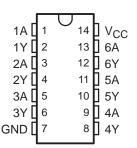
SN54LS05, SN54S05 SN7405, SN74LS05, SN74S05 HEX INVERTERS WITH OPEN-COLLECTOR OUTPUTS

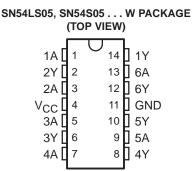
SDLS030A - DECEMBER 1983 - REVISED NOVEMBER 2003

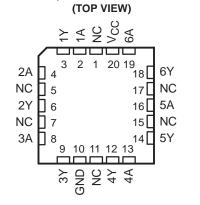
- Package Options Include Plastic Small-Outline (D, NS), Shrink Small-Outline (DB), and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) DIPs
- Dependable Texas Instrument Quality and Reliability

SN5405, SN54LS05, SN54S05...J PACKAGE SN7405...N PACKAGE SN74LS05...D, DB, N, OR NS PACKAGE SN74S05...D, N, OR NS PACKAGE

(TOP VIEW)







SN54LS05. SN54S05...FK PACKAGE

NC - No internal connection

description/ordering information

These devices contain six independent inverters. To perform correctly, the open-collector outputs require pullup resistors. These devices may be connected to other open-collector outputs to implement active-low wired-OR or active-high wire-AND functions. Open-collector devices often are used to generate high V_{OH} levels.

ORDERING INFORMATION

TA	PAC	(AGE†	ORDERABLE PART NUMBER	TOP-SIDE MARKING
			SN7405N	SN7405N
	PDIP – N	Tube	SN74LS05N	SN74LS05N
			SN74S05N	SN74S05N
		Tube	SN74LS05D	1.005
0°C to 70°C	SOIC - D	Tape and reel	SN74LS05DR	LS05
0°C to 70°C	SOIC - D	Tube	SN74S05D	005
	Tape and		SN74S05DR	S05
	COD NO	Tana and saal	SN74LS05NSR	74LS05
	SOP – NS	Tape and reel	SN74S05NSR	74S05
	SSOP – DB	Tape and reel	SN74LS05DBR	LS05
	CDIP – J	Tube	SNJ54LS05J	SNJ54LS05J
	CDIP = J	Tube	SNJ54S05J	SNJ54S05J
5500 to 40500	CDID W	Tube	SNJ54LS05W	SNJ54LS05W
–55°C to 125°C	CDIP – W	Tube	SNJ54S05W	SNJ54S05W
	LCCC - FK	Tube	SNJ54LS05FK	SNJ54LS05FK
	LCCC - FK	Tube	SNJ54S05FK	SNJ54S05FK

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



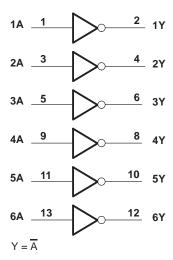
Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



FUNCTION TABLE (each inverter)

INPUT A	OUTPUT Y
Н	L
L	Н

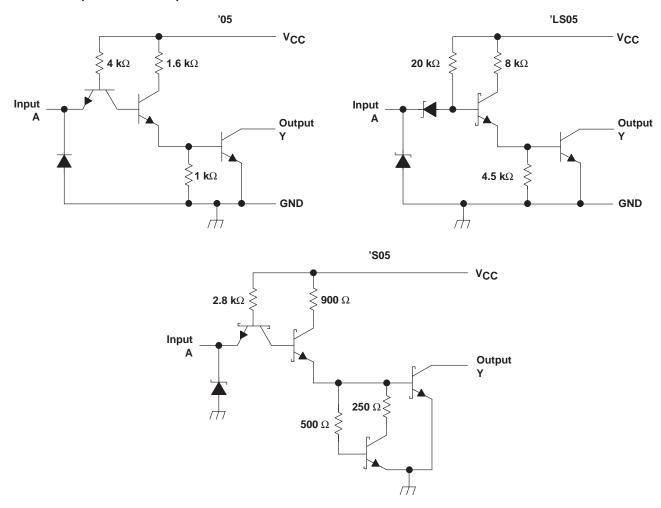
logic diagram (positive logic)



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

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schematic (each inverter)



Resistor values shown are nominal.

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

Supply voltage, V _{CC} (see Note 1): '05, 'LS05, '3	S05	7 V
Input voltage, V _I : '05, 'S05		5.5 V
'LS05		7 V
Off-state output voltage, VO		7 V
Package thermal impedance, θ _{JA} (see Note 2):	: D package	86°C/W
	DB package	96°C/W
	N package	80°C/W
	NS package	76°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. Voltage values are with respect to network ground terminal.

^{2.} The package thermal impedance is calculated in accordance with JESD 51-7.

SDLS030A - DECEMBER 1983 - REVISED NOVEMBER 2003

recommended operating conditions

			SN5405			SN7405		LINUT
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
VIH	High-level input voltage	2			2			V
VIL	Low-level input voltage			0.8			0.8	V
VOH	High-level output voltage			5.5			5.5	V
l _{OL}	Low-level output current			16			16	mA
TA	Operating free-air temperature	-55		125	0		70	°C

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

				SN5405			SN7405		
PARAMETER		TEST CONDITIONS†	MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	UNIT
VIK	V _{CC} = MIN,	$I_I = -12 \text{ mA}$			-1.5			-1.5	V
1	\/ NAINI	V _{IL} = 0.8 V						0.25	A
ЮН	$V_{CC} = MIN,$	$V_{OH} = 5.5 \text{ V}$ $V_{IL} = 0.7 \text{ V}$			0.25				mA
V _{OL}	V _{CC} = MIN,	$V_{IH} = 2 V$, $I_{OL} = 16 \text{ mA}$		0.2	0.4		0.2	0.4	V
IĮ	V _{CC} = MAX,	V _I = 5.5 V			1			1	mA
lН	V _{CC} = MAX,	V _I = 2.4 V			40			40	μΑ
I _{IL}	V _{CC} = MAX,	V _I = 0.4 V			-1.6			-1.6	mA
ІССН	V _{CC} = MAX,	V _I = 0 V		6	12		6	12	mA
ICCL	$V_{CC} = MAX$,	V _I = 4.5 V		18	33		18	33	mA

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CO	NDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	•	V	$R_L = 4 k\Omega$	0. 45 -5		40	55	
t _{PHL}	А	Y	R _L = 400 Ω	C _L = 15 pF		8	15	ns

[‡] All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}\text{C}$.

recommended operating conditions

		SN54LS05 SN74LS05			5			
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
٧ _{IH}	High-level input voltage	2			2			V
٧ _{IL}	Low-level input voltage			0.7			8.0	V
Vон	High-level output voltage			5.5			5.5	V
l _{OL}	Low-level output current			4			8	mA
TA	Operating free-air temperature	-55		125	0		70	°C

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

			+	S	N54LS0	5	S	N74LS0	5	
PARAMETER		TEST CONDITIONS	I	MIN	TYP‡	MAX	MIN	TYP [‡]	MAX	UNIT
VIK	V _{CC} = MIN,	I _I = -18 mA				-1.5			-1.5	V
ЮН	V _{CC} = MIN,	$V_{IL} = MAX$,	V _{OH} = 5.5 V			0.1			0.1	mA
.,	N/ MAIN		I _{OL} = 4 mA		0.25	0.4		0.25	0.4	.,
V _{OL}	$V_{CC} = MIN,$	V _{IH} = 2 V	$I_{OL} = 8 \text{ mA}$					0.35	0.5	V
Ц	V _{CC} = MAX,	V _I = 7 V				0.1			0.1	mA
ΊΗ	$V_{CC} = MAX$,	V _I = 2.7 V				20			20	μΑ
IIL	$V_{CC} = MAX$,	V _I = 0.4 V				-0.4			-0.4	mA
ІССН	$V_{CC} = MAX$,	$V_I = 0 V$	•		1.2	2.4		1.2	2.4	mA
ICCL	$V_{CC} = MAX$,	V _I = 4.5 V			3.6	6.6		3.6	6.6	mA

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}		V	D 010 0 45 = 5		17	32	
t _{PHL}	А	Y	$R_L = 2 k\Omega$, $C_L = 15 pF$		15	28	ns

 $[\]ddagger$ All typical values are at VCC = 5 V, TA = 25°C.

recommended operating conditions

		9	N54S05		9	N74S05	}	LINUT
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
VCC	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
VIH	High-level input voltage	2			2			V
VIL	Low-level input voltage			0.8			0.8	V
Vон	High-level output voltage			5.5			5.5	V
loL	Low-level output current			20			20	mA
TA	Operating free-air temperature	-55		125	0		70	°C

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

DADAMETER		TEGE CONDITIONS [†]	SN5	54S05		5	N74S05		
PARAMETER		TEST CONDITIONS†	MIN T	YP‡ N	IAX	MIN	TYP [‡]	MAX	UNIT
VIK	V _{CC} = MIN,	$I_I = -18 \text{ mA}$		-	-1.2			-1.2	V
	\/ NAINI	V _{IL} = 0.8 V						0.25	A
ІОН	$V_{CC} = MIN,$	$V_{OH} = 5.5 \text{ V}$ $V_{IL} = 0.7 \text{ V}$		().25				mA
V _{OL}	$V_{CC} = MIN,$	$V_{IH} = 2 V$, $I_{OL} = 20 \text{ mA}$			0.5			0.5	V
l _l	$V_{CC} = MAX$,	V _I = 5.5 V			1			1	mA
lн	V _{CC} = MAX,	V _I = 2.7 V			50			50	μΑ
I _I L	V _{CC} = MAX,	V _I = 0.5 V			-2			-2	mA
ІССН	V _{CC} = MAX,	V _I = 0 V		9 1	9.8		9	19.8	mA
ICCL	$V_{CC} = MAX$,	V _I = 4.5 V		30	54		30	54	mA

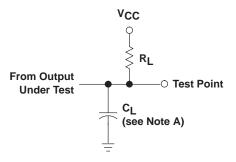
[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}\text{C}$ (see Figure 1)

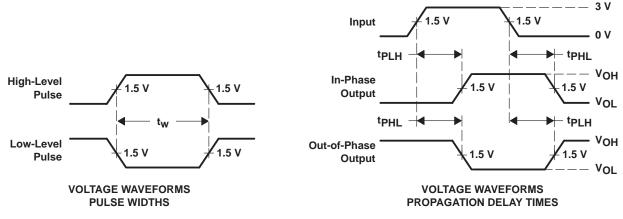
PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CO	MIN	TYP	MAX	UNIT	
t _{PLH}				0 45 = 5	2	5	7.5	no
t _{PHL}	_	V	D 000 0	$C_L = 15 pF$	2	4.5	7	ns
t _{PLH}	A	Y	$R_L = 280 \Omega$	C. 50 pF		7.5		
t _{PHL}				$C_L = 50 pF$		7		ns

[‡] All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^{\circ}\text{C}$.

PARAMETER MEASUREMENT INFORMATION SERIES 54/74 AND 54S/74S DEVICES



LOAD CIRCUIT

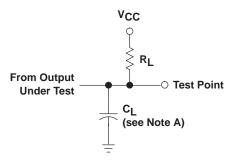


NOTES: A. C_I includes probe and jig capacitance.

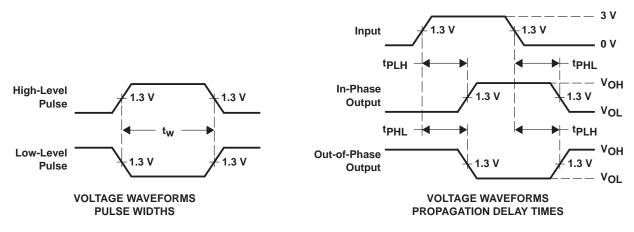
- B. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily.
- C. All input pulses are supplied by generators having the following characteristics: PRR \leq 1 MHz, Z_O = 50 Ω , and: For Series 54/74, $t_f \leq$ 7 ns, $t_f \leq$ 7 ns. For Series 54S/74S, $t_f \leq$ 2.5 ns, $t_f \leq$ 2.5 ns.
- D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION SERIES 54LS/74LS DEVICES



LOAD CIRCUIT



NOTES: A. C_L includes probe and jig capacitance.

- B. In the examples above, the phase relationships between inputs and outputs have been chosen arbitrarily.
- C. All input pulses are supplied by generators having the following characteristics: PRR \leq 1 MHz, $Z_O = 50 \ \Omega$, $t_f \leq 1.5 \ ns$, $t_f \leq 2.6 \ ns$.
- D. The outputs are measured one at a time with one input transition per measurement.

Figure 2. Load Circuit and Voltage Waveforms

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
JM38510/07004BCA	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 07004BCA	Samples
M38510/07004BCA	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	JM38510/ 07004BCA	Samples
SN54LS05J	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54LS05J	Samples
SN54S05J	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SN54S05J	Samples
SN7405N	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN7405N	Samples
SN7405NE4	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN7405N	Samples
SN74LS05D	ACTIVE	SOIC	D	14	50	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS05	Samples
SN74LS05DBR	ACTIVE	SSOP	DB	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS05	Samples
SN74LS05DR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS05	Samples
SN74LS05DRE4	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	LS05	Samples
SN74LS05N	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74LS05N	Samples
SN74LS05NE4	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74LS05N	Samples
SN74LS05NSR	ACTIVE	SO	NS	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	74LS05	Samples
SN74S05D	ACTIVE	SOIC	D	14	50	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	S05	Samples
SN74S05N	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	0 to 70	SN74S05N	Samples
SN74S05NSR	ACTIVE	SO	NS	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	0 to 70	74\$05	Samples
SNJ54LS05FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54LS 05FK	Samples
SNJ54LS05J	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54LS05J	Samples

www.ti.com 18-Mar-2021

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
SNJ54LS05W	ACTIVE	CFP	W	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54LS05W	Samples
SNJ54S05FK	ACTIVE	LCCC	FK	20	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54S 05FK	Samples
SNJ54S05J	ACTIVE	CDIP	J	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54S05J	Samples
SNJ54S05W	ACTIVE	CFP	W	14	1	Non-RoHS & Green	SNPB	N / A for Pkg Type	-55 to 125	SNJ54S05W	Samples

(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) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

- (3) MSL, Peak Temp. The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead finish/Ball material Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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PACKAGE OPTION ADDENDUM

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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN54LS05, SN54S05, SN74LS05, SN74S05:

• Catalog : SN74LS05, SN74S05

Military: SN54LS05, SN54S05

NOTE: Qualified Version Definitions:

• Catalog - TI's standard catalog product

• Military - QML certified for Military and Defense Applications

PACKAGE MATERIALS INFORMATION

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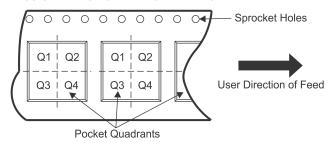
TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	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

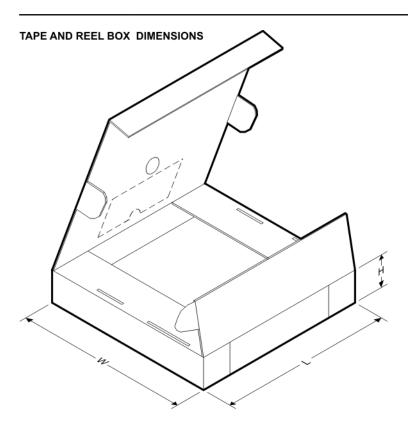


*All dimensions are nominal

Device Device	Package Type	Package Drawing		SPQ	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS05DR	SOIC	D	14	2500	(mm) 330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74LS05NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74S05NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

PACKAGE MATERIALS INFORMATION

www.ti.com 30-Dec-2020



*All dimensions are nominal

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Device	Package Type	Package Drawing	Pins SPQ		Length (mm)	Width (mm)	Height (mm)	
SN74LS05DR	SOIC	D	14	2500	853.0	449.0	35.0	
SN74LS05NSR	SO	NS	14	2000	853.0	449.0	35.0	
SN74S05NSR	SO	NS	14	2000	853.0	449.0	35.0	

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- 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. Falls within JEDEC MS-004



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.



W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- 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-F14



CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary. Refer to the product data sheet for package details.

4040083-5/G





CERAMIC DUAL IN LINE PACKAGE



- 1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- 2. This drawing is subject to change without notice.
- 3. This package is hermitically sealed with a ceramic lid using glass frit.
- His package is remitted by sealed with a ceramic its using glass mit.
 Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
 Falls within MIL-STD-1835 and GDIP1-T14.



CERAMIC DUAL IN LINE PACKAGE



D (R-PDSO-G14)

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 AB.



D (R-PDSO-G14)

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.



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.



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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