

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	
Quitaut Current (Each Quitaut, Source or Sink)	Steady-State	0.5	А
	Peak Transient	3	А
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	
VIN	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	$V_{A,B} = 2.4V$	-200		50	А
	A, B Input leakage current high	$V_{A,B} = 35.3V$			200	А
	Shutdown input current low	$V_{SHUTDOWN} = 0.4V$		20	100	А
	Shutdown input ourront high	$V_{SHUTDOWN} = 2.4V$		170	500	А
	Shataown input current high	$V_{SHUTDOWN} = 6.2V$		0.6	1.5	mA
	Enable input current low	$V_{\text{ENABLE}} = 0V$	-600	-460	200	А
	Enable input current high	$V_{\text{ENABLE}} = 6.2V$			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 High Saturation	$I_{OUT} = -50 \text{mA}$			2.0	V
	Output High Saturation	$I_{OUT} = -500 \text{mA}$			2.5	V
V	Output Low Saturation	$I_{OUT} = 50 \text{mA}$			0.5	V
VOUT		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	TYP	MAX	UNIT							
FROM A,B INPUT TO OUTPUT:													
	CL = 0pF			25	40	ns							
	CL - 1000pE	UC1708		25	45	20							
Rise Time Delay (TPLH)		UC2708/UC3708		25	40	115							
	CL = 2200 pE	UC1708		25	50	20							
	CL = 2200pF	UC2708/UC3708		25	45	115							
	CL = 0pF			55	75	ns							
	$CL = 1000 \text{pE}^{(1)}$	UC1708		25	80	20							
10% to 90% Rise (TTLH)		UC2708/UC3708		25	50	115							
	CL = 2200 pE	UC1708		40	85	20							
	CL = 2200pF UC2708/UC3708			40	55	115							
	CL = 0pF		25	40									
Fall Time Delay (TPHL)	$CL = 1000 pF^{(1)}$			25	45	ns							
	CL = 2200pF			35 50									
	CL = 0pF			15	20	ns							
90% to 10% Fall (TTHL)	$CL = 1000 pF^{(1)}$			25	45								
	CL = 2200pF			40	55								

(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	TEST C	MIN	TYP	MAX	UNIT							
FROM SHUTDOWN INPUT TO OUTPUT:												
	CL = 0pF			25	75	ns						
	CI 1000pE <sup>(1)</sup>	UC1708		30	80	20						
Rise Time Delay (TPLH)		UC2708/UC3708		30	75	115						
	CL 2200pF	UC1708		35	85	20						
	CL = 2200pF	UC2708/UC3708		35	75	ns						
	CL = 0pF			50	75	ns						
10% to 90% Rise (TTLH)	CL = 1000pF <sup>(1)</sup>	UC1708		25	80	20						
		UC2708/UC3708		25	50	ns						
	CL 2200pF	UC1708		40	85	20						
	UC2708/UC3708			40	55	ns						
	CL = 0pF			25	45							
Fall Time Delay (TPHL)	$CL = 1000 pF^{(1)}$			30	50	ns						
	CL = 2200pF			35	55							
	CL = 0pF			25	20							
90% to 10% Fall (TTHL)	$CL = 1000 pF^{(1)}$			25	45	ns						
	CL = 2200pF			40	55							
Total Supply Current	F = 200kHz, 50% duty cycl		23	25								
	F = 200kHz, 50% duty cycl	e, both channels; CL = 2200pF		38	45	ШA						

(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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#### PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Top-Side Markings	Samples
5962-0051401Q2A	ACTIVE	LCCC	FK	20	1	TBD	Call TI	Call TI	-55 to 125	(4) 5962- 0051401Q2A UC1708L/ 883B	Samples
5962-0051401QEA	ACTIVE	CDIP	J	16	1	TBD	Call TI	Call TI	-55 to 125	5962-0051401QE A UC1708JE/883B	Samples
5962-0051401QPA	ACTIVE	CDIP	JG	8	1	TBD	Call TI	Call TI	-55 to 125	0051401QPA UC1708	Samples
5962-0051401V2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 0051401V2A UC1708L QMLV	Samples
5962-0051401VEA	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-0051401VE A UC1708JEQMLV	Samples
5962-0051401VPA	ACTIVE	CDIP	JG	8	1	TBD	A42	N / A for Pkg Type	-55 to 125	0051401VPA UC1708	Samples
UC1708J	ACTIVE	CDIP	JG	8	1	TBD	A42	N / A for Pkg Type	-55 to 125	UC1708J	Samples
UC1708J883B	ACTIVE	CDIP	JG	8	1	TBD	A42	N / A for Pkg Type	-55 to 125	0051401QPA UC1708	Samples
UC1708JE	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	UC1708JE	Samples
UC1708JE883B	ACTIVE	CDIP	J	16	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-0051401QE A UC1708JE/883B	Samples
UC1708L883B	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 0051401Q2A UC1708L/ 883B	Samples
UC2708D	OBSOLETI		UTR			TBD	Call TI	Call TI	-40 to 85		
UC2708DW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2708DW	Samples
UC2708DWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2708DW	Samples



24-Jan-2013

Ordershie Device	Status	Deekege Ture	Deekees	Dine	Deekere Otv	Eac Dian	Lead/Dall Finish	MCL Deals Tomm	On Tomp (°C)	Ton Sido Markingo	Compleo
Orderable Device	Status (1)	Раскаде туре	Drawing	PINS	Package Qty		Lead/ball Finish		Op remp ( C)		Samples
UC2708DWTR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2708DW	Samples
UC2708DWTRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2708DW	Samples
UC2708J	OBSOLETE	-	UTR			TBD	Call TI	Call TI	-40 to 85		
UC2708JE	OBSOLETE		UTR			TBD	Call TI	Call TI	-40 to 85		
UC2708N	ACTIVE	PDIP	Ρ	8	50	Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type	-40 to 85	UC2708N	Samples
UC2708NG4	ACTIVE	PDIP	Ρ	8	50	Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type	-40 to 85	UC2708N	Samples
UC2708Q	OBSOLETE	_	UTR			TBD	Call TI	Call TI	-40 to 85		
UC3708DW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3708DW	Samples
UC3708DWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3708DW	Samples
UC3708DWTR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3708DW	Samples
UC3708DWTRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3708DW	Samples
UC3708N	ACTIVE	PDIP	Ρ	8	50	Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type	0 to 70	UC3708N	Samples
UC3708NE	ACTIVE	PDIP	Ν	16	25	Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type	0 to 70	UC3708NE	Samples
UC3708NEG4	ACTIVE	PDIP	Ν	16	25	Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type	0 to 70	UC3708NE	Samples
UC3708NG4	ACTIVE	PDIP	Ρ	8	50	Green (RoHS & no Sb/Br)	CU NIPDAU	N / A for Pkg Type	0 to 70	UC3708N	Samples
UC3708Q	OBSOLETE		UTR			TBD	Call TI	Call TI	0 to 70		

<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.



## PACKAGE OPTION ADDENDUM

24-Jan-2013

<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.

<sup>(4)</sup> Only one of markings shown within the brackets will appear on the physical 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

# PACKAGE MATERIALS INFORMATION

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### TAPE AND REEL INFORMATION





## QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
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

TEXAS INSTRUMENTS

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# PACKAGE MATERIALS INFORMATION

26-Jan-2013



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
UC2708DWTR	SOIC	DW	16	2000	367.0	367.0	38.0
UC3708DWTR	SOIC	DW	16	2000	367.0	367.0	38.0

## **MECHANICAL DATA**

MCER001A - JANUARY 1995 - REVISED JANUARY 1997



#### **CERAMIC DUAL-IN-LINE**



NOTES: 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.
- E. Falls within MIL STD 1835 GDIP1-T8



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.

LEADLESS CERAMIC CHIP CARRIER

FK (S-CQCC-N\*\*) 28 TERMINAL SHOWN



NOTES: 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



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.



DW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.

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-013 variation AA.



## LAND PATTERN DATA



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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