High Speed PWM Controller

FEATURES

- Compatible with Voltage or Current Mode Topologies
- Practical Operation Switching Frequencies to 1MHz
- 50ns Propagation Delay to Output
- High Current Dual Totem Pole Outputs (1.5A Peak)
- Wide Bandwidth Error Amplifier
- Fully Latched Logic with Double Pulse Suppression
- Pulse-by-Pulse Current Limiting
- Soft Start / Max. Duty Cycle Control
- Under-Voltage Lockout with Hysteresis
- Low Start Up Current (1.1mA)

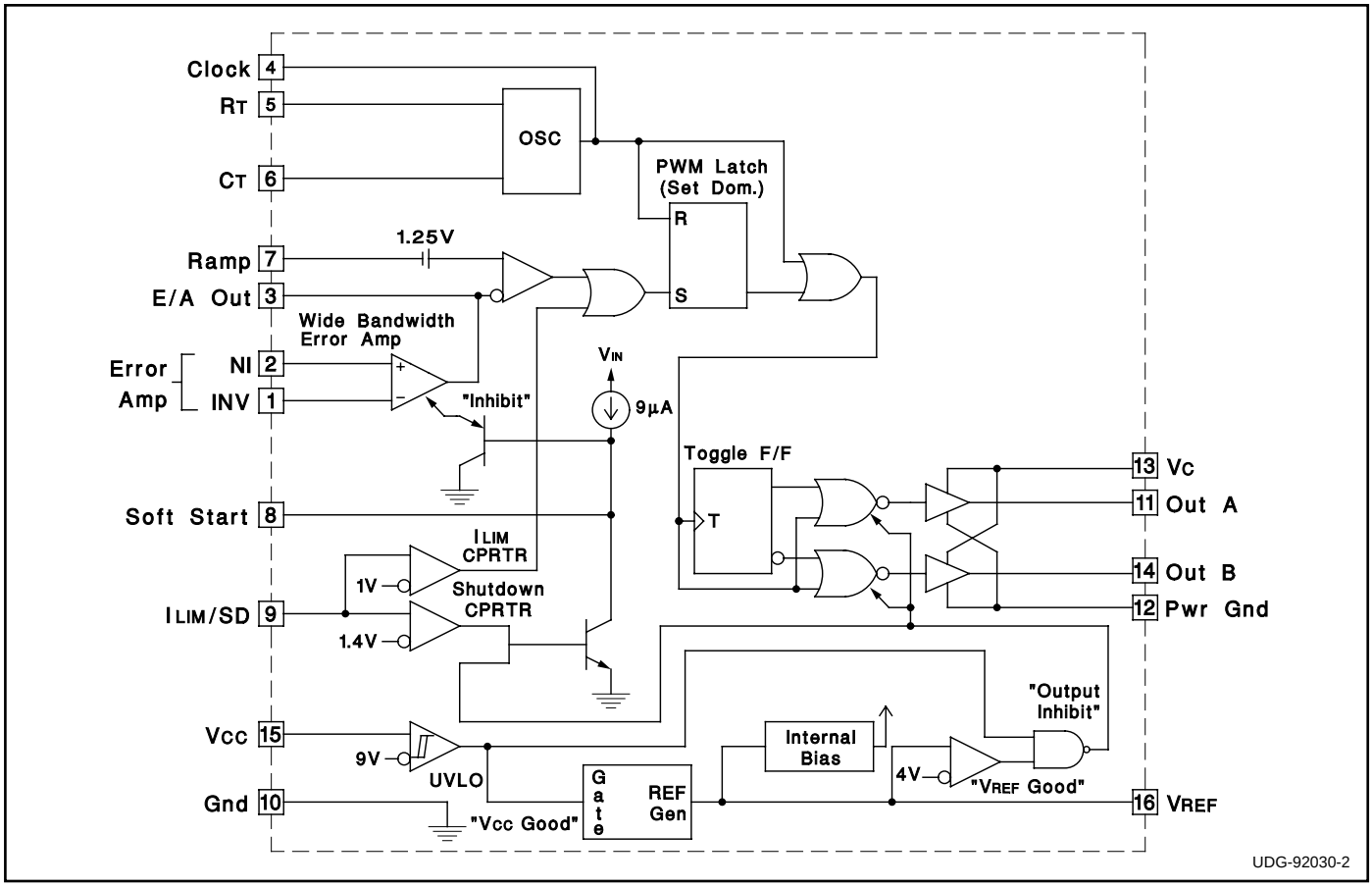
DESCRIPTION

The UC1825 family of PWM control ICs is optimized for high frequency switched mode power supply applications. Particular care was given to minimizing propagation delays through the comparators and logic circuitry while maximizing bandwidth and slew rate of the error amplifier. This controller is designed for use in either current-mode or voltage mode systems with the capability for input voltage feed-forward.

Protection circuitry includes a current limit comparator with a 1V threshold, a TTL compatible shutdown port, and a soft start pin which will double as a maximum duty cycle clamp. The logic is fully latched to provide jitter free operation and prohibit multiple pulses at an output. An under-voltage lockout section with 800mV of hysteresis assures low start up current. During under-voltage lockout, the outputs are high impedance.

These devices feature totem pole outputs designed to source and sink high peak currents from capacitive loads, such as the gate of a power MOSFET. The on state is designed as a high level.

BLOCK DIAGRAM



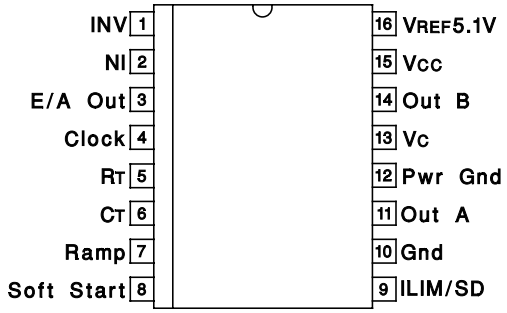
ABSOLUTE MAXIMUM RATINGS (Note 1)

Supply Voltage (Pins 13, 15) 30V
Output Current, Source or Sink (Pins 11, 14)
DC 0.5A
Pulse (0.5 s) 2.0A
Analog Inputs
(Pins 1, 2, 7) . . . . . -0.3V to 7V
(Pin 8, 9) . . . . . -0.3V to 6V
Clock Output Current (Pin 4) . . . . . -5mA
Error Amplifier Output Current (Pin 3) 5mA
Soft Start Sink Current (Pin 8) 20mA
Oscillator Charging Current (Pin 5) . . . . . -5mA
Power Dissipation 1W
Storage Temperature Range . . . . . -65°C to +150°C
Lead Temperature (Soldering, 10 seconds) . . . . . 300°C

Note 1: All voltages are with respect to GND (Pin 10); all currents are positive into, negative out of part; pin numbers refer to DIL-16 package.

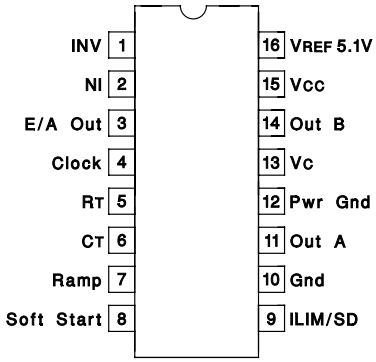
Note 3: Consult Unitrode Integrated Circuit Databook for thermal limitations and considerations of package.

SOIC-16 (Top View)
DW Package

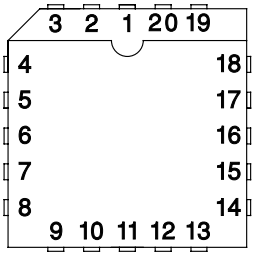


CONNECTION DIAGRAMS

DIL-16 (Top View)
J or N Package



PLCC-20 & LCC-20
(Top View)
Q & L Packages



PACKAGE PIN FUNCTION	
FUNCTION	PIN
N/C	1
INV	2
NI	3
E/A Out	4
Clock	5
N/C	6
RT	7
CT	8
Ramp	9
Soft Start	10
N/C	11
ILIM/SD	12
Gnd	13
Out A	14
Pwr Gnd	15
N/C	16
VC	17
Out B	18
VCC	19
VREF 5.1V	20

THERMAL RATINGS TABLE

Package	Θ_{JA}	Θ_{JC}
DIL-16J	80-120	28(2)
DIL-16N	90(1)	45
PLCC-20	43-75(1)	34
LCC-20	70-80	20(2)
SOIC-16	50-120(1)	35

(1) Specified Θ_{JA} (junction to ambient) is for devices mounted to 5in^2 FR4 PC board with one ounce copper where noted. When resistance range is given, lower values are for 5in^2 aluminum PC board. Test PWB was 0.062in thick and typically used 0.635mm trace widths for power packages and 1.3mm trace widths for non-power packages with 100 x 100 mil probe land area at the end of each trace.

(2) Θ_{JC} data values stated were derived from MIL-STD-1835B. MIL-STD-1835B states that the baseline values shown are worst case (mean +2s) for a 60 x 60mil microcircuit device silicon die and applicable for devices with die sizes up to 14400 square mils. For device die sizes greater than 14400 square mils use the following values; dual-in-line, 11°C/W; flat pack 10°C/W; pin grid array, 10°C/W.

ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications apply for , R_T = 3.65k, C_T = 1nF, V_{CC} = 15V, -55°C<T_A<125°C for the UC1825, –40°C<T_A<85°C for the UC2825, and 0°C<T_A<70°C for the UC3825, T_A=T_O.

PARAMETERS	TEST CONDITIONS	UC1825 UC2825			UC3825			
		MIN	TOP	MAX	MIN	TOP	MAX	UNITS
Reference Section								
Output Voltage	T_O = 25°C, I_O = 1mA	5.05	5.10	5.15	5.00	5.10	5.20	V
Line Regulation	10V < V_{CC} < 30V		2	20		2	20	mV
Load Regulation	1mA < I_O < 10mA		5	20		5	20	mV
Temperature Stability*	T_{MIN} < T_A < T_{MAX}		0.2	0.4		0.2	0.4	mV/°C
Total Output Variation*	Line, Load, Temperature	5.00		5.20	4.95		5.25	V
Output Noise Voltage*	10Hz < f < 10kHz		50			50		µV
Long Term Stability*	T_J = 125°C, 1000hrs.		5	25		5	25	mV
Short Circuit Current	V_{REF} = 0V	-15	-50	-100	-15	-50	-100	mA
Oscillator Section								
Initial Accuracy*	T_J = 2°C	360	400	440	360	400	440	kHz
Voltage Stability*	10V < V_{CC} < 30V		0.2	2		0.2	2	%
Temperature Stability*	T_{MIN} < T_A < T_{MAX}		5			5		%
Total Variation*	Line, Temperature	340		460	340		460	kHz
Oscillator Section (cont.)								
Clock Out High		3.9	4.5		3.9	4.5		V
Clock Out Low			2.3	2.9		2.3	2.9	V
Ramp Peak*		2.6	2.8	3.0	2.6	2.8	3.0	V
Ramp Valley*		0.7	1.0	1.25	0.7	1.0	1.25	V
Ramp Valley to Peak*		1.6	1.8	2.0	1.6	1.8	2.0	V
Error Amplifier Section								
Input Offset Voltage				10			15	mV
Input Bias Current			0.6	3		0.6	3	µA
Input Offset Current			0.1	1		0.1	1	µA
Open Loop Gain	1V < V_O < 4V	60	95		60	95		dB
CMRR	1.5V < V_{CM} < 5.5V	75	95		75	95		dB
PSRR	10V < V_{CC} < 30V	85	110		85	110		dB
Output Sink Current	$V_{PIN\ 3}$ = 1V	1	2.5		1	2.5		mA
Output Source Current	$V_{PIN\ 3}$ = 4V	-0.5	-1.3		-0.5	-1.3		mA
Output High Voltage	$I_{PIN\ 3}$ = -0.5mA	4.0	4.7	5.0	4.0	4.7	5.0	V
Output Low Voltage	$I_{PIN\ 3}$ = 1mA	0	0 .5	1.0	0	0.5	1.0	V
Unity Gain Bandwidth*		3	5.5		3	5.5		MHz
Slew Rate*		6	12		6	12		V/µs

ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications apply for , R_T = 3.65k, C_T = 1nF, V_{CC} = 15V, -55°C<T_A<125°C for the UC1825, –40°C<T_A<85°C for the UC2825, and 0°C<T_A<70°C for the UC3825, T_A=T_J.

PARAMETERS	TEST CONDITIONS	UC1825 UC2825			UC3825			UNITS
		MIN	TOP	MAX	MIN	TOP	MAX	
PWM Comparator Section								
Pin 7 Bias Current	$V_{PIN\ 7}$ = 0V		-1	-5		-1	-5	µA
Duty Cycle Range		0		80	0		85	%
Pin 3 Zero DC Threshold	$V_{PIN\ 7}$ = 0V	1.1	1.25		1.1	1.25		V
Delay to Output*			50	80		50	80	ns
Soft-Start Section								
Charge Current	$V_{PIN\ 8}$ = 0.5V	3	9	20	3	9	20	µA
Discharge Current	$V_{PIN\ 8}$ = 1V	1			1			mA
Current Limit / Shutdown Section								
Pin 9 Bias Current	0 < $V_{PIN\ 9}$ < 4V			15			10	µA
Current Limit Threshold		0.9	1.0	1.1	0.9	1.0	1.1	V
Shutdown Threshold		1.25	1.40	1.55	1.25	1.40	1.55	V
Delay to Output			50	80		50	80	ns
Output Section								
Output Low Level	I_{OUT} = 20mA		0.25	0.40		0.25	0.40	V
	I_{OUT} = 200mA		1.2	2.2		1.2	2.2	V
Output High Level	I_{OUT} = -20mA	13.0	13.5		13.0	13.5		V
	I_{OUT} = -200mA	12.0	13.0		12.0	13.0		V
Collector Leakage	V_C = 30V		100	500		10	500	µA
Rise/Fall Time*	CL = 1nF		30	60		30	60	ns
Under-Voltage Lockout Section								
Start Threshold		8.8	9.2	9.6	8.8	9.2	9.6	V
UVLO Hysteresis		0.4	0.8	1.2	0.4	0.8	1.2	V
Supply Current Section								
Start Up Current	V_{CC} = 8V		1.1	2.5		1.1	2.5	mA
ICC	$V_{PIN\ 1}$, $V_{PIN\ 7}$, $V_{PIN\ 9}$ = 0V; $V_{PIN\ 2}$ = 1V		22	33		22	33	mA

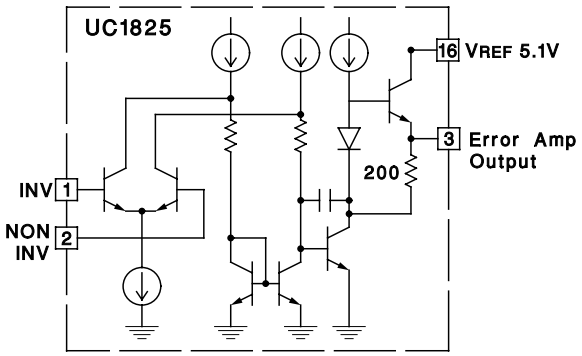
* This parameter not 100% tested in production but guaranteed by design.

Printed Circuit Board Layout Considerations

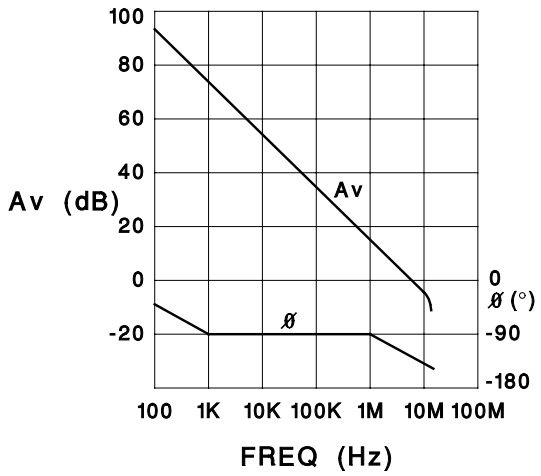
High speed circuits demand careful attention to layout and component placement. To assure proper performance of the UC1825 follow these rules: 1) Use a ground plane. 2) Damp or clamp parasitic inductive kick energy from the gate of driven MOSFETs. Do not allow the output pins to ring below ground. A series gate resistor or a shunt 1 Amp Schottky diode at the output pin will serve this purpose. 3) Bypass V_{CC}, V_C, and V_{REF}. Use 0.1µF monolithic ceramic capacitors with low equivalent series inductance. Allow less than 1 cm of total lead length for each capacitor between the bypassed pin and the ground plane. 4) Treat the timing capacitor, CT, like a bypass capacitor.

Error Amplifier Circuit

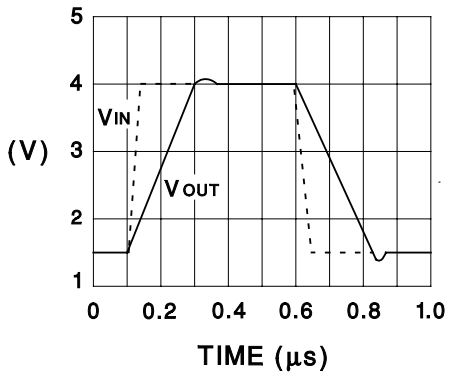
Simplified Schematic



Open Loop Frequency Response

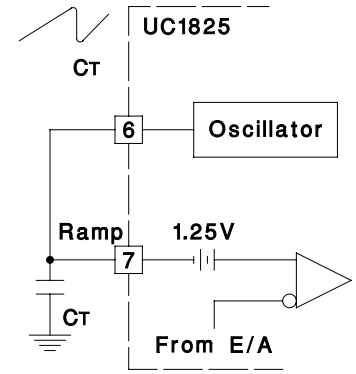


Unity Gain Slew Rate

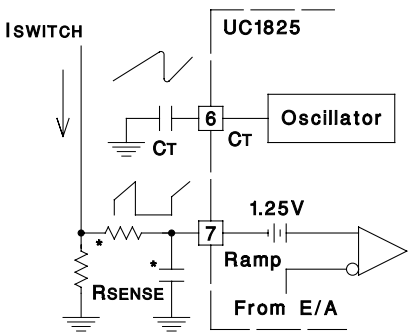


PWM Applications

Conventional (Voltage Mode)

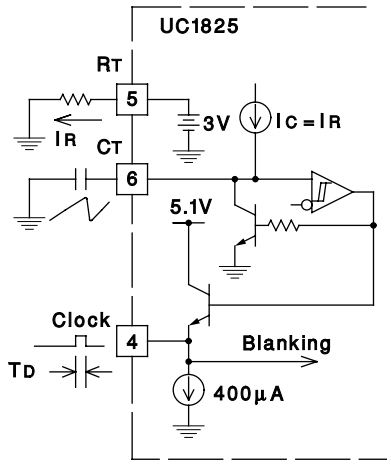


Current-Mode

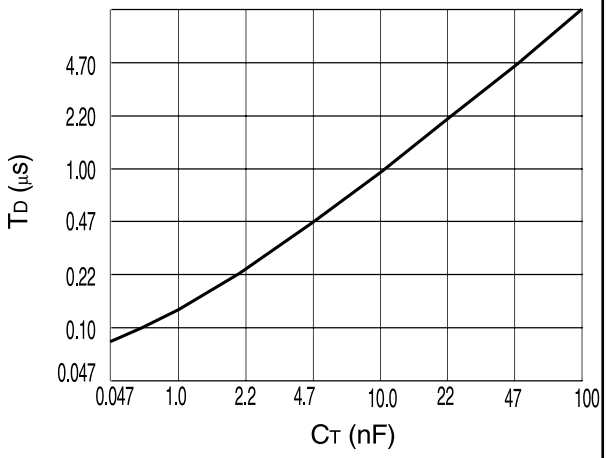


* A small filter may be required to suppress switch noise.

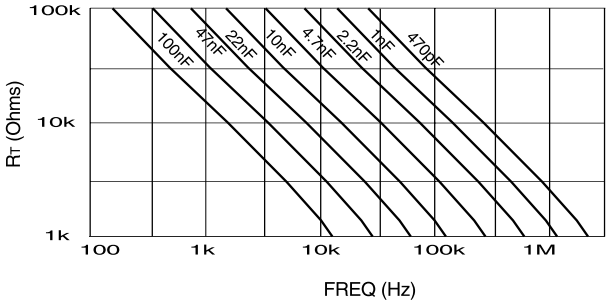
Oscillator Circuit



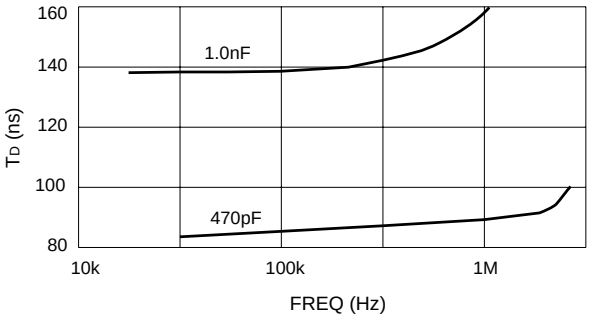
Deadtime vs C_T (3k R_T 100k)



Timing Resistance vs Frequency

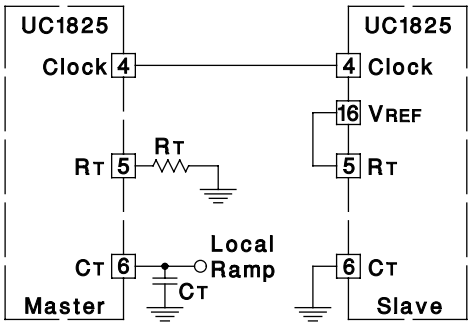


Deadtime vs Frequency

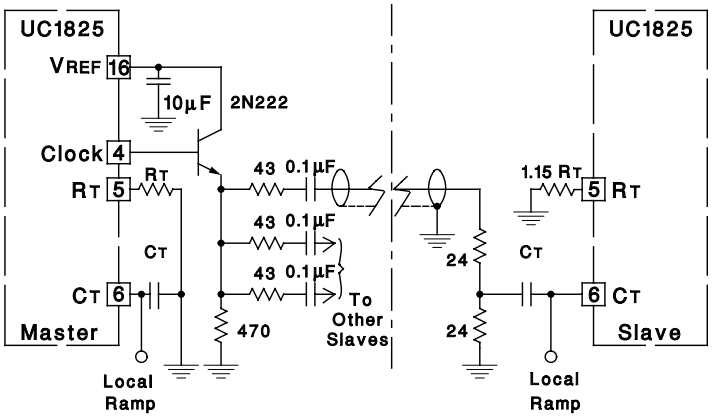


Synchronized Operation

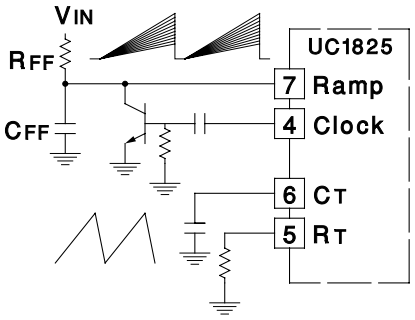
Two Units in Close Proximity



Generalized Synchronization

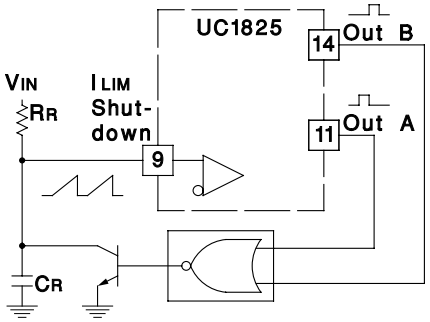


Forward Technique for Off-Line Voltage Mode Application



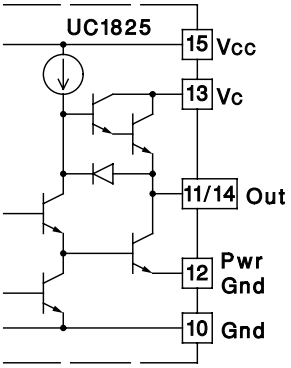
Constant Volt-Second Clamp Circuit

The circuit shown here will achieve a constant volt-second product clamp over varying input voltages. The ramp generator components, RT and CR are chosen so that the ramp at Pin 9 crosses the 1V threshold at the same time the desired maximum volt-second product is reached. The delay through the functional nor block must be such that the ramp capacitor can be completely discharged during the minimum deadtime.

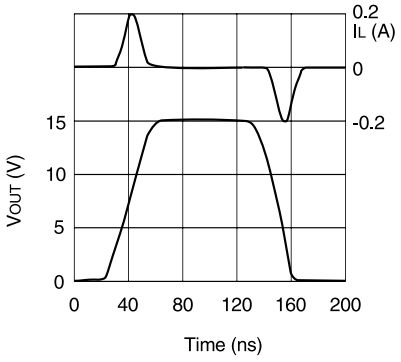


Output Section

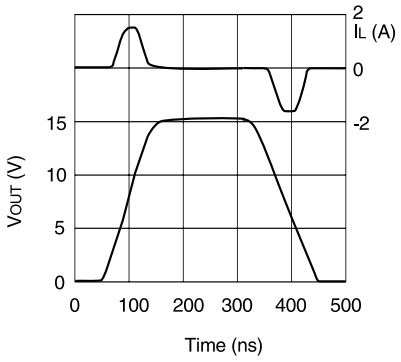
Simplified Schematic



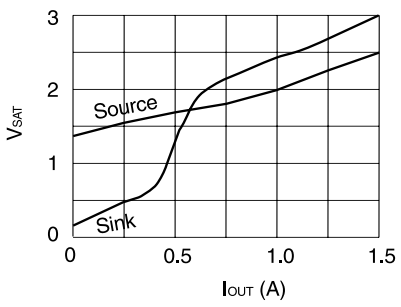
Rise/Fall Time (CL=1nF)



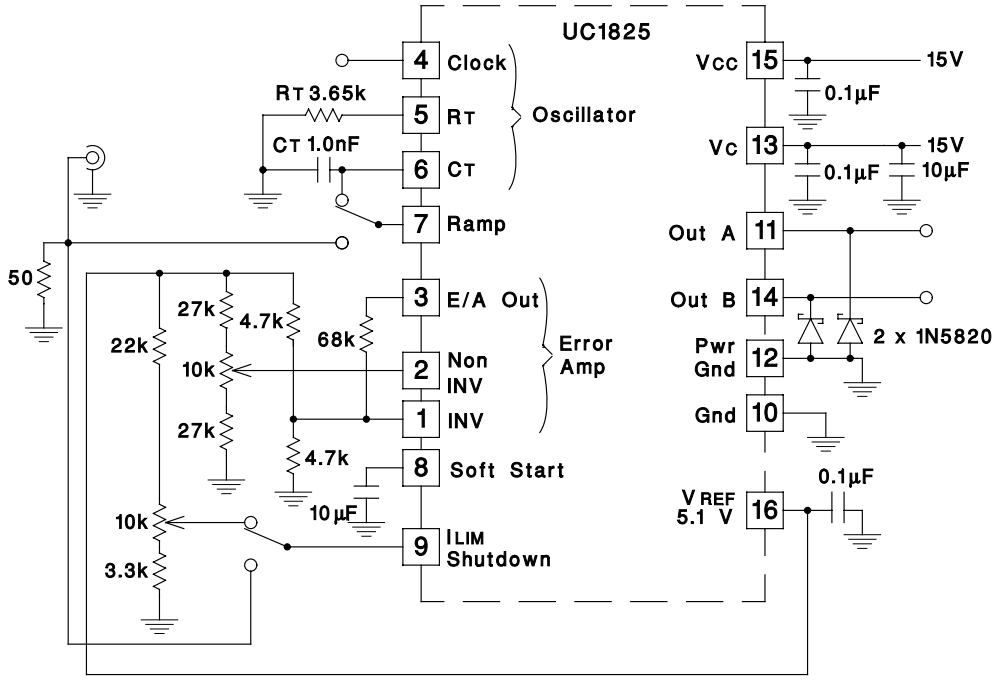
Rise/Fall Time (CL=10nF)



Saturation Curves



Open Loop Laboratory Test Fixture

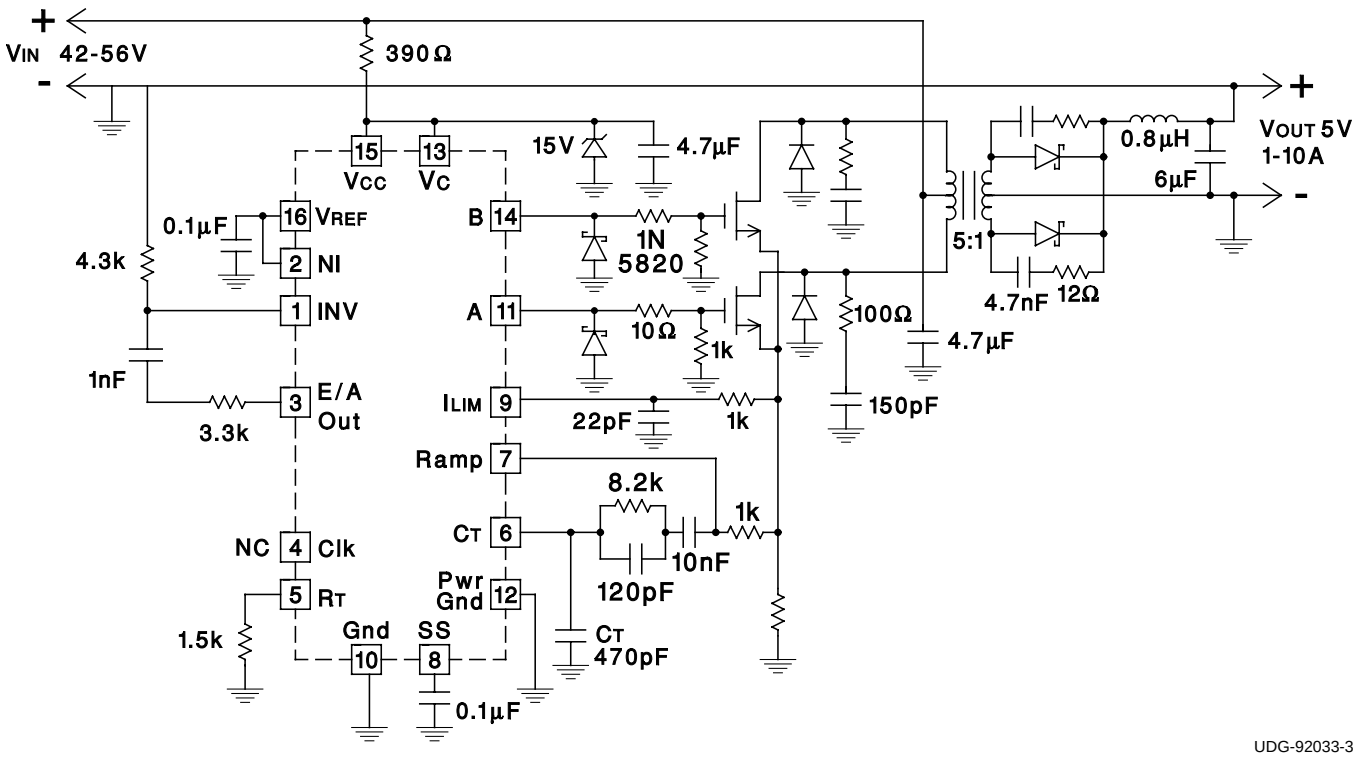


UDG-92032-2

This test fixture is useful for exercising many of the UC1825's functions and measuring their specifications.

As with any wideband circuit, careful grounding and bypass procedures should be followed. The use of a ground plane is highly recommended.

Design Example: 50W, 48V to 5V DC to DC Converter - 1.5MHz Clock Frequency



UDG-92033-3

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)
5962-87681012A	NRND	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-87681012A UC1825L/ 883B
5962-8768101EA	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8768101EA UC1825J/883B
5962-8768101QFA	Active	Production	CFP (W) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8768101QFA UC1825W/883B
UC1825J	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1825J
UC1825J.A	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1825J
UC1825J883B	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8768101EA UC1825J/883B
UC1825J883B.A	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8768101EA UC1825J/883B
UC1825L	NRND	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1825L
UC1825L.A	NRND	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	UC1825L
UC1825L883B	NRND	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-87681012A UC1825L/ 883B
UC1825L883B.A	NRND	Production	LCCC (FK) | 20	55 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-87681012A UC1825L/ 883B
UC1825W883B	Active	Production	CFP (W) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8768101QFA UC1825W/883B
UC1825W883B.A	Active	Production	CFP (W) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-55 to 125	5962-8768101QFA UC1825W/883B
UC2825DW	NRND	Production	SOIC (DW) | 16	40 | TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2825DW
UC2825DW.A	NRND	Production	SOIC (DW) | 16	40 | TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2825DW
UC2825DWG4	NRND	Production	SOIC (DW) | 16	40 | TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2825DW

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)
UC2825DWTR	NRND	Production	SOIC (DW) | 16	2000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2825DW
UC2825DWTR.A	NRND	Production	SOIC (DW) | 16	2000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	UC2825DW
UC2825J	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-40 to 85	UC2825J
UC2825J.A	NRND	Production	CDIP (J) | 16	25 | TUBE	No	SNPB	N/A for Pkg Type	-40 to 85	UC2825J
UC2825N	NRND	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	UC2825N
UC2825N.A	NRND	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	UC2825N
UC2825NG4	NRND	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	UC2825N
UC3825DW	NRND	Production	SOIC (DW) | 16	40 | TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3825DW
UC3825DW.A	NRND	Production	SOIC (DW) | 16	40 | TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3825DW
UC3825DWG4	NRND	Production	SOIC (DW) | 16	40 | TUBE	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3825DW
UC3825DWTR	NRND	Production	SOIC (DW) | 16	2000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3825DW
UC3825DWTR.A	NRND	Production	SOIC (DW) | 16	2000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	0 to 70	UC3825DW
UC3825N	NRND	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	UC3825N
UC3825N.A	NRND	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	UC3825N
UC3825NG4	NRND	Production	PDIP (N) | 16	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	0 to 70	UC3825N

(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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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 UC1825, UC2825, UC2825M, UC3825 :

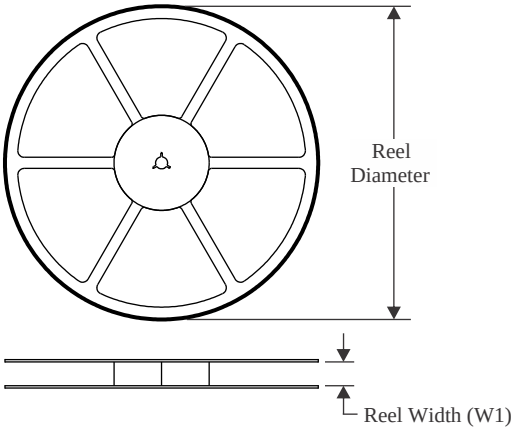
- Catalog : UC3825, UC2825
- Military : UC2825M, UC1825
- Space : UC1825-SP

NOTE: Qualified Version Definitions:

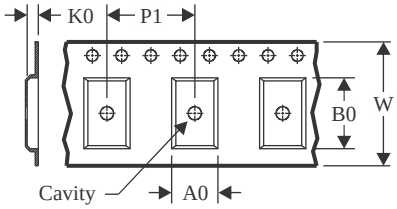
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

TAPE AND REEL INFORMATION

REEL DIMENSIONS

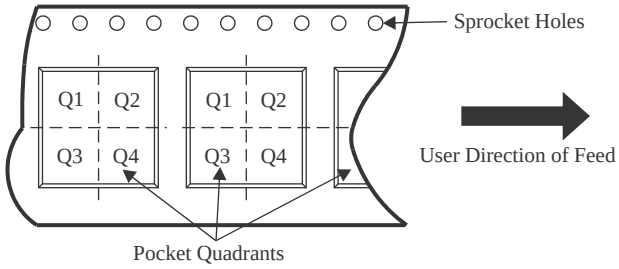


TAPE DIMENSIONS



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

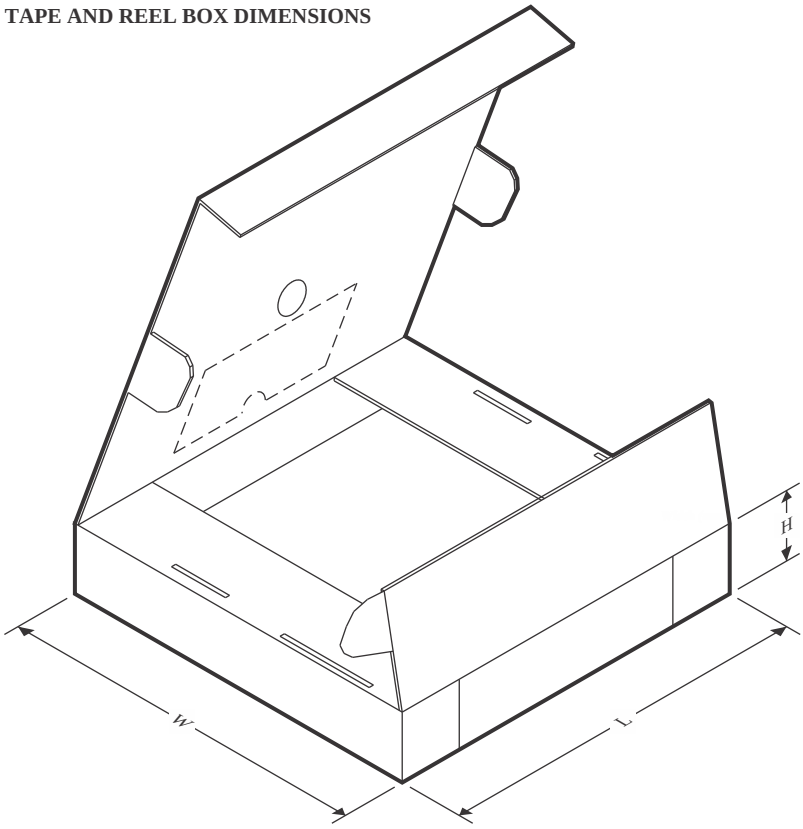
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	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
UC2825DWTR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1
UC3825DWTR	SOIC	DW	16	2000	330.0	16.4	10.75	10.7	2.7	12.0	16.0	Q1

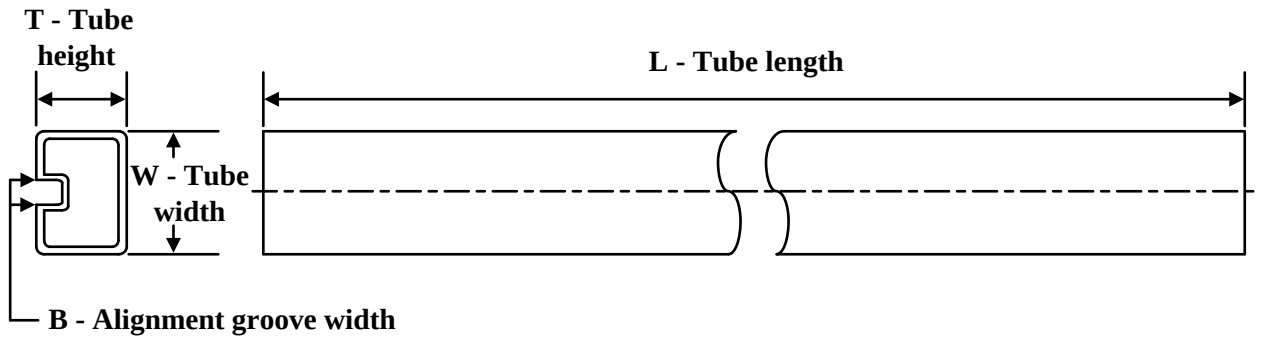
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
UC2825DWTR	SOIC	DW	16	2000	353.0	353.0	32.0
UC3825DWTR	SOIC	DW	16	2000	353.0	353.0	32.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-8768101QFA	W	CFP	16	25	506.98	26.16	6220	NA
UC1825L	FK	LCCC	20	55	506.98	12.06	2030	NA
UC1825L.A	FK	LCCC	20	55	506.98	12.06	2030	NA
UC1825W883B	W	CFP	16	25	506.98	26.16	6220	NA
UC1825W883B.A	W	CFP	16	25	506.98	26.16	6220	NA
UC2825DW	DW	SOIC	16	40	507	12.83	5080	6.6
UC2825DW.A	DW	SOIC	16	40	507	12.83	5080	6.6
UC2825DWG4	DW	SOIC	16	40	507	12.83	5080	6.6
UC2825N	N	PDIP	16	25	506	13.97	11230	4.32
UC2825N.A	N	PDIP	16	25	506	13.97	11230	4.32
UC2825NG4	N	PDIP	16	25	506	13.97	11230	4.32
UC3825DW	DW	SOIC	16	40	507	12.83	5080	6.6
UC3825DW.A	DW	SOIC	16	40	507	12.83	5080	6.6
UC3825DWG4	DW	SOIC	16	40	507	12.83	5080	6.6
UC3825N	N	PDIP	16	25	506	13.97	11230	4.32
UC3825N.A	N	PDIP	16	25	506	13.97	11230	4.32
UC3825NG4	N	PDIP	16	25	506	13.97	11230	4.32

GENERIC PACKAGE VIEW

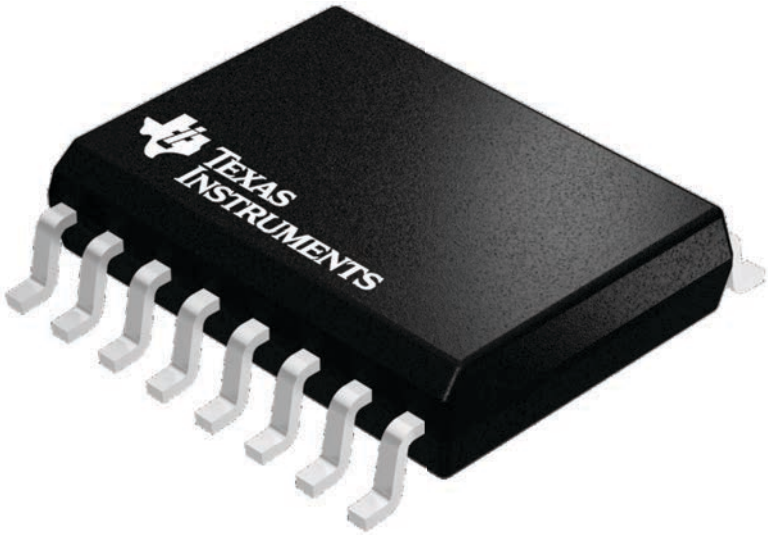
DW 16

SOIC - 2.65 mm max height

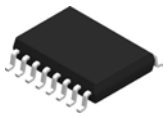
7.5 x 10.3, 1.27 mm pitch

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

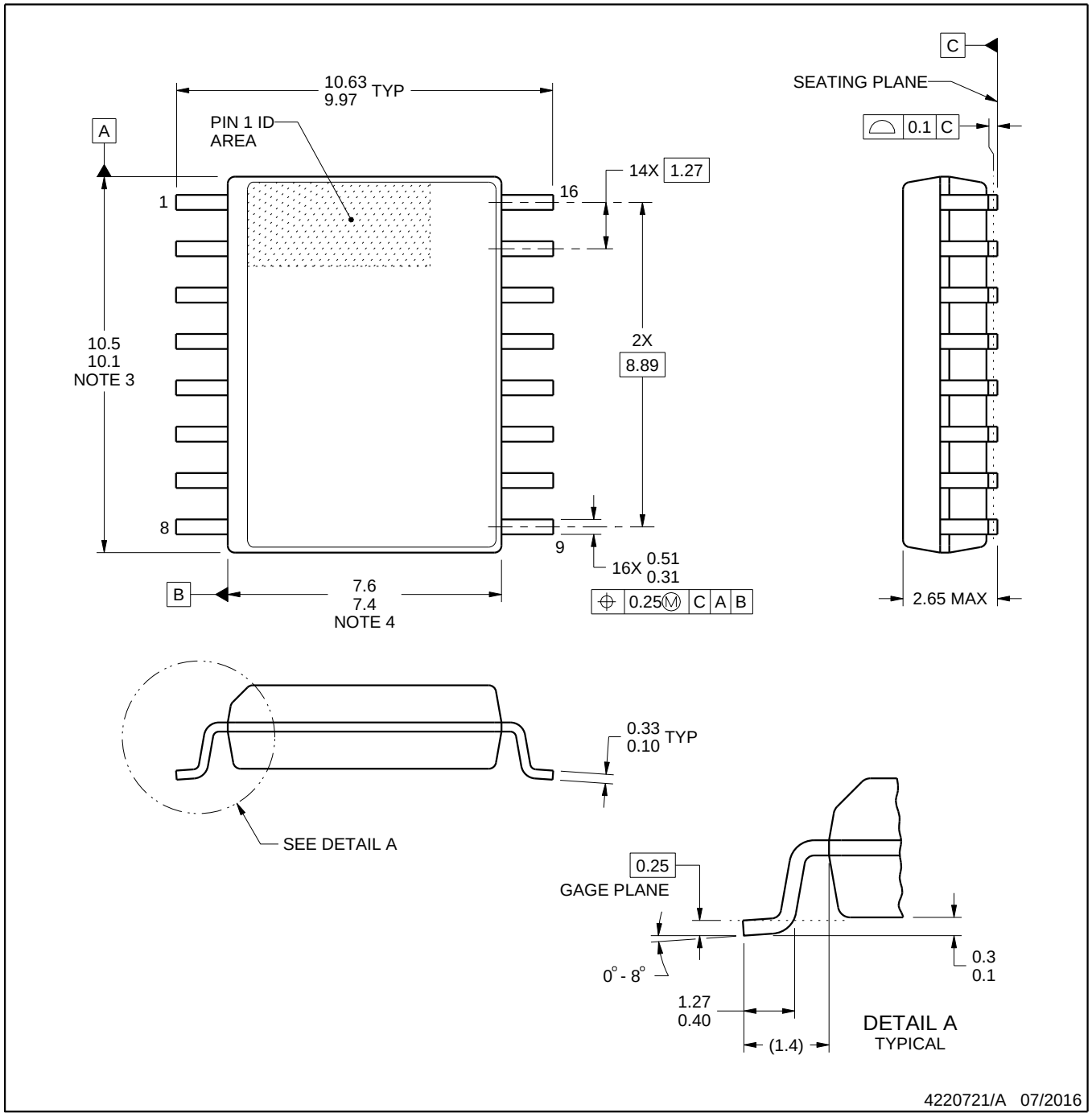


PACKAGE OUTLINE

DW0016A

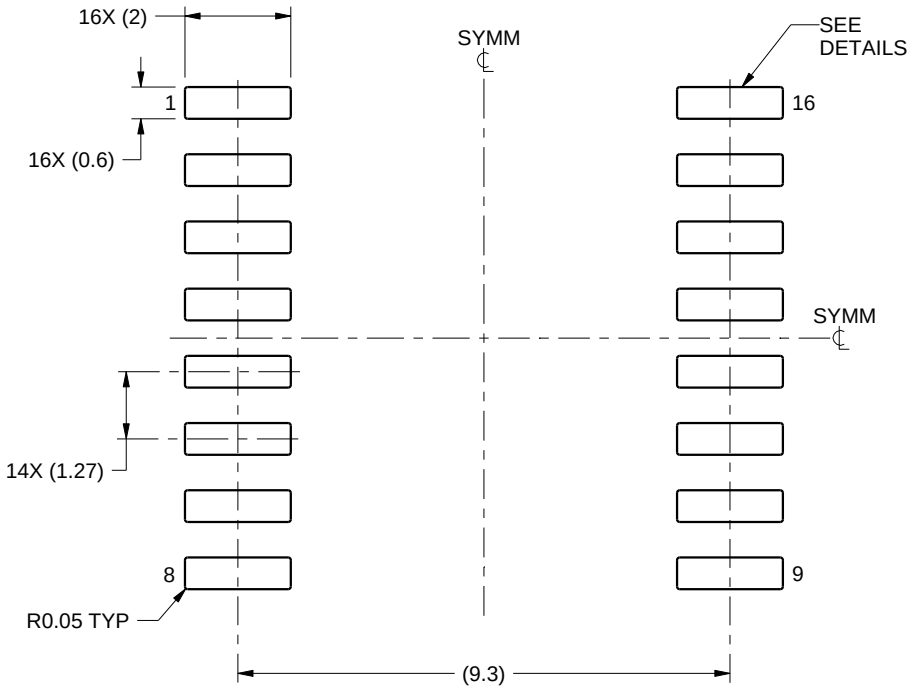
SOIC - 2.65 mm max height

SOIC

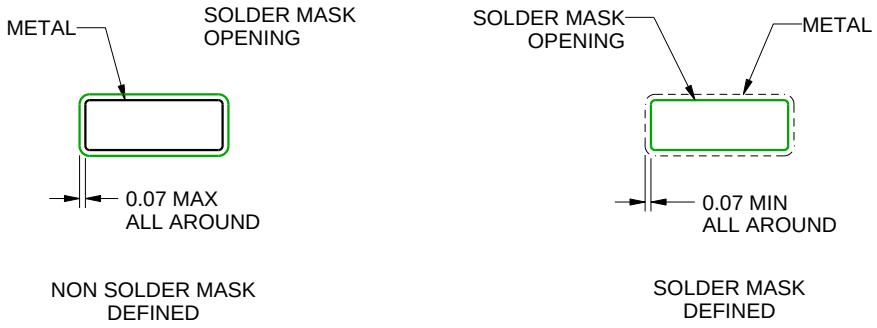


NOTES:

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

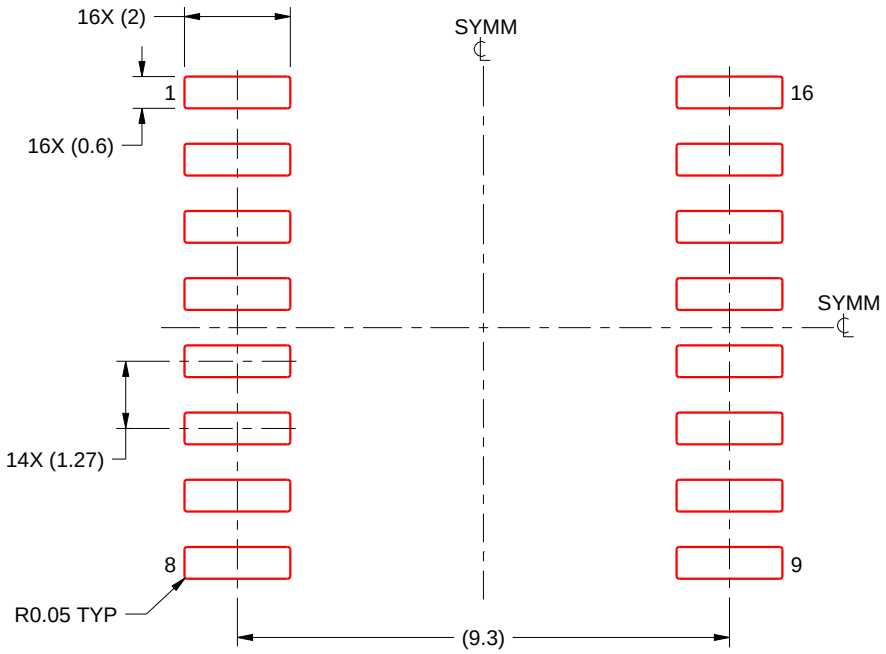


SOLDER MASK DETAILS

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.



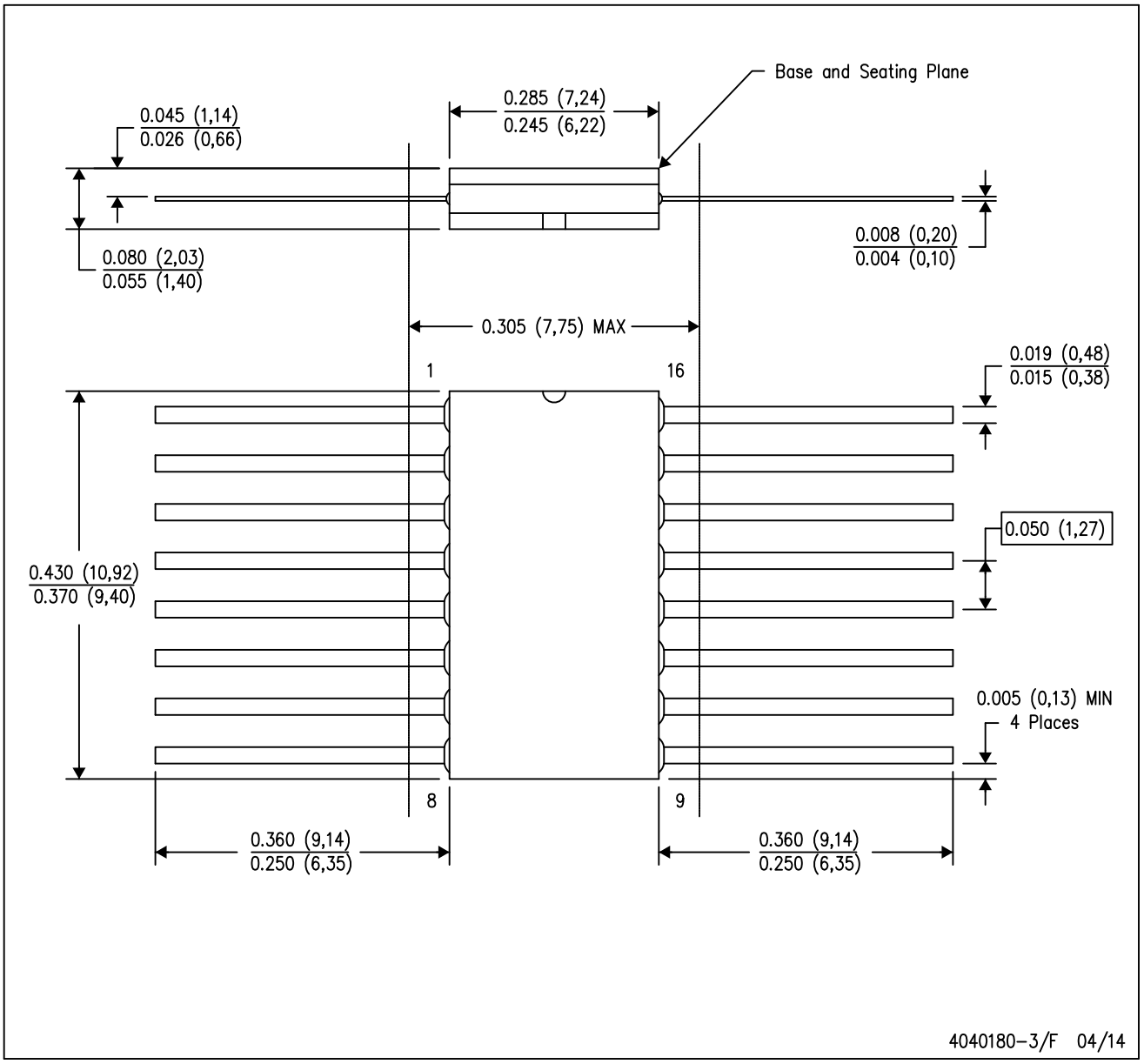
SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:7X

4220721/A 07/2016

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

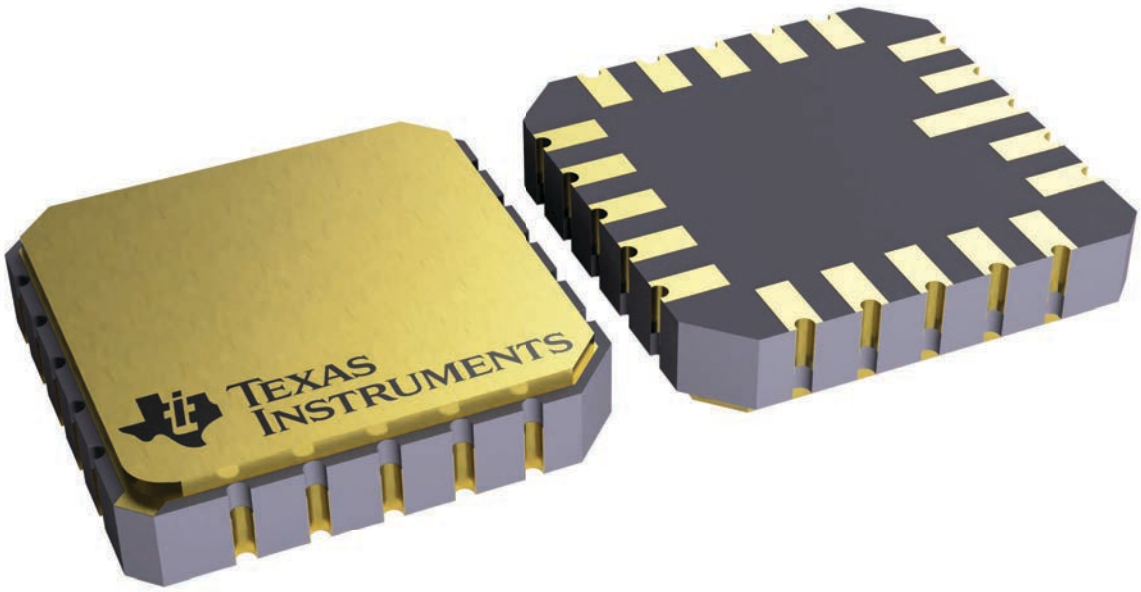
FK 20

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.

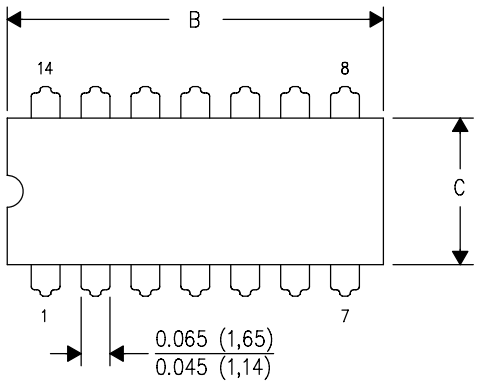


4229370VA\

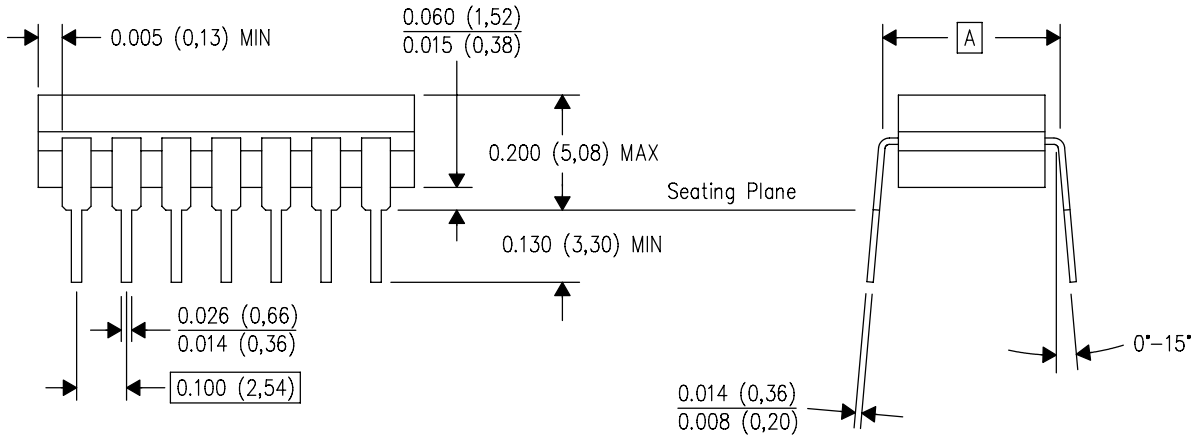
J (R–GDIP–T**)

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)



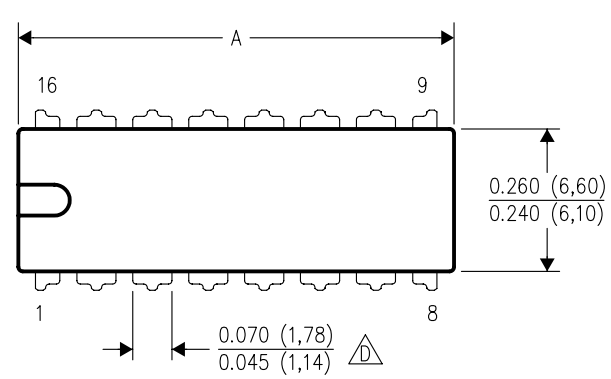
4040083/F 03/03

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.

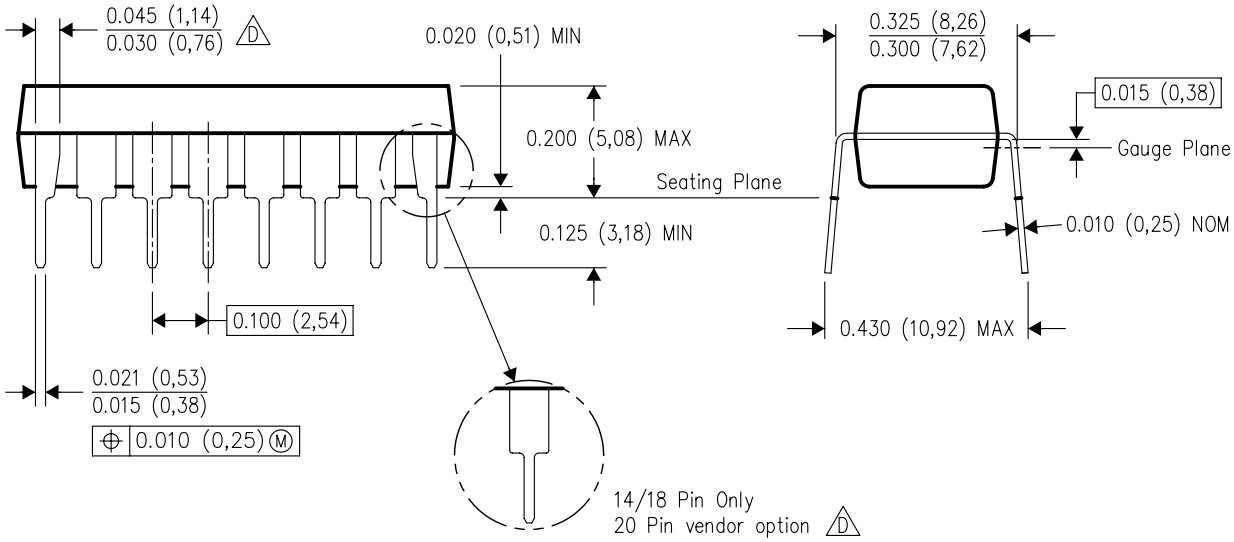
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

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