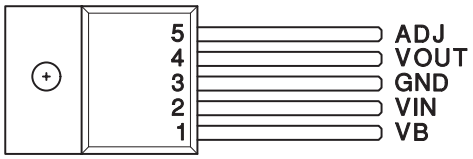
UC285-1, UC285-2, UC285-3, UC285-ADJ, UC385-1, UC385-2, UC385-3, UC385-ADJ
FAST TRANSIENT RESPONSE 5-A LOW-DROPOUT REGULATOR

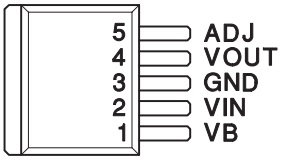
SLUS212F − NOVEMBER 1999 − REVISED MAY 2009

- **Fast Transient Response**
- **10-mA to 5-A Load Current**
- **Short Circuit Protection**
- **Maximum Dropout of 500-mV at 5-A Load Current**
- **Separate Bias (VB) and VIN Pins**
- **Available in Adjustable or Fixed Output Voltages**
- **5-Pin Package Allows Kelvin Sensing of Load Voltage**
- **Reverse Current Protection**

5-PIN TO-220
T PACKAGE (TOP VIEW)



5-PIN TO-263
TD PACKAGE
(TOP VIEW)



Note: Tab = Ground

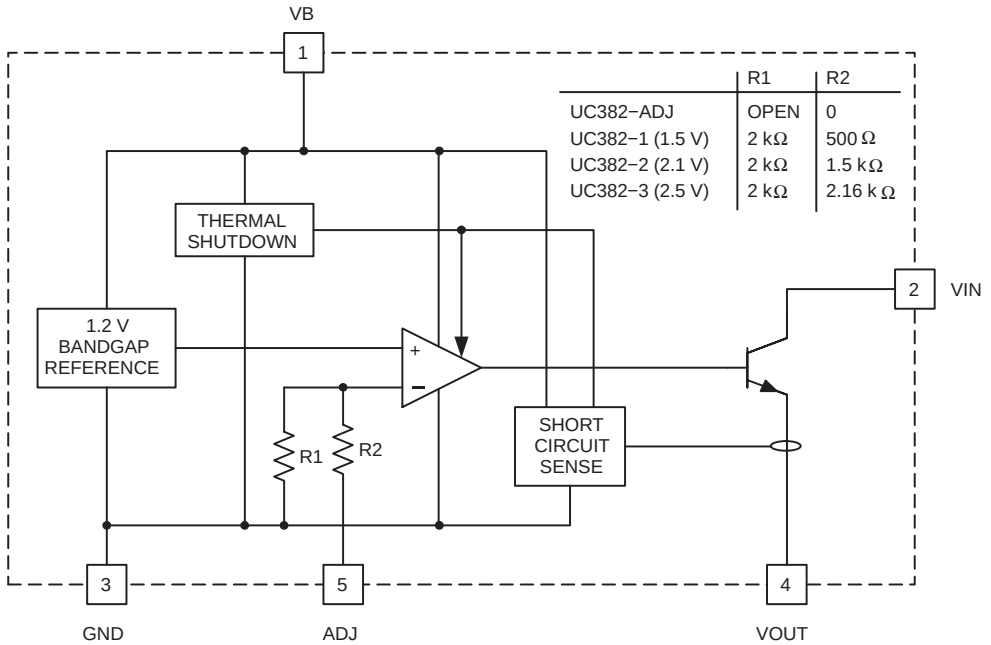
description

The UC385 is a low dropout linear regulator providing a quick response to fast load changes. Combined with its precision onboard reference, the UC385 excels at driving GTL and BTL buses. Due to its fast response to load transients, the total capacitance required to decouple the regulator's output can be significantly decreased when compared to standard LDO linear regulators.

Dropout voltage (VIN to VOUT) is only 490 mV maximum and 350 mV typical at 5-A load (0°C to 100°C).

The onboard bandgap reference is stable with temperature and scaled for a 1.2 V input to the internal power amplifier. The UC385 is available in fixed output voltages of 1.5 V, 2.1 V, or 2.5 V. The output voltage of the adjustable version can be set with two external resistors. If the external resistors are omitted, the output voltage defaults to 1.2 V.

block diagram



UDG-00084

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

VB . . . . . 13 V
VIN . . . . . 7.5 V
Output voltage . . . . . 1.2 V to −6.0 V
Storage temperature . . . . . −65°C to 150°C
Junction temperature . . . . . −55°C to 150°C
Lead temperature (soldering, 10 seconds) . . . . . 300°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.

AVAILABLE OPTIONS(1)

T_J	PACKAGED DEVICES							
	TO-220 (T)				TO−263 (TD)(2)			
	OUTPUT VOLTAGE				OUTPUT VOLTAGE			
	1.5 V	2.1 V	2.5 V	1.2 V or ADJ	1.5 V	2.1 V	2.5 V	1.2 V or ADJ
–40°C to 100°C	285T-1	285T-2	285T-3	285T-ADJ	285TD-1	285TD-2	285TD-3	285TD-ADJ
0°C to 100°C	385T-1	385T-2	385T-3	385T-ADJ	385TD-1	385TD-2	385TD-3	385TD-ADJ

1. For more package and ordering information, see the Package Option Addendum located at the end of this data sheet.
2. For 50 piece reel, add KTTT (e.g., UC285TDKTTT−1); for 500 piece reel, add TR (e.g., UC285TDTR−1).

electrical characteristics unless otherwise stated, these parameters apply for T_A = −40°C to 100°C for the UC285-x series and 0°C to 100°C for the UC385-x, VB = 5 V; VIN = 3.3 V, VOUT = 2.5 V, $T_A = T_J$.

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
UC385-3 Fixed 2.5 V, 5-A Family						
Output voltage	UC385-3	I_{VOUT} = 100 mA	2.475	2.5	2.525	V
	UC285-3	I_{VOUT} = 100 mA	2.45	2.5	2.525	V
Load regulation		I_{VOUT} = 10 mA to 5 A		0.5	4	mV
VIN PSRR			80	110		dB
VB PSRR			50	65		dB
VIN dropout voltage (VIN - VOUT)		I_{VOUT} = 5 A, T_J = 25°C		350	425	mV
	UC385-3	I_{VOUT} = 5 A		350	490	mV
	UC285-3	I_{VOUT} = 5 A		350	500	mV
VB dropout (VB - VOUT)	UC385-3	I_{VOUT} = 5 A		1.8	2.1	V
	UC285-3	I_{VOUT} = 5 A		1.8	2.2	V
Short circuit current limit			5.1		7.5	A
VB current		I_{VOUT} = 10 mA		8	15	mA
		I_{VOUT} = 5 A		40	100	mA
VIN current		I_{VOUT} = 5 A	4.9	4.96		A
UC385-2 Fixed 2.1 V, 5-A Family						
Output voltage	UC385-2	I_{VOUT} = 100 mA	2.079	2.1	2.121	V
	UC285-2	I_{VOUT} = 100 mA	2.058	2.1	2.121	V
Load regulation		I_{VOUT} = 10 mA to 5 A		0.5	4	mV
VIN PSRR			80	110		dB
VB PSRR			50	67		dB

electrical characteristics unless otherwise stated, these parameters apply for T_A = −40°C to 100°C for the UC285-x series and 0°C to 100°C for the UC385-x, VB = 5 V; VIN = 3.3 V, VOUT = 2.5 V, $T_A = T_J$.

PARAMETER		TEST CONDITION	MIN	TYP	MAX	UNIT
UC385−2 Fixed 2.1 V, 5-A Family (continued)						
VIN dropout voltage (VIN - VOUT)		I_{VOUT} = 5 A, T_J = 25°C		350	425	mV
	UC385-2	I_{VOUT} = 5 A		350	490	mV
	UC285-2	I_{VOUT} = 5 A		350	500	mV
VB dropout (VB - VOUT)	UC385-2	I_{VOUT} = 5 A		1.8	2.1	V
	UC285-2	I_{VOUT} = 5 A		1.8	2.2	V
Short circuit current limit			5.1		7.5	A
VB current		I_{VOUT} = 10 mA		8	15	mA
		I_{VOUT} = 5 A		40	100	mA
VIN current		I_{VOUT} = 5 A	4.9	4.96		A
UC385−1 Fixed 1.5 V, 5-A Family						
Output voltage	UC385-1	I_{VOUT} = 100 mA	1.485	1.5	1.515	V
	UC285-1	I_{VOUT} = 100 mA	1.470	1.5	1.515	V
Load regulation		I_{VOUT} = 10 mA to 5 A		0.5	4	mV
VIN PSRR			80	110		dB
VB PSRR			50	65		dB
VIN dropout voltage (VIN - VOUT)		I_{VOUT} = 5 A, T_J = 25°C		350	425	mV
	UC285-1	I_{VOUT} 5 A		350	490	mV
	UC285-2	I_{VOUT} = 5 A		350	500	mV
VB dropout (VB - VOUT)	UC385-1	I_{VOUT} = 5 A		1.8	2.1	V
	UC285-1	I_{VOUT} = 5 A		1.8	2.2	V
Short circuit current limit			5.1		7.5	A
VB current		I_{VOUT} = 10 mA		8	15	mA
		I_{VOUT} = 5 A		40	100	mA
VIN = current		I_{VOUT} = 5 A	4.9	4.96		A
UC385-ADJ Adjustable, 5-A Family						
ADJ voltage	UC385-ADJ	I_{VOUT} - 100 mA	1.188	1.2	1.212	V
	UC285-ADJ	I_{VOUT} - 100 mA	1.176	1.2	1.212	V
Load regulation		I_{VOUT} = 10 mA to 5 A		0.5	4	mV
VIN PSRR		VOUT programmed for 2.5 V	80	110		dB
VB PSRR VOUT		Programmed for 2.5 V	50	65		dB
VIN dropout voltage (VIN - VOUT)		I_{VOUT} = 5 A, T_J = 25°C		350	425	mV
	UC385-ADJ	I_{VOUT} = 5 A		350	490	mV
	UC285-ADJ	I_{VOUT} = 5 A		350	500	mV
VB dropout (VB - VOUT)	UC385-ADJ	I_{VOUT} = 5 A		1.8	2.1	V
	UC285-ADJ	I_{VOUT} = 5 A		1.8	2.2	V
Short circuit current limit			5.1		7.5	A
VB current		I_{VOUT} = 10 mA		8	15	mA
		I_{VOUT} = 5 A		40	100	mA
VIN current		I_{VOUT} = 5 A	4.9	4.96		A

pin descriptions

ADJ: In the adjustable version, the user programs the output voltage with two external resistors. The resistors should be 0.1% for high accuracy. The output amplifier is configured as a noninverting operational amplifier. The resistors should meet the criteria of R3 || R4 < 100 Ω. Connect ADJ to VOUT for an output voltage of 1.2 V. Note that the point at which the feedback network is connected to the output is the Kelvin sense point.

GND: For accurate results, the GND pin should be referenced to the load ground.

VB: Supplies power to all circuits of the regulator except the output power transistor. The 2-V headroom from VB to VOUT allows the use of a Darlington output stage for inherently low output impedance and fast response. (Dropout is derated for junction temperatures below 0°C.)

VIN: Supplies the current to the collector of the output power transistor only. The dropout (VIN-VOUT) is under 100 mV for light loads; maximum dropout is 490 mV at 5 A for T_J = 0°C to 100°C. (Dropout is derated for junction temperatures over 100°C.)

VOUT: This pin should be connected to the load via a low impedance path. Avoid connectors which add significant inductance and resistance. Note that even though a Kelvin sense is available through a 5-pin package, care must be taken since voltage drops along wire traces add to the dropout voltage.

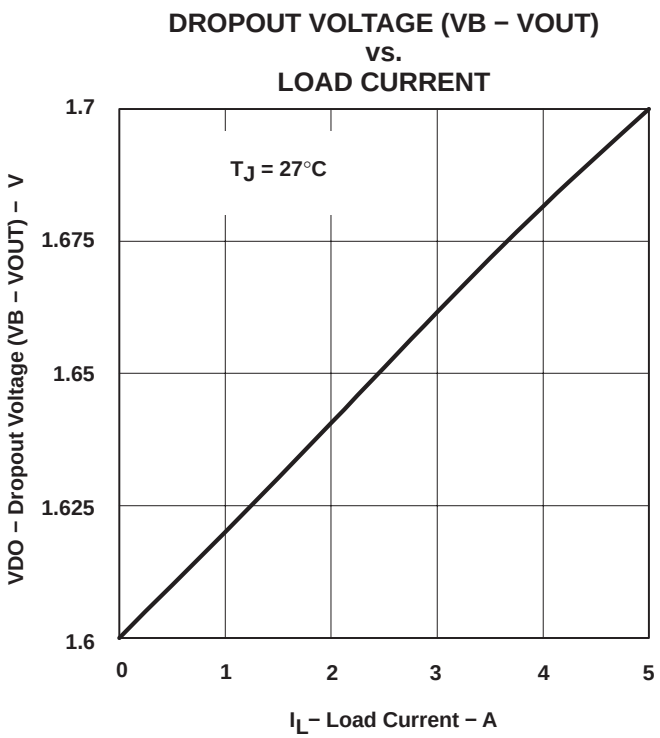

Figure 1

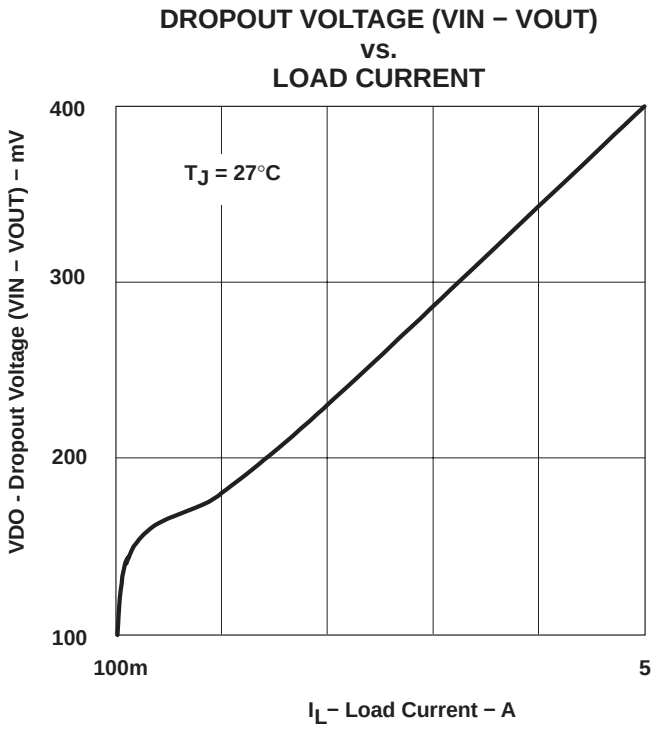

Figure 2

APPLICATION INFORMATION

The UC385 is easy to use. The adjustable version requires two resistors to set the output voltage. The fixed versions of the UC385 require no external resistors. All versions of the UC385 require decoupling capacitors on the input and output. In a typical application, VB and VIN are driven from switching power supplies which may have large filter capacitors at their outputs. If the UC385 is further than 12 inches from the power supply, it is recommended to add local decoupling as close as possible to the linear regulator.

Decouple the output of the UC385 with at least 100 µF of high quality tantalum or Sanyo OSCON capacitors close to the VOUT pin for maximum stability. Many applications involving ultrafast GTL or BTL applications require additional capacitance close to the load. The exact amount will vary according to speed and magnitude of the load transients and the tolerance allowed for transients on VOUT. When specifying the decoupling capacitors, the series resistance of the capacitor bank is an important factor in its ability to filter load transients.

The UC385 allows for Kelvin sensing the voltage at the load. This improves regulation performance and eliminates the voltage drops due to wire trace resistance. This voltage drop must be added to the headroom (VIN to VOUT and VB to VOUT). The dropout of 350 mV is measured at the pins and does not include additional drops due to trace resistance.

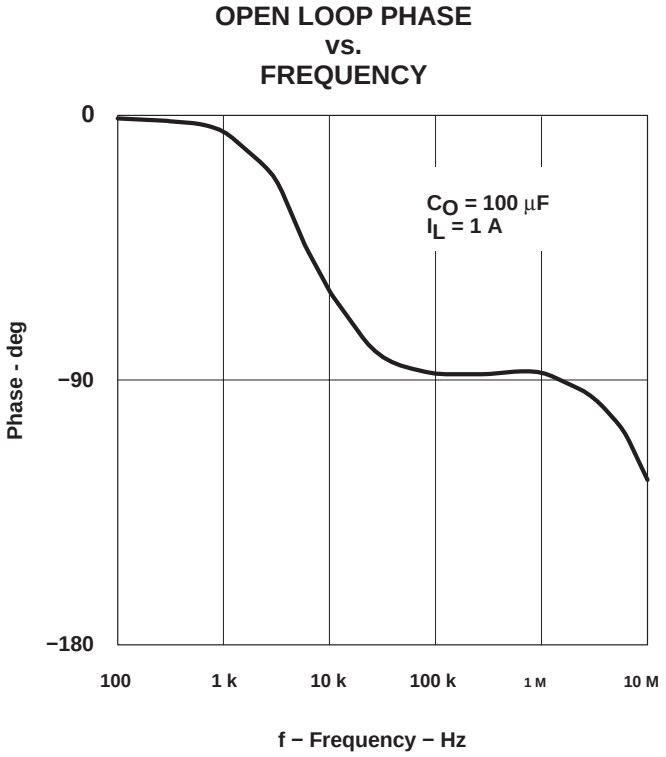

Figure 3

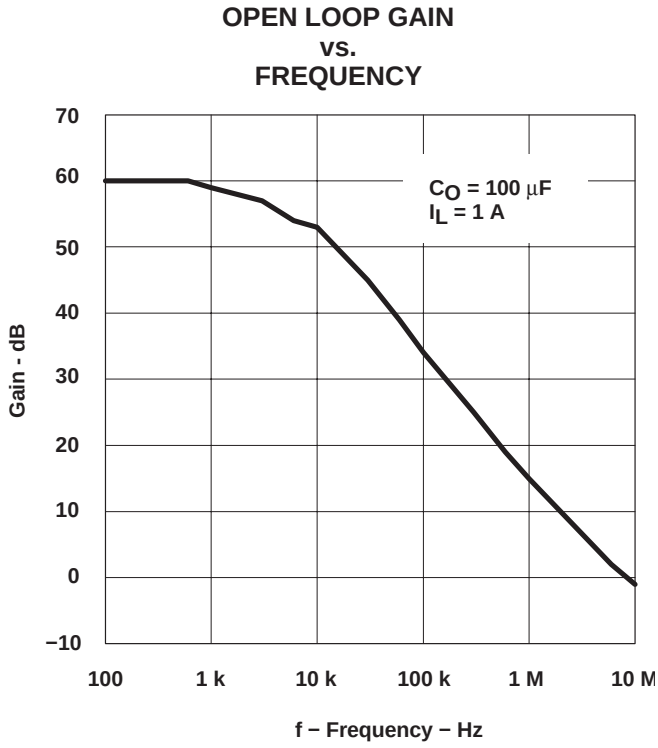

Figure 4

APPLICATION INFORMATION

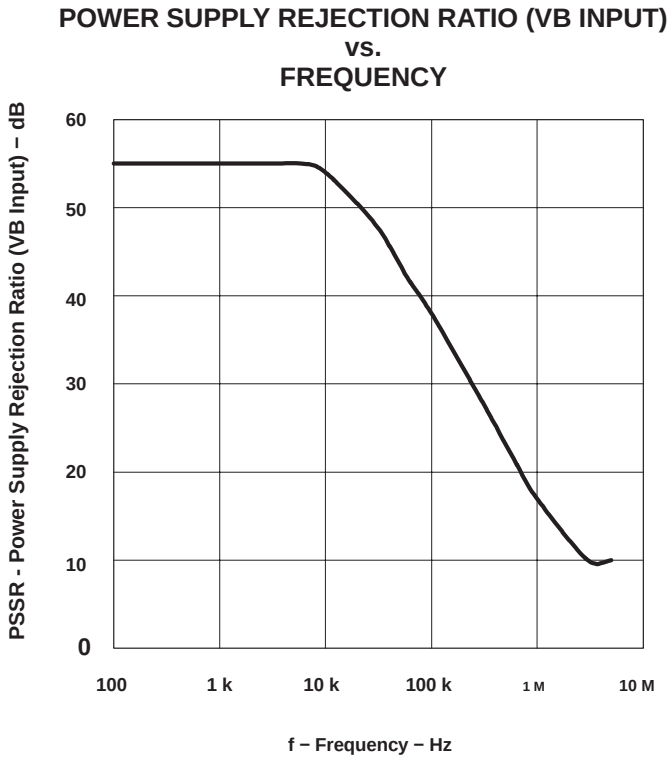

Figure 5

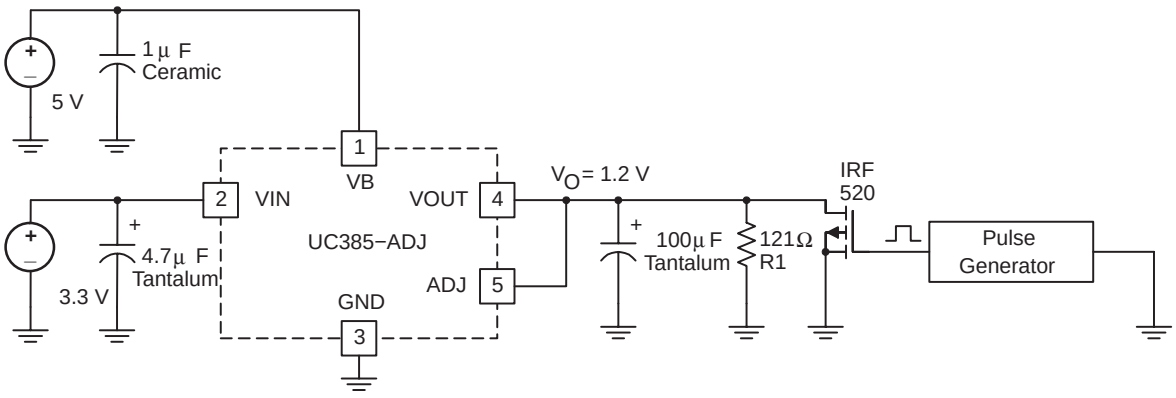

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Figure 6. Transient Test Circuit

APPLICATION INFORMATION

10 mA to 3 A/μs Load Transient Response

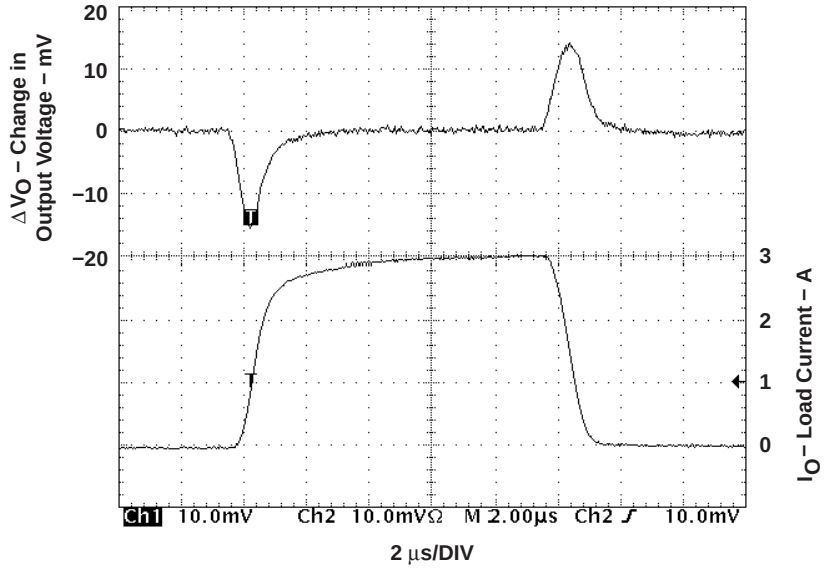

Figure 7

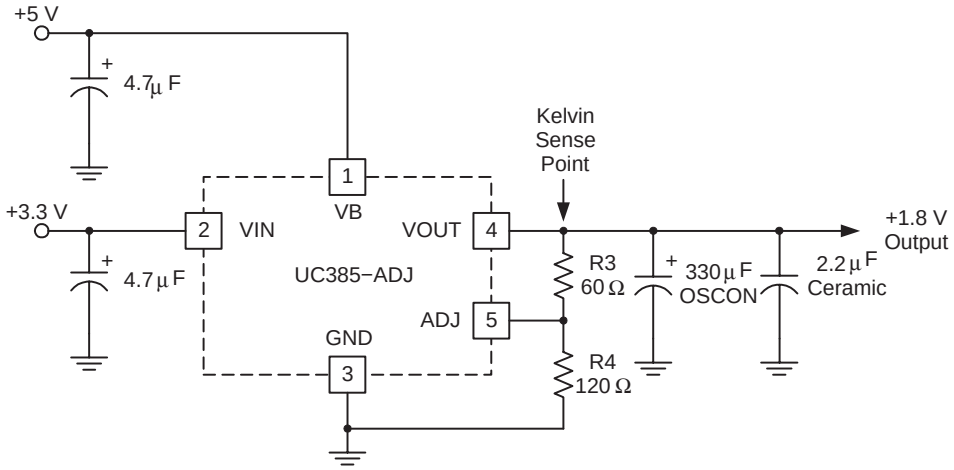

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Figure 8. Typical UC385-ADJ Application

APPLICATION INFORMATION

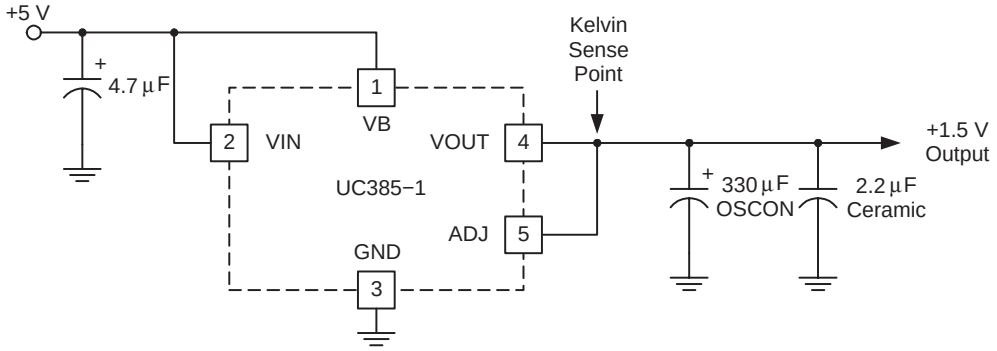

Figure 9. Typical UC385-1, -2, or -3 Application

Revision History

DATE	REV	PAGE	SECTION	DESCRIPTION
5/09	F	2	Absolute Maximum Ratings	Added VB.

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
UC285T-3	ACTIVE	TO-220	KC	5	50	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 85	UC285T-3	Samples
UC285T-ADJ	ACTIVE	TO-220	KC	5	50	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 100	UC285T-ADJ	Samples
UC285T-ADJG3	ACTIVE	TO-220	KC	5	50	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	-40 to 100	UC285T-ADJ	Samples
UC285TDKTTT-1	ACTIVE	DDPAK/ TO-263	KTT	5	50	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	UC285TD-1	Samples
UC285TDKTTT-3	ACTIVE	DDPAK/ TO-263	KTT	5	50	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 85	UC285TD-3	Samples
UC285TDKTTT-ADJ	ACTIVE	DDPAK/ TO-263	KTT	5	50	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 100	UC285TD-ADJ	Samples
UC285TDKTTT-ADJG3	ACTIVE	DDPAK/ TO-263	KTT	5	50	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	-40 to 100	UC285TD-ADJ	Samples
UC385T-1	ACTIVE	TO-220	KC	5	50	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	0 to 70	UC385T-1	Samples
UC385T-2	ACTIVE	TO-220	KC	5	50	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	0 to 70	UC385T-2	Samples
UC385T-3	ACTIVE	TO-220	KC	5	50	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	0 to 70	UC385T-3	Samples
UC385T-ADJ	ACTIVE	TO-220	KC	5	50	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	0 to 70	UC385T-ADJ	Samples
UC385T-ADJG3	ACTIVE	TO-220	KC	5	50	Green (RoHS & no Sb/Br)	CU SN	N / A for Pkg Type	0 to 70	UC385T-ADJ	Samples
UC385TDKTTT-1	ACTIVE	DDPAK/ TO-263	KTT	5	50	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-1	Samples
UC385TDKTTT-1G3	ACTIVE	DDPAK/ TO-263	KTT	5	50	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-1	Samples
UC385TDKTTT-3	ACTIVE	DDPAK/ TO-263	KTT	5	50	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-3	Samples
UC385TDKTTT-ADJ	ACTIVE	DDPAK/ TO-263	KTT	5	50	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-ADJ	Samples
UC385TDKTTT-ADJG3	ACTIVE	DDPAK/ TO-263	KTT	5	50	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-ADJ	Samples

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
UC385TDTR-1	ACTIVE	DDPAK/ TO-263	KTT	5	500	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-1	Samples
UC385TDTR-1G3	ACTIVE	DDPAK/ TO-263	KTT	5	500	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-1	Samples
UC385TDTR-3	ACTIVE	DDPAK/ TO-263	KTT	5	500	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-3	Samples
UC385TDTR-3G3	ACTIVE	DDPAK/ TO-263	KTT	5	500	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-3	Samples
UC385TDTR-ADJ	ACTIVE	DDPAK/ TO-263	KTT	5	500	Green (RoHS & no Sb/Br)	CU SN	Level-2-260C-1 YEAR	0 to 70	UC385TD-ADJ	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) 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)

(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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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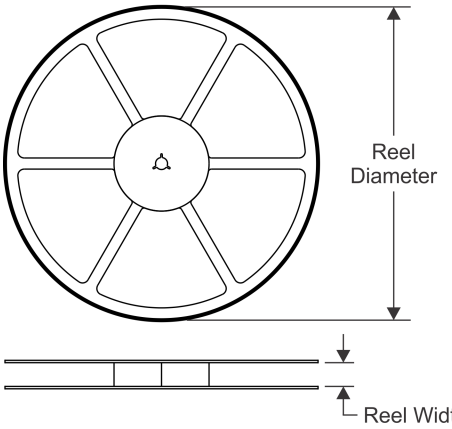
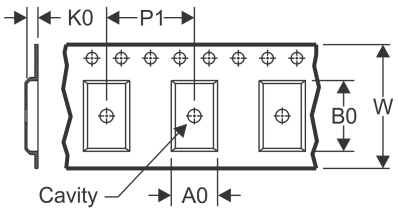
TAPE AND REEL INFORMATION

REEL DIMENSIONS

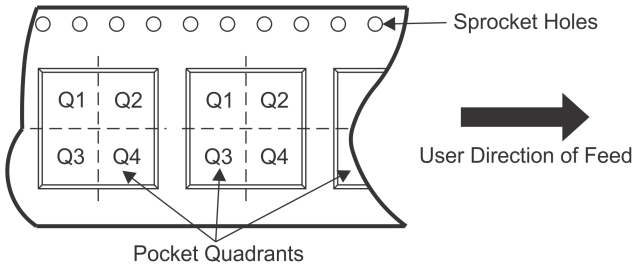


TAPE DIMENSIONS



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

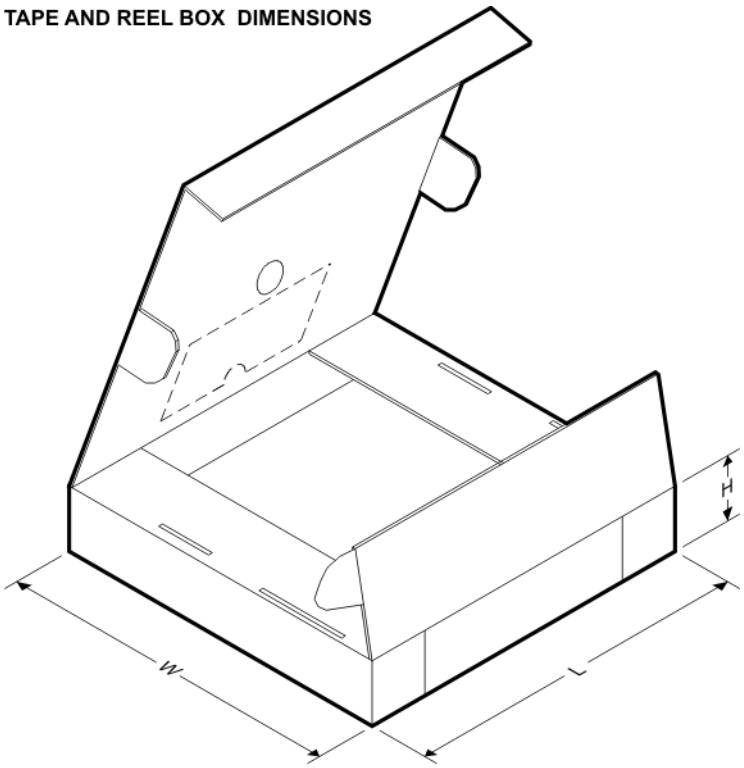
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
UC285TDKTTT-1	DDPAK/ TO-263	KTT	5	50	330.0	24.4	10.6	15.6	4.9	16.0	24.0	Q2
UC285TDKTTT-3	DDPAK/ TO-263	KTT	5	50	330.0	24.4	10.6	15.6	4.9	16.0	24.0	Q2
UC285TDKTTT-ADJ	DDPAK/ TO-263	KTT	5	50	330.0	24.4	10.6	15.6	4.9	16.0	24.0	Q2
UC385TDKTTT-1	DDPAK/ TO-263	KTT	5	50	330.0	24.4	10.6	15.6	4.9	16.0	24.0	Q2
UC385TDKTTT-3	DDPAK/ TO-263	KTT	5	50	330.0	24.4	10.6	15.6	4.9	16.0	24.0	Q2
UC385TDKTTT-ADJ	DDPAK/ TO-263	KTT	5	50	330.0	24.4	10.6	15.6	4.9	16.0	24.0	Q2
UC385TDTR-1	DDPAK/ TO-263	KTT	5	500	330.0	24.4	10.6	15.6	4.9	16.0	24.0	Q2
UC385TDTR-3	DDPAK/ TO-263	KTT	5	500	330.0	24.4	10.6	15.6	4.9	16.0	24.0	Q2
UC385TDTR-ADJ	DDPAK/ TO-263	KTT	5	500	330.0	24.4	10.6	15.6	4.9	16.0	24.0	Q2

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

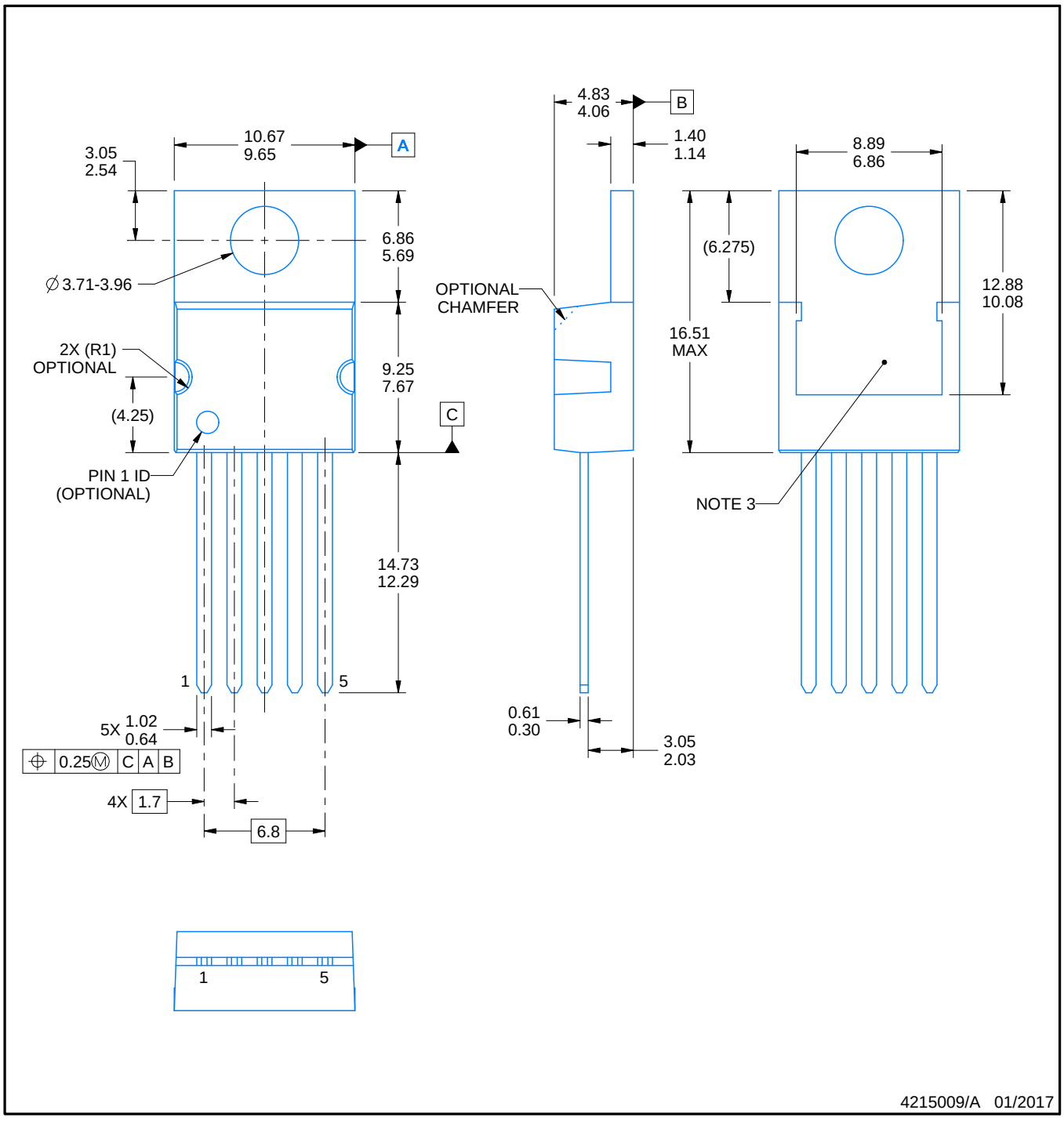
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
UC285TDKTTT-1	DDPAK/TO-263	KTT	5	50	367.0	367.0	45.0
UC285TDKTTT-3	DDPAK/TO-263	KTT	5	50	367.0	367.0	45.0
UC285TDKTTT-ADJ	DDPAK/TO-263	KTT	5	50	367.0	367.0	45.0
UC385TDKTTT-1	DDPAK/TO-263	KTT	5	50	367.0	367.0	45.0
UC385TDKTTT-3	DDPAK/TO-263	KTT	5	50	367.0	367.0	45.0
UC385TDKTTT-ADJ	DDPAK/TO-263	KTT	5	50	367.0	367.0	45.0
UC385TDTR-1	DDPAK/TO-263	KTT	5	500	367.0	367.0	45.0
UC385TDTR-3	DDPAK/TO-263	KTT	5	500	367.0	367.0	45.0
UC385TDTR-ADJ	DDPAK/TO-263	KTT	5	500	367.0	367.0	45.0

PACKAGE OUTLINE

KC0005A

TO-220 - 16.51 mm max height

TO-220



NOTES:

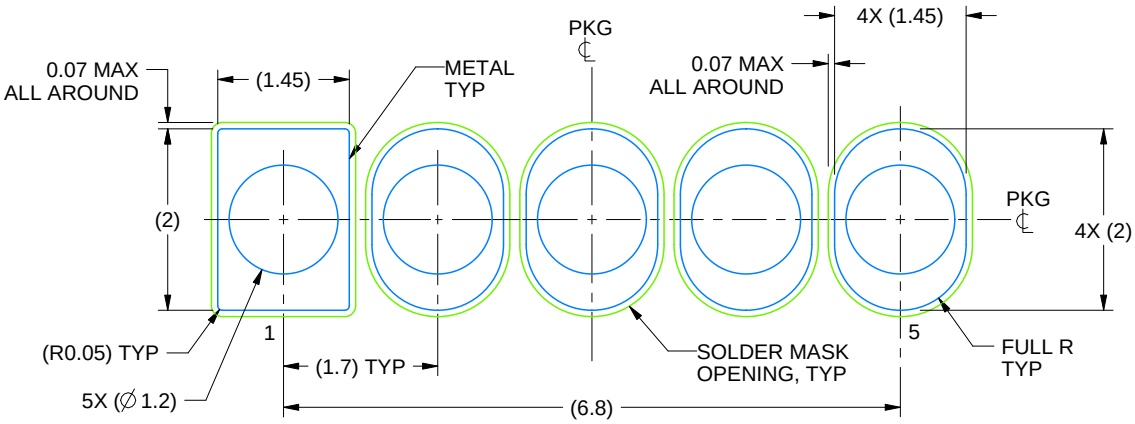
1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Shape may vary per different assembly sites.

EXAMPLE BOARD LAYOUT

KC0005A

TO-220 - 16.51 mm max height

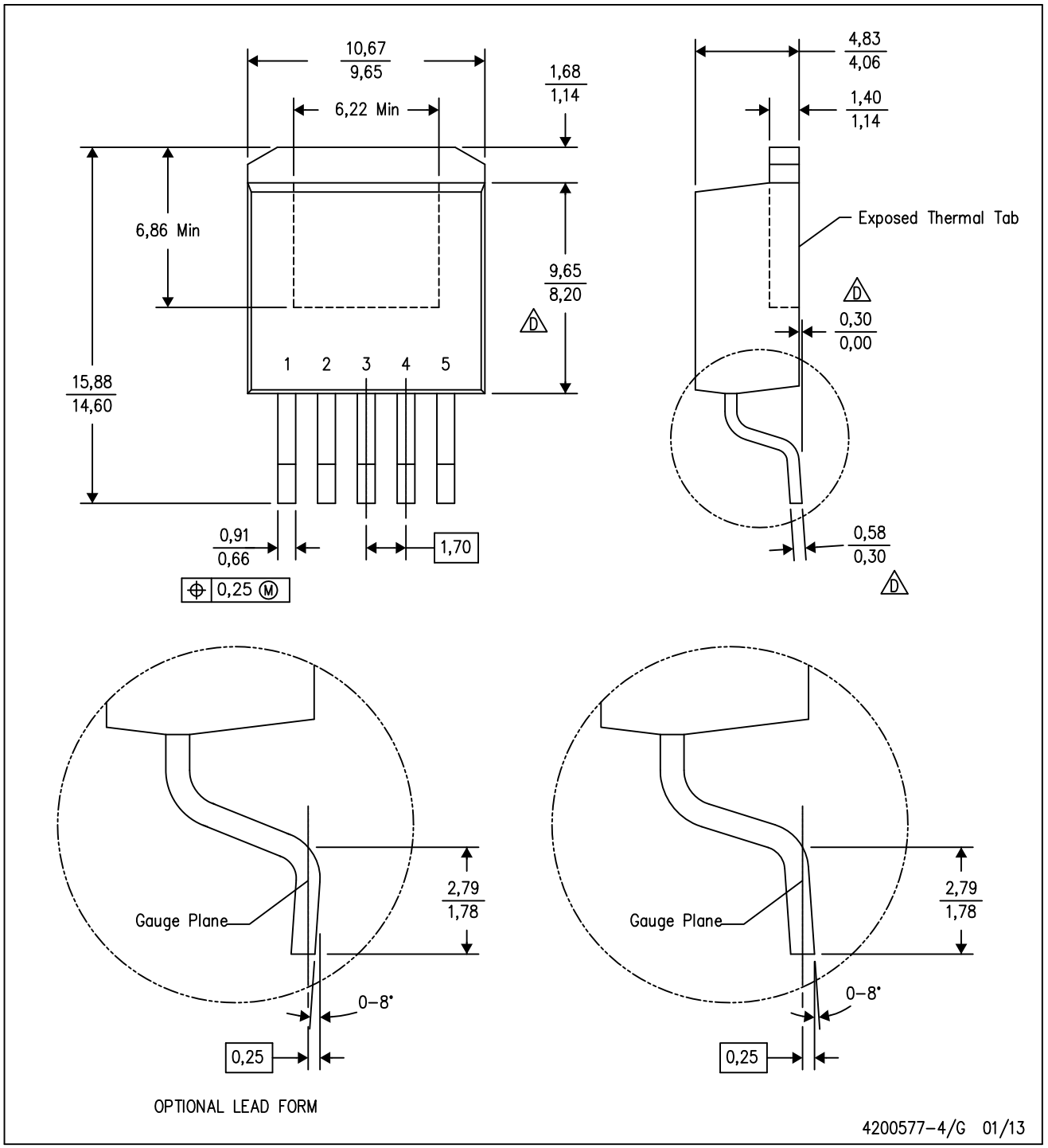
TO-220



LAND PATTERN
NON-SOLDER MASK DEFINED
SCALE:12X

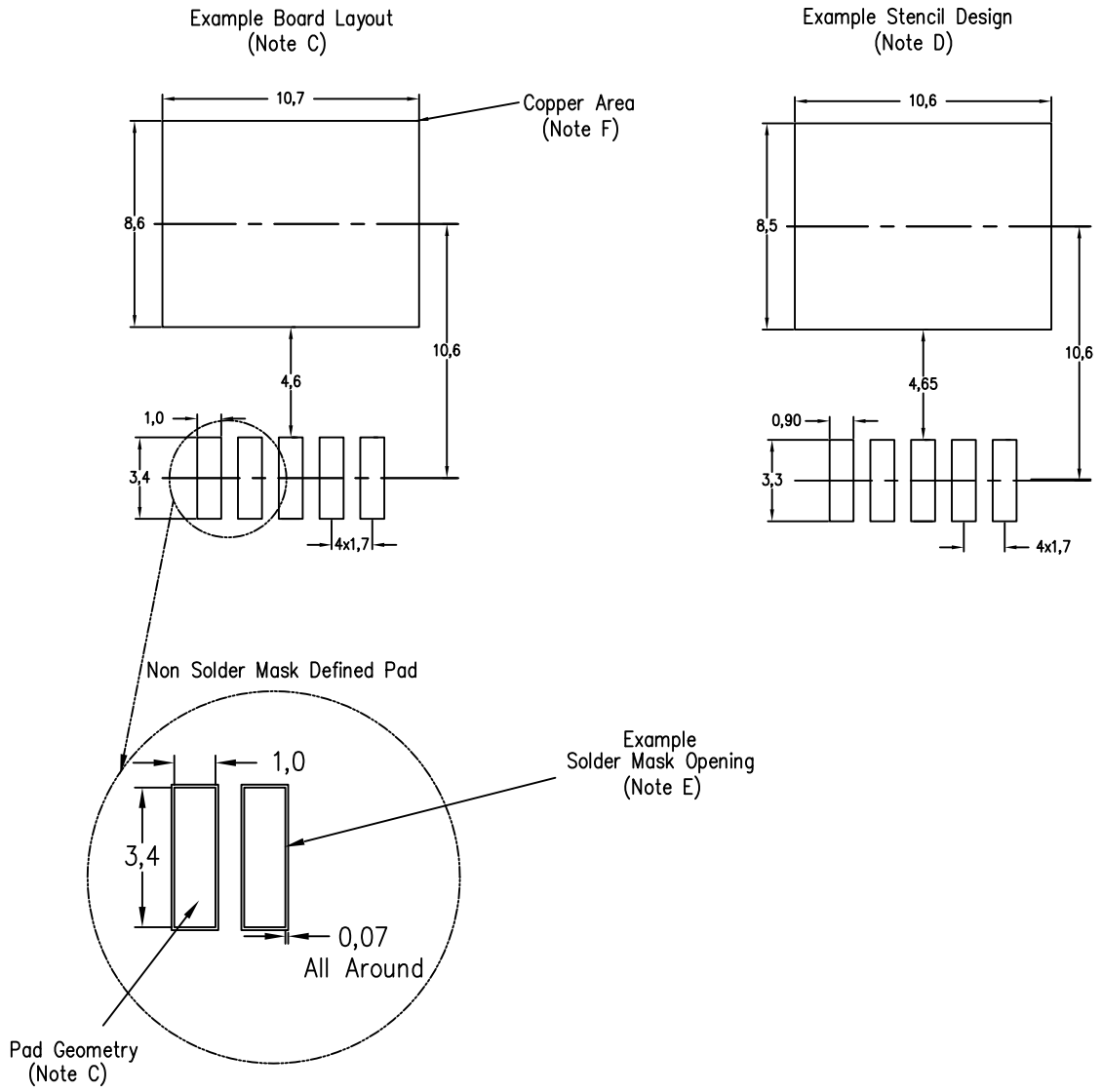
4215009/A 01/2017

KTT (R–PSFM–G5) PLASTIC FLANGE–MOUNT PACKAGE



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. Mold flash or protrusion not to exceed 0.005 (0,13) per side.
D. Falls within JEDEC TO–263 variation BA, except minimum lead thickness, maximum seating height, and minimum body length.

KTT (R–PSFM–G5) PLASTIC FLANGE–MOUNT PACKAGE



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–SM–782 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.
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.
F. This package is designed to be soldered to a thermal pad on the board. Refer to the Product Datasheet for specific thermal information, via requirements, and recommended thermal pad size. For thermal pad sizes larger than shown a solder mask defined pad is recommended in order to maintain the solderable pad geometry while increasing copper area.

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