

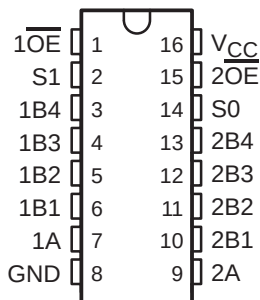
SN74CBTLV3253

LOW-VOLTAGE DUAL 1-OF-4 FET MULTIPLEXER/DEMULTIPLEXER

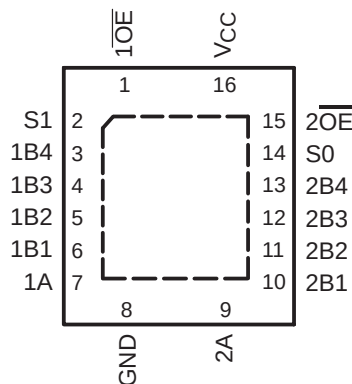
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- Functionally Equivalent to QS3253
- 5-Ω Switch Connection Between Two Ports
- Rail-to-Rail Switching on Data I/O Ports
- I_{off} Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II

D, DBQ, DGV, OR PW PACKAGE
(TOP VIEW)



RGY PACKAGE
(TOP VIEW)



description/ordering information

The SN74CBTLV3253 is a dual 1-of-4 high-speed FET multiplexer/demultiplexer. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

The select (S0, S1) inputs control the data flow. The FET multiplexers/demultiplexers are disabled when the associated output-enable ($\overline{OE}$) input is high.

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} feature ensures that damaging current will not backflow through the device when it is powered down. The device has isolation during power off.

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.

ORDERING INFORMATION

T_A	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	QFN – RGY	Tape and reel	SN74CBTLV3253RGYR	CL253
	SOIC – D	Tube	SN74CBTLV3253D	CBTLV3253
		Tape and reel	SN74CBTLV3253DR	
	SSOP (QSOP) – DBQ	Tape and reel	SN74CBTLV3253DBQR	CL253
	TSSOP – PW	Tape and reel	SN74CBTLV3253PWR	CL253
	TVSOP – DGV	Tape and reel	SN74CBTLV3253DGV	CL253

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



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**TEXAS
INSTRUMENTS**

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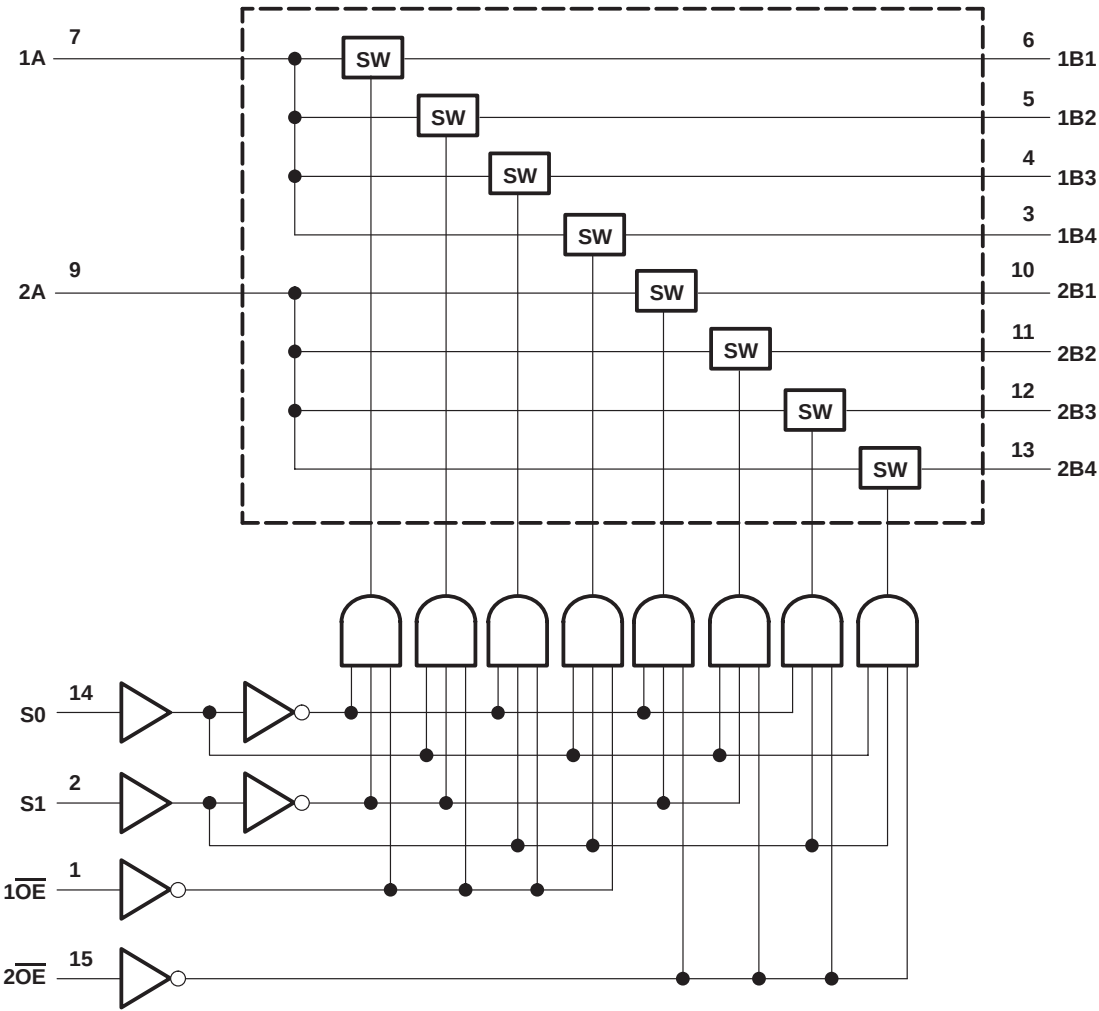
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FUNCTION TABLE
(each multiplexer/demultiplexer)

INPUTS			FUNCTION
$\overline{\text{OE}}$	S1	S0	
L	L	L	A port = B1 port
L	L	H	A port = B2 port
L	H	L	A port = B3 port
L	H	H	A port = B4 port
H	X	X	Disconnect

logic diagram (positive logic)

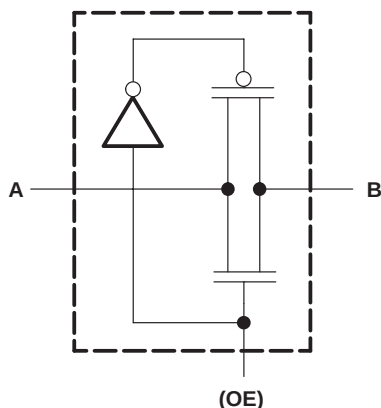


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simplified schematic, each FET switch



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

Supply voltage range, V_{CC}	–0.5 V to 4.6 V
Input voltage range, V_I (see Note 1)	–0.5 V to 4.6 V
Continuous channel current	128 mA
Input clamp current, I_{IK} ($V_{I/O} < 0$)	–50 mA
Package thermal impedance, θ_{JA} (see Note 2): D package	73°C/W
(see Note 2): DBQ package	90°C/W
(see Note 2): DGV package	120°C/W
(see Note 2): PW package	108°C/W
(see Note 3): RGY package	39°C/W
Storage temperature range, T_{stg}	–65°C to 150°C

[†] 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 and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
 2. The package thermal impedance is calculated in accordance with JESD 51-7.
 3. The package thermal impedance is calculated in accordance with JESD 51-5.

recommended operating conditions (see Note 4)

			MIN	MAX	UNIT
V_{CC}	Supply voltage		2.3	3.6	V
V_{IH}	High-level control input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7		V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2		
V_{IL}	Low-level control input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.7	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$		0.8	
T_A	Operating free-air temperature		–40	85	°C

NOTE 4: All unused control inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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LOW-VOLTAGE DUAL 1-OF-4 FET MULTIPLEXER/DEMULTIPLEXER

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

PARAMETER		TEST CONDITIONS		MIN	TYP [†]	MAX	UNIT
V_{IK}		$V_{CC} = 3\text{ V}$,	$I_I = -18\text{ mA}$			-1.2	V
I_I		$V_{CC} = 3.6\text{ V}$,	$V_I = V_{CC}$ or GND			± 1	μA
I_{off}		$V_{CC} = 0$,	V_I or $V_O = 0$ to 3.6 V			15	μA
I_{CC}		$V_{CC} = 3.6\text{ V}$,	$I_O = 0$, $V_I = V_{CC}$ or GND			10	μA
$\Delta I_{CC}^\ddagger$	Control inputs	$V_{CC} = 3.6\text{ V}$,	One input at 3 V , Other inputs at V_{CC} or GND			300	μA
C_i	Control inputs	$V_I = 3\text{ V}$ or 0				3	pF
$C_{io}(\text{OFF})$	A port	$V_O = 3\text{ V}$ or 0 , $\overline{OE} = V_{CC}$				20.5	pF
	B port					5.5	
$r_{on}^\S$	$V_{CC} = 2.3\text{ V}$, TYP at $V_{CC} = 2.5\text{ V}$	$V_I = 0$	$I_I = 64\text{ mA}$			5	Ω
			$I_I = 24\text{ mA}$			5	
		$V_I = 1.7\text{ V}$,	$I_I = 15\text{ mA}$			27	
	$V_{CC} = 3\text{ V}$	$V_I = 0$	$I_I = 64\text{ mA}$			5	
			$I_I = 24\text{ mA}$			5	
		$V_I = 2.4\text{ V}$,	$I_I = 15\text{ mA}$			10	

[†] All typical values are at $V_{CC} = 3.3\text{ V}$ (unless otherwise noted), $T_A = 25^\circ\text{C}$.

[‡] This is the increase in supply current for each input that is at the specified voltage level, rather than V_{CC} or GND.

[§] Measured by the voltage drop between the A and the B terminals at the indicated current through the switch. On-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$		$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	
t_{pd}	A or B [¶]	B or A		0.15		0.25	ns
	S	A or B	1	6.8	1	5.5	
t_{en}	S	A or B	1	4.3	1	4	ns
t_{dis}	S	A or B	1	5.1	1	5.5	ns
t_{en}	$\overline{OE}$	A or B	1	5	1	4.8	ns
t_{dis}	$\overline{OE}$	A or B	1	5.5	1	5.4	ns

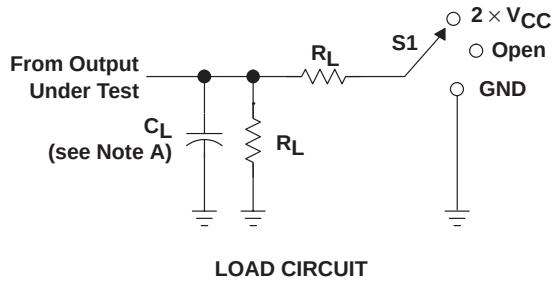
[¶] The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

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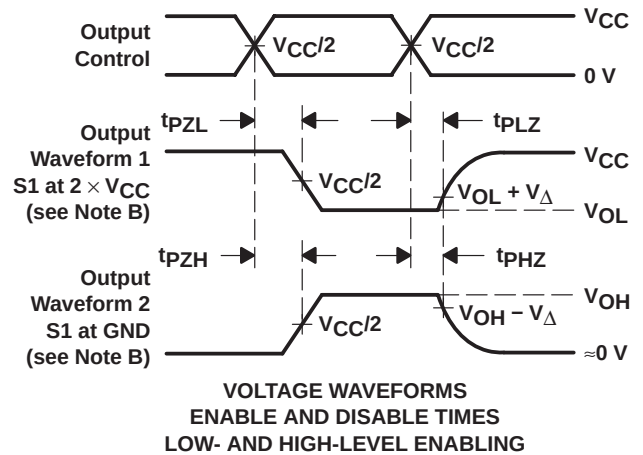
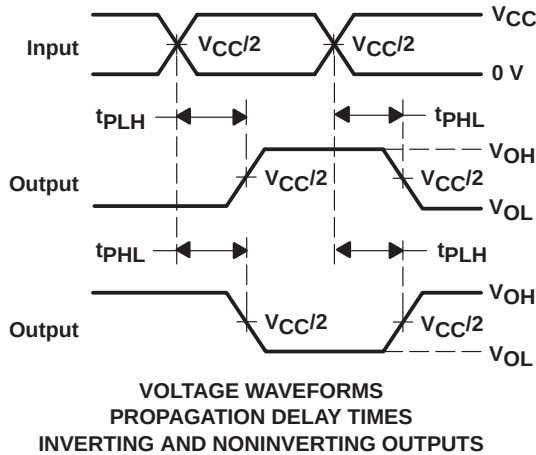
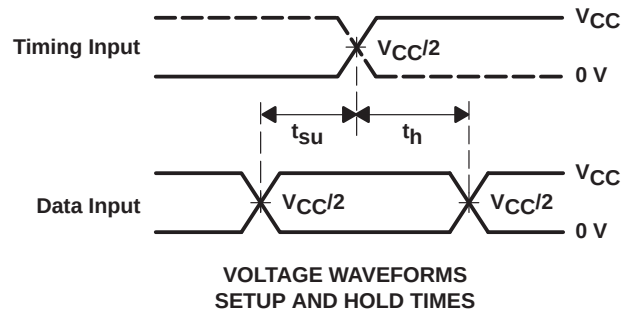
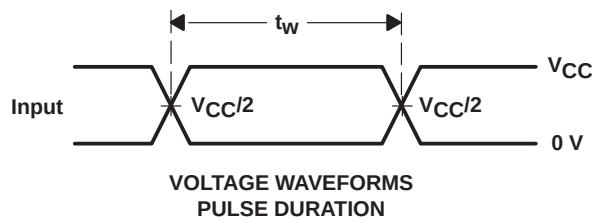
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PARAMETER MEASUREMENT INFORMATION



TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CC}$
t_{PHZ}/t_{PZH}	GND

V_{CC}	C_L	R_L	V_{Δ}
$2.5 \text{ V} \pm 0.2 \text{ V}$	30 pF	500 Ω	0.15 V
$3.3 \text{ V} \pm 0.3 \text{ V}$	50 pF	500 Ω	0.3 V



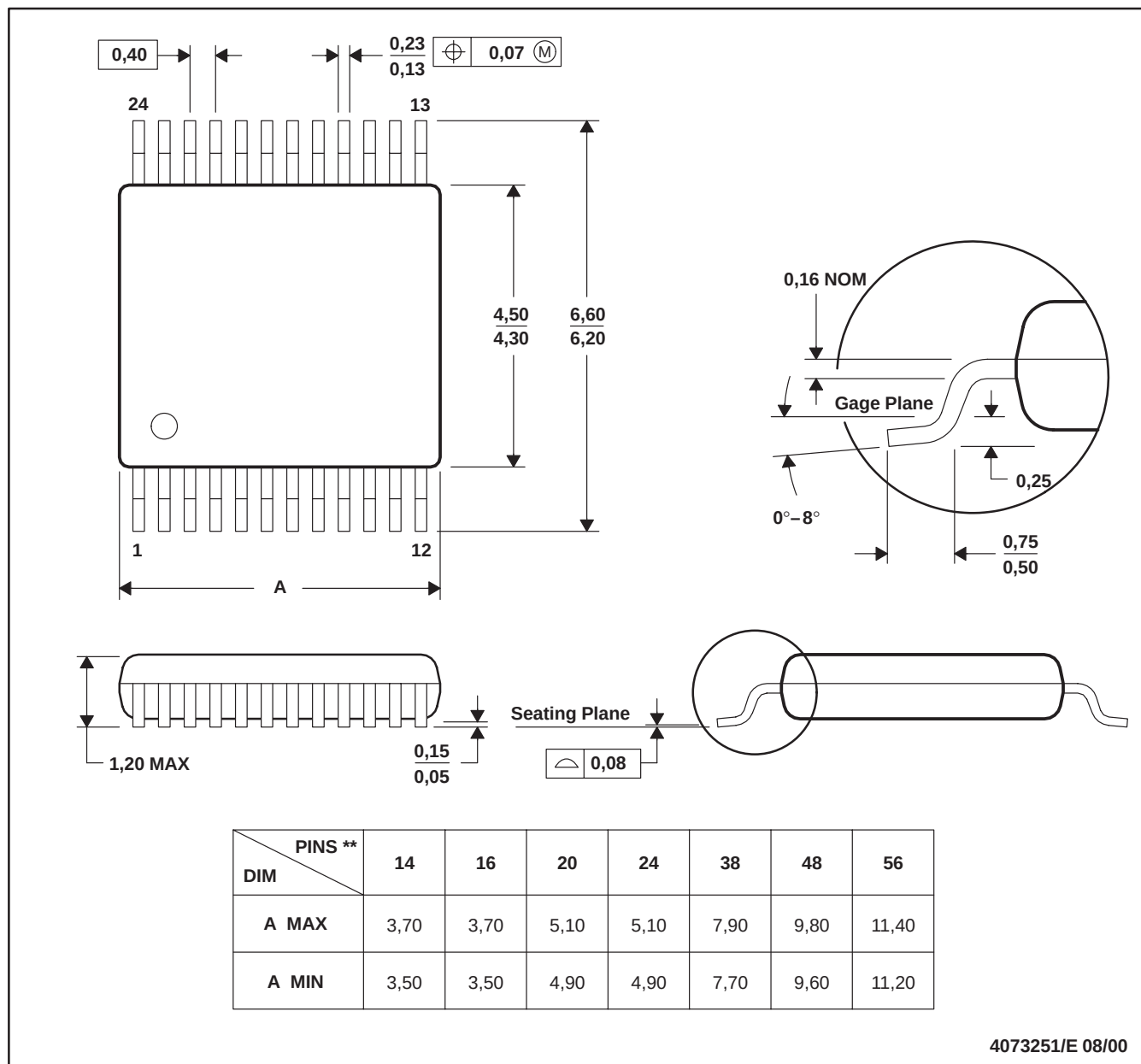
- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.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

Figure 1. Load Circuit and Voltage Waveforms

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

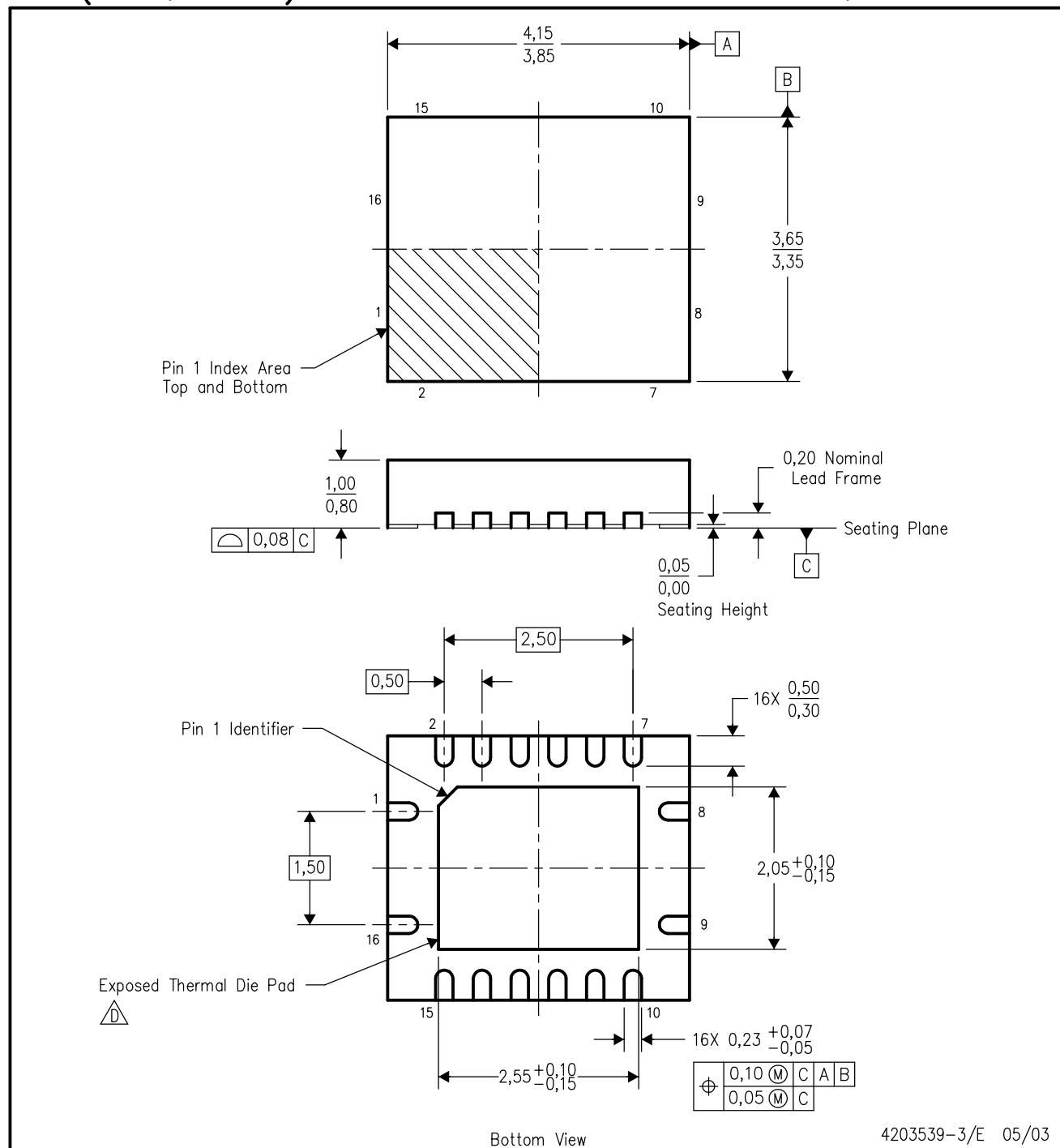
24 PINS SHOWN



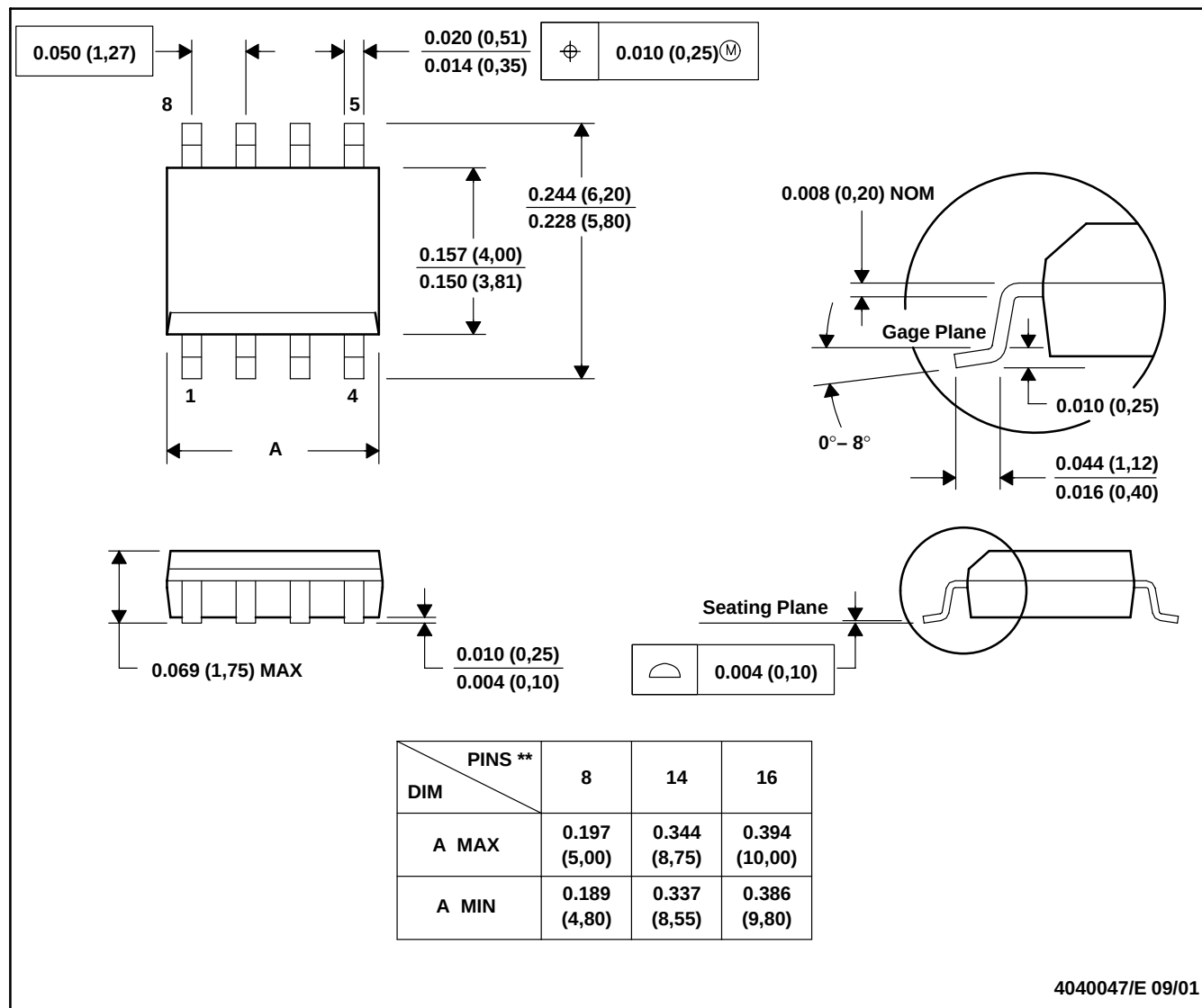
- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

RGY (R-PQFP-N16)

PLASTIC QUAD FLATPACK



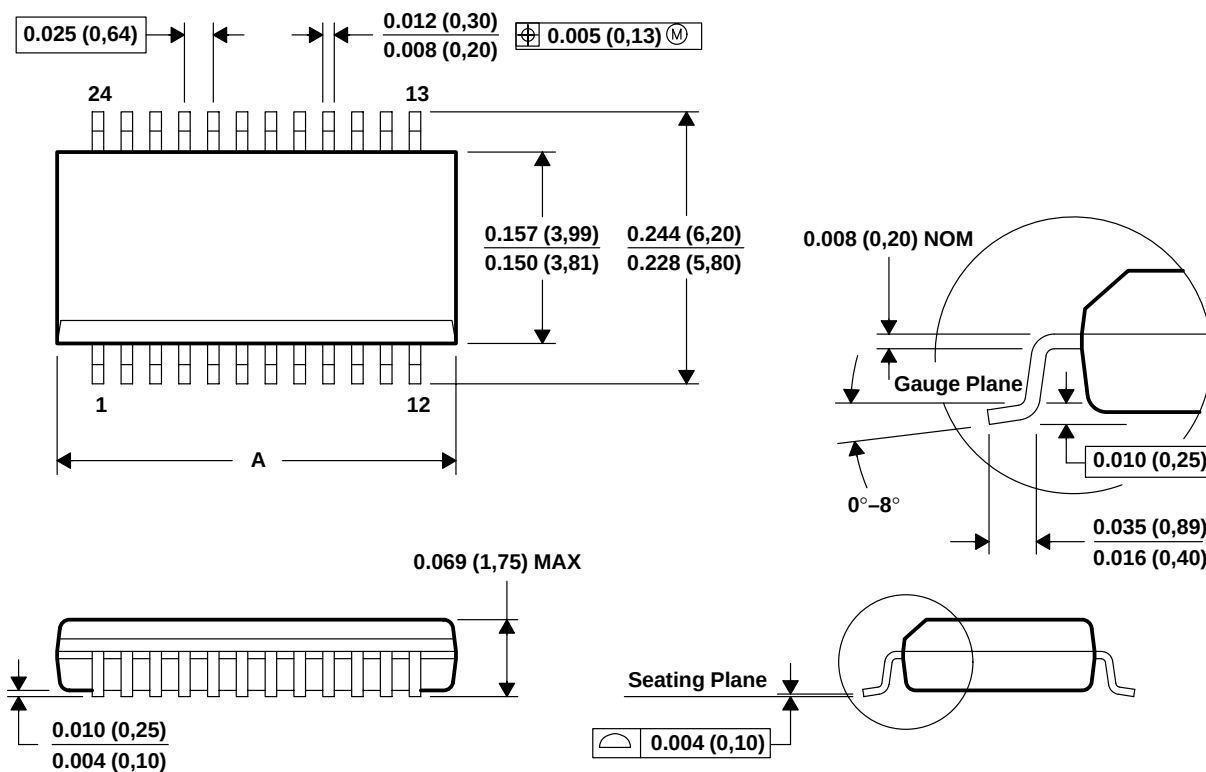
- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.
 - D. The package thermal performance may be enhanced by bonding the thermal die pad to an external thermal plane. This pad is electrically and thermally connected to the backside of the die and possibly selected ground leads.
 - E. Package complies to JEDEC MO-241 variation BB.

D (R-PDSO-G)****PLASTIC SMALL-OUTLINE PACKAGE****8 PINS SHOWN**

- 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-012

DBQ (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE



PINS **	16	20	24	28
DIM				
A MAX	0.197 (5,00)	0.344 (8,74)	0.344 (8,74)	0.394 (10,01)
A MIN	0.189 (4,80)	0.337 (8,56)	0.337 (8,56)	0.386 (9,80)
M0-137 VARIATION	AB	AD	AE	AF

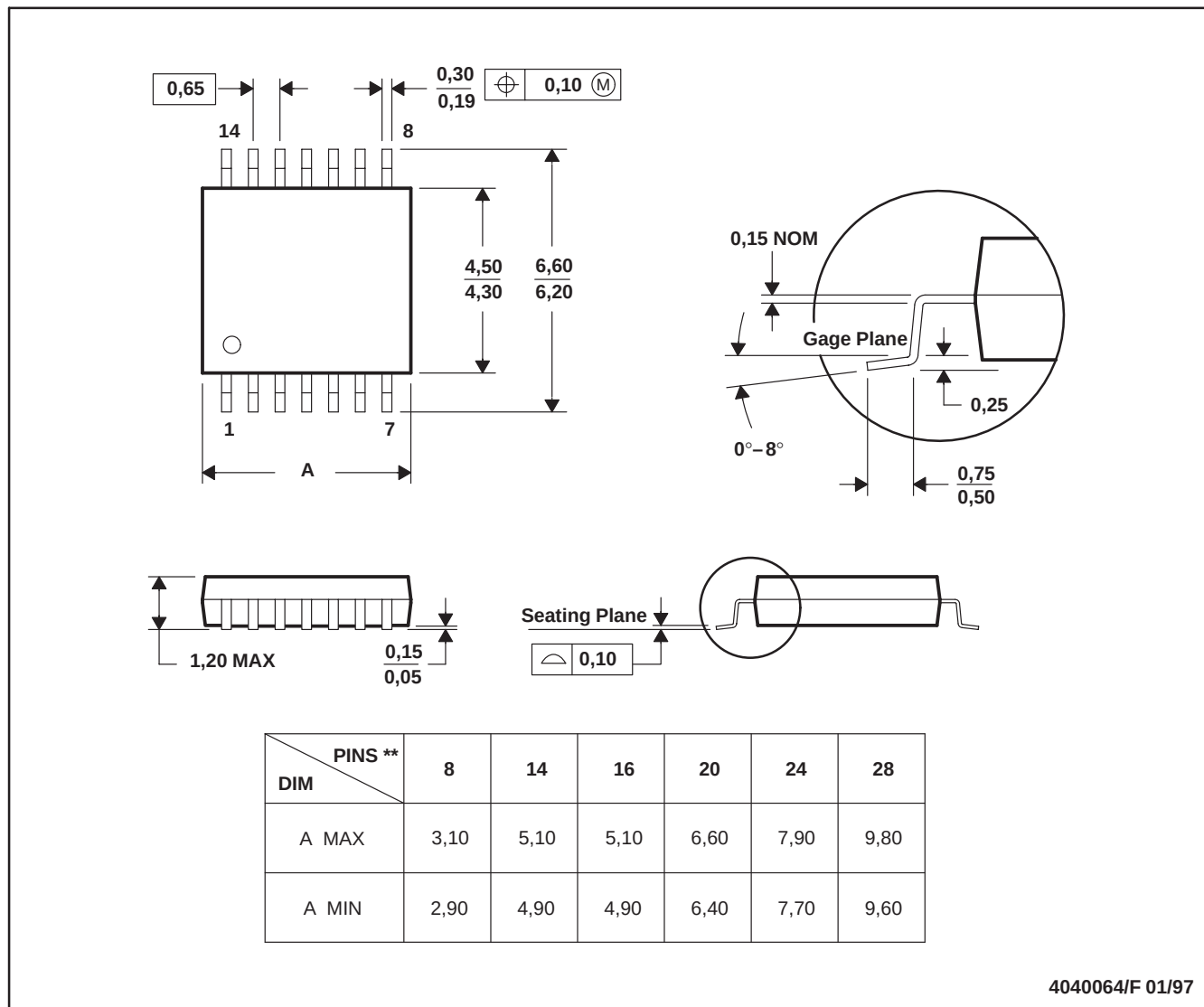
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- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 D. Falls within JEDEC MO-137.

PW (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.
 D. Falls within JEDEC MO-153

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