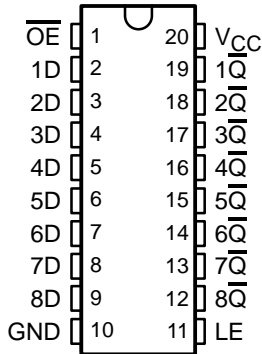


# SN54HC563, SN74HC563 OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS

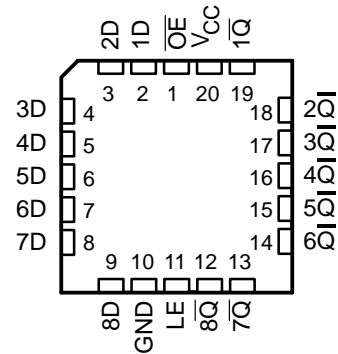
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- Wide Operating Voltage Range of 2 V to 6 V
- High-Current 3-State Outputs Drive Bus Lines Directly or Up To 15 LSTTL Loads
- Low Power Consumption, 80- $\mu$ A Max  $I_{CC}$
- Typical  $t_{pd} = 21$  ns
- $\pm 6$ -mA Output Drive at 5 V
- Low Input Current of 1  $\mu$ A Max
- Bus-Structured Pinout

SN54HC563 . . . J OR W PACKAGE  
SN74HC563 . . . DW OR N PACKAGE  
(TOP VIEW)



SN54HC563 . . . FK PACKAGE  
(TOP VIEW)



## description/ordering information

These 8-bit transparent D-type latches 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.

While the latch-enable (LE) input is high, the  $\bar{Q}$  outputs follow the complements of the data (D) inputs. When LE is taken low, the outputs are latched at the inverses of the levels set up at the D inputs.

A buffered output-enable ( $\overline{OE}$ ) input places 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 high logic level provide the capability to drive bus lines without interface or pullup components.

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.

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

## ORDERING INFORMATION

TA	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP – N	Tube	SN74HC563N	SN74HC563N
	SOIC – DW	Tube	SN74HC563DW	HC563
		Tape and reel	SN74HC563DWR	
-55°C to 125°C	CDIP – J	Tube	SNJ54HC563J	SNJ54HC563J
	CFP – W	Tube	SNJ54HC563W	SNJ54HC563W
	LCCC – FK	Tube	SNJ54HC563FK	SNJ54HC563FK

† 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).



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 **TEXAS  
INSTRUMENTS**

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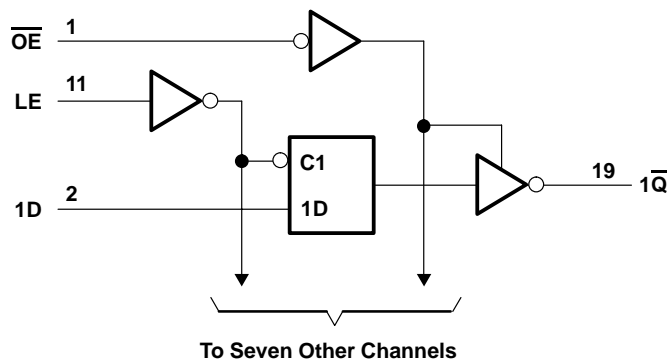
# SN54HC563, SN74HC563 OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS

SCLS145C – DECEMBER 1982 – REVISED MARCH 2003

FUNCTION TABLE  
(each latch)

INPUTS			OUTPUT
$\overline{OE}$	LE	D	$\overline{Q}$
L	H	H	L
L	H	L	H
L	L	X	$\overline{Q}_0$
H	X	X	Z

## logic diagram (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 clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1) .....	$\pm 20$ mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1) .....	$\pm 20$ mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 35$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 70$ mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DW package .....	58°C/W
N package .....	69°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.

# SN54HC563, SN74HC563 OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS

SCLS145C – DECEMBER 1982 – REVISED MARCH 2003

## recommended operating conditions (see Note 3)

		SN54HC563			SN74HC563			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	2	5	6	2	5	6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V		1.5	1.5		V	
		V <sub>CC</sub> = 4.5 V		3.15	3.15			
		V <sub>CC</sub> = 6 V		4.2	4.2			
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V			0.5	0.5	V	
		V <sub>CC</sub> = 4.5 V			1.35	1.35		
		V <sub>CC</sub> = 6 V			1.8	1.8		
V <sub>I</sub>	Input voltage	0		V <sub>CC</sub>	0	V <sub>CC</sub>	V	
V <sub>O</sub>	Output voltage	0		V <sub>CC</sub>	0	V <sub>CC</sub>	V	
t <sub>t</sub>	Input transition (rise and fall) time	V <sub>CC</sub> = 2 V			1000	1000	ns	
		V <sub>CC</sub> = 4.5 V			500	500		
		V <sub>CC</sub> = 6 V			400	400		
T <sub>A</sub>	Operating free-air temperature	-55		125	-40	85	°C	

NOTE 3: 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.

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

PARAMETER	TEST CONDITIONS		V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54HC563		SN74HC563		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = -20 μA	2 V	1.9	1.998		1.9	1.9	V		
			4.5 V	4.4	4.499		4.4	4.4			
			6 V	5.9	5.999		5.9	5.9			
		I <sub>OH</sub> = -6 mA	4.5 V	3.98	4.3		3.7	3.84			
		I <sub>OH</sub> = -7.8 mA	6 V	5.48	5.8		5.2	5.34			
V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 μA	2 V		0.002	0.1		0.1	0.1	V	
			4.5 V		0.001	0.1		0.1	0.1		
			6 V		0.001	0.1		0.1	0.1		
		I <sub>OL</sub> = 6 mA	4.5 V		0.17	0.26		0.4	0.33		
		I <sub>OL</sub> = 7.8 mA	6 V		0.15	0.26		0.4	0.33		
I <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0		6 V		±0.1	±100		±1000	±1000	nA	
I <sub>OZ</sub>	V <sub>O</sub> = V <sub>CC</sub> or 0		6 V		±0.01	±0.5		±10	±5	μA	
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0		6 V			8		160	80	μA	
C <sub>i</sub>			2 V to 6 V		3	10		10	10	pF	

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**SN54HC563, SN74HC563**  
**OCTAL TRANSPARENT D-TYPE LATCHES**  
**WITH 3-STATE OUTPUTS**

SCLS145C – DECEMBER 1982 – REVISED MARCH 2003

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

	$V_{CC}$	$T_A = 25^\circ\text{C}$		SN54HC563		SN74HC563		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
$t_w$ Pulse duration, LE high	2 V	80	120	100				ns
	4.5 V	16	24	20				
	6 V	14	20	17				
$t_{su}$ Setup time, data before LE↓	2 V	50	75	63				ns
	4.5 V	10	15	13				
	6 V	9	13	11				
$t_h$ Hold time, data after LE↓	2 V	5	5	5				ns
	4.5 V	5	5	5				
	6 V	5	5	5				

switching characteristics over recommended operating free-air temperature range,  $C_L = 50$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC563		SN74HC563		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	D	$\bar{Q}$	2 V	77	175	265	220			ns	
			4.5 V	26	35	53	44				
			6 V	23	30	45	37				
	LE	Any $\bar{Q}$	2 V	90	175	265	220				
			4.5 V	27	35	53	44				
			6 V	23	30	45	37				
$t_{en}$	$\overline{OE}$	Any $\bar{Q}$	2 V	70	150	225	190			ns	
			4.5 V	24	30	45	38				
			6 V	21	26	38	32				
$t_{dis}$	$\overline{OE}$	Any $\bar{Q}$	2 V	47	150	225	190			ns	
			4.5 V	23	30	45	38				
			6 V	21	26	38	32				
$t_t$		Any $\bar{Q}$	2 V	28	60	90	75			ns	
			4.5 V	8	12	18	15				
			6 V	6	10	15	13				

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**OCTAL TRANSPARENT D-TYPE LATCHES**  
**WITH 3-STATE OUTPUTS**

SCLS145C – DECEMBER 1982 – REVISED MARCH 2003

switching characteristics over recommended operating free-air temperature range,  $C_L = 150 \text{ pF}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC563		SN74HC563		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	D	$\bar{Q}$	2 V	95	200	300	250	ns			
			4.5 V	33	40	60	50				
			6 V	29	34	51	43				
	LE	Any $\bar{Q}$	2 V	103	225	335	285				
			4.5 V	33	45	67	57				
			6 V	29	38	57	48				
$t_{en}$	$\overline{OE}$	Any $\bar{Q}$	2 V	85	200	300	250	ns			
			4.5 V	29	40	60	50				
			6 V	26	34	51	43				
$t_t$		Any $\bar{Q}$	2 V	60	210	315	265	ns			
			4.5 V	17	42	63	53				
			6 V	14	36	53	45				

operating characteristics,  $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance per latch	No load	50	pF

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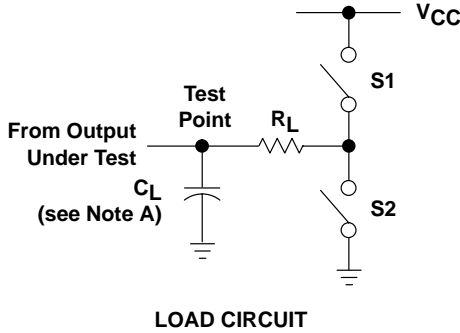


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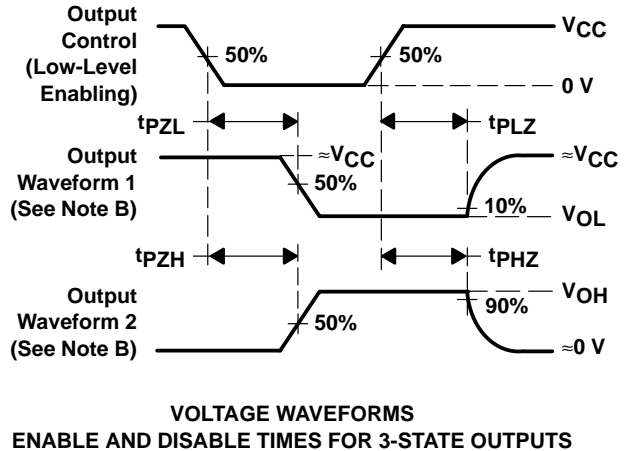
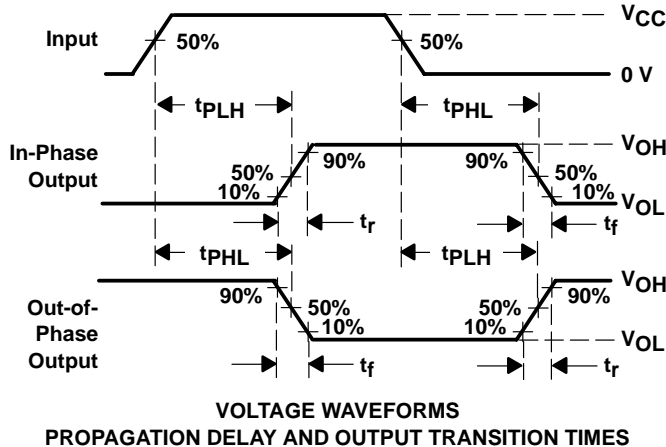
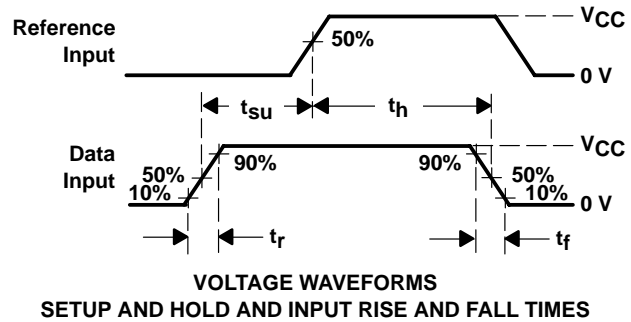
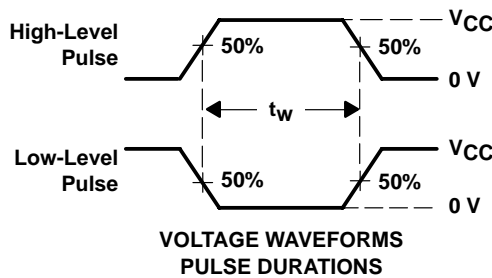
# SN54HC563, SN74HC563 OCTAL TRANSPARENT D-TYPE LATCHES WITH 3-STATE OUTPUTS

SCLS145C – DECEMBER 1982 – REVISED MARCH 2003

## PARAMETER MEASUREMENT INFORMATION



PARAMETER	$R_L$	$C_L$	S1	S2
$t_{en}$	1 k $\Omega$	50 pF or 150 pF	Open	Closed
			Closed	Open
$t_{dis}$	1 k $\Omega$	50 pF	Open	Closed
			Closed	Open
$t_{pd}$ or $t_t$	—	50 pF or 150 pF	Open	Open



- NOTES: A.  $C_L$  includes probe and test-fixture 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. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.  
 D. The outputs are measured one at a time with one input 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  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

**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>
SN74HC563DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC563DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC563DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC563DWR	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC563DWRE4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC563DWRG4	ACTIVE	SOIC	DW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74HC563N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74HC563NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type

<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), 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)

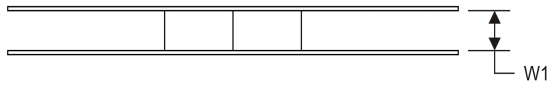
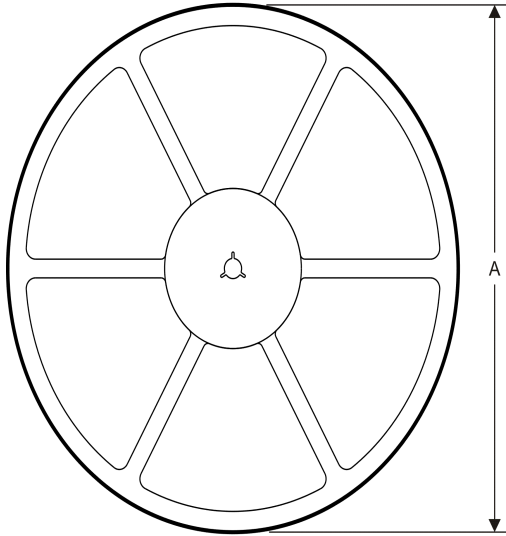
<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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**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

**TAPE AND REEL INFORMATION**

\*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
SN74HC563DWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.0	2.7	12.0	24.0	Q1



TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HC563DWR	SOIC	DW	20	2000	367.0	367.0	45.0

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



4040049/E 12/2002

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

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-013 variation AC.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4209202-4/E 07/11

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Refer to IPC7351 for alternate board design.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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