


Power Supply Supervisory Circuit

FEATURES

- **Includes Over-Voltage, Under-Voltage, and Current Sensing Circuits**
- **Internal 1% Accurate Reference**
- **Programmable Time Delays**
- **SCR "Crowbar" Drive of 300 mA**
- **Remote Activation Capability**
- **Optional Over-Voltage Latch**
- **Uncommitted Comparator Inputs for Low Voltage Sensing (UC1544 Series Only)**

DESCRIPTION

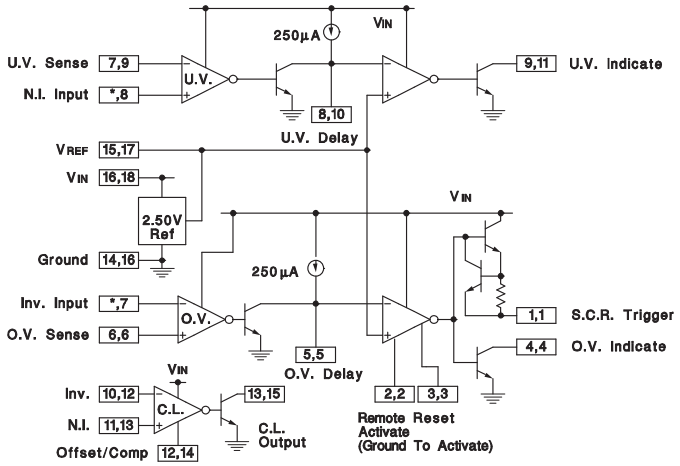
The monolithic integrated circuits contain all the functions necessary to monitor and control the output of a sophisticated power supply system. Over-voltage (O.V.) sensing with provision to trigger an external SCR "crowbar" shutdown; an undervoltage (U.V.) circuit which can be used to monitor either the output or to sample the input line voltage; and a third op amp/comparator usable for current sensing (C.L.) are all included in this device, together with an independent, accurate reference generator.

Both over- and under-voltage sensing circuits can be externally programmed for minimum time duration of fault before triggering. All functions contain open collector outputs which can be used independently or wire-or'ed together, and although the SCR trigger is directly connected only to the over-voltage sensing circuit, it may be optionally activated by any of the other outputs, or from an external signal. The O.V. circuit also includes an optional latch and external reset capability.

The UC1544/2544/3544 devices have the added versatility of completely uncommitted inputs to the voltage sensing comparators so that levels less than 2.5 V may be monitored by dividing down the internal reference voltage. The current sense circuit may be used with external compensation as a linear amplifier or as a highgain comparator. Although nominally set for zero input offset, a fixed threshold may be added with an external resistor. Instead of current limiting, this circuit may also be used as an additional voltage monitor.

The reference generator circuit is internally trimmed to eliminate the need for external potentiometers and the entire circuit may be powered directly from either the output being monitored or from a separate bias voltage.

BLOCK DIAGRAM



NOTE:

For each terminal, first number refers to 1543 series, second to 1544 series. *On 1543 series, this function is internally connected to VREF.

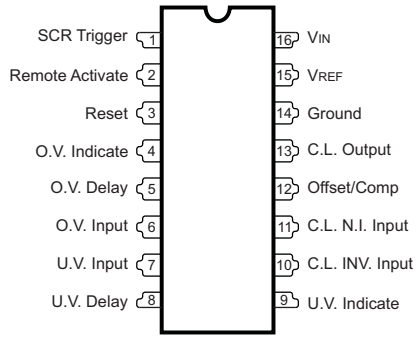
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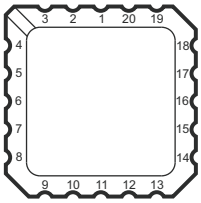
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Connection Diagrams

DIL-16, SOIC-16 (TOP VIEW) **UC 1543**
J or N, DW Package **UC 2543**
(Also W Package for the UC1543 Only) **UC 3543**

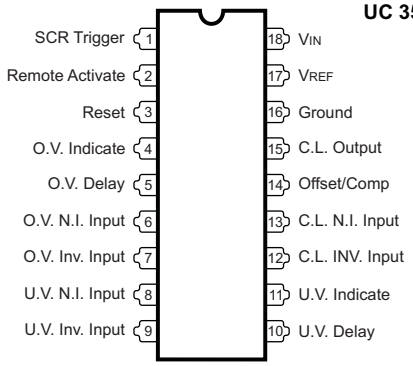


PLCC-20, LCC-20
(TOP VIEW)
Q or L Package

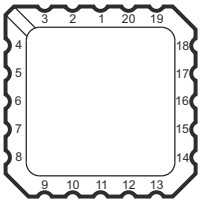


PACKAGE PIN FUNCTION	
FUNCTION	PIN
N/C	1
SCR Trigger	2
Remote Activate	3
Reset	4
O.V. Indicate	5
N/C	6
O.V. Delay	7
O.V. Input	8
N/C	9
N/C	10
U.V. Input	11
U.V. Delay	12
U.V. Indicate	13
C.L. INV. Input	14
C.L. N.I. Input	15
Offset/Comp	16
C.L. Output	17
Ground	18
VREF	19
VIN	20

DIL-18, SOIC-18 (TOP VIEW) **UC 1544**
J or N, DW Package **UC 2544**
UC 3544



PLCC-20, LCC-20
(TOP VIEW)
Q or L Package



PACKAGE PIN FUNCTION	
FUNCTION	PIN
N/C	1
SCR Trigger	2
Remote Activate	3
Reset	4
O.V. Indicate	5
N/C	6
O.V. Delay	7
O.V. N.I. Input	8
O.V. INV. Input	9
U.V. N.I. Input	10
U.V. INV. Input	11
U.V. Delay	12
U.V. Indicate	13
C.L. INV. Input	14
C.L. N.I. Input	15
Offset/Comp	16
C.L. Output	17
Ground	18
VREF	19
VIN	20

ABSOLUTE MAXIMUM RATINGS(1)

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

			VALUE	UNIT
V_{IN}	Input supply voltage		40	V
	Sense inputs, voltage range		0 to VIN	
	SCR trigger current (2)		-600	mA
	Indicator output voltage		40	V
	Indicator output sink current		50	mA
	Power dissipation (package limitation)		1000	mW
T_J	Operating temperature range	UC1543, UC1544	-55 to 125	°C
		UC2543, UC2544	-25 to 85	
		UC3543, UC3544	0 to 70	
T_{stg}	Storage temperature range		-65 to 150	

(1) Currents are positive-into, negative-out of the specified terminal.
(2) At higher input voltages, a dissipation limiting resistor, RG, is required.

ELECTRICAL CHARACTERISTICS

Unless otherwise stated, these specifications apply for T_A = -55°C to 125°C for theUC1543 and UC1544; -25°C to 85°C for the UC2543 and UC2544; and 0°C to 70°C for the UC3543 and UC3544. Electrical tests are performed with V_{IN} = 10 V and 2-kΩ pull-up resistors on all indicator outputs. All electrical specifications for the UC1544, UC2544, and UC3544 devices are tested with the inverting over-voltage input and the non-inverting under-voltage input externallyconnected to the 2.5 V reference. $T_A = T_J$.

PARAMETER		TEST CONDITIONS	UC1543/UC1544/UC2543/ UC2544			UC3543/UC3544			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{IN}	Input voltage range	T_J = 25°C to T_{MAX}	4.5		40	4.5		40	V
		T_{MIN} to T_{MAX}	4.7		40	4.7		40	
I_{CC}	Supply current	V_{IN} = 40 V, output open, T_J = 25°C		7	10		7	10	mA
		$T_{MIN} \leq T_J \leq T_{MAX}$			15			15	
Reference Section									
V_{OUT}	Output voltage	T_J = 25°C	2.48	2.5	2.52	2.45	2.50	2.55	V
		Over temperature range	2.45		2.55	2.40		2.60	
	Line regulation	V_{IN} = 5 to 30 V		1	5		1	5	mV
	Load regulation	I_{REF} = 0 to 10 mA		1	10		1	10	
	Short circuit current	V_{REF} = 0	-10	-20	-40	-12	-20	-40	mA
	Temperature stability			50			50		ppm/°C
SCR Trigger Section									
	Peak output current	V_{IN} = 5V, RG = 0, VO = 0	-100	-300	-600	-100	-300	-600	mA
	Peak output voltage	V_{IN} = 15 V, I_O = -100 mA	12	13		12	13		V
	Output OFF voltage	V_{IN} = 40 V		0	0.1		0	0.1	
	Remote activate current	R/A Pin = GND		-0.4	-0.8		-0.4	-0.8	mA
	Remote activate voltage	R/A Pin Open		2	6		2	6	V
	Reset current	Reset = GND, R/A = GND		-0.4	-0.8		-0.4	-0.8	mA
	Reset voltage	Reset open, R/A = GND		2	6		2	6	V
	Output current rise time	R_L = 50, T_J = 25°C, C_D = 0		400			400		mA/µs
	Prop. delay from R/A	R_L = 50, T_J = 25°C, C_D = 0		300			300		ns
	Prop. delay from O/V input	R_L = 50, T_J = 25°C, C_D = 0		500			500		
Comparator Section									
	Input threshold (Input voltage rising on O.V. and falling on U.V.)	T_J = 25°C	2.45	2.50	2.55	2.40	2.50	2.60	V
		Over temperature range	2.40		2.60	2.35		2.65	
	Input hysteresis			25			25		mV
	Input bias current	Sense input = 0 V		-0.3	-1.0		-0.3	-1.0	µA
	Delay saturation			0.2	0.5		0.2	0.5	V
	Delay high level			6	7		6	7	
	Delay charging current	V_O = 0	-200	-250	-300	-200	-250	-300	µA
	Indicate saturation	I_L = 10 mA		0.2	0.5		0.2	0.5	V
	Indicate leakage	V_{IND} = 40 V		0.01	1.0		0.01	1.0	µA
	Propagation delay	Input over drive = 200 mV, T_J = 25°C, C_D = 0		400			400		ns
		Input over drive = 200 mV, T_J = 25°C, C_D = 1 µF		10			10		ms

ELECTRICAL CHARACTERISTICS (continued)

Unless otherwise stated, these specifications apply for T_A = -55°C to 125°C for theUC1543 and UC1544; -25°C to 85°C for the UC2543 and UC2544; and 0°C to 70°C for the UC3543 and UC3544. Electrical tests are performed with V_{IN} = 10 V and 2-kΩ pull-up resistors on all indicator outputs. All electrical specifications for the UC1544, UC2544, and UC3544 devices are tested with the inverting over-voltage input and the non-inverting under-voltage input externallyconnected to the 2.5 V reference. $T_A = T_J$.

Current Limit Section									
	Input voltage range		0		VIN -3V	0		VIN -3V	V
	Input Bias Current	Offset pin open, V_{CM} = 0		-0.3	-1.0		-0.3	-1.0	µA
	Input offset voltage	Offset pin open, V_{CM} = 0		0	10		0	10	mV
		10k from offset pin to GND	80	100	120	80	100	120	
	CMRR	0 ≤ V_{CM}≤ 12 V, V_{IN} = 15 V	60	70		60	70		dB
	AVOL	Offset pin open, V_{CM} = 0 V, R_L = 10 kΩ to 15 kΩ, V_{OUT} = 1 to 6 V	72	80		72	80		
	Output saturation	I_L = 10 mA		0.2	0.5		0.2	0.5	V
	Output leakage	V_{IND} = 40 V		0.01	1.0		0.01	1.0	µA
	Small signal bandwidth	A_V = 0dB, T_J = 25°C		5			5		MHz
	Propagation delay	$V_{OVERDRIVE}$ = 100 mV, T_J = 25°C		200			200		ns

TYPICAL CHARACTERISTICS

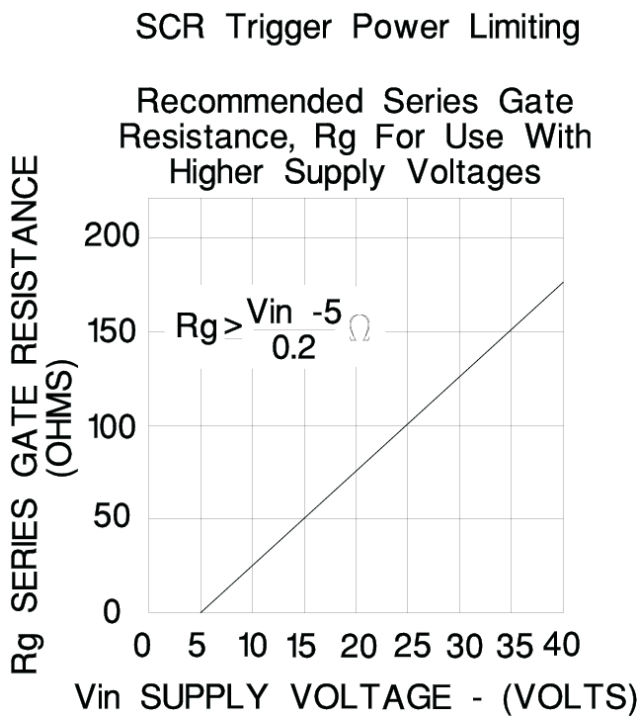


Figure 1.

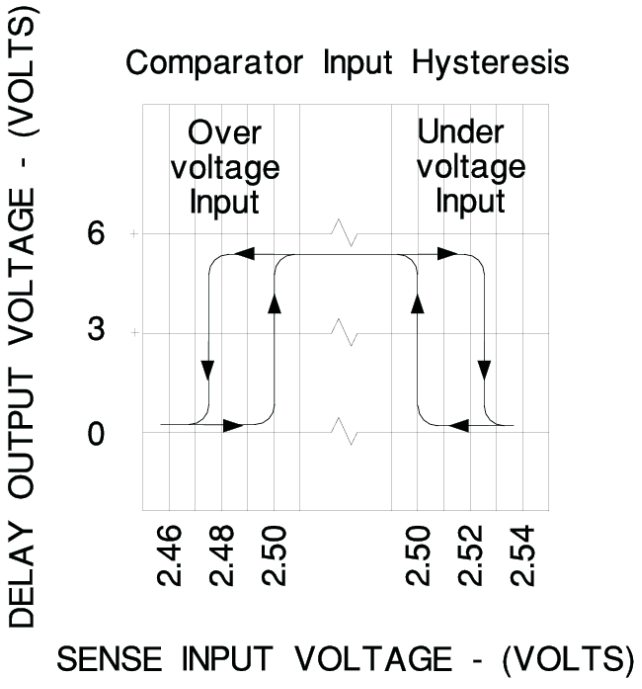


Figure 2.

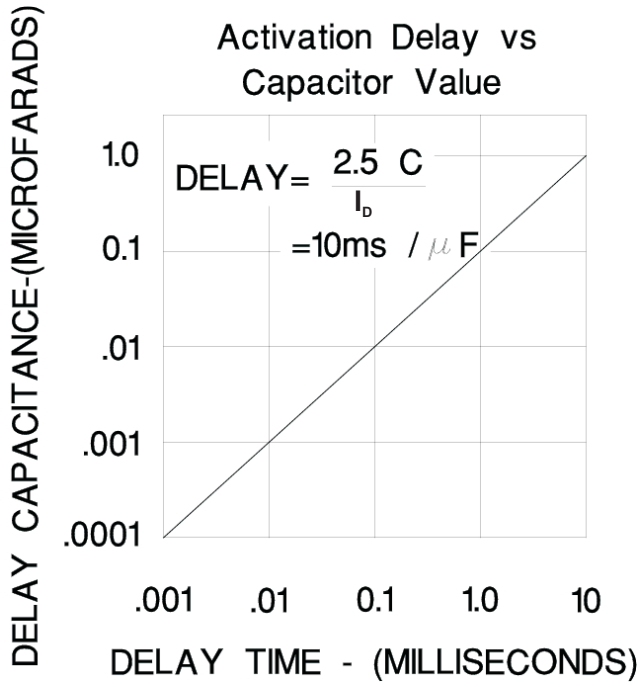


Figure 3.

Current Limit Input Threshold

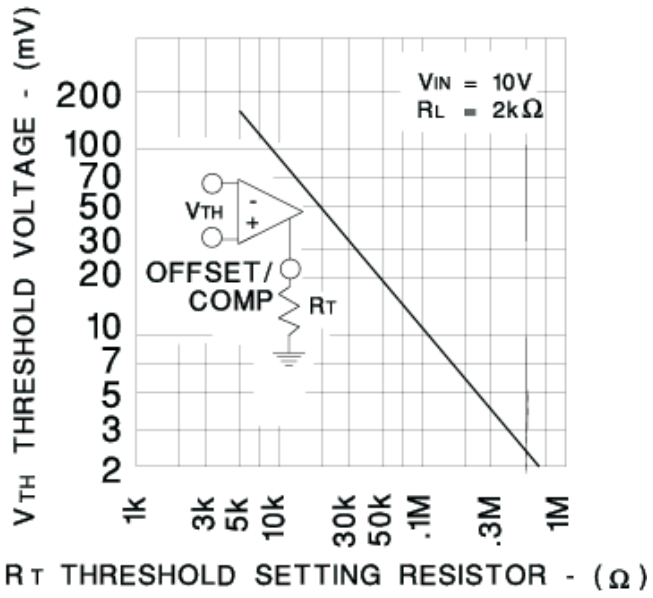


Figure 4.

Current Limit Amplifier Gain

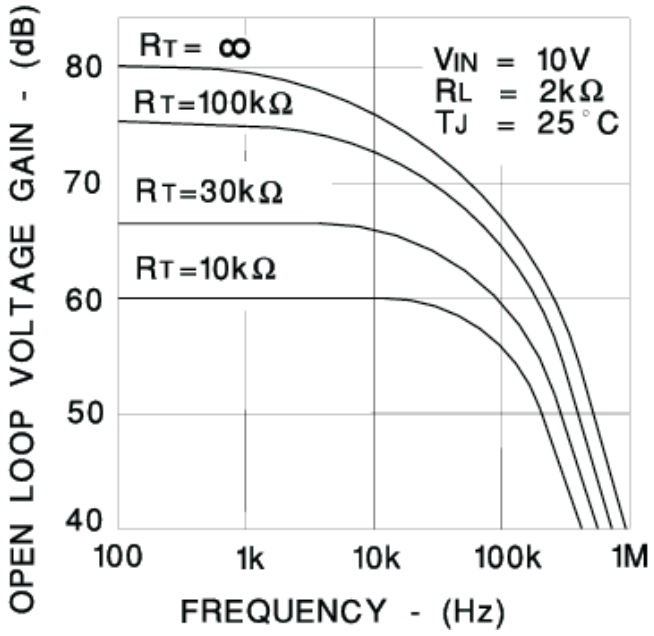


Figure 5.

Current Limit Amplifier Frequency Response

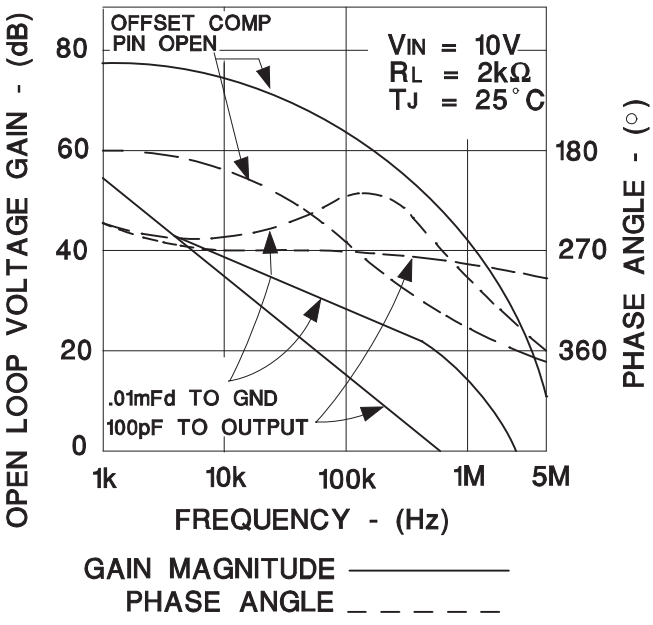


Figure 6.

APPLICATION INFORMATION

The values for the external components are determined as follows:

Current limit input threshold, $$V_{TH} = \frac{1000}{R1}$$

C_S is determined by the current loop dynamics

Peak current to load, $$I_P \cong \frac{V_{TH}}{R_{SC}} + \frac{V_O}{R_{SC}}\left(\frac{R2}{R2+R3}\right)$$

Short circuit current, $$I_{SC} = \frac{V_{TH}}{R_{SC}}$$

Low output voltage limit, $$V_{O(low)} = \frac{2.5(R4+R5+R6)}{R5+R6}$$

High output voltage limit, $$V_{O(high)} = \frac{2.5(R4+R5+R6)}{R6}$$

Voltage sensing delay, $t_D = 10{,}000C_d$

SCR trigger power limiting resistor, $$R_G > \frac{V_{IN}-5}{0.2}$$

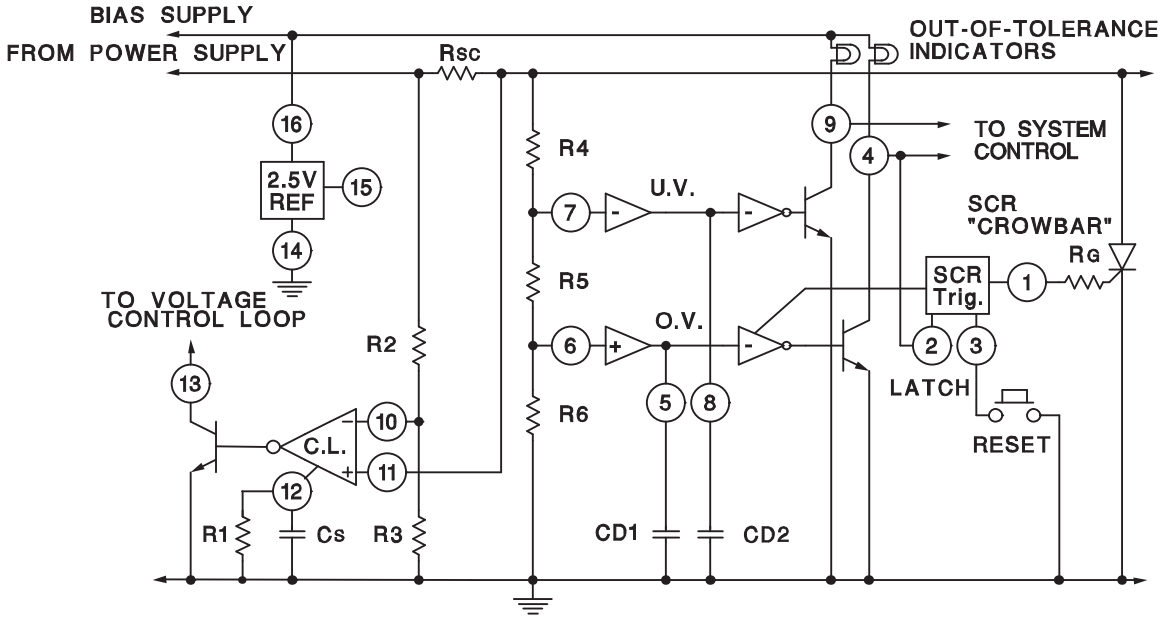


Figure 7. Typical Application

APPLICATION INFORMATION (continued)

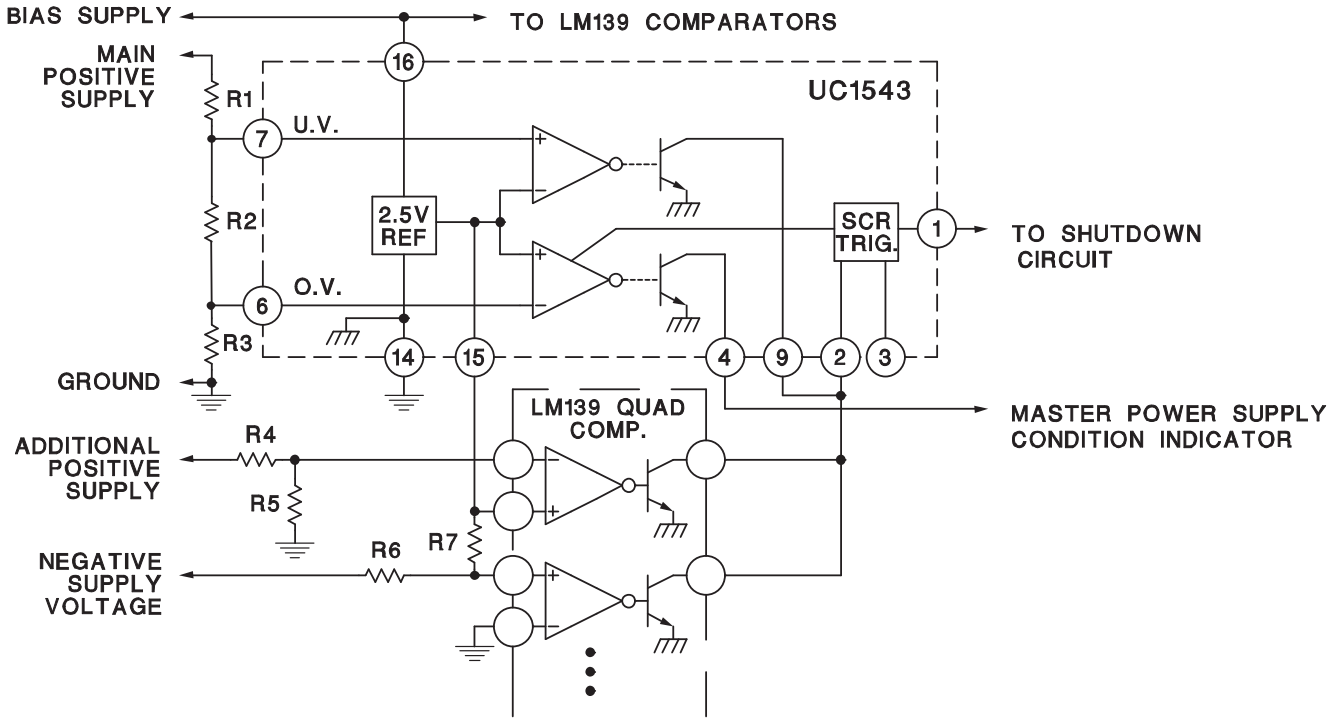


Figure 8. Sensing Multiple Supply Voltages

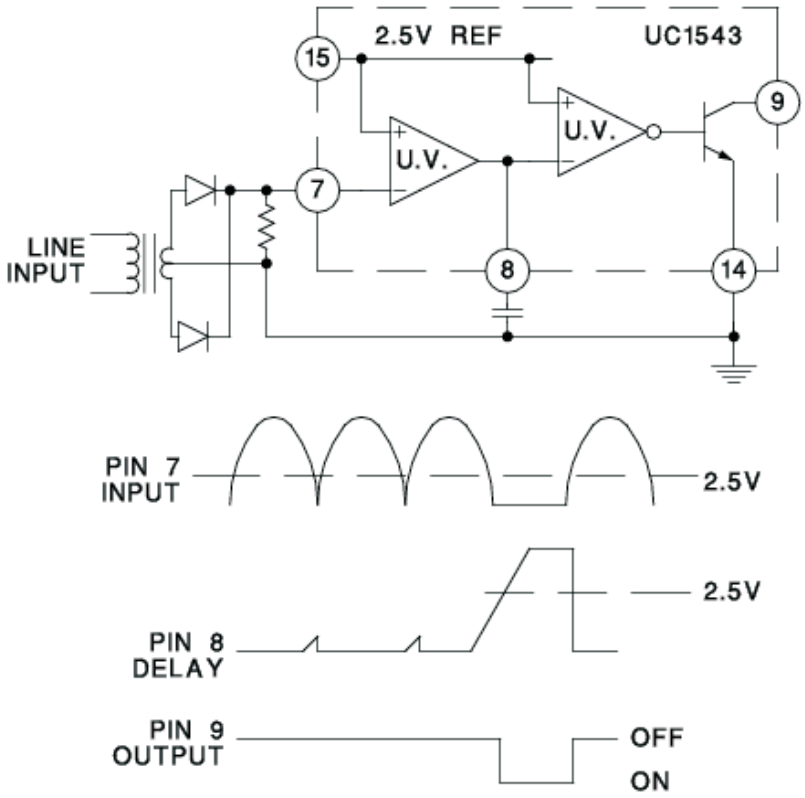


Figure 9. Input Line Monitor

APPLICATION INFORMATION (continued)

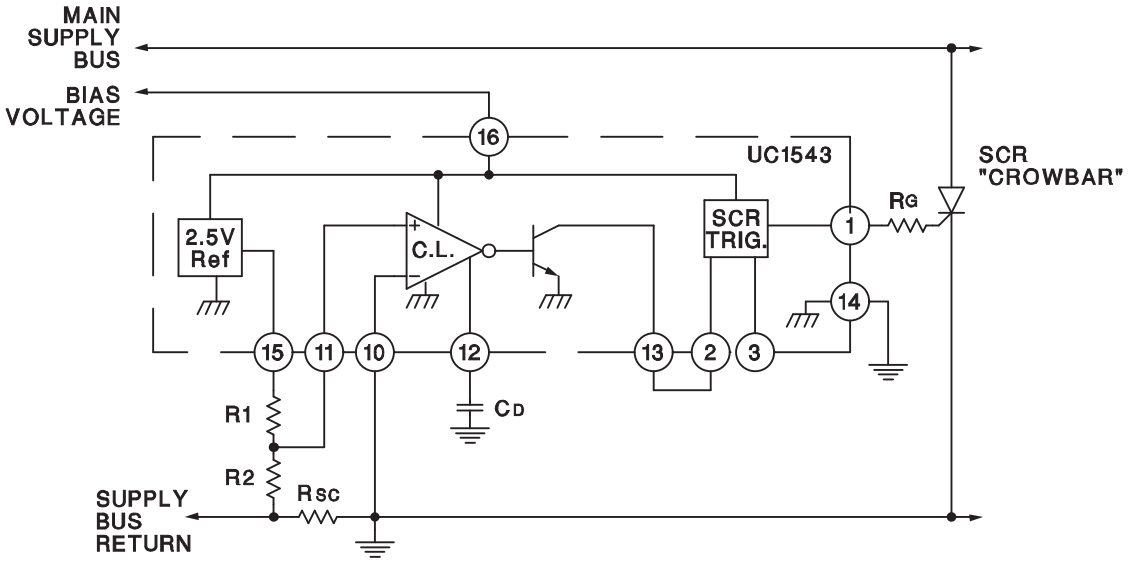


Figure 10. Overcurrent Shutdown

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-8774001EA	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8774001EA UC1543J/883B
5962-8774001FA	Active	Production	CFP (W) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	See UC1543W883B	5962-8774001FA UC1543W/883B
UC1543J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1543J
UC1543J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1543J
UC1543J883B	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8774001EA UC1543J/883B
UC1543J883B.A	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8774001EA UC1543J/883B
UC1543L	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1543L
UC1543L.A	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1543L
UC1543L883B	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1543L/ 883B
UC1543L883B.A	Active	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1543L/ 883B
UC1543W883B	Active	Production	CFP (W) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-	5962-8774001FA UC1543W/883B
UC1543W883B.A	Active	Production	CFP (W) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8774001FA UC1543W/883B
UC2543DW	Active	Production	SOIC (DW) | 16	40 | TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2543DW
UC2543DW.A	Active	Production	SOIC (DW) | 16	40 | TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2543DW
UC2543J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-25 to 85	UC2543J
UC2543J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-25 to 85	UC2543J
UC3543J	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	0 to 70	UC3543J
UC3543J.A	Active	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	0 to 70	UC3543J

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

(2) **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.

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

(4) **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.

(5) **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.

(6) **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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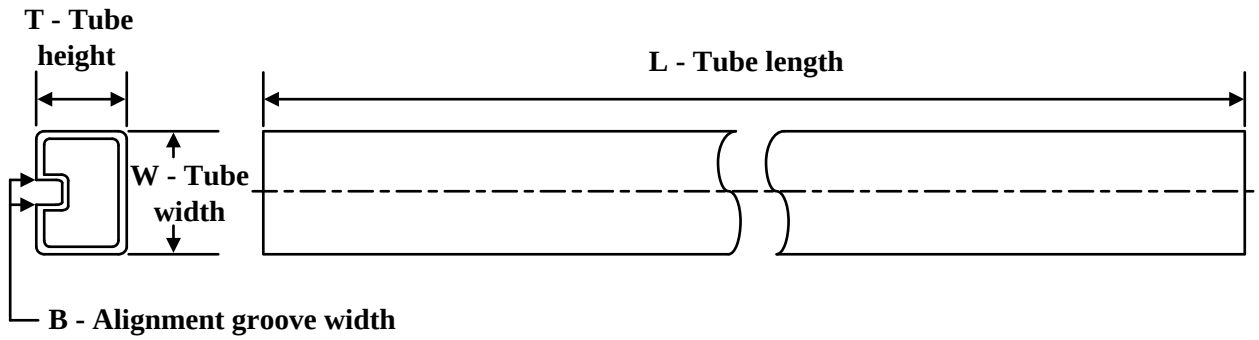
OTHER QUALIFIED VERSIONS OF UC2543, UC2543M, UC3543M :

- Catalog : UC2543
- Military : UC2543M, UC1543

NOTE: Qualified Version Definitions:

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

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-8774001FA	W	CFP	16	25	506.98	26.16	6220	NA
UC1543L	FK	LCCC	20	55	506.98	12.06	2030	NA
UC1543L.A	FK	LCCC	20	55	506.98	12.06	2030	NA
UC1543L883B	FK	LCCC	20	55	506.98	12.06	2030	NA
UC1543L883B.A	FK	LCCC	20	55	506.98	12.06	2030	NA
UC1543W883B	W	CFP	16	25	506.98	26.16	6220	NA
UC1543W883B.A	W	CFP	16	25	506.98	26.16	6220	NA
UC2543DW	DW	SOIC	16	40	507	12.83	5080	6.6
UC2543DW.A	DW	SOIC	16	40	507	12.83	5080	6.6

GENERIC PACKAGE VIEW

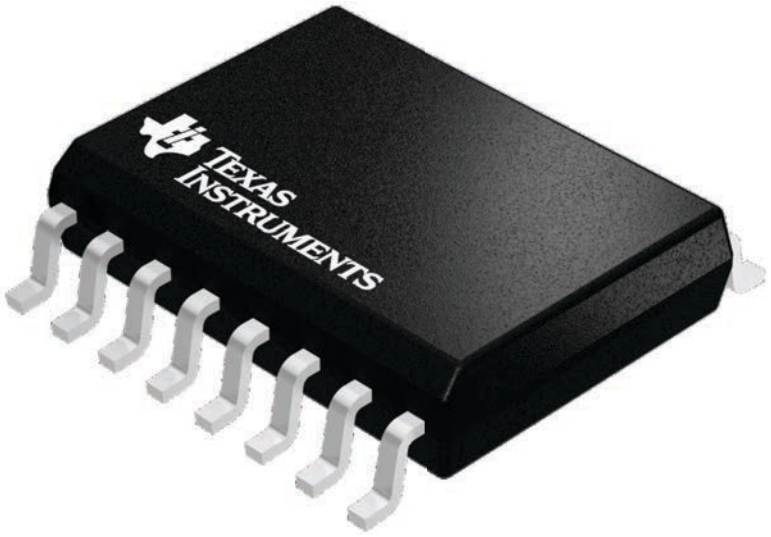
DW 16

SOIC - 2.65 mm max height

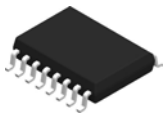
7.5 x 10.3, 1.27 mm pitch

SMALL OUTLINE INTEGRATED CIRCUIT

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



4224780/A

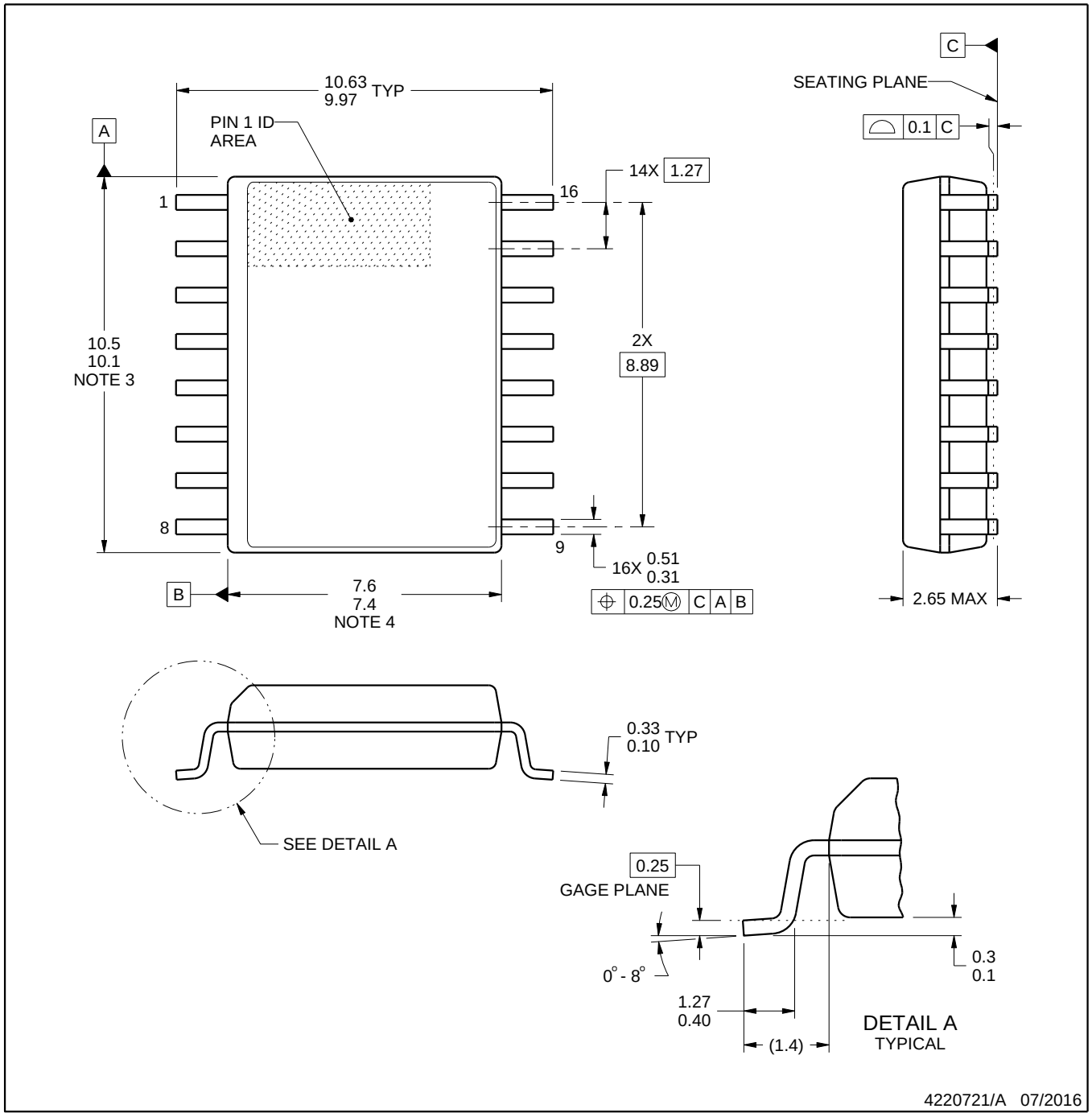


PACKAGE OUTLINE

DW0016A

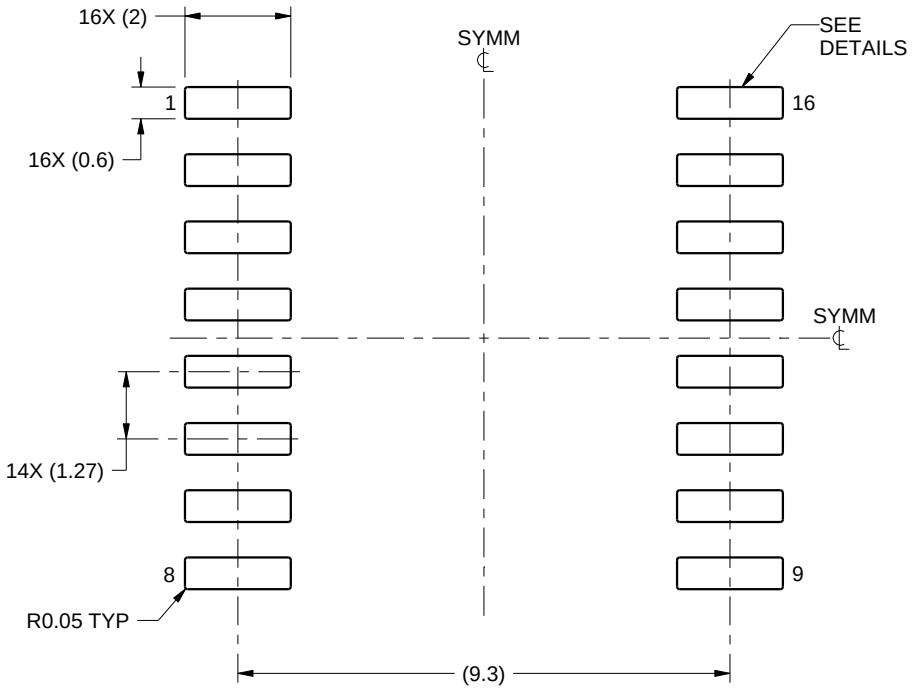
SOIC - 2.65 mm max height

SOIC

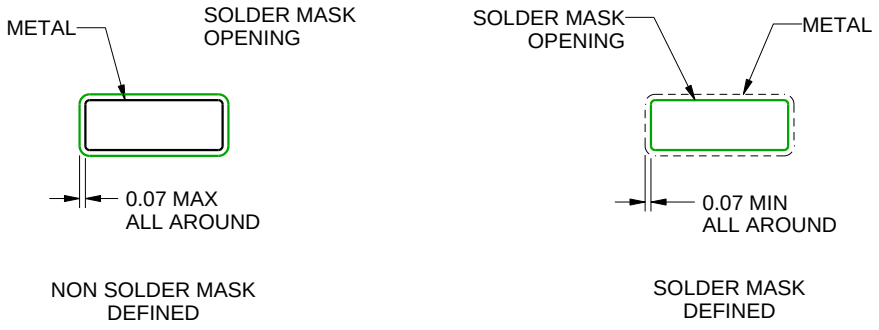


NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. 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.



LAND PATTERN EXAMPLE
SCALE:7X

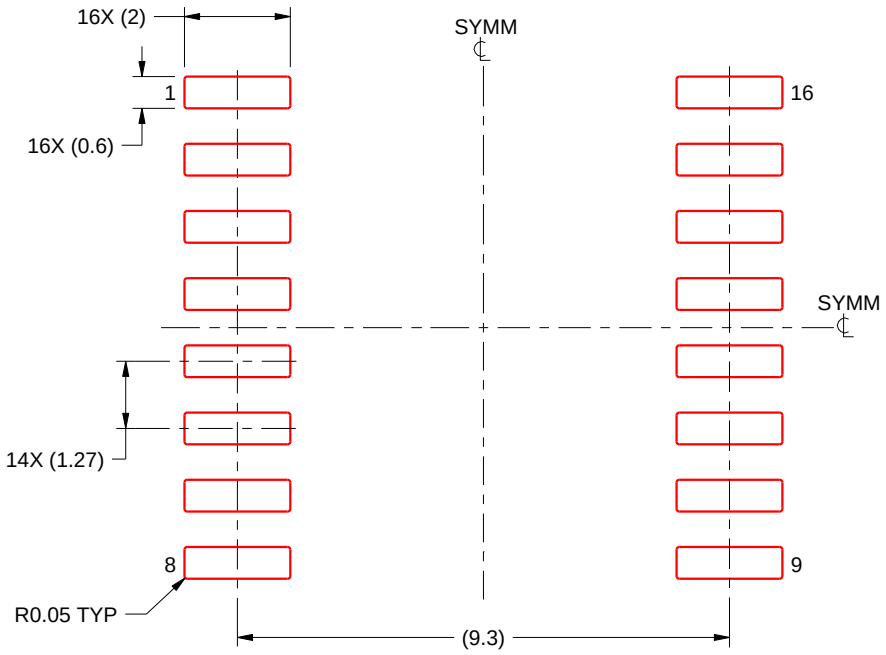


SOLDER MASK DETAILS

4220721/A 07/2016

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.



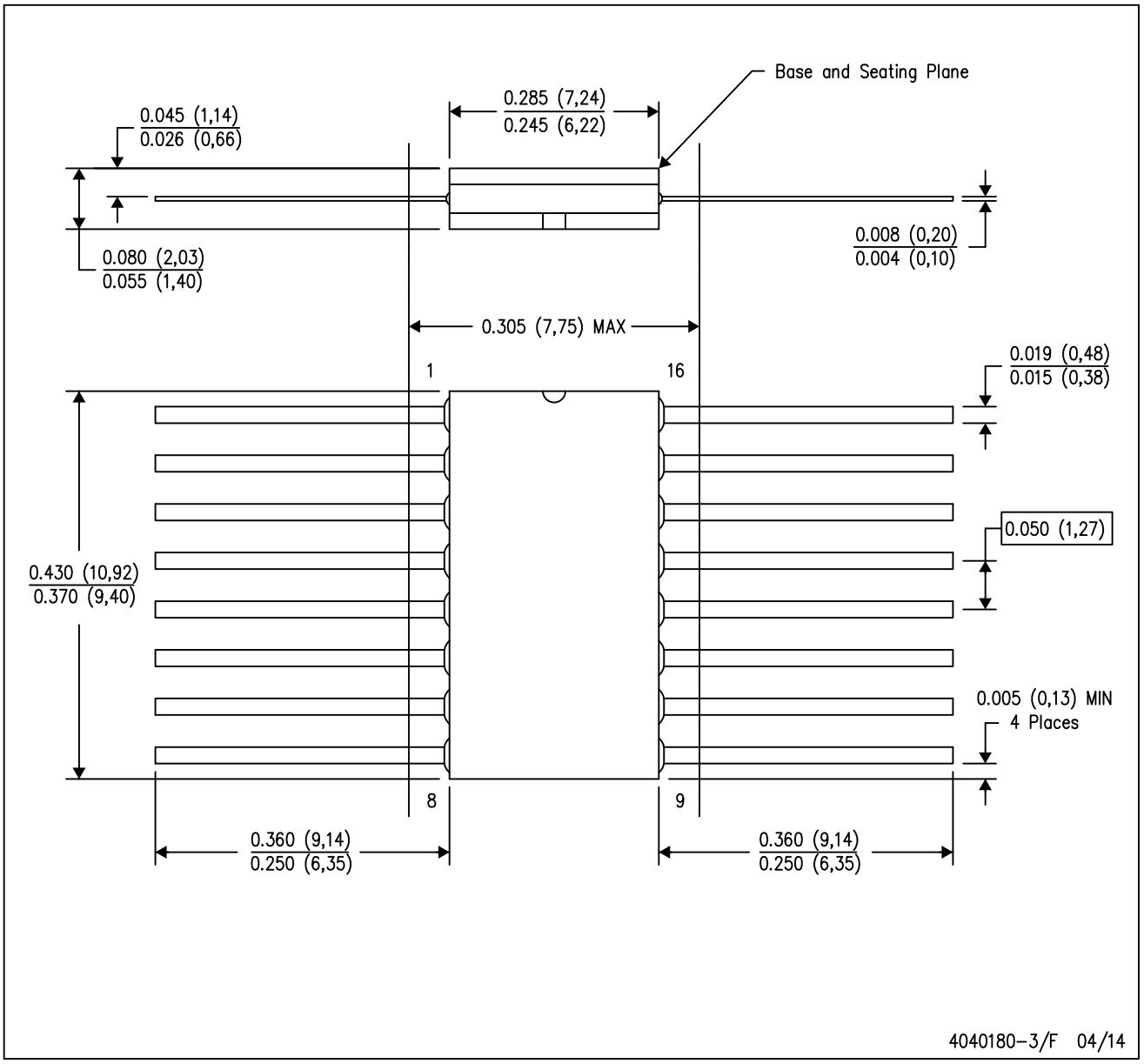
SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:7X

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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.

W (R–GDFP–F16) CERAMIC DUAL FLATPACK



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 only.
E. Falls within MIL STD 1835 GDFP2–F16

GENERIC PACKAGE VIEW

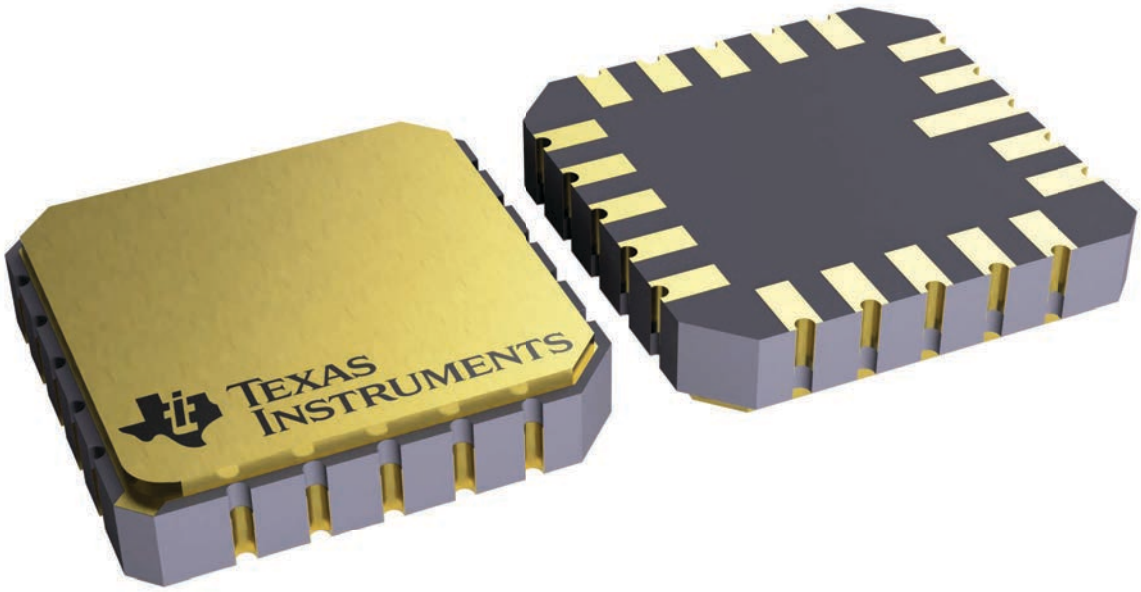
FK 20

LCCC - 2.03 mm max height

8.89 x 8.89, 1.27 mm pitch

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.

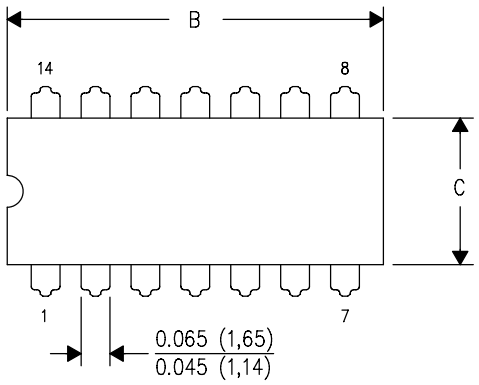


4229370VA\

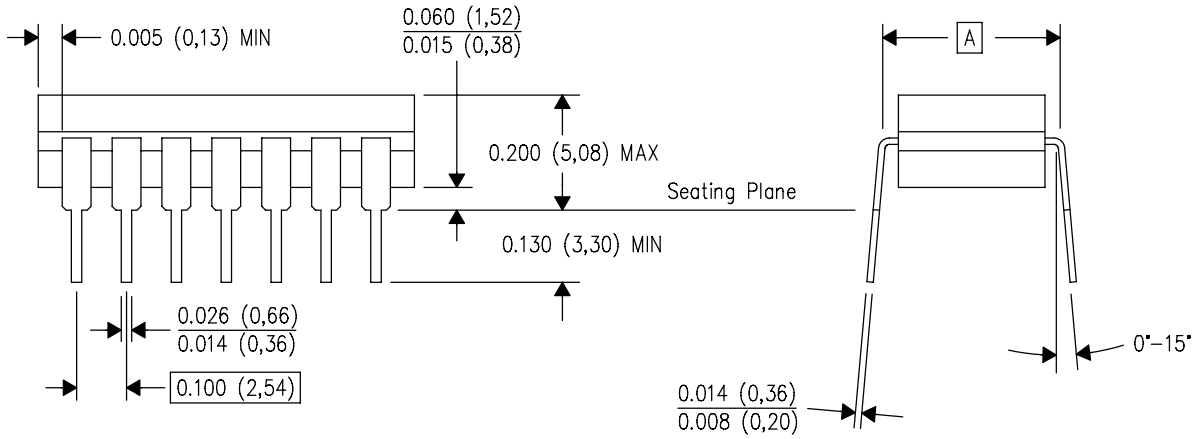
J (R–GDIP–T**)

14 LEADS SHOWN

CERAMIC DUAL IN–LINE PACKAGE



DIM \ PINS **	14	16	18	20
A	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC	0.300 (7,62) BSC
B MAX	0.785 (19,94)	.840 (21,34)	0.960 (24,38)	1.060 (26,92)
B MIN	—	—	—	—
C MAX	0.300 (7,62)	0.300 (7,62)	0.310 (7,87)	0.300 (7,62)
C MIN	0.245 (6,22)	0.245 (6,22)	0.220 (5,59)	0.245 (6,22)



4040083/F 03/03

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.

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