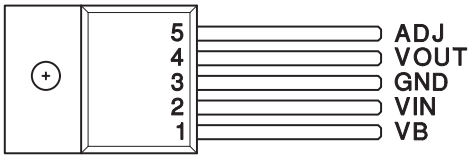
UC282-1, UC282-2, UC282-3, UC282-ADJ, UC382-1, UC382-2, UC382-3, UC382-ADJ
FAST LDO LINEAR REGULATOR

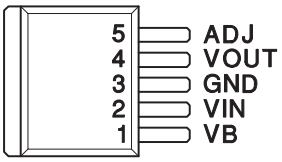
SLUS317B − JANUARY 2000 − REVISED FEBRUARY 2004

- **Fast Transient Response**
- **10-mA to 3-A Load Current**
- **Short Circuit Protection**
- **Maximum Dropout of 450-mV at 3-A Load Current**
- **Separate Bias 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

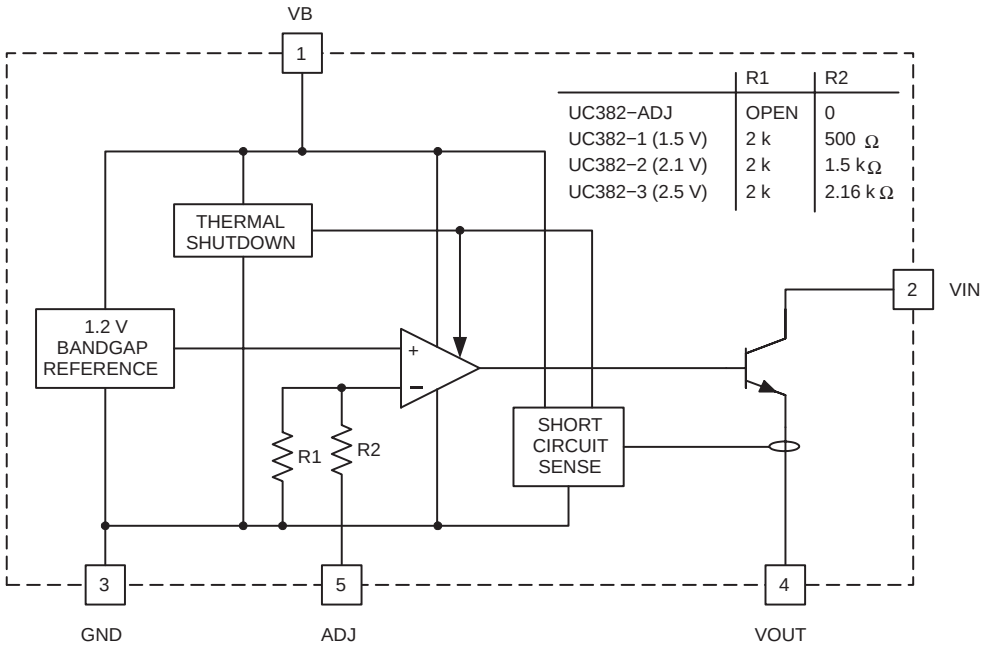
description

The UC382 is a low-dropout-linear regulator providing a quick response to fast load changes. Combined with its precision onboard reference, the UC382 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 450 mV maximum at 100°C and 350 mV typical at 3-A load.

The onboard bandgap reference is stable with temperature and scaled for a 1.2-V input to the internal-power amplifier. The UC382 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



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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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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, T_{stg} . . . . . −65°C to 150°C
Junction temperature, T_J . . . . . −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.

‡ Currents are positive into, negative out of the specified terminal. Consult Packaging Section of Databook for thermal limitations and considerations of packages.

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	282T-1	282T-2	282T-3	282T-ADJ	282TD-1	282TD-2	282TD-3	282TD-ADJ
0°C to 100°C	382T-1	382T-2	382T-3	382T-ADJ	382TD-1	382TD-2	382TD-3	382TD-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., UC282TDKTTT−1); for 500 piece reel, add TR (e.g., UC282TDTR−1).

electrical characteristics, T_A = −40°C to 100°C for the UC282-X series and 0°C to 100°C for the UC382-X, VB = 5 V, VIN = 3.3 V, VOUT = 2.5 V for the UC382-ADJ, $T_A = T_J$, (unless otherwise stated)

UC382-3 fixed 2.5 V, 3-A family

PARAMETERS	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Output voltage (I_{VOUT} = 100 mA)	UC382-3		2.475	2.500	2.525	V
	UC282-3		2.450	2.500	2.525	V
Load regulation	I_{VOUT} = 10 mA to 3 A			0.5	4	mV
VIN PSSR			80	100		dB
VB PSSR			50	60		dB
VIN dropout voltage = VIN−VOUT	I_{VOUT} = 3 A,	T_J = 25°C		350	425	mV
	I_{VOUT} = 3 A,	UC382-3		350	450	mV
	I_{VOUT} = 3 A,	UC282-3		350	500	mV
VB dropout = VB−VOUT	I_{VOUT} = 3 A,	UC382-3		1.8	2.10	V
	I_{VOUT} = 3 A,	UC282-3		1.8	2.20	V
Short circuit current limit			3.3		4.5	A
VB current	I_{VOUT} = 10 mA			6	11	mA
	I_{VOUT} = 3 A			18	60	mA
VIN current	I_{VOUT} = 3 A		2.94	2.97		A

electrical characteristics, T_A = −40°C to 100°C for the UC282-X series and 0°C to 100°C for the UC382-X, VB = 5 V, VIN = 3.3 V, VOUT = 2.5 V for the UC382-ADJ, $T_A = T_J$, (unless otherwise stated)

UC382-2 fixed 2.1 V, 3-A family

PARAMETERS	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Output voltage (I_{VOUT} = 100 mA)	UC382-2		2.079	2.100	2.121	V
	UC282-2		2.058	2.100	2.121	V
Load regulation	I_{VOUT} = 10 mA to 3 A			0.5	4	mV
VIN PSSR			80	100		dB
VB PSSR			52	62		dB
VIN dropout voltage = VIN−VOUT	I_{VOUT} = 3 A,	T_J = 25°C		350	425	mV
	I_{VOUT} = 3 A,	UC382-2		350	450	mV
	I_{VOUT} = 3 A,	UC282-2		350	500	mV
VB dropout = VB−VOUT	I_{VOUT} = 3 A,	UC382-2		1.8	2.10	V
	I_{VOUT} = 3 A,	UC282-2		1.8	2.20	V
Short circuit current limit			3.3		4.5	A
VB current	I_{VOUT} = 10 mA			6	11	mA
	I_{VOUT} = 3 A			18	60	mA
VIN current	I_{VOUT} = 3 A		2.94	2.97		A

UC382-1 fixed 1.5 V, 3-A family

PARAMETERS	TEST CONDITIONS		MIN	TYP	MAX	UNITS
Output voltage (I_{VOUT} = 100 mA)	UC382-1		1.485	1.500	1.515	V
	UC282-1		1.470	1.500	1.515	V
Load regulation	I_{VOUT} = 10 mA to 3 A			0.5	4	mV
VIN PSSR			80	100		dB
VB PSSR			55	65		dB
VIN dropout voltage = VIN−VOUT	I_{VOUT} = 3 A,	T_J = 25°C		350	425	mV
	I_{VOUT} = 3 A,	UC382-1		350	450	mV
	I_{VOUT} = 3 A,	UC282-1		350	500	mV
VB dropout = VB−VOUT	I_{VOUT} = 3 A,	UC382-1		1.8	2.10	V
	I_{VOUT} = 3 A,	UC282-1		1.8	2.20	V
Short circuit current limit			3.3		4.5	A
VB current	I_{VOUT} = 10 mA			6	11	mA
	I_{VOUT} = 3 A			18	60	mA
VIN current	I_{VOUT} = 3 A		2.94	2.97		A

electrical characteristics, T_A = −40°C to 100°C for the UC282-X series and 0°C to 100°C for the UC382-X, VB = 5 V, VIN = 3.3 V, VOUT = 2.5 V for the UC382-ADJ, $T_A = T_J$, (unless otherwise stated)

UC382-ADJ adjustable, 3-A family

PARAMETERS	TEST CONDITIONS		MIN	TYP	MAX	UNITS
ADJ voltage (I_{VOUT} = 100 mA)	UC382-ADJ		1.188	1.200	1.212	V
	UC282-ADJ		1.176	1.200	1.212	V
Load regulation	I_{VOUT} = 10 mA to 3 A			0.5	4	mV
VIN PSSR	VOUT programmed for 2.5 V		80	100		dB
VB PSSR	VOUT programmed for 2.5 V		50	60		dB
VIN dropout voltage = VIN−VOUT	I_{VOUT} = 3 A,	T_J = 25°C		350	425	mV
	I_{VOUT} = 3 A,	UC382-ADJ		350	450	mV
	I_{VOUT} = 3 A,	UC282-ADJ		350	500	mV
VB dropout = VB−VOUT	I_{VOUT} = 3 A,	UC382-ADJ		1.8	2.10	V
	I_{VOUT} = 3 A,	UC282-ADJ		1.8	2.20	V
Short circuit current limit			3.3		4.5	A
VB current	I_{VOUT} = 10 mA			6	11	mA
	I_{VOUT} = 3 A			18	60	mA
VIN current	I_{VOUT} = 3 A		2.94	2.97		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 non-inverting-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. For -1, -2, and -3 versions, ADJ pin is tied to VOUT to obtain specified output voltage.

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 collector of 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 450 mV at 3 A for T_J = 0°C to 100°C. (Dropout is derated for junction temperatures over 100°C.) At full load, the majority of the VB current is going to the load.

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.

pin descriptions (continued)

DROPOUT VOLTAGE ($V_B - V_{OUT}$) vs LOAD CURRENT

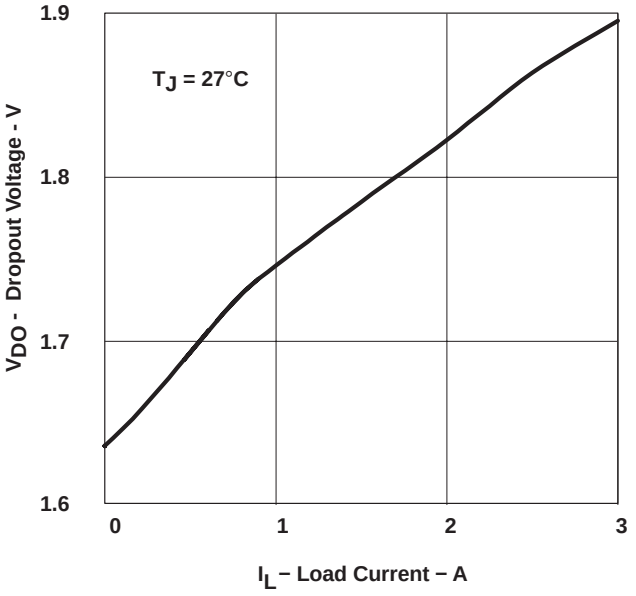

Figure 1

DROPOUT VOLTAGE ($V_{IN} - V_{OUT}$) vs LOAD CURRENT

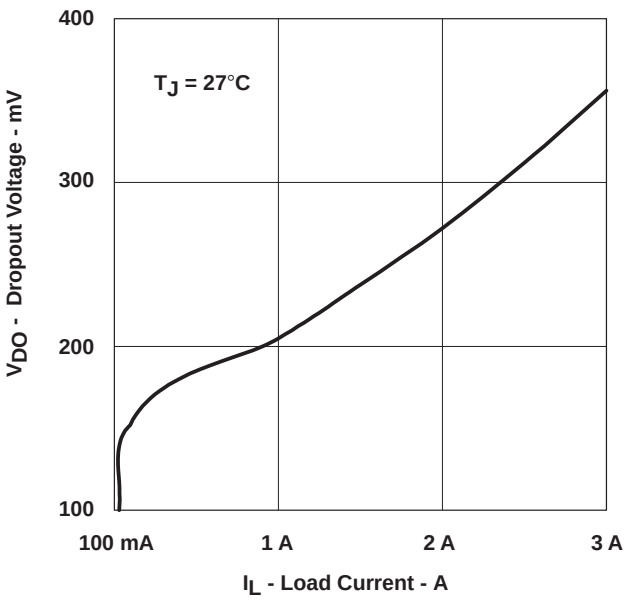

Figure 2

APPLICATION INFORMATION

The UC382 is easy to use. The adjustable version requires two 0.1% resistors to set the output voltage. The fixed versions of the UC382 require no external resistors. All versions of the UC382 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 UC382 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 UC382 with at least 100 μF of high-quality tantalum or Sanyo OSCON capacitors close to the VOUT pin for maximum stability. Many applications involving Ultra-Fast 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 UC382 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 450 mV is measured at the pins and does not include additional drops due to trace resistance. The minimum load current is 10 mA.

Two or more UC382's may be used in parallel. While stable, this arrangement does degrade the transient response.

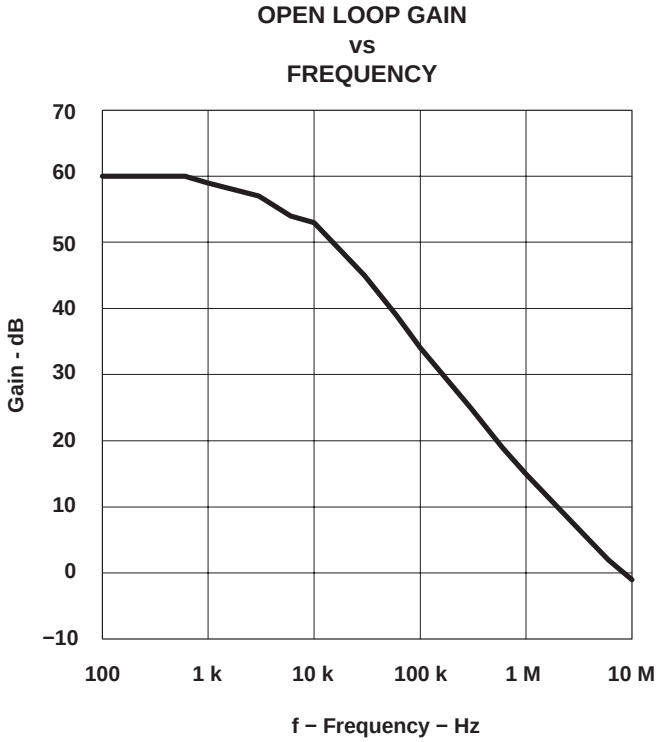

Figure 3

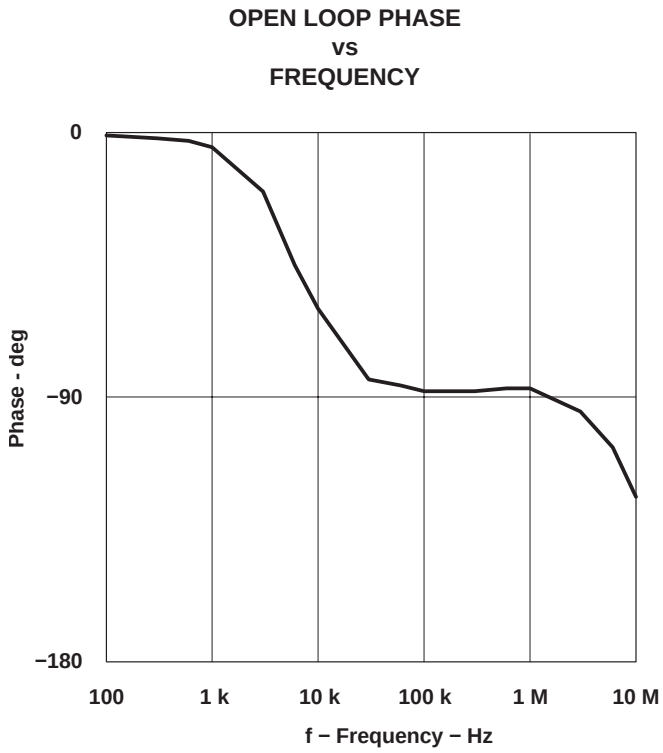

Figure 4

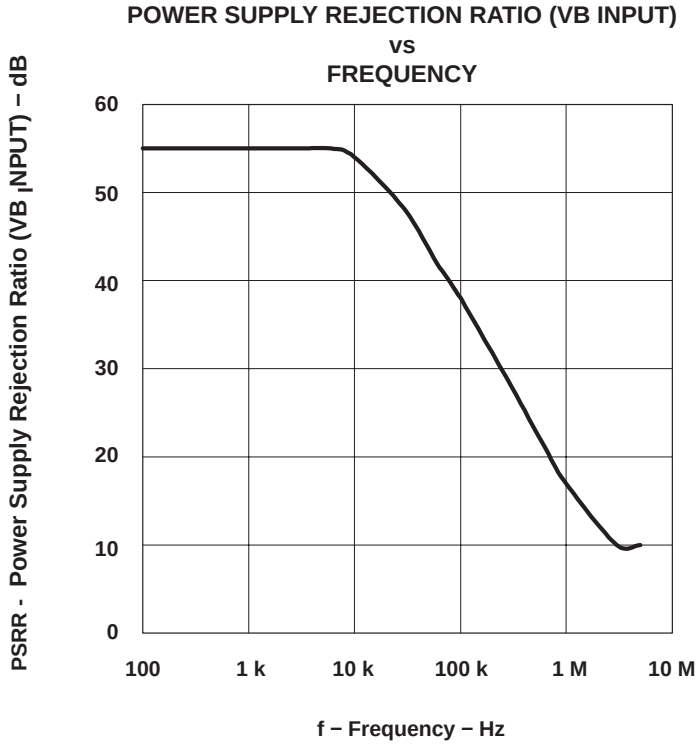

Figure 5

APPLICATION INFORMATION

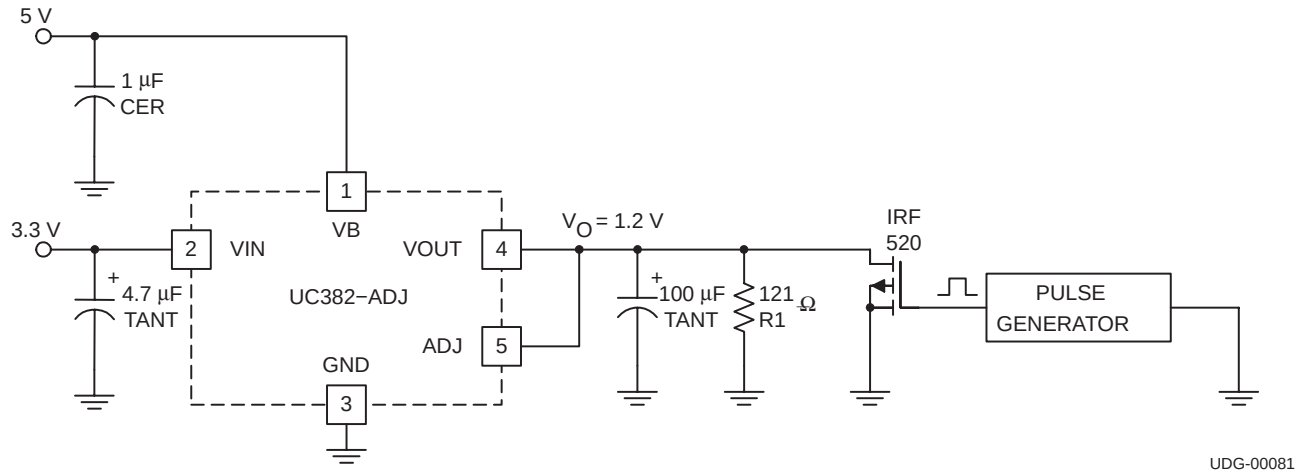

Figure 6. Transient Test Circuit

10 mA to 3 A/µs Load Transient Response

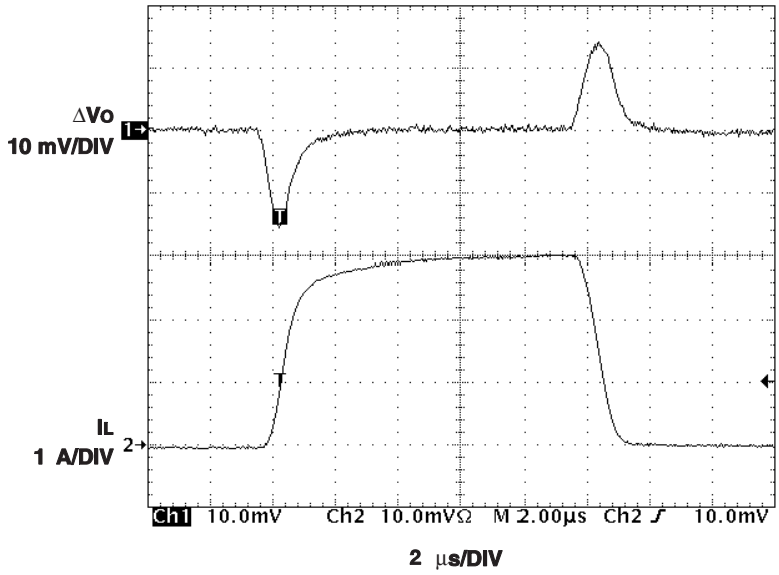

Figure 7

APPLICATION INFORMATION

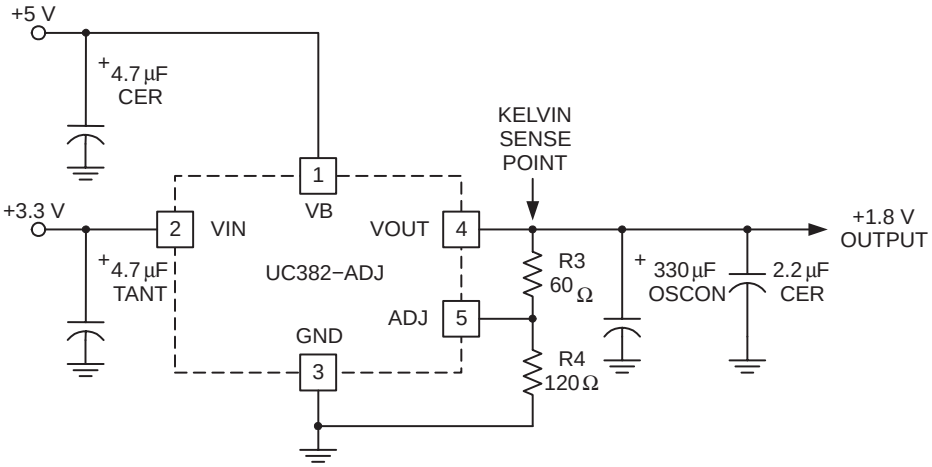

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Figure 8. Typical UC382-ADJ Application

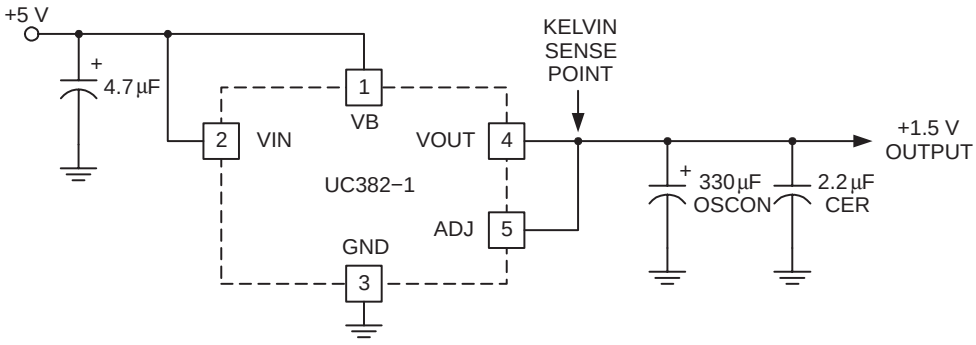

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Figure 9. Typical UC382-1, -2, or -3 Application

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)
UC282T-ADJ	Active	Production	TO-220 (KC) | 5	50 | TUBE	Yes	SN	N/A for Pkg Type	-40 to 100	UC282T-ADJ
UC282T-ADJ.A	Active	Production	TO-220 (KC) | 5	50 | TUBE	Yes	SN	N/A for Pkg Type	-40 to 100	UC282T-ADJ
UC282TDKTTT-1	Active	Production	DDPAK/ TO-263 (KTT) | 5	50 | TUBE	Yes	SN	Level-2-260C-1 YEAR	-40 to 100	UC282TD-1
UC282TDKTTT-1.A	Active	Production	DDPAK/ TO-263 (KTT) | 5	50 | TUBE	Yes	SN	Level-2-260C-1 YEAR	-40 to 100	UC282TD-1
UC282TDTR-3	Active	Production	DDPAK/ TO-263 (KTT) | 5	500 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 100	UC282TD-3
UC282TDTR-3.A	Active	Production	DDPAK/ TO-263 (KTT) | 5	500 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 100	UC282TD-3
UC282TDTR-ADJ	Active	Production	DDPAK/ TO-263 (KTT) | 5	500 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 100	UC282TD-ADJ
UC282TDTR-ADJ.A	Active	Production	DDPAK/ TO-263 (KTT) | 5	500 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-40 to 100	UC282TD-ADJ
UC382T-ADJ	Active	Production	TO-220 (KC) | 5	50 | TUBE	Yes	SN	N/A for Pkg Type	-	UC382T-ADJ
UC382T-ADJ.A	Active	Production	TO-220 (KC) | 5	50 | TUBE	Yes	SN	N/A for Pkg Type	0 to 100	UC382T-ADJ
UC382T-ADJG3	Active	Production	TO-220 (KC) | 5	50 | TUBE	Yes	SN	N/A for Pkg Type	0 to 100	UC382T-ADJ
UC382TDKTTT-2	Active	Production	DDPAK/ TO-263 (KTT) | 5	50 | TUBE	Yes	SN	Level-2-260C-1 YEAR	0 to 70	UC382TD-2
UC382TDKTTT-2.A	Active	Production	DDPAK/ TO-263 (KTT) | 5	50 | TUBE	Yes	SN	Level-2-260C-1 YEAR	0 to 70	UC382TD-2
UC382TDTR-ADJ	Active	Production	DDPAK/ TO-263 (KTT) | 5	500 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	-	UC382TD-ADJ
UC382TDTR-ADJ.A	Active	Production	DDPAK/ TO-263 (KTT) | 5	500 | LARGE T&R	Yes	SN	Level-2-260C-1 YEAR	0 to 100	UC382TD-ADJ

(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.

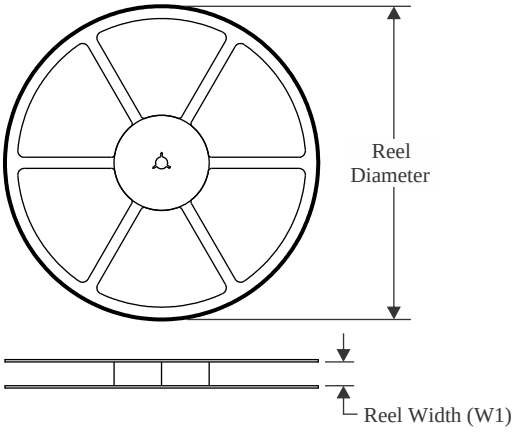
(5) MSL rating/Peak reflow: The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be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

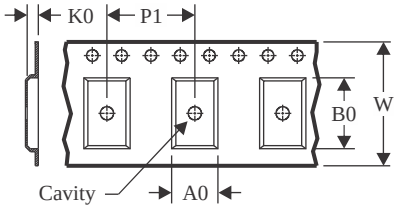
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

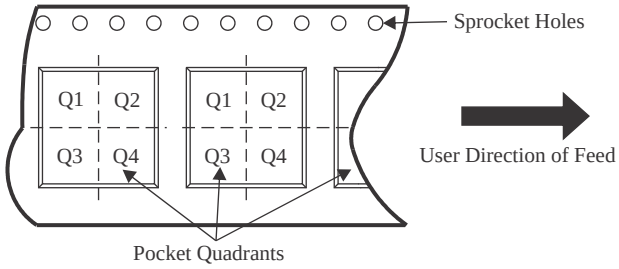


TAPE DIMENSIONS



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

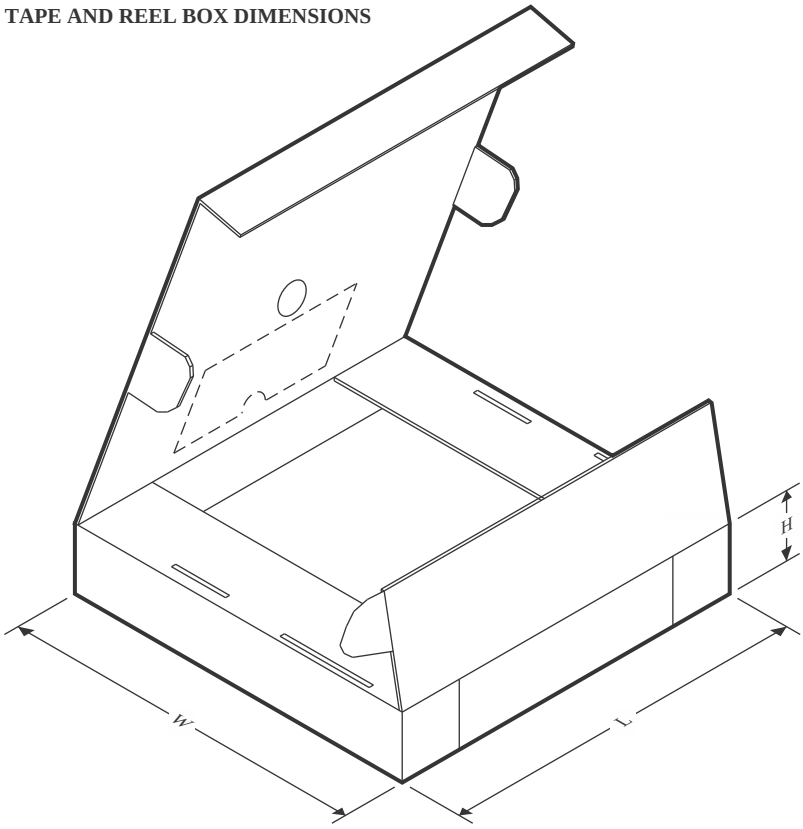
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
UC282TDTR-3	DDPAK/ TO-263	KTT	5	500	330.0	24.4	10.9	16.1	4.9	16.0	24.0	Q2
UC282TDTR-ADJ	DDPAK/ TO-263	KTT	5	500	330.0	24.4	10.9	16.1	4.9	16.0	24.0	Q2
UC382TDTR-ADJ	DDPAK/ TO-263	KTT	5	500	330.0	24.4	10.9	16.1	4.9	16.0	24.0	Q2

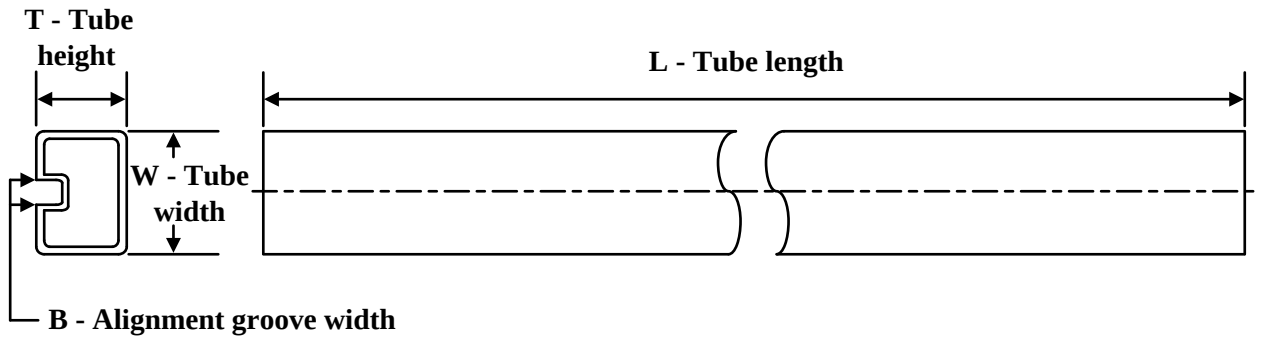
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
UC282TDTR-3	DDPAK/TO-263	KTT	5	500	356.0	356.0	45.0
UC282TDTR-ADJ	DDPAK/TO-263	KTT	5	500	356.0	356.0	45.0
UC382TDTR-ADJ	DDPAK/TO-263	KTT	5	500	356.0	356.0	45.0

TUBE



*All dimensions are nominal

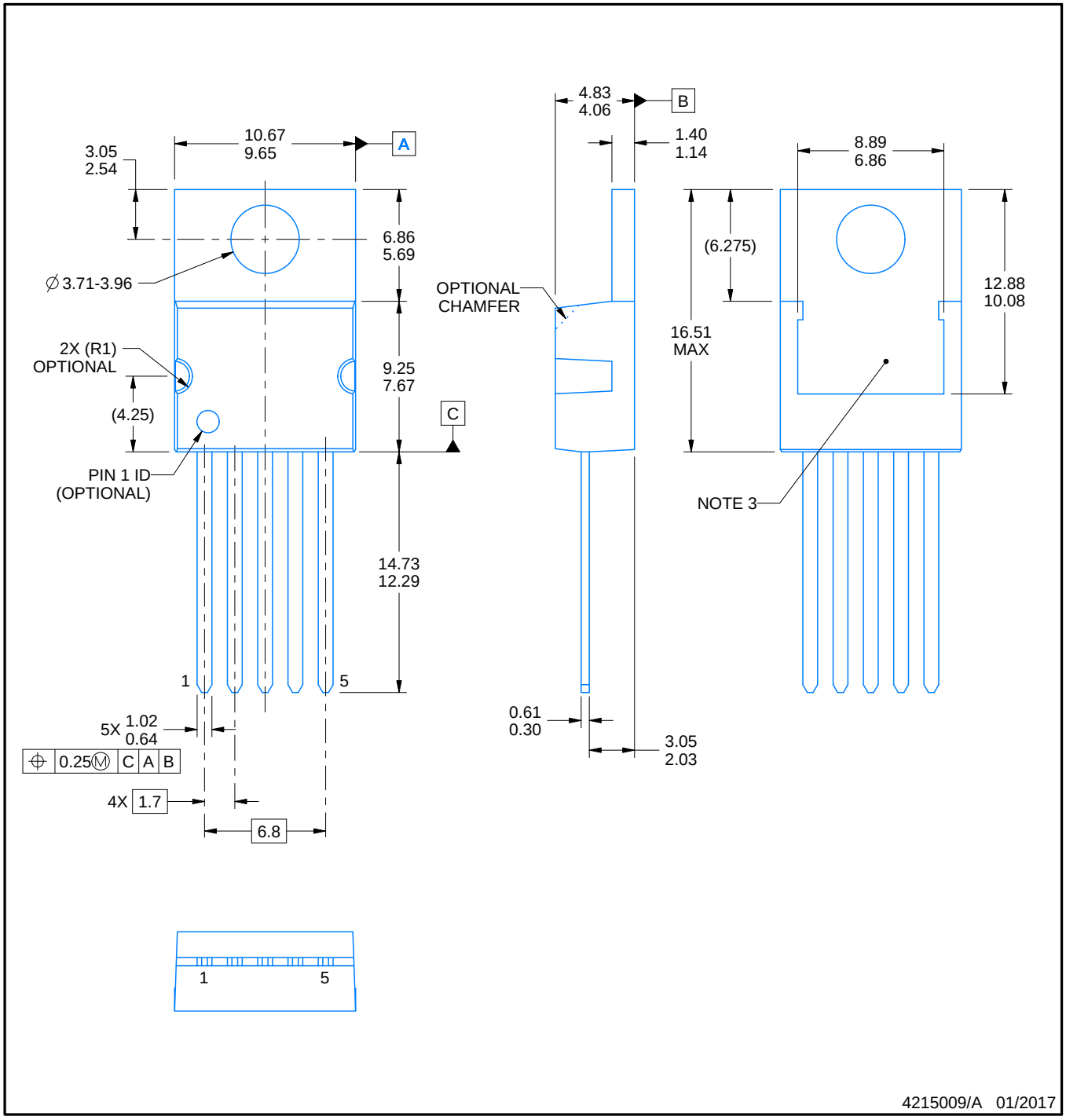
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
UC282T-ADJ	KC	TO-220	5	50	546	31	11930	3.17
UC282T-ADJ.A	KC	TO-220	5	50	546	31	11930	3.17
UC382T-ADJ	KC	TO-220	5	50	546	31	11930	3.17
UC382T-ADJ.A	KC	TO-220	5	50	546	31	11930	3.17
UC382T-ADJG3	KC	TO-220	5	50	546	31	11930	3.17

KC0005A

PACKAGE OUTLINE

TO-220 - 16.51 mm max height

TO-220



NOTES:

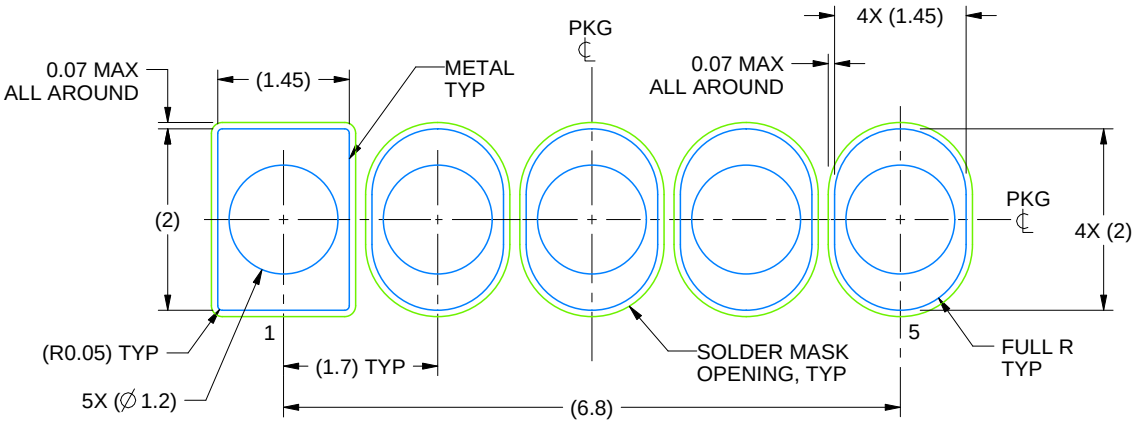
1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Shape may vary per different assembly sites.

EXAMPLE BOARD LAYOUT

KC0005A

TO-220 - 16.51 mm max height

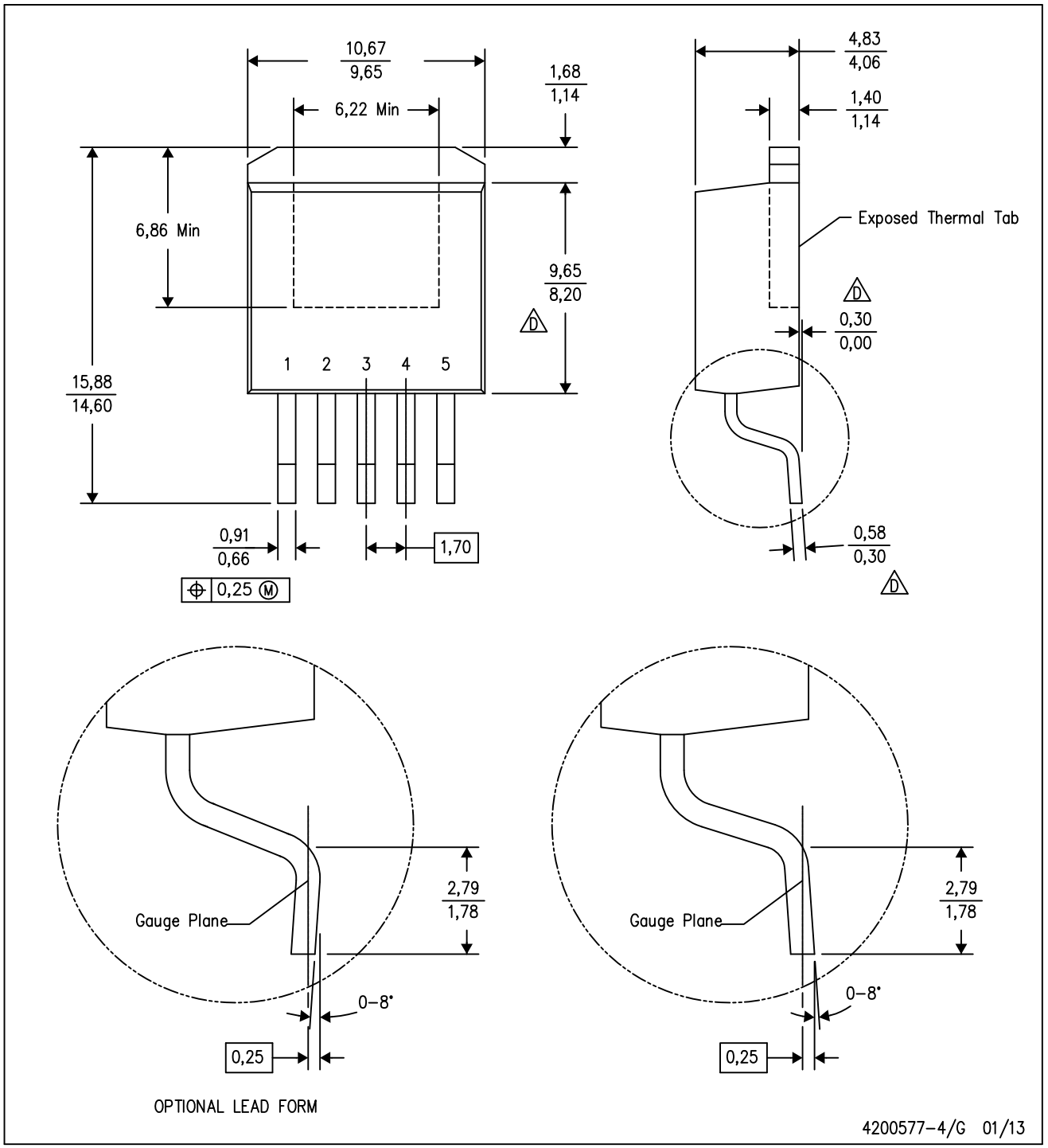
TO-220



LAND PATTERN
NON-SOLDER MASK DEFINED
SCALE:12X

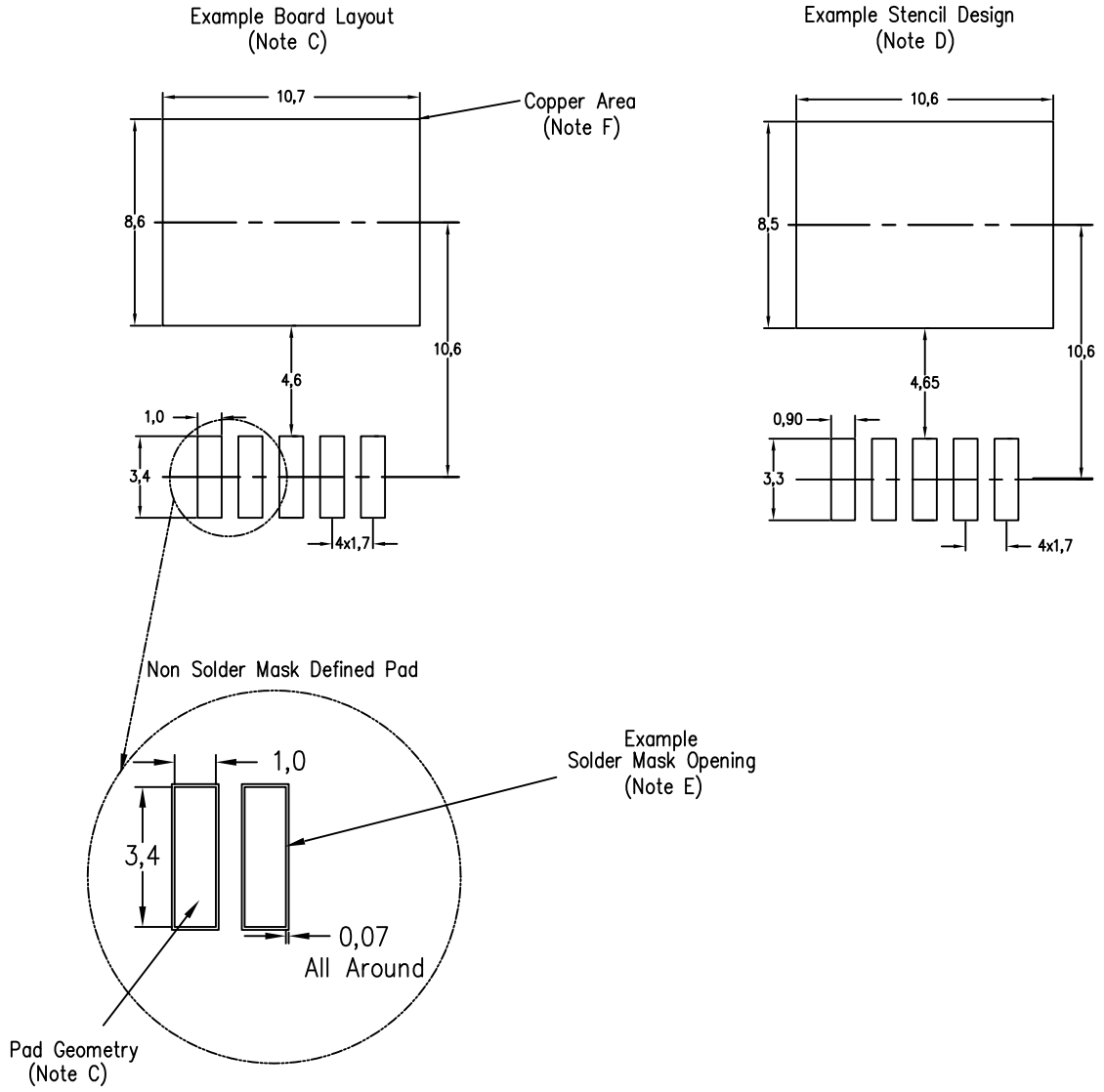
4215009/A 01/2017

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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