ARHAR	VQFN	RHA	40	2500	356.0	356.0	35.0
CDCU877ARHAT	VQFN	RHA	40	250	210.0	185.0	35.0
CDCU877RHAR	VQFN	RHA	40	2500	356.0	356.0	35.0
CDCU877RHAT	VQFN	RHA	40	250	210.0	185.0	35.0

GENERIC PACKAGE VIEW

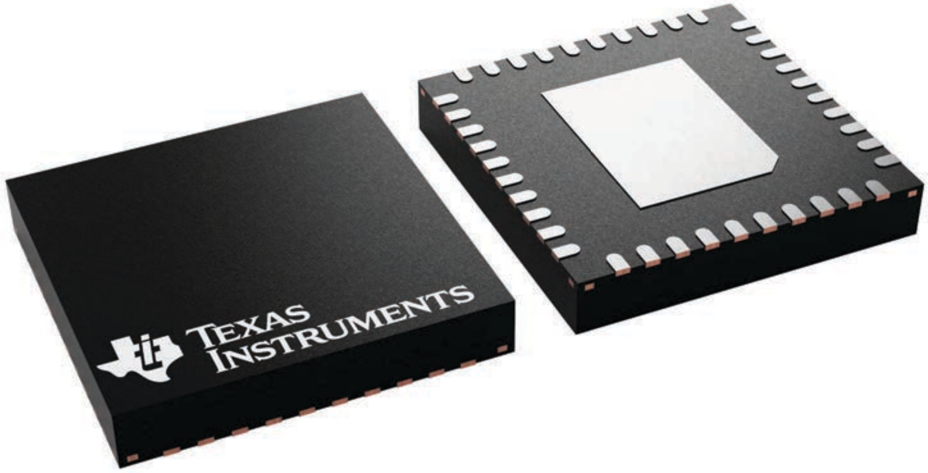
RHA 40

VQFN - 1 mm max height

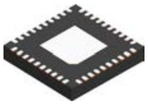
6 x 6, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



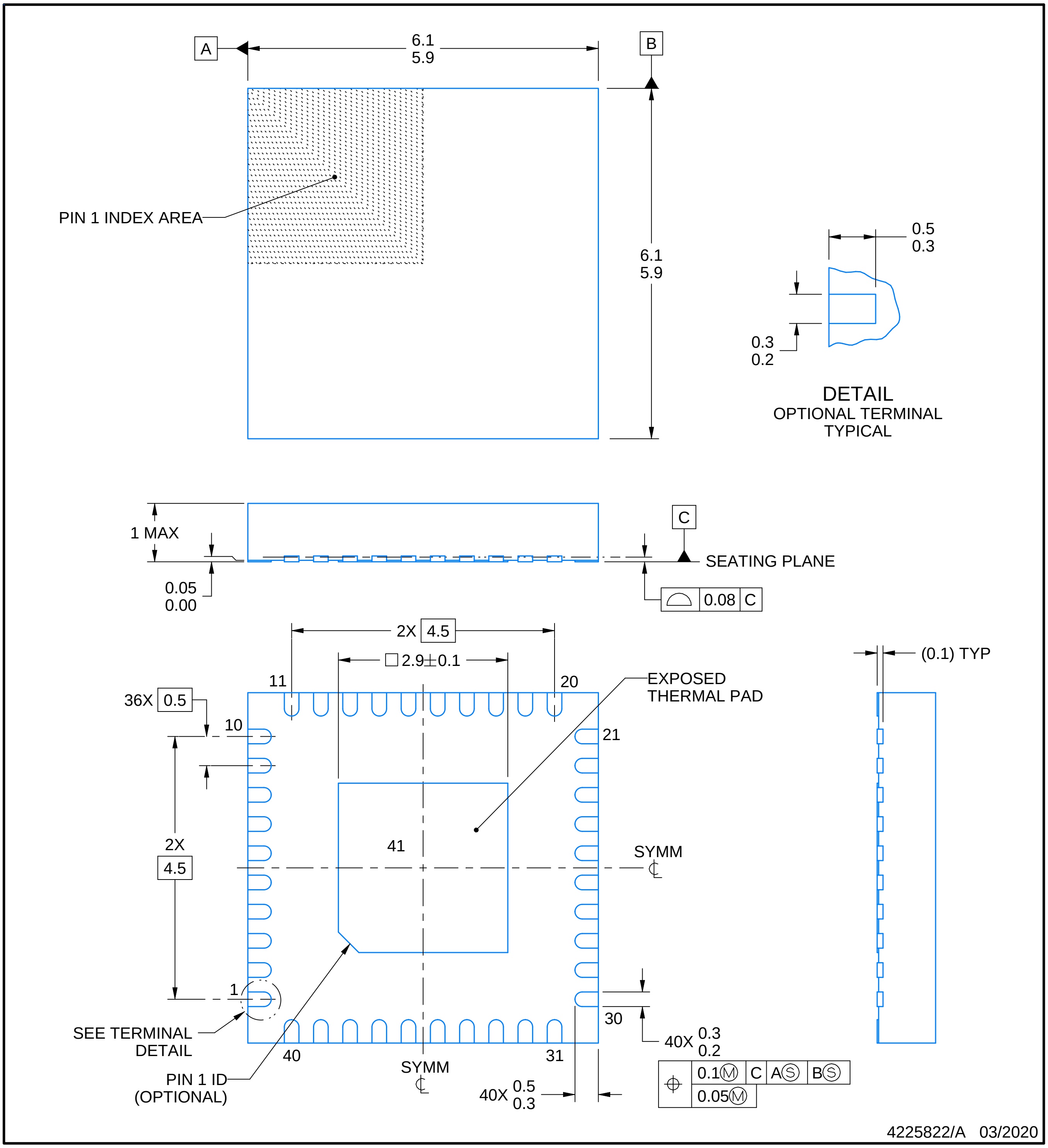
PACKAGE OUTLINE



RHA0040D

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



4225822/A 03/2020

NOTES:

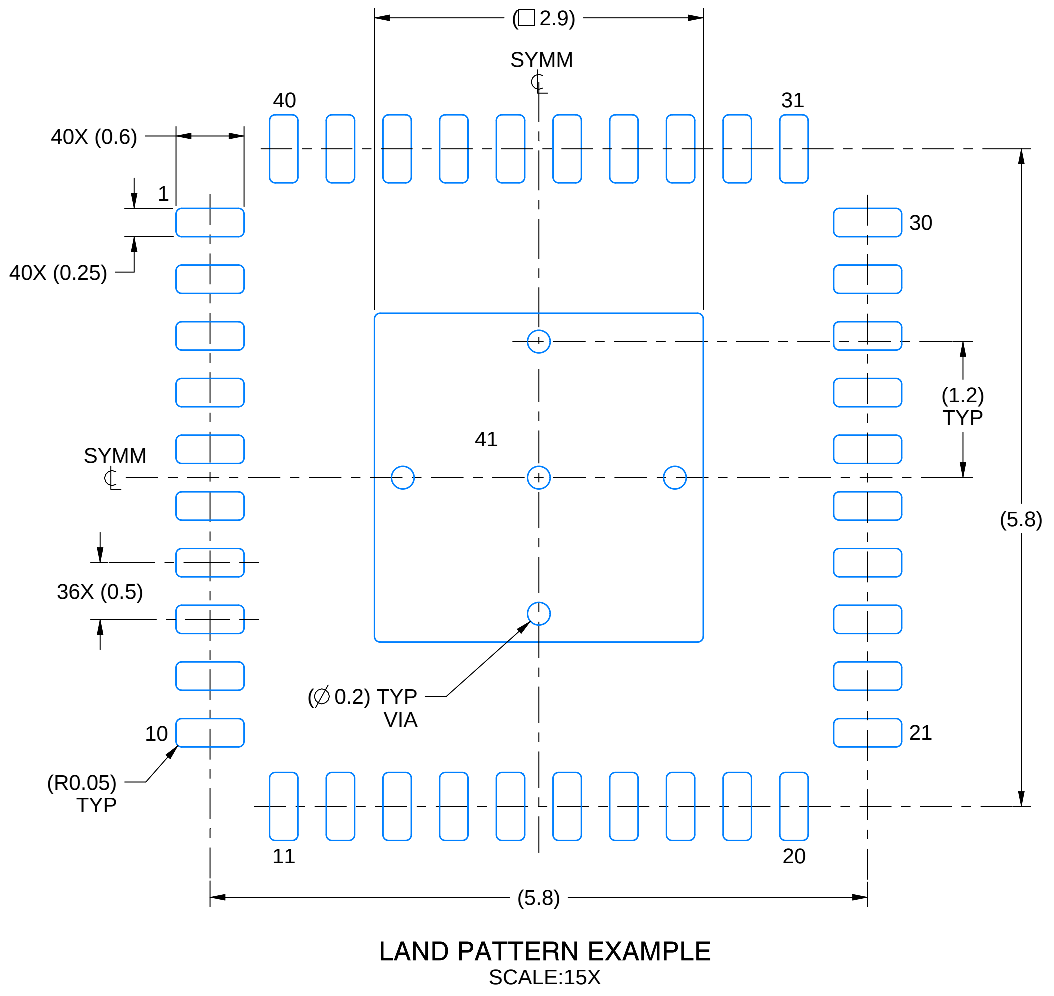
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

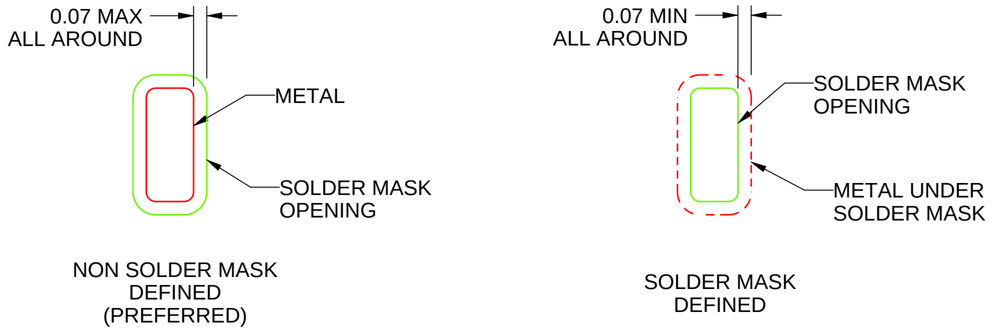
RHA0040D

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
SCALE:15X



SOLDER MASK DETAILS

4225822/A 03/2020

NOTES: (continued)

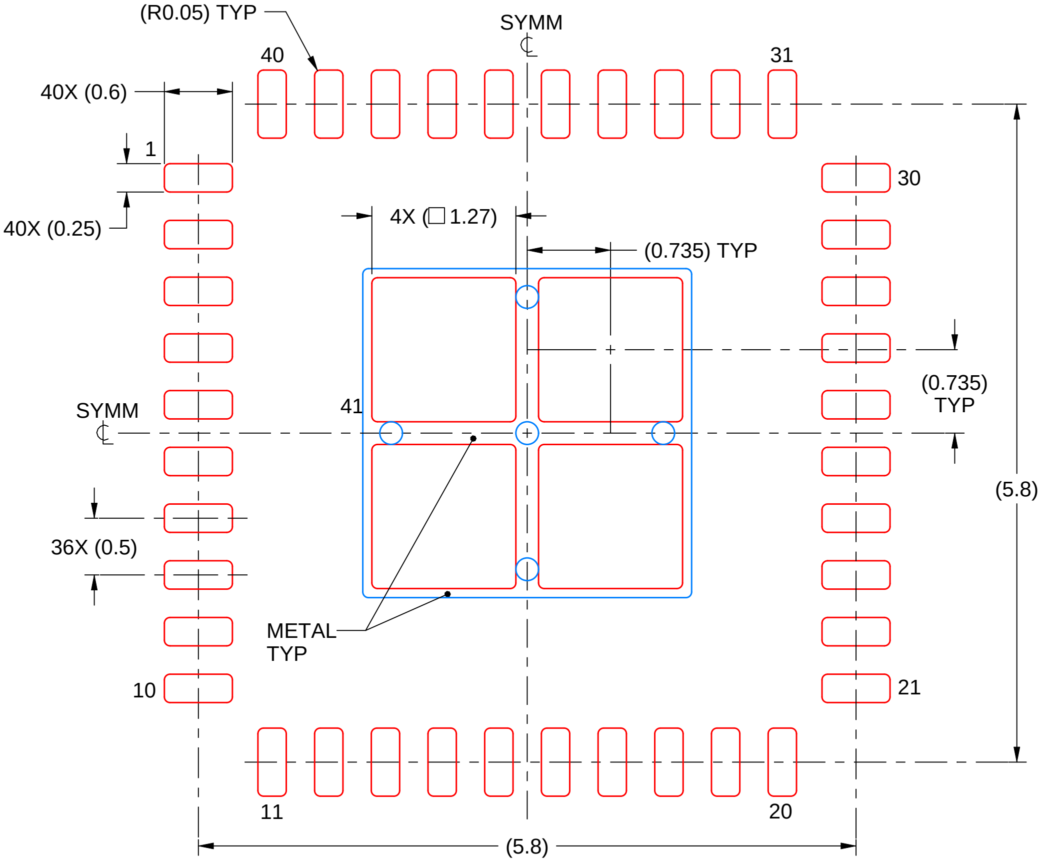
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view.

EXAMPLE STENCIL DESIGN

RHA0040D

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD 41:
76.46% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE:15X

4225822/A 03/2020

NOTES: (continued)

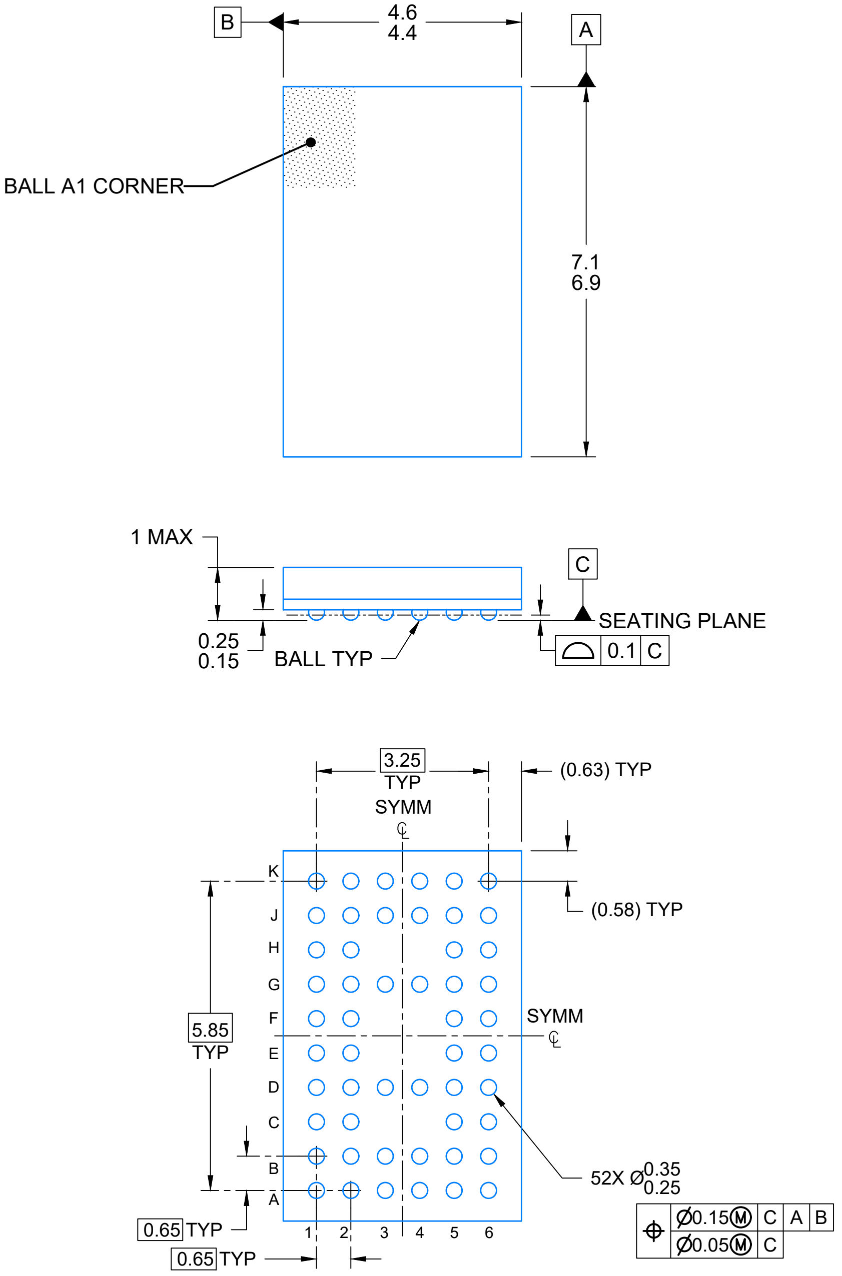
6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

PACKAGE OUTLINE

NMK0052A

NFBGA - 1 mm max height

PLASTIC BALL GRID ARRAY



4225135/A 08/2019

NOTES:

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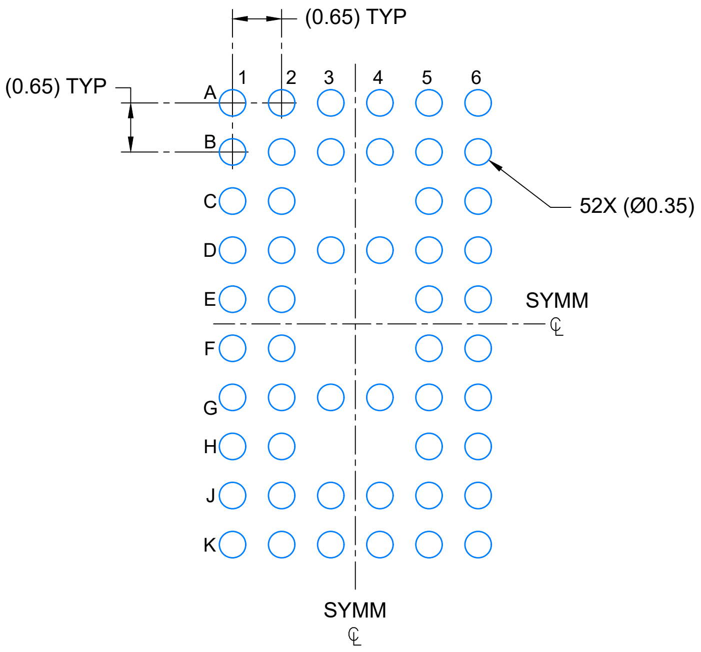
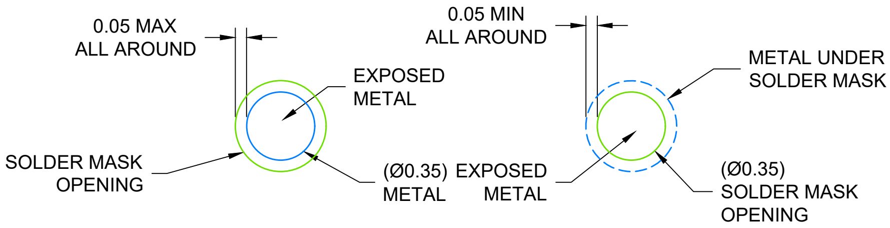
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.



LAND PATTERN EXAMPLE
SCALE: 10X



NON- SOLDER MASK
DEFINED
(PREFERRED)

SOLDER MASK
DEFINED

SOLDER MASK DETAILS
NOT TO SCALE

4225135/A 08/2019

NOTES: (continued)

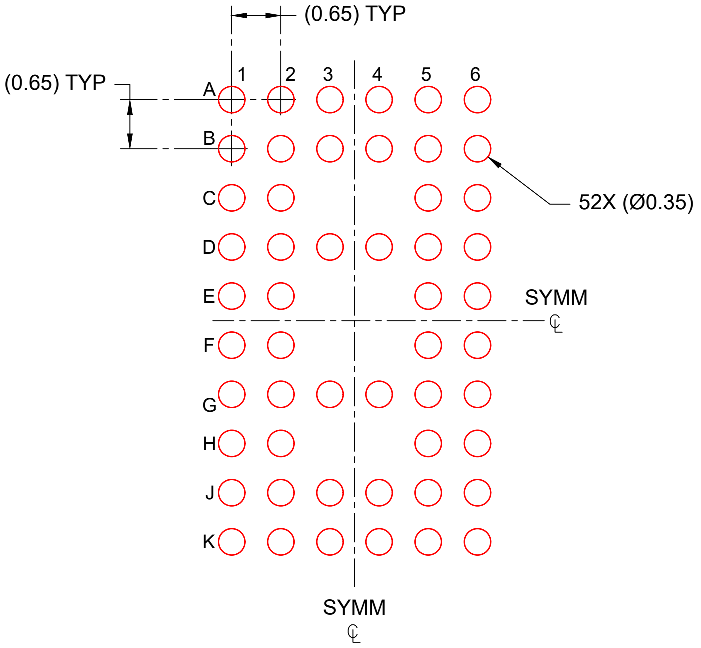
3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. Refer to Texas Instruments Literature number SNVA009 (www.ti.com/lit/snva009).

EXAMPLE STENCIL DESIGN

NMK0052A

NFBGA - 1 mm max height

PLASTIC BALL GRID ARRAY



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

4225135/A 08/2019

NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

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ASA

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Michele Dickstein
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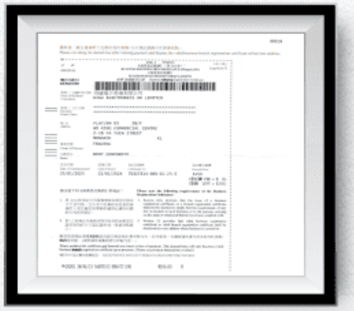

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