SN54AHC158, SN74AHC158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

SCLS346G - MAY 1996 - REVISED JULY 2003

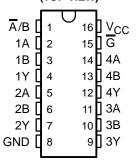
- Operating Range 2-V to 5.5-V V_{CC}
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)

description/ordering information

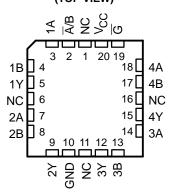
These quadruple 2-line to 1-line data selectors/multiplexers are designed for 2-V to $5.5\text{-V}\ \text{V}_{CC}$ operation.

The 'AHC158 devices feature a common strobe (\overline{G}) input. When the strobe is high, all outputs are high. When the strobe is low, a 4-bit word is selected from one of two sources and is routed to the four outputs. These devices provide inverted data.

SN54AHC158 . . . J OR W PACKAGE SN74AHC158 . . . D, DB, DGV, N, NS, OR PW PACKAGE (TOP VIEW)



SN54AHC158 . . . FK PACKAGE (TOP VIEW)



NC - No internal connection

ORDERING INFORMATION

TA	PACKA	GE†	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	PDIP – N	Tube	SN74AHC158N	SN74AHC158N
	SOIC - D	Tube	SN74AHC158D	AHC158
	3010 - 15	Tape and reel	SN74AHC158DR	A110130
–40°C to 85°C	SOP – NS	Tape and reel	SN74AHC158NSR	AHC158
40 0 10 03 0	SSOP – DB	Tape and reel	SN74AHC158DBR	HA158
	TSSOP – PW	Tube	SN74AHC158PW	HA158
	1330F = FW	Tape and reel	SN74AHC158PWR	TIATO
	TVSOP – DGV	Tape and reel	SN74AHC158DGVR	HA158
	CDIP – J	Tube	SNJ54AHC158J	SNJ54AHC158J
–55°C to 125°C	CFP – W	Tube	SNJ54AHC158W	SNJ54AHC158W
	LCCC – FK	Tube	SNJ54AHC158FK	SNJ54AHC158FK

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



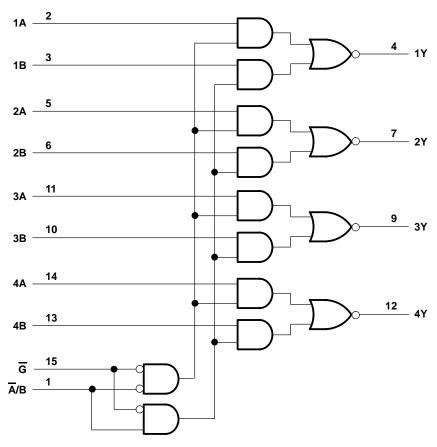
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



FUNCTION TABLE (each data selector/multiplexer)

	INPL		OUTPUT	
G	A/B	Α	В	Y
Н	Х	Χ	Х	Н
L	L	L	X	Н
L	L	Н	X	L
L	Н	Χ	L	Н
L	Н	Χ	Н	L

logic diagram (positive logic)



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

SN54AHC158, SN74AHC158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

SCLS346G - MAY 1996 - REVISED JULY 2003

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 7 V
Output voltage range, VO (see Note 1)		. $-0.5 \text{ V to V}_{CC} + 0.5 \text{ V}$
Input clamp current, I_{IK} ($V_I < 0$)		
Output clamp current, IOK (VO < 0 or VO > VCC	;)	±20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})		±25 mA
Continuous current through V _{CC} or GND		±50 mA
Package thermal impedance, θ_{JA} (see Note 2):	D package	73°C/W
	DB package	82°C/W
	DGV package	120°C/W
	N package	67°C/W
	NS package	64°C/W
	PW package	108°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.

recommended operating conditions (see Note 3)

·			SN54A	HC158	SN74A	HC158	UNIT	
			MIN	MAX	MIN	MAX	I	
Vcc	Supply voltage		2	5.5	2	5.5	V	
		V _{CC} = 2 V	1.5		1.5			
V_{IH}	High-level input voltage	V _{CC} = 3 V	2.1		2.1		V	
		V _{CC} = 5.5 V	3.85		3.85			
		V _{CC} = 2 V				0.5		
V_{IL}	Low-level input voltage	V _{CC} = 3 V		0.9		0.9	V	
		V _{CC} = 5.5 V		1.65		1.65		
٧ _I	Input voltage		0	5.5	0	5.5	V	
٧o	Output voltage		0,4	Vcc	0	Vcc	V	
		V _{CC} = 2 V	Ź	-50		-50	μΑ	
loh	High-level output current	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	200	-4		-4	A	
		$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$	P	-8	-8		mA	
		V _{CC} = 2 V		50		50	μΑ	
I_{OL}	Low-level output current	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		4		4	mA	
		$V_{CC} = 5 V \pm 0.5 V$		8		8	IIIA	
Δt/Δν	langet transition rise or fall rate	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$		100		100	no/\/	
ΔυΔν	Input transition rise or fall rate	$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$		20		20	ns/V	
TA	Operating free-air temperature		-55	125	-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.

SN54AHC158, SN74AHC158 QUADRUPLE 2-LINE TO 1-LINE DATA SELECTORS/MULTIPLEXERS

SCLS346G - MAY 1996 - REVISED JULY 2003

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

	DAMETED	TEST CONDITIONS	V	T,	\ = 25°C	;	SN54AI	HC158	SN74A	HC158	LINUT	
l PA	RAMETER	TEST CONDITIONS	VCC	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT	
			2 V	1.9	2		1.9		1.9			
		I _{OH} = -50 μA	3 V	2.9	3		2.9		2.9			
VOH			4.5 V	4.4	4.5		4.4		4.4		V	
		$I_{OH} = -4 \text{ mA}$	3 V	2.58			2.48	3	2.48			
		I _{OH} = -8 mA	4.5 V	3.94			3.8	N.	3.8			
			2 V			0.1	(0.1		0.1		
		I _{OL} = 50 μA	3 V			0.1	40	0.1		0.1		
VOL			4.5 V			0.1	20	0.1		0.1	V	
		I _{OL} = 4 mA	3 V			0.36	PAG	0.5		0.44		
		I _{OL} = 8 mA	4.5 V			0.36		0.5		0.44		
lı	A or B inputs	V _I = 5.5 V or GND	0 V to 5.5 V			±0.1		±1*		±1	μΑ	
ICC	_	$V_I = V_{CC}$ or GND, $I_O = 0$	5.5 V			4		40		40	μА	
Ci		V _I = V _{CC} or GND	5 V		2	10				10	pF	

 $^{^{*}}$ On products compliant to MIL-PRF-38535, this parameter is not production tested at $V_{CC} = 0 \text{ V}$.

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

PARAMETER	FROM	то	LOAD	T,	A = 25°	С	SN54A	HC158	SN74A	HC158	UNIT	
PARAMETER	(INPUT)	(OUTPUT)	CAPACITANCE	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNIT	
t _{PLH}	A or B	Y	C _I = 15 pF		6.2**	9.7**	1**	11.5**	1	11.5	ns	
^t PHL	AOIB		CL = 13 μ		6.2**	9.7**	1**	11.5**	1	11.5	115	
^t PLH	Ā/B	Y	C _L = 15 pF		8.4**	13.2**	1**	15.5**	1	15.5	20	
t _{PHL}	A/B		CL = 13 μ		8.4**	13.2**	1**	15.5**	1	15.5	ns	
t _{PLH}	IG	Y	C _I = 15 pF		8.7**	13.6**	1**	16**	1	16	ns	
^t PHL	g	'	OL = 13 pi		8.7**	13.6**	1**	16**	1	16	113	
t _{PLH}	A or B	Y	C _I = 50 pF		8.7	13.2	1 ,	15	1	15	ns	
t _{PHL}	AUB	ī	CL = 50 pr		8.7	13.2	150	15	1	15	115	
t _{PLH}	Ā/B	Y	C _I = 50 pF		10.9	16.7	9	19	1	19	ns	
t _{PHL}	A/B		CL = 30 pr		10.9	16.7	Q 1	19	1	19	115	
^t PLH	IG	Y	C _I = 50 pF		11.2	17.1	1	19.5	1	19.5	20	
t _{PHL}	G	ſ	CL = 50 pr		11.2	17.1	1	19.5	1	19.5	ns	

^{**} On products compliant to MIL-PRF-38535, this parameter is not production tested.

SCLS346G - MAY 1996 - REVISED JULY 2003

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

PARAMETER	FROM	то	LOAD	T,	Վ = 25° C	;	SN54A	HC158	SN74AI	HC158	UNIT	
PARAMETER	(INPUT)	(OUTPUT)	CAPACITANCE	MIN	TYP	MAX	MIN	MAX	MIN	MAX	ONIT	
t _{PLH}	A or B	Y	C _I = 15 pF		4.1*	6.4*	1*	7.5*	1	7.5	ns	
^t PHL	AOIB		C[= 15 pr		4.1*	6.4*	1*	7.5*	1	7.5	115	
t _{PLH}	A/B	Y	C _L = 15 pF		5.3*	8.1*	1*	9.5*	1	9.5	nc	
t _{PHL}	A/B	ī	CL = 15 pr		5.3*	8.1*	1*	9.5*	1	9.5	ns	
tPLH	ĪG	Y	C _I = 15 pF		5.6*	8.6*	1*	10*	1	10	ns	
^t PHL	G	,	CL = 15 pr		5.6*	8.6*	1*	10*	1	10) 115	
t _{PLH}	A or B	Υ	C: - 50 pF		5.6	8.4	1 .	9.5	1	9.5	no	
t _{PHL}	AUB	ī	C _L = 50 pF		5.6	8.4	15)	9.5	1	9.5	ns	
tPLH		Y	C _I = 50 pF		6.8	10.1	9	11.5	1	11.5	20	
tPLH	A/B	ſ	CL = 50 pr		6.8	10.1	Q 1	11.5	1	11.5	ns	
t _{PLH}	G	Y	C. = 50 pE		7.1	10.6	1	12	1	12	ns	
t _{PHL}	5	ſ	$C_L = 50 pF$		7.1	10.6	1	12	1	12	115	

^{*} On products compliant to MIL-PRF-38535, this parameter is not production tested.

noise characteristics V_{CC} = 5 V, C_L = 50 pF, T_A = 25°C (see Note 4)

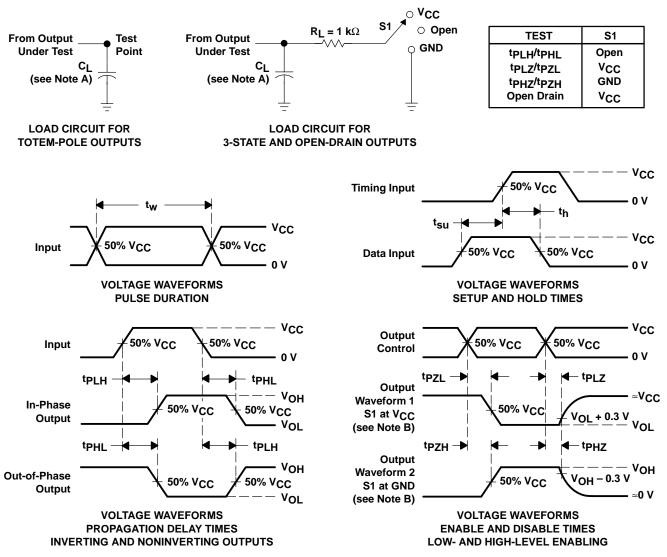
	PARAMETER	SN	58	UNIT	
	PARAMETER	MIN	TYP	MAX	UNII
V _{OL(P)}	Quiet output, maximum dynamic V _{OL}			0.8	V
V _{OL(V)}	Quiet output, minimum dynamic V _{OL}			-0.8	V
V _{OH(V)}	Quiet output, minimum dynamic V _{OH}		4.8		V
VIH(D)	High-level dynamic input voltage	3.5			V
V _{IL(D)}	Low-level dynamic input voltage			1.5	V

NOTE 4: Characteristics are for surface-mount packages only.

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

	PARAMETER	TEST C	ONDITIONS	TYP	UNIT
C _{pd} Power	dissipation capacitance	No load,	f = 1 MHz	11	pF

PARAMETER MEASUREMENT INFORMATION



NOTES: A. C_I 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 1 MHz, Z_O = 50 Ω , t_f \leq 3 ns, t_f \leq 3 ns.
- D. The outputs are measured one at a time with one input transition per measurement.
- E. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms





28-Aug-2010

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
SN74AHC158D	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Purchase Samples
SN74AHC158DBLE	OBSOLETE	SSOP	DB	16		TBD	Call TI	Call TI	Samples Not Available
SN74AHC158DBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
SN74AHC158DBRE4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
SN74AHC158DBRG4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
SN74AHC158DE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Purchase Samples
SN74AHC158DG4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Purchase Samples
SN74AHC158DR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Contact TI Distributor
SN74AHC158DRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
SN74AHC158DRG4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
SN74AHC158N	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	Purchase Samples
SN74AHC158NE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	Purchase Samples
SN74AHC158NSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Purchase Samples
SN74AHC158NSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Purchase Samples
SN74AHC158NSRG4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Purchase Samples
SN74AHC158PW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Purchase Samples
SN74AHC158PWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Purchase Samples
SN74AHC158PWG4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Purchase Samples



PACKAGE OPTION ADDENDUM

28-Aug-2010

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
SN74AHC158PWLE	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI	Samples Not Available
SN74AHC158PWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
SN74AHC158PWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
SN74AHC158PWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office

(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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PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
	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

All differsions are nominal												
Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74AHC158DBR	SSOP	DB	16	2000	330.0	16.4	8.2	6.6	2.5	12.0	16.0	Q1
SN74AHC158DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74AHC158NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74AHC158PWR	TSSOP	PW	16	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

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*All dimensions are nominal

7 iii diiiioloo die riemiidi							
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AHC158DBR	SSOP	DB	16	2000	346.0	346.0	33.0
SN74AHC158DR	SOIC	D	16	2500	333.2	345.9	28.6
SN74AHC158NSR	SO	NS	16	2000	346.0	346.0	33.0
SN74AHC158PWR	TSSOP	PW	16	2000	346.0	346.0	29.0

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.



D (R-PDS0-G16)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
- E. Reference JEDEC MS-012 variation AC.



PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M—1994.
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
- E. Falls within JEDEC MO-153



PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Publication IPC-7351 is recommended for alternate designs.
- 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 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



MECHANICAL DATA

NS (R-PDSO-G**)

14-PINS SHOWN

PLASTIC SMALL-OUTLINE PACKAGE



- 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

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