

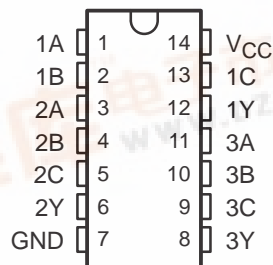
SN74AC11-Q1 TRIPLE 3-INPUT POSITIVE-AND GATE

SCLS523 – AUGUST 2003

- **Qualification in Accordance With AEC-Q100†**
- **Qualified for Automotive Applications**
- **Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **2-V to 6-V V_{CC} Operation**
- **Inputs Accept Voltages to 6 V**
- **Max t_{pd} of 7.5 ns at 5 V**

† Contact factory for details. Q100 qualification data available on request.

**D PACKAGE
(TOP VIEW)**



description/ordering information

The 'AC11 device contains three independent 3-input AND gates. This device performs the Boolean function $Y = A \cdot B \cdot C$ or $Y = \overline{A} + \overline{B} + \overline{C}$ in positive logic.

ORDERING INFORMATION

T _A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	SOIC – D	Tape and reel	SN74AC11IDRQ1	AC11IQ1
	TSSOP – PW	Tape and reel	SN74AC11IPWRQ1	AC11IQ1

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

**FUNCTION TABLE
(each gate)**

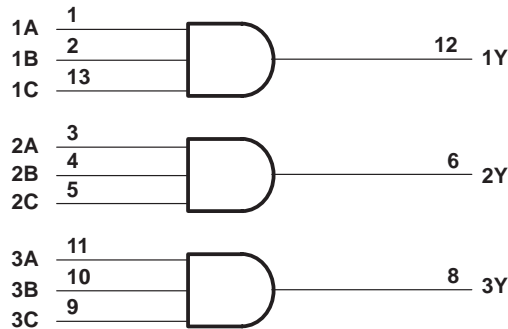
INPUTS			OUTPUT
A	B	C	Y
H	H	H	H
L	X	X	L
X	L	X	L
X	X	L	L

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logic diagram, each gate (positive logic)



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

Supply voltage range, V_{CC}	–0.5 V to 7 V
Input voltage range, V_I (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Output voltage range, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$)	±20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	±50 mA
Continuous current through V_{CC} or GND	±200 mA
Package thermal impedance, θ_{JA} (see Note 2): D package	86°C/W
PW package	113°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 voltage ratings may be exceeded if the input and output current ratings are observed.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

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recommended operating conditions (see Note 3)

			MIN	MAX	UNIT
V_{CC}	Supply voltage		2	6	V
V_{IH}	High-level input voltage	$V_{CC} = 3\text{ V}$	2.1		V
		$V_{CC} = 4.5\text{ V}$	3.15		
		$V_{CC} = 5.5\text{ V}$	3.85		
V_{IL}	Low-level input voltage	$V_{CC} = 3\text{ V}$		0.9	V
		$V_{CC} = 4.5\text{ V}$		1.35	
		$V_{CC} = 5.5\text{ V}$		1.65	
V_I	Input voltage		0	V_{CC}	V
V_O	Output voltage		0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 3\text{ V}$		-12	mA
		$V_{CC} = 4.5\text{ V}$		-24	
		$V_{CC} = 5.5\text{ V}$		-24	
I_{OL}	Low-level output current	$V_{CC} = 3\text{ V}$		12	mA
		$V_{CC} = 4.5\text{ V}$		24	
		$V_{CC} = 5.5\text{ V}$		24	
$\Delta t/\Delta v$	Input transition rise or fall rate			8	ns/V
T_A	Operating free-air temperature		-40	85	°C

NOTE 3: All unused 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.

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

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
V_{OH}	$I_{OH} = -50\text{ }\mu\text{A}$	3 V	2.9	2.99		2.9		V
		4.5 V	4.4	4.49		4.4		
		5.5 V	5.4	5.49		5.4		
	$I_{OH} = -12\text{ mA}$	3 V	2.56			2.46		
	$I_{OH} = -24\text{ mA}$	4.5 V	3.86			3.76		
		5.5 V	4.86			4.76		
	$I_{OH} = -50\text{ mA}^\dagger$	5.5 V						
	$I_{OH} = -75\text{ mA}^\dagger$	5.5 V				3.85		
V_{OL}	$I_{OL} = 50\text{ }\mu\text{A}$	3 V		0.002	0.1		0.1	V
		4.5 V		0.001	0.1		0.1	
		5.5 V		0.001	0.1		0.1	
	$I_{OL} = 12\text{ mA}$	3 V			0.36		0.44	
	$I_{OL} = 24\text{ mA}$	4.5 V			0.36		0.44	
		5.5 V			0.36		0.44	
	$I_{OL} = 50\text{ mA}^\dagger$	5.5 V						
	$I_{OL} = 75\text{ mA}^\dagger$	5.5 V					1.65	
I_I	$V_I = V_{CC}$ or GND	5.5 V			± 0.1		± 1	μA
I_{CC}	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			2		20	μA
C_i	$V_I = V_{CC}$ or GND	5 V		2.6				pF

† Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.

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switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^{\circ}\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
t_{PLH}	A, B, or C	Y	1.5	5.5	9.5	1	10	ns
t_{PHL}			1.5	5.5	8.5	1	9.5	

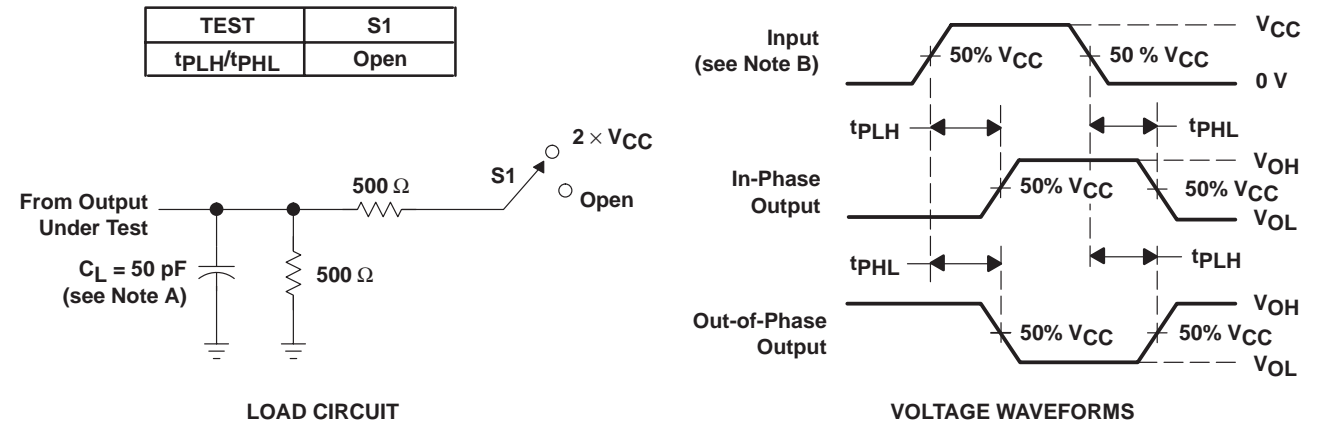
switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^{\circ}\text{C}$			MIN	MAX	UNIT
			MIN	TYP	MAX			
t_{PLH}	A, B, or C	Y	1.5	4	8	1	8.5	ns
t_{PHL}			1.5	4	7	1	7.5	

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^{\circ}\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	$C_L = 50\text{pF}$, $f = 1\text{ MHz}$	20	pF

PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_L includes probe and jig capacitance.
 B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 2.5\text{ ns}$, $t_f \leq 2.5\text{ ns}$.
 C. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
SN74AC11IDRQ1	ACTIVE	SOIC	D	14	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-250C-1 YEAR/ Level-1-235C-UNLIM
SN74AC11IPWRQ1	ACTIVE	TSSOP	PW	14	2000	Pb-Free (RoHS)	CU NIPDAU	Level-1-250C-UNLIM

⁽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⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), 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.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

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)

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

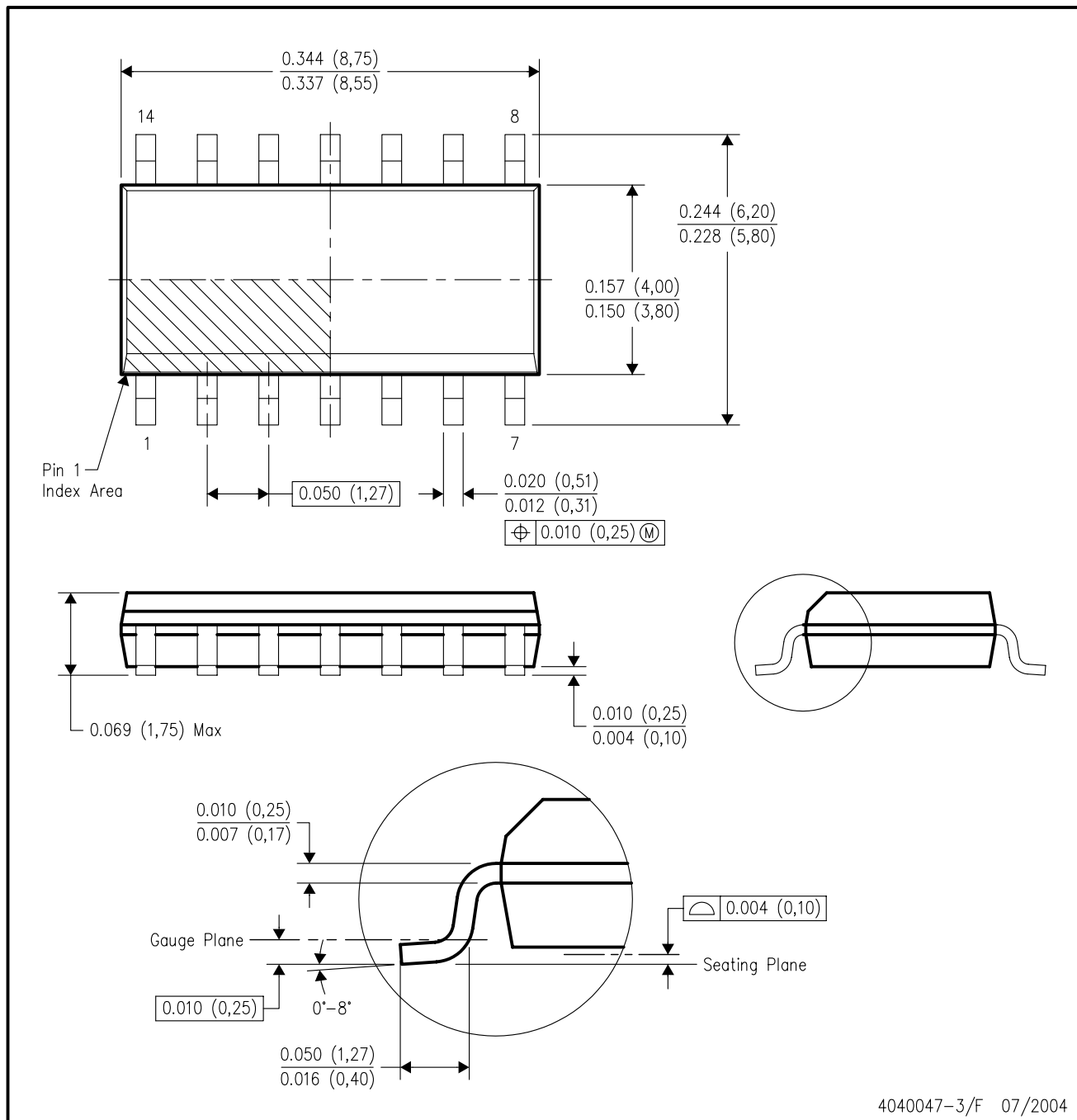
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MECHANICAL DATA

D (R-PDSO-G14)

PLASTIC SMALL-OUTLINE PACKAGE



4040047-3/F 07/2004

- 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 variation AB.

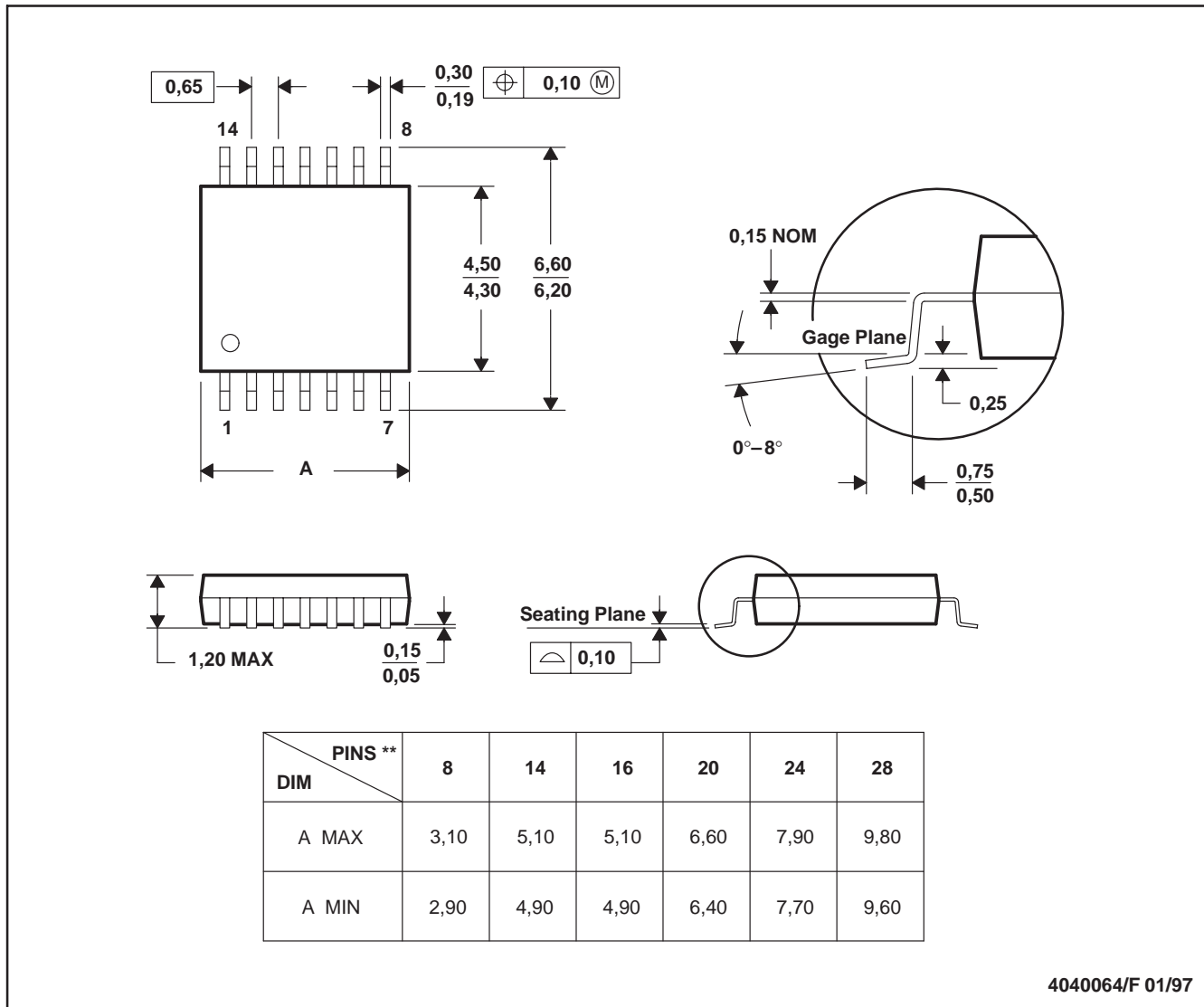
MECHANICAL DATA

MTSS001C – JANUARY 1995 – REVISED FEBRUARY 1999

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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