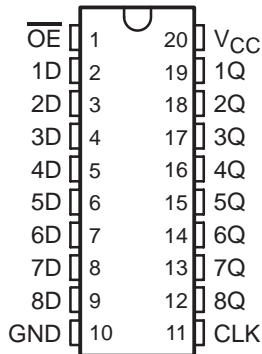


# SN54LVC574A, SN74LVC574A OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

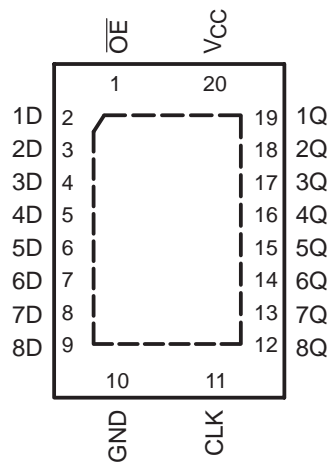
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- Operate From 1.65 V to 3.6 V
- Inputs Accept Voltages to 5.5 V
- Specified From  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $-40^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ , and  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$
- Max  $t_{pd}$  of 7 ns at 3.3 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  $<0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^{\circ}\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  $>2$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^{\circ}\text{C}$
- Support Mixed-Mode Signal Operation on All Ports (5-V Input/Output Voltage With 3.3-V  $V_{CC}$ )
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

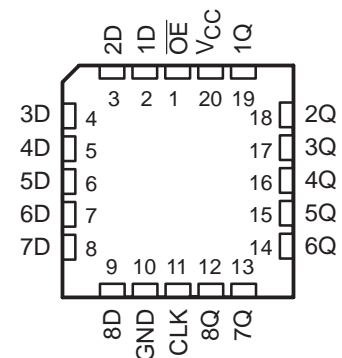
SN54LVC574A . . . J OR W PACKAGE  
SN74LVC574A . . . DB, DGV, DW, N, NS,  
OR PW PACKAGE  
(TOP VIEW)



SN74LVC574A . . . RGY PACKAGE  
(TOP VIEW)



SN54LVC574A . . . FK PACKAGE  
(TOP VIEW)



## description/ordering information

The SN54LVC574A octal edge-triggered D-type flip-flop is designed for 2.7-V to 3.6-V  $V_{CC}$  operation, and the SN74LVC574A octal edge-triggered D-type flip-flop is designed for 1.65-V to 3.6-V  $V_{CC}$  operation.

These devices feature 3-state outputs designed specifically for driving highly capacitive or relatively low-impedance loads. They are particularly suitable for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

On the positive transition of the clock (CLK) input, the Q outputs are set to the logic levels at the data (D) inputs.

A buffered output-enable ( $\overline{OE}$ ) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased drive provide the capability to drive bus lines without interface or pullup components.

$\overline{OE}$  does not affect the internal operations of the flip-flops. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

These devices are fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.



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.

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

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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

# SN54LVC574A, SN74LVC574A OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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## description/ordering information (continued)

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

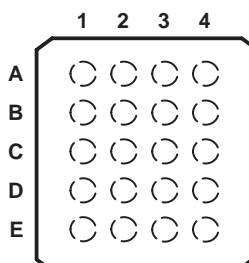
Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of these devices as translators in a mixed 3.3-V/5-V system environment.

### ORDERING INFORMATION

TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	QFN – RGY	Reel of 1000	SN74LVC574ARGYR	LC574A
	VFBGA – GQN	Reel of 1000	SN74LVC574AGQNR	LC574A
	VFBGA – ZQN (Pb-free)		SN74LVC574AZQNR	
-40°C to 125°C	PDIP – N	Tube of 20	SN74LVC574AN	SN74LVC574AN
	SOIC – DW	Tube of 25	SN74LVC574ADW	LVC574A
		Reel of 2000	SN74LVC574ADWR	
	SOP – NS	Reel of 2000	SN74LVC574ANSR	LVC574A
	SSOP – DB	Reel of 2000	SN74LVC574ADBR	LC574A
	TSSOP – PW	Tube of 70	SN74LVC574APW	LC574A
		Reel of 2000	SN74LVC574APWR	
Reel of 250		SN74LVC574APWT		
TVSOP – DGV	Reel of 2000	SN74LVC574ADGVR	LC574A	
-55°C to 125°C	CDIP – J	Tube of 20	SNJ54LVC574AJ	SNJ54LVC574AJ
	CFP – W	Tube of 85	SNJ54LVC574AW	SNJ54LVC574AW
	LCCC – FK	Tube of 55	SNJ54LVC574AFK	SNJ54LVC574AFK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

#### GQN OR ZQN PACKAGE (TOP VIEW)



#### terminal assignments

	1	2	3	4
A	1D	$\overline{OE}$	$V_{CC}$	1Q
B	3D	3Q	2D	2Q
C	5D	4D	5Q	4Q
D	7D	7Q	6D	6Q
E	GND	8D	CLK	8Q

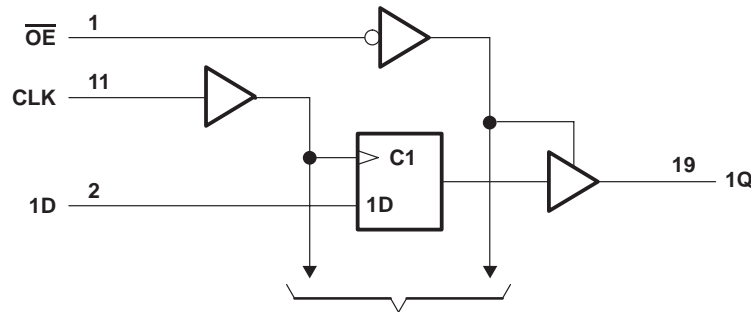
#### FUNCTION TABLE (each flip-flop)

INPUTS			OUTPUT Q
$\overline{OE}$	CLK	D	
L	↑	H	H
L	↑	L	L
L	L	X	$Q_0$
H	X	X	Z

# SN54LVC574A, SN74LVC574A OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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## logic diagram (positive logic)



To Seven Other Channels

Pin numbers shown are for the DB, DGV, DW, FK, J, N, NS, PW, RGY, and W packages.

## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, $V_{CC}$ .....	-0.5 V to 6.5 V
Input voltage range, $V_I$ (see Note 1) .....	-0.5 V to 6.5 V
Voltage range applied to any output in the high-impedance or power-off state, $V_O$ (see Note 1) .....	-0.5 V to 6.5 V
Voltage range applied to any output in the high or low state, $V_O$ (see Notes 1 and 2) .....	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	-50 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	-50 mA
Continuous output current, $I_O$ .....	$\pm 50$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 100$ mA
Package thermal impedance, $\theta_{JA}$ (see Note 3): DB package .....	70°C/W
(see Note 3): DGV package .....	92°C/W
(see Note 3): DW package .....	58°C/W
(see Note 3): GQN/ZQN package .....	78°C/W
(see Note 3): N package .....	69°C/W
(see Note 3): NS package .....	60°C/W
(see Note 3): PW package .....	83°C/W
(see Note 4): RGY package .....	37°C/W
Storage temperature range, $T_{stg}$ .....	-65°C to 150°C
Power dissipation, $P_{tot}$ ( $T_A = -40^\circ\text{C}$ to $125^\circ\text{C}$ ) (see Notes 5 and 6) .....	500 mW

† 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.

- NOTES:
1. The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
  2. The value of  $V_{CC}$  is provided in the recommended operating conditions table.
  3. The package thermal impedance is calculated in accordance with JESD 51-7.
  4. The package thermal impedance is calculated in accordance with JESD 51-5.
  5. For the DW package: above 70°C the value of  $P_{tot}$  derates linearly with 8 mW/K.
  6. For the DB, DGV, N, NS, and PW packages: above 60°C the value of  $P_{tot}$  derates linearly with 5.5 mW/K.

# SN54LVC574A, SN74LVC574A OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 7)

		SN54LVC574A		UNIT
		-55 TO 125°C		
		MIN	MAX	
V <sub>CC</sub>	Supply voltage	Operating		V
		Data retention only		
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2.7 V to 3.6 V		V
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2.7 V to 3.6 V		V
V <sub>I</sub>	Input voltage	0	5.5	V
V <sub>O</sub>	Output voltage	High or low state		V
		3-state		
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 2.7 V		mA
		V <sub>CC</sub> = 3 V		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2.7 V		mA
		V <sub>CC</sub> = 3 V		
Δt/Δv	Input transition rise or fall rate	6		ns/V

NOTE 7: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

## recommended operating conditions (see Note 7)

		SN74LVC574A						UNIT
		T <sub>A</sub> = 25°C		-40 TO 85°C		-40 TO 125°C		
		MIN	MAX	MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage	Operating		1.65		3.6		V
		Data retention only		1.5		1.5		
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V		0.65 × V <sub>CC</sub>		0.65 × V <sub>CC</sub>		V
		V <sub>CC</sub> = 2.3 V to 2.7 V		1.7		1.7		
		V <sub>CC</sub> = 2.7 V to 3.6 V		2		2		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 1.65 V to 1.95 V		0.35 × V <sub>CC</sub>		0.35 × V <sub>CC</sub>		V
		V <sub>CC</sub> = 2.3 V to 2.7 V		0.7		0.7		
		V <sub>CC</sub> = 2.7 V to 3.6 V		0.8		0.8		
V <sub>I</sub>	Input voltage	0	5.5	0	5.5	0	5.5	V
V <sub>O</sub>	Output voltage	High or low state		0		V <sub>CC</sub>		V
		3-state		0		5.5		
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 1.65 V		-4		-4		mA
		V <sub>CC</sub> = 2.3 V		-8		-8		
		V <sub>CC</sub> = 2.7 V		-12		-12		
		V <sub>CC</sub> = 3 V		-24		-24		
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 1.65 V		4		4		mA
		V <sub>CC</sub> = 2.3 V		8		8		
		V <sub>CC</sub> = 2.7 V		12		12		
		V <sub>CC</sub> = 3 V		24		24		
Δt/Δv	Input transition rise or fall rate	6		6		6		ns/V

NOTE 7: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



# SN54LVC574A, SN74LVC574A OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	SN54LVC574A			UNIT
			-55 TO 125°C			
			MIN	TYP†	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -100 μA	2.7 V to 3.6 V	V <sub>CC</sub> - 0.2			V
	I <sub>OH</sub> = -12 mA	2.7 V	2.2			
		3 V	2.4			
	I <sub>OH</sub> = -24 mA	3 V	2.2			
V <sub>OL</sub>	I <sub>OL</sub> = 100 μA	2.7 V to 3.6 V	0.2			V
	I <sub>OL</sub> = 12 mA	2.7 V	0.4			
	I <sub>OL</sub> = 24 mA	3 V	0.55			
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	3.6 V	±5			μA
I <sub>OZ</sub>	V <sub>O</sub> = 0 to 5.5 V	3.6 V	±15			μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.6 V	10			μA
	3.6 V ≤ V <sub>I</sub> ≤ 5.5 V‡		10			
ΔI <sub>CC</sub>	One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND	2.7 V to 3.6 V	500			μA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V	4			pF
C <sub>o</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	3.3 V	5.5			pF

† T<sub>A</sub> = 25°C

‡ This applies in the disabled state only.

# SN54LVC574A, SN74LVC574A OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	SN74LVC574A						UNIT	
			T <sub>A</sub> = 25°C			-40 TO 85°C		-40 TO 125°C		
			MIN	TYP	MAX	MIN	MAX	MIN		MAX
V <sub>OH</sub>	I <sub>OH</sub> = -100 μA	1.65 V to 3.6 V	V <sub>CC</sub> - 0.2			V <sub>CC</sub> - 0.2		V <sub>CC</sub> - 0.2		V
	I <sub>OH</sub> = -4 mA	1.65 V	1.29			1.2		1.2		
	I <sub>OH</sub> = -8 mA	2.3 V	1.9			1.7		1.7		
	I <sub>OH</sub> = -12 mA	2.7 V	2.2			2.2		2.2		
	I <sub>OH</sub> = -24 mA	3 V	2.4			2.4		2.4		
V <sub>OL</sub>	I <sub>OL</sub> = 100 μA	1.65 V to 3.6 V				0.1		0.2		V
	I <sub>OL</sub> = 4 mA	1.65 V				0.24		0.45		
	I <sub>OL</sub> = 8 mA	2.3 V				0.3		0.7		
	I <sub>OL</sub> = 12 mA	2.7 V				0.4		0.4		
	I <sub>OL</sub> = 24 mA	3 V				0.55		0.55		
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	3.6 V				±1		±5		μA
I <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 5.5 V	0				±4		±10		μA
I <sub>OZ</sub>	V <sub>I</sub> = 0 to 5.5 V	3.6 V				±1		±10		μA
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.6 V				1.5		10		μA
	3.6 V ≤ V <sub>I</sub> ≤ 5.5 V†		I <sub>O</sub> = 0				1.5		10	
ΔI <sub>CC</sub>	One input at V <sub>CC</sub> - 0.6 V, Other inputs at V <sub>CC</sub> or GND	2.7 V to 3.6 V				500		500		μA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V				4				pF
C <sub>o</sub>	V <sub>O</sub> = V <sub>CC</sub> or GND	3.3 V				5.5				pF

† This applies in the disabled state only.

timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

		V <sub>CC</sub>	SN54LVC574A		UNIT
			-55 TO 125°C		
			MIN	MAX	
f <sub>clock</sub>	Clock frequency	2.7 V	150		MHz
		3.3 V ± 0.3 V	150		
t <sub>w</sub>	Pulse duration, CLK high or low	2.7 V	3.3		ns
		3.3 V ± 0.3 V	3.3		
t <sub>su</sub>	Setup time, data before CLK↑	2.7 V	2		ns
		3.3 V ± 0.3 V	2		
t <sub>h</sub>	Hold time, data after CLK↑	2.7 V	2		ns
		3.3 V ± 0.3 V	2		



# SN54LVC574A, SN74LVC574A OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub>	SN54LVC574A		UNIT
				-55 TO 125°C		
				MIN	MAX	
f <sub>max</sub>			2.7 V	150		MHz
			3.3 V ± 0.3 V	150		
t <sub>pd</sub>	CLK	Q	2.7 V	8		ns
			3.3 V ± 0.3 V	1	7	
t <sub>en</sub>	$\overline{OE}$	Q	2.7 V	9		ns
			3.3 V ± 0.3 V	1	7.5	
t <sub>dis</sub>	$\overline{OE}$	Q	2.7 V	7		ns
			3.3 V ± 0.3 V	0.5	6.4	

timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

	V <sub>CC</sub>	SN74LVC574A						UNIT	
		T <sub>A</sub> = 25°C			-40 TO 85°C		-40 TO 125°C		
		MIN	TYP	MAX	MIN	MAX	MIN		MAX
f <sub>clock</sub> Clock frequency	1.8 V ± 0.15 V			55		55		40	MHz
	2.5 V ± 0.2 V			95		95		80	
	2.7 V			150		150		150	
	3.3 V ± 0.3 V			150		150		150	
t <sub>w</sub> Pulse duration, CLK high or low	1.8 V ± 0.15 V	9			9			9	ns
	2.5 V ± 0.2 V	4			4			4	
	2.7 V	3.3			3.3			3.3	
	3.3 V ± 0.3 V	3.3			3.3			3.3	
t <sub>su</sub> Setup time, data before CLK↑	1.8 V ± 0.15 V	6			6			6	ns
	2.5 V ± 0.2 V	4			4			4	
	2.7 V	2			2			2	
	3.3 V ± 0.3 V	2			2			2	
t <sub>h</sub> Hold time, data after CLK↑	1.8 V ± 0.15 V	4			4			4	ns
	2.5 V ± 0.2 V	2			2			2	
	2.7 V	1.5			1.5			1.5	
	3.3 V ± 0.3 V	1.5			1.5			1.5	

# SN54LVC574A, SN74LVC574A OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub>	SN74LVC574A						UNIT	
				T <sub>A</sub> = 25°C			-40 TO 85°C		-40 TO 125°C		
				MIN	TYP	MAX	MIN	MAX	MIN		MAX
f <sub>max</sub>			1.8 V ± 0.15 V	55			55		40		MHz
			2.5 V ± 0.2 V	95			95		80		
			2.7 V	150			150		150		
			3.3 V ± 0.3 V	150			150		150		
t <sub>pd</sub>	CLK	Q	1.8 V ± 0.15 V	1.0	7.1	21.5	1	21.6	1.0	21.6	ns
			2.5 V ± 0.2 V	1.0	4.9	10.0	1	10.5	1.0	10.5	
			2.7 V	1.0	5.0	7.8	1	8	1.0	8.0	
			3.3 V ± 0.3 V	2.2	4.6	6.8	2.2	7	2.2	7.0	
t <sub>en</sub>	$\overline{OE}$	Q	1.8 V ± 0.15 V	1.0	6.6	19.0	1	19.5	1.0	19.5	ns
			2.5 V ± 0.2 V	1.0	4.8	10.0	1	10.5	1.0	10.5	
			2.7 V	1.0	5.5	8.3	1	8.5	1.0	8.5	
			3.3 V ± 0.3 V	1.5	4.4	7.3	1.5	7.5	1.5	7.5	
t <sub>dis</sub>	$\overline{OE}$	Q	1.8 V ± 0.15 V	1.0	5.4	18.3	1	18.8	1.0	18.8	ns
			2.5 V ± 0.2 V	1.0	3.0	7.3	1	7.8	1.0	7.8	
			2.7 V	1.0	4.0	6.8	1	7	1.0	7.3	
			3.3 V ± 0.3 V	1.7	3.9	6.2	1.7	6.4	1.7	6.6	
t <sub>sk(o)</sub>			3.3 V ± 0.3 V				1		1	ns	

## operating characteristics, T<sub>A</sub> = 25°C

PARAMETER		TEST CONDITIONS	V <sub>CC</sub>	TYP	UNIT	
C <sub>pd</sub>	Power dissipation capacitance per flip-flop	f = 10 MHz		25	pF	
				Outputs enabled		1.8 V
						2.5 V
						3.3 V
				Outputs disabled		1.8 V
						2.5 V
		3.3 V	11			

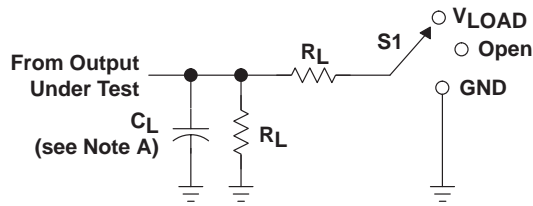




# SN54LVC574A, SN74LVC574A OCTAL EDGE-TRIGGERED D-TYPE FLIP-FLOPS WITH 3-STATE OUTPUTS

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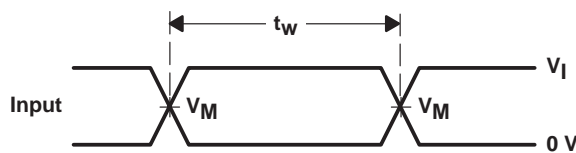
## PARAMETER MEASUREMENT INFORMATION



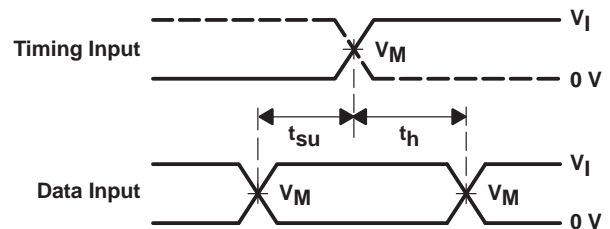
LOAD CIRCUIT

TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

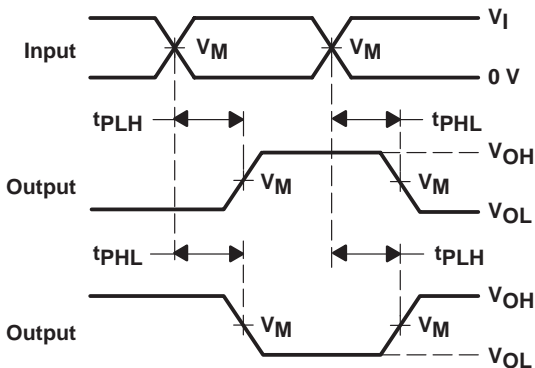
$V_{CC}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_{\Delta}$
	$V_I$	$t_r/t_f$					
$1.8\text{ V} \pm 0.15\text{ V}$	$V_{CC}$	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	1 k $\Omega$	0.15 V
$2.5\text{ V} \pm 0.2\text{ V}$	$V_{CC}$	$\leq 2\text{ ns}$	$V_{CC}/2$	$2 \times V_{CC}$	30 pF	500 $\Omega$	0.15 V
2.7 V	2.7 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 $\Omega$	0.3 V
$3.3\text{ V} \pm 0.3\text{ V}$	2.7 V	$\leq 2.5\text{ ns}$	1.5 V	6 V	50 pF	500 $\Omega$	0.3 V



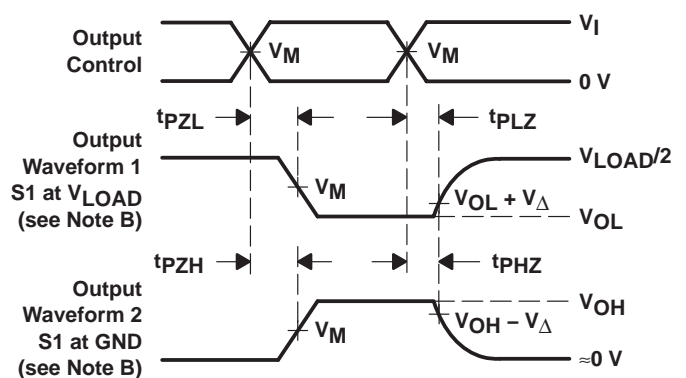
VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  - All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

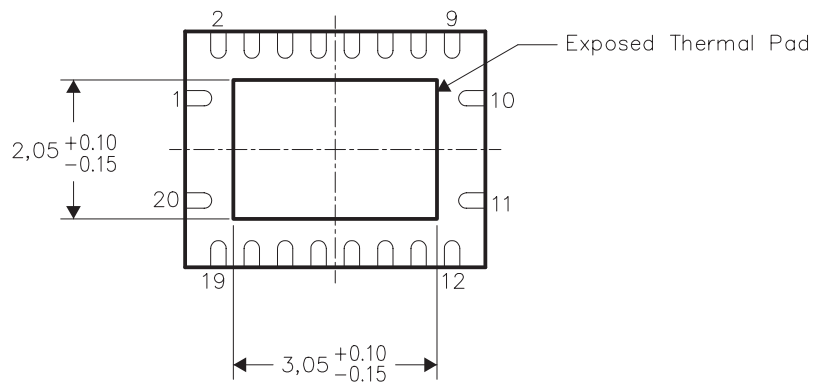
Figure 1. Load Circuit and Voltage Waveforms

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB), the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to a ground plane or special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, Quad Flatpack No-Lead Logic Packages, Texas Instruments Literature No. SCBA017. This document is available at [www.ti.com](http://www.ti.com).

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
5962-9757601Q2A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
5962-9757601QRA	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
5962-9757601QSA	ACTIVE	CFP	W	16	1	TBD	Call TI	Level-NC-NC-NC
SN74LVC574ADBLE	OBSOLETE	SSOP	DB	20		TBD	Call TI	Call TI
SN74LVC574ADBR	ACTIVE	SSOP	DB	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LVC574ADGVR	ACTIVE	TVSOP	DGV	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74LVC574ADW	ACTIVE	SOIC	DW	20	25	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74LVC574ADWR	ACTIVE	SOIC	DW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74LVC574AGQNR	ACTIVE	VFBGA	GQN	20	1000	TBD	SNPB	Level-1-240C-UNLIM
SN74LVC574AN	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
SN74LVC574ANSR	ACTIVE	SO	NS	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
SN74LVC574APW	ACTIVE	TSSOP	PW	20	70	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74LVC574APWLE	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI
SN74LVC574APWR	ACTIVE	TSSOP	PW	20	2000	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74LVC574APWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LVC574APWT	ACTIVE	TSSOP	PW	20	250	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM
SN74LVC574ARGYR	ACTIVE	QFN	RGY	20	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
SN74LVC574AZQNR	ACTIVE	VFBGA	ZQN	20	1000	Pb-Free (RoHS)	SNAGCU	Level-1-260C-UNLIM
SNJ54LVC574AFK	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LVC574AJ	ACTIVE	CDIP	J	16	1	TBD	Call TI	Level-NC-NC-NC
SNJ54LVC574AW	ACTIVE	CFP	W	16	1	TBD	Call TI	Level-NC-NC-NC

<sup>(1)</sup> 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.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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J (R-GDIP-T\*\*)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package is hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only.
  - E. Falls within MIL STD 1835 GDFP1-F16 and JEDEC MO-092AC

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN

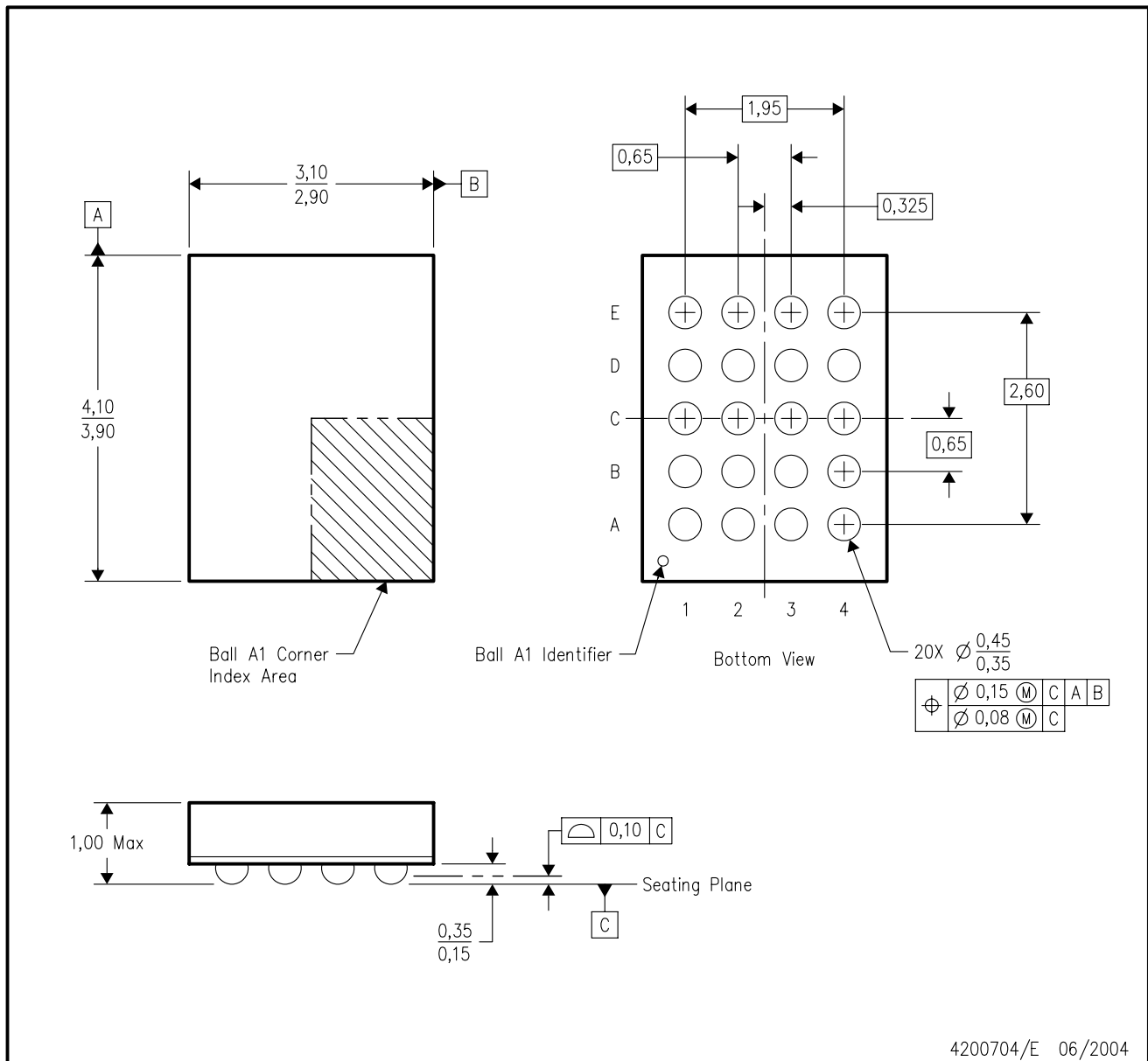


4040140/D 10/96

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a metal lid.
  - D. The terminals are gold plated.
  - E. Falls within JEDEC MS-004

GQN (R-PBGA-N20)

PLASTIC BALL GRID ARRAY



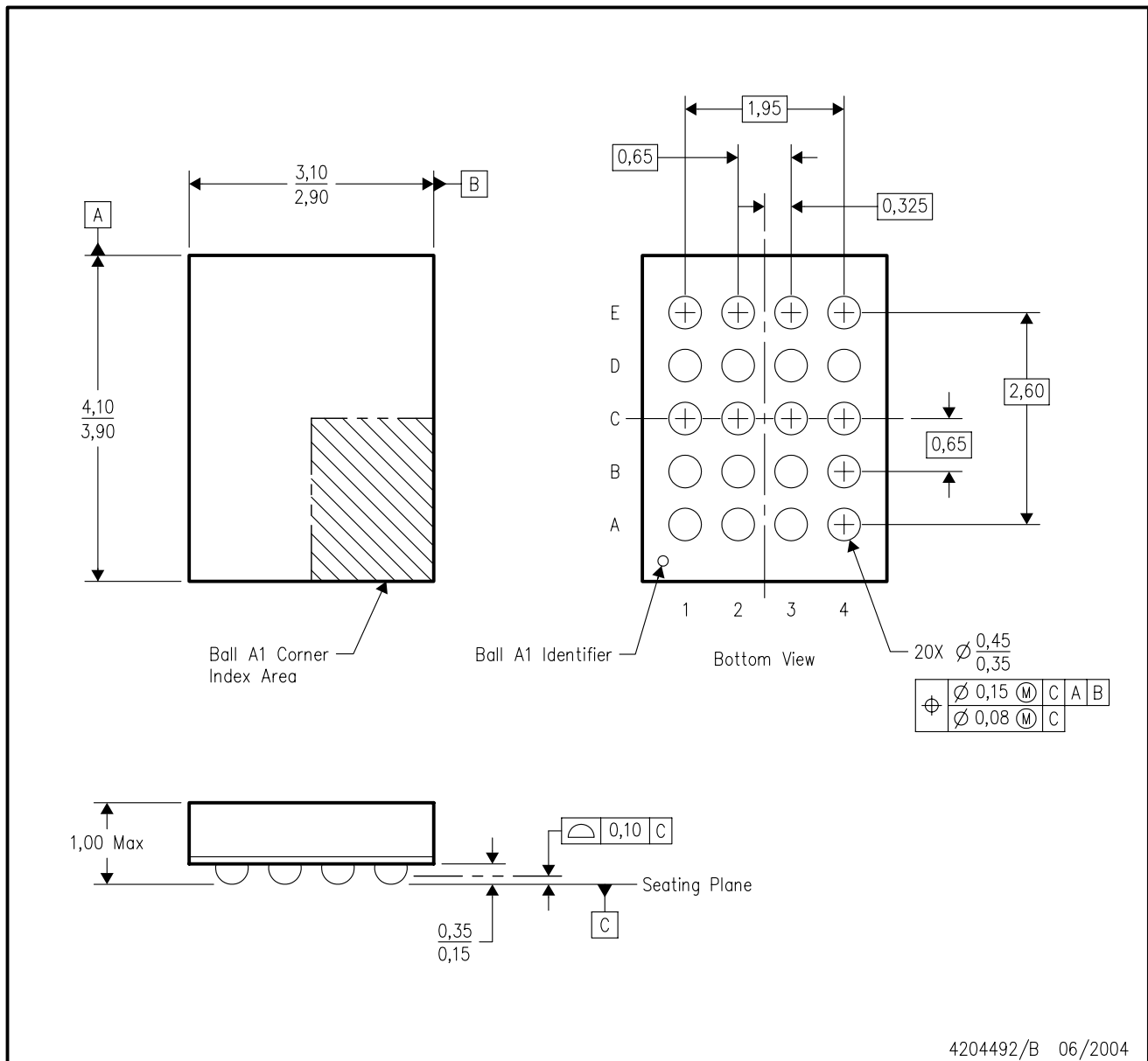
4200704/E 06/2004

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MO-225 variation BC.
  - D. This package is tin-lead (SnPb). Refer to the 20 ZQN package (drawing 4204492) for lead-free.



ZQN (R-PBGA-N20)

PLASTIC BALL GRID ARRAY



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MO-225 variation BC.
  - D. This package is lead-free. Refer to the 20 GQN package (drawing 4200704) for tin-lead (SnPb).

N (R-PDIP-T\*\*)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

DGV (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

DW (R-PDSO-G20)

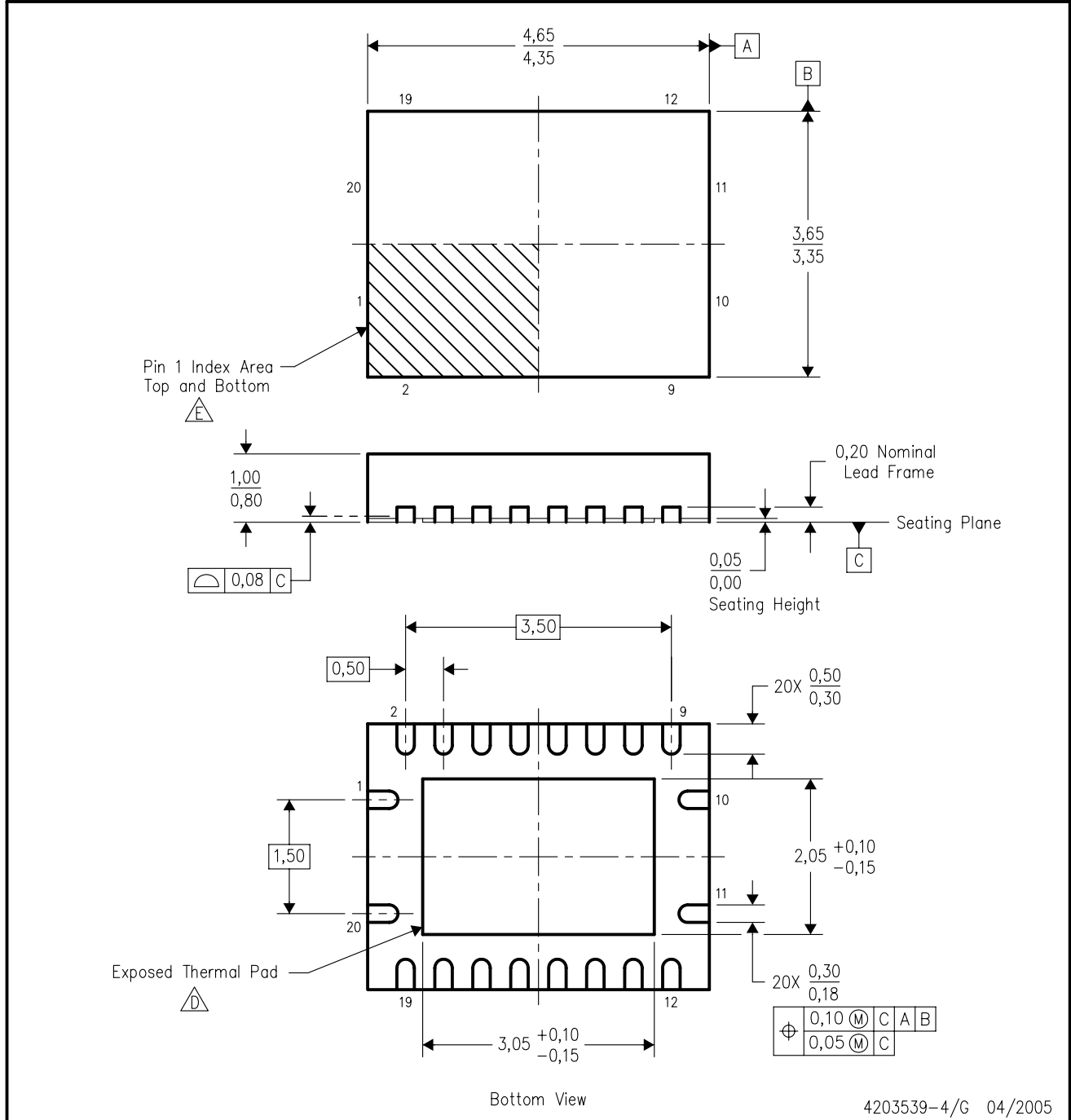
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AC.

RGY (R-PQFP-N20)

PLASTIC QUAD FLATPACK



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. QFN (Quad Flatpack No-Lead) package configuration.
  - The package thermal pad must be soldered to the board for thermal and mechanical performance.
  - Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
  - F. Package complies to JEDEC MO-241 variation BC.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153



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