

UC1708 UC2708 UC3708 SLUS171C-MARCH 1997-REVISED SEPTEMBER 2007

### DUAL NON-INVERTING POWER DRIVER

#### FEATURES

- 3.0A Peak Current Totem Pole Output
- 5 to 35V Operation
- 25ns Rise and Fall Times
- 25ns Propagation Delays
- Thermal Shutdown and Under-Voltage Protection

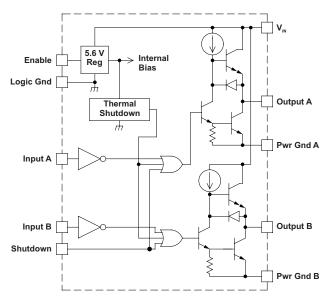
- High-Speed, Power MOSFET Compatible
- Efficient High Frequency Operation
- Low Cross-Conduction Current Spike
- Enable and Shutdown Functions
- Wide Input Voltage Range
- ESD Protection to 2kV

### DESCRIPTION

The UC1708 family of power drivers is made with a high-speed, high-voltage, Schottky process to interface control functions and high-power switching devices – particularly power MOSFETs. Operating over a 5 V to 35 V supply range, these devices contain two independent channels. The A and B inputs are compatible with TTL and CMOS logic families, but can withstand input voltages as high as  $V_{IN}$ . Each output can source or sink up to 3 A as long as power dissipation limits are not exceeded.

Although each output can be activated independently with its own inputs, they can be forced low in common through the action of either a digital high signal at the Shutdown terminal or by forcing the Enable terminal low. The Shutdown terminal will only force the outputs low, it will not effect the behavior of the rest of the device. The Enable terminal effectively places the device in under-voltage lockout, reducing power consumption by as much as 90%. During under-voltage and disable (Enable terminal forced low) conditions, the outputs are held in a self-biasing, low-voltage, state.

The UC3708 and UC2708 are available in plastic 8-pin MINI DIP and 16-pin *bat-wing* DIP packages for commercial operation over a 0°C to 70°C temperature range and industrial temperature range of –25°C to 85°C respectively. For operation over a –55°C to 125°C temperature range, the UC1708 is available in hermetically sealed 8-pin MINI CDIP, 16 pin CDIP and 20 pin CLCC packages. Surface mount devices are also available.



#### **BLOCK DIAGRAM**

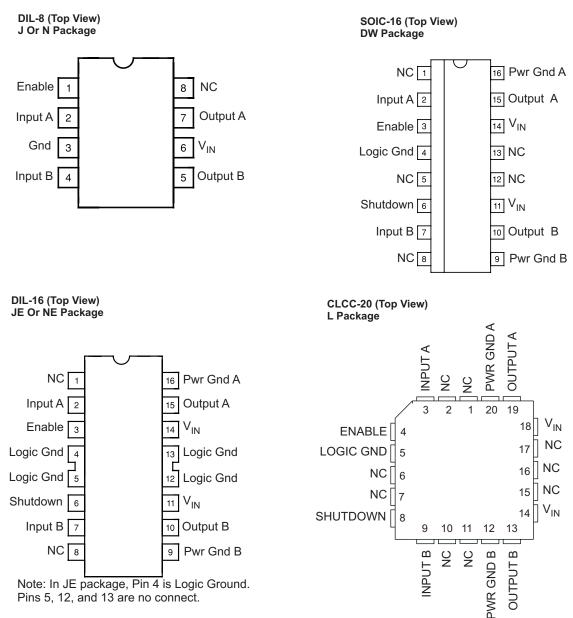
NOTE: Shutdown feature is not available in J or N packages only.

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.

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#### CONNECTION DIAGRAMS



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### ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

		VALUE	UNIT
Supply Voltage, V <sub>IN</sub>		35	V
Output Current (Each Output, Source or Sink)	Steady-State	0.5	А
Output Current (Each Output, Source of Sink)	Peak Transient	3	A
Ouput Voltage		-0.3 to (V <sub>IN</sub> + 0.3)	V
Enable and Shutdown Inputs		-0.3 to 6.2	V
A and B Inputs		-0.3 to (V <sub>IN</sub> + 0.3)	V
Operating Junction Temperature <sup>(2)</sup>		150	°C
Storage Temperature Range		-65 to 150	°C
Lead Temperature (Soldering, 10 Seconds)		300	°C

(1) All voltages are with respect to Logic Gnd pin. All currents are positive into, negative out of, device terminals.r

(2) Consult Unitrode Integrated Circuits databook for information regarding thermal specifications and limitations of packages.

#### ELECTRICAL CHARACTERISTICS

Unless otherwise stated, V<sub>IN</sub>=10V to 35V, and these specifications apply for: –55°C<T<sub>A</sub><125°C for the UC1708, –25°C<T<sub>A</sub><85°C for the UC2708, and 0°C<T<sub>A</sub><70°C for the UC3708, T<sub>A</sub> = T<sub>J</sub>

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
		Outputs low		18	26	
V <sub>IN</sub>	Supply current	Outputs high		14	18	mA
		Enable = 0 V		1	4	
	A, B and shutdown inputs low level				0.8	V
	A, B and shutdown inputs high level		2.0			V
	A, B Input current low	$V_{A,B} = 0.4V$	-1	-0.6		mA
	A, B Input current high	V <sub>A,B</sub> = 2.4V	-200		50	А
	A, B Input leakage current high	V <sub>A,B</sub> = 35.3V			200	А
	Shutdown input current low	V <sub>SHUTDOWN</sub> = 0.4V		20	100	А
	Object dama in a start start with inte	V <sub>SHUTDOWN</sub> = 2.4V		170	500	А
	Shutdown input current high	V <sub>SHUTDOWN</sub> = 6.2V		0.6	1.5	mA
	Enable input current low	V <sub>ENABLE</sub> = 0V	-600	-460	200	А
	Enable input current high	V <sub>ENABLE</sub> = 6.2V			200	А
	Enable threshold rising			2.8	3.6	V
	Enable threshold falling		1.0	2.4	3.4	V
V <sub>IN</sub> –	Output Llink Coturnation	$I_{OUT} = -50 \text{mA}$			2.0	V
V <sub>OUT</sub>	Output High Saturation	I <sub>OUT</sub> = -500mA			2.5	V
V	Output Low Soturation	I <sub>OUT</sub> = 50mA			0.5	V
V <sub>OUT</sub>	Output Low Saturation	I <sub>OUT</sub> = 500mA			2.5	V
	Thermal Shutdown			155		°C

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### SWITCHING CHARACTERISTICS (see Figure 1)

(VIN = 20V, delays measured to 10% output change.)

PARAMETER	TEST	CONDITIONS	MIN	ΤΥΡ	MAX	UNIT	
FROM A,B INPUT TO OUTPUT							
	CL = 0pF			25	40	ns	
	CI 1000pF	UC1708		25	45		
Rise Time Delay (TPLH)	CL = 1000pF	UC2708/UC3708		25	40	ns	
	CL 2200mF	UC1708		25	50		
	CL = 2200pF	UC2708/UC3708		25	45	ns	
	CL = 0pF			55	75	ns	
	CL = 1000pF <sup>(1)</sup>	UC1708		25	25 80		
10% to 90% Rise (TTLH)	$CL = 1000 pr^{(0)}$	UC2708/UC3708		25	50	ns	
	CL 2200mF	UC1708		40	85		
	CL = 2200pF	UC2708/UC3708		40	55	ns	
	CL = 0pF	CL = 0pF					
Fall Time Delay (TPHL)	$CL = 1000pF^{(1)}$	$CL = 1000pF^{(1)}$				ns	
	CL = 2200pF	CL = 2200pF					
90% to 10% Fall (TTHL)	CL = 0pF		15	20			
	$CL = 1000 pF^{(1)}$	CL = 1000pF <sup>(1)</sup>			45	15 ns	
	CL = 2200pF						

(1) These parameters, specified at 1000pF, although ensured over recommended operating conditions, are not tested in production.

### SWITCHING CHARACTERISTICS (see Figure 1)

(VIN = 20V, delays measured to 10% output change.)

PARAMETER	TES	T CONDITIONS	MIN	TYP	MAX	UNIT
FROM SHUTDOWN INPUT TO	OUTPUT:	ł			1	
	CL = 0pF			25	75	ns
	CL = 1000pF <sup>(1)</sup>	UC1708		30	80	~~
Rise Time Delay (TPLH)		UC2708/UC3708		30	75	ns
		UC1708		35	85	~~~
	CL = 2200pF	UC2708/UC3708		35	75	ns
10% to 90% Rise (TTLH)	CL = 0pF			50	75	ns
	CL = 1000pF <sup>(1)</sup>	UC1708		25	80	00
		UC2708/UC3708		25	50	ns
		UC1708		40	85	~~~
	CL = 2200pF	UC2708/UC3708		40	55	ns
	CL = 0pF	CL = 0pF				
Fall Time Delay (TPHL)	$CL = 1000 pF^{(1)}$	CL = 1000pF <sup>(1)</sup>				
	CL = 2200pF					
	CL = 0pF	CL = 0pF				
90% to 10% Fall (TTHL)	$CL = 1000 pF^{(1)}$	CL = 1000pF <sup>(1)</sup>				
	CL = 2200pF	CL = 2200pF				
Total Supply Current	F = 200kHz, 50% duty o	F = 200kHz, 50% duty cycle, both channels; CL = 0pF				mA
Total Supply Current	F = 200kHz, 50% duty of	F = 200kHz, 50% duty cycle, both channels; CL = 2200pF				

(1) These parameters, specified at 1000pF, although ensured over recommended operating conditions, are not tested in production.

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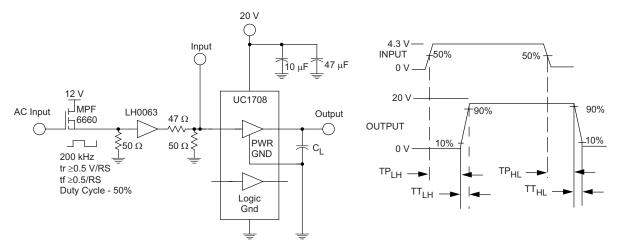
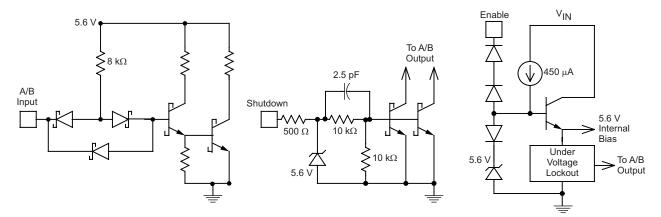


Figure 1. AC Test Circuit and Switching Time Waveforms

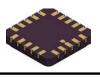


NOTE: Shutdown feature available only in JE, NE or DW Packages.

#### Figure 2. Equivalent Input Circuits

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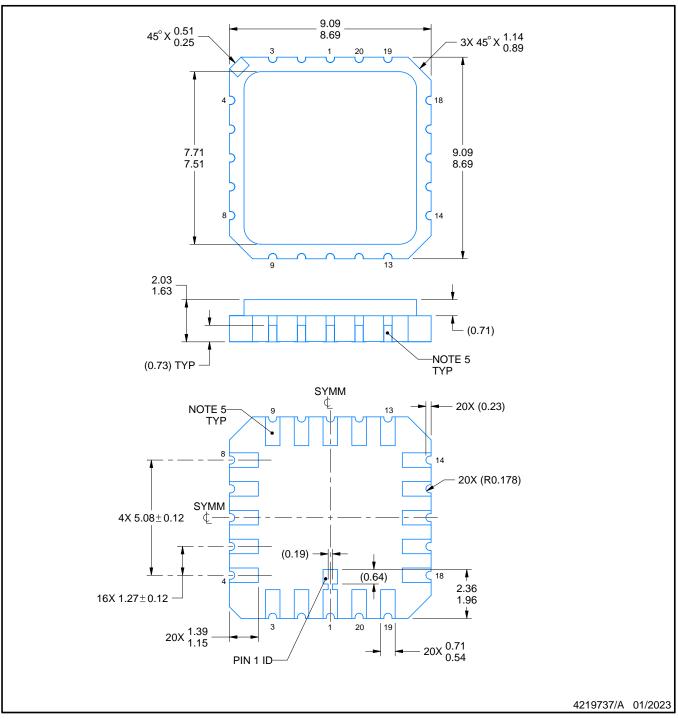
# FK0020A



## **PACKAGE OUTLINE**

### LCCC - 2.03 mm max height

LEADLESS CERAMIC CHIP CARRIER



NOTES:

- 1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing All linear dimensions are in minimeters. Any dimensions in per ASME Y14.5M.
   This drawing is subject to change without notice.
   This package can be hermetically sealed with a metal lid.
   Reference JEDEC Registration MS-004.
   The terminals are gold-plated.

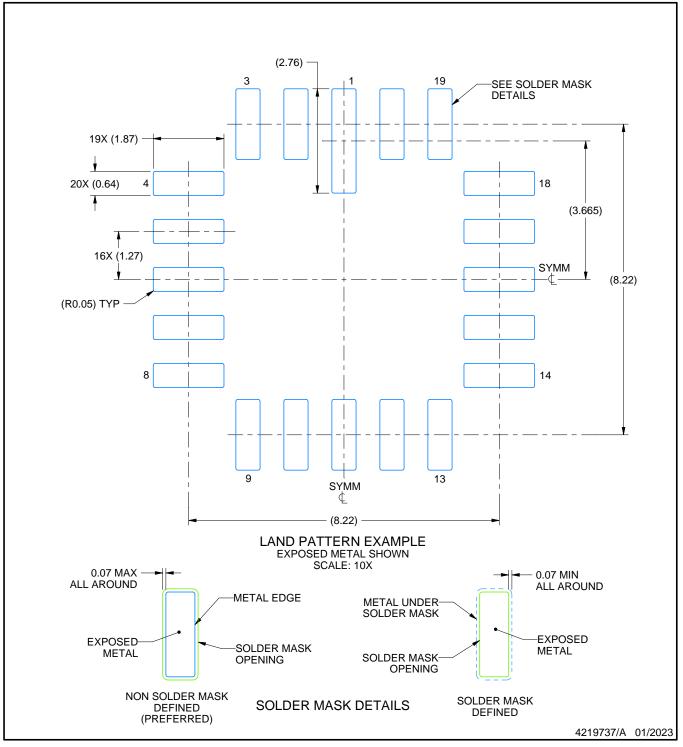


# FK0020A

# **EXAMPLE BOARD LAYOUT**

### LCCC - 2.03 mm max height

LEADLESS CERAMIC CHIP CARRIER



NOTES: (continued)

6. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).

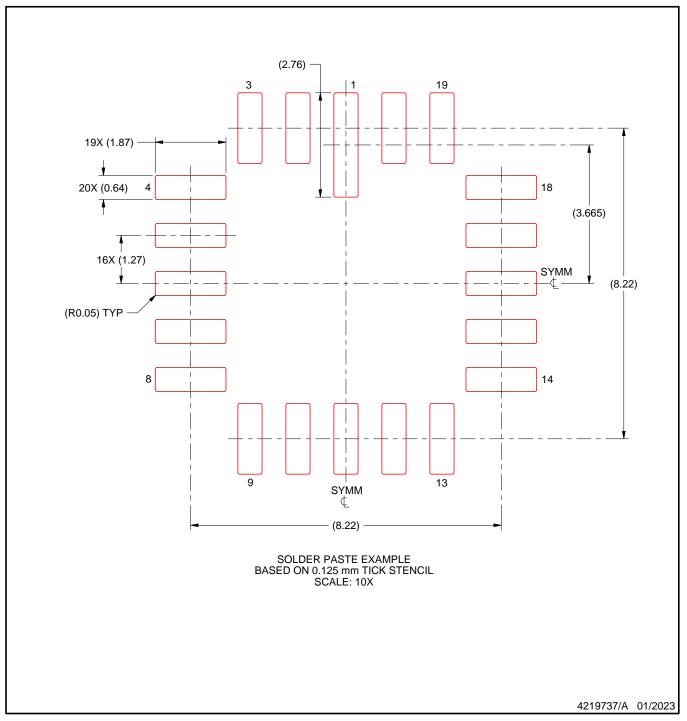


# FK0020A

# **EXAMPLE STENCIL DESIGN**

### LCCC - 2.03 mm max height

LEADLESS CERAMIC CHIP CARRIER



NOTES: (continued)

7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.





### PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	<b>RoHS</b> (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-0051401Q2A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 0051401Q2A UC1708L/ 883B
5962-0051401QEA	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-0051401QE A UC1708JE/883B
5962-0051401QPA	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	0051401QPA UC1708
5962-0051401V2A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 0051401V2A UC1708L QMLV
5962-0051401V2A.A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 0051401V2A UC1708L QMLV
5962-0051401VEA	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-0051401VE A UC1708JEQMLV
5962-0051401VEA.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-0051401VE A UC1708JEQMLV
5962-0051401VPA	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	0051401VPA UC1708
5962-0051401VPA.A	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	0051401VPA UC1708
UC1708J	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1708J
UC1708J.A	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1708J
UC1708J883B	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	0051401QPA UC1708
UC1708J883B.A	Active	Production	CDIP (JG)   8	50   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	0051401QPA UC1708
UC1708JE	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1708JE



29-May-2025

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	<b>RoHS</b> (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
UC1708JE.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1708JE
UC1708JE883B	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-0051401QE A UC1708JE/883B
UC1708JE883B.A	Active	Production	CDIP (J)   16	25   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-0051401QE A UC1708JE/883B
UC1708L883B	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 0051401Q2A UC1708L/ 883B
UC1708L883B.A	Active	Production	LCCC (FK)   20	55   TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962- 0051401Q2A UC1708L/ 883B
UC2708DW	Active	Production	SOIC (DW)   16	40   TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2708DW
UC2708DW.A	Active	Production	SOIC (DW)   16	40   TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2708DW
UC2708DWTR	Active	Production	SOIC (DW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2708DW
UC2708DWTR.A	Active	Production	SOIC (DW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2708DW
UC2708N	Active	Production	PDIP (P)   8	50   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	UC2708N
UC2708N.A	Active	Production	PDIP (P)   8	50   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	UC2708N
UC3708DW	Active	Production	SOIC (DW)   16	40   TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3708DW
UC3708DW.A	Active	Production	SOIC (DW)   16	40   TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3708DW
UC3708DWG4	Active	Production	SOIC (DW)   16	40   TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3708DW
UC3708DWTR	Active	Production	SOIC (DW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3708DW
UC3708DWTR.A	Active	Production	SOIC (DW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3708DW
UC3708N	Active	Production	PDIP (P)   8	50   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	UC3708N
UC3708N.A	Active	Production	PDIP (P)   8	50   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	UC3708N
UC3708NE	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	UC3708NE
UC3708NE.A	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	UC3708NE
UC3708NG4	Active	Production	PDIP (P)   8	50   TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	UC3708N

<sup>(1)</sup> **Status:** For more details on status, see our product life cycle.



### PACKAGE OPTION ADDENDUM

29-May-2025

<sup>(2)</sup> Material type: When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> RoHS values: Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

<sup>(4)</sup> Lead finish/Ball material: Parts 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.

<sup>(5)</sup> MSL rating/Peak reflow: The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> Part marking: There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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#### OTHER QUALIFIED VERSIONS OF UC1708, UC1708-SP, UC3708 :

- Catalog : UC3708, UC1708
- Military : UC1708
- Space : UC1708-SP

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Military QML certified for Military and Defense Applications



• Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application



Texas

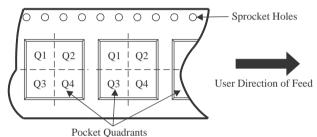
STRUMENTS

### TAPE AND REEL INFORMATION





#### QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions 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
UC2708DWTR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
UC3708DWTR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1



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## PACKAGE MATERIALS INFORMATION

25-Jul-2025



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
UC2708DWTR	SOIC	DW	16	2000	353.0	353.0	32.0
UC3708DWTR	SOIC	DW	16	2000	353.0	353.0	32.0

### TEXAS INSTRUMENTS

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25-Jul-2025

### TUBE



### - B - Alignment groove width

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	Τ (μm)	B (mm)
5962-0051401Q2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-0051401V2A	FK	LCCC	20	55	506.98	12.06	2030	NA
5962-0051401V2A.A	FK	LCCC	20	55	506.98	12.06	2030	NA
UC1708L883B	FK	LCCC	20	55	506.98	12.06	2030	NA
UC1708L883B.A	FK	LCCC	20	55	506.98	12.06	2030	NA
UC2708DW	DW	SOIC	16	40	507	12.83	5080	6.6
UC2708DW.A	DW	SOIC	16	40	507	12.83	5080	6.6
UC2708N	Р	PDIP	8	50	506	13.97	11230	4.32
UC2708N.A	Р	PDIP	8	50	506	13.97	11230	4.32
UC3708DW	DW	SOIC	16	40	507	12.83	5080	6.6
UC3708DW.A	DW	SOIC	16	40	507	12.83	5080	6.6
UC3708DWG4	DW	SOIC	16	40	507	12.83	5080	6.6
UC3708N	Р	PDIP	8	50	506	13.97	11230	4.32
UC3708N.A	Р	PDIP	8	50	506	13.97	11230	4.32
UC3708NE	N	PDIP	16	25	506	13.97	11230	4.32
UC3708NE.A	N	PDIP	16	25	506	13.97	11230	4.32
UC3708NG4	Р	PDIP	8	50	506	13.97	11230	4.32

### **DW 16**

## **GENERIC PACKAGE VIEW**

### SOIC - 2.65 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

7.5 x 10.3, 1.27 mm pitch

This image is a representation of the package family, actual package may vary. Refer to the product data sheet for package details.





## **DW0016A**



## **PACKAGE OUTLINE**

SOIC - 2.65 mm max height

SOIC



#### NOTES:

- 1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
  This drawing is subject to change without notice.
  This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not
- exceed 0.15 mm, per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.
- 5. Reference JEDEC registration MS-013.



## DW0016A

## **EXAMPLE BOARD LAYOUT**

### SOIC - 2.65 mm max height

SOIC



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



## DW0016A

## **EXAMPLE STENCIL DESIGN**

### SOIC - 2.65 mm max height

SOIC



NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

9. Board assembly site may have different recommendations for stencil design.



## FK 20

### 8.89 x 8.89, 1.27 mm pitch

## **GENERIC PACKAGE VIEW**

### LCCC - 2.03 mm max height

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary. Refer to the product data sheet for package details.





J (R-GDIP-T\*\*) 14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



NOTES: A. All linear dimensions are in inches (millimeters).

- B. This drawing is subject to change without notice.
- C. This package is hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
- E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

P(R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



- A. All linear dimensions are in inches (millimeters).B. This drawing is subject to change without notice.
- C. Falls within JEDEC MS-001 variation BA.



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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



NOTES:

- 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).
- $\triangle$  The 20 pin end lead shoulder width is a vendor option, either half or full width.



# **JG0008A**

## **PACKAGE OUTLINE**

### CDIP - 5.08 mm max height

CERAMIC DUAL IN-LINE PACKAGE



NOTES:

- 1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing 2. This drawing is subject to change without notice.3. This package can be hermetically sealed with a ceramic lid using glass frit.

- Index point is provided on cap for terminal identification.
   Falls within MIL STD 1835 GDIP1-T8



## JG0008A

# **EXAMPLE BOARD LAYOUT**

### CDIP - 5.08 mm max height

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