TEXAS INSTRUMENTS

uA7805, uA7808, uA7810
uA7812, uA7815, uA7824

SLVS056P – MAY 1976 – REVISED JANUARY 2015

µA78xx Fixed Positive Voltage Regulators

1 Features

- 3-Terminal Regulators
- Available in fixed 5-V/8-V/10-V/12-V/15-V/24-V options
- Output Current up to 1.5 A
- Internal Thermal-Overload Protection
- High Power-Dissipation Capability
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Output Capacitor Not Needed for Stability

2 Applications

- On-card Regulation
- Portable Devices
- Computing & Servers
- Telecommunications

3 Description

This series of fixed-voltage integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these regulators can deliver up to 1.5 A of output current. The internal current-limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents, and also can be used as the power-pass element in precision regulators.

Device Information[1]

PART NUMBER	PACKAGE	BODY SIZE (NOM)
µA78xx	TO-220 (3)	10.16 mm x 8.82 mm
	TO-220 (3)	10.16 mm x 8.82 mm
	TO-263 (3)	10.06 mm x 9.02 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.
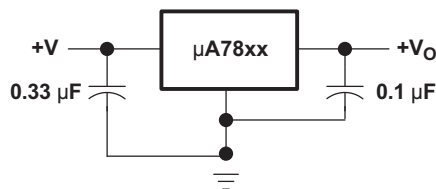
4 Simplified Schematic

uA7805, uA7808, uA7810
uA7812, uA7815, uA7824
SLVS056P – MAY 1976 – REVISED JANUARY 2015

www.ti.com

Table of Contents

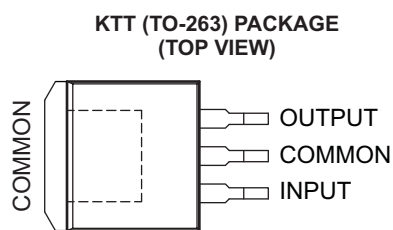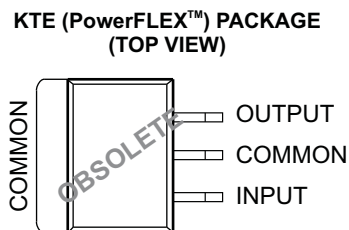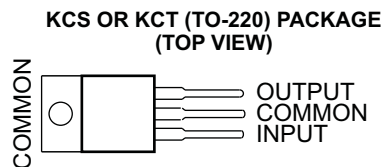## 5 Revision History

Changes from Revision O (August 2012) to Revision P   **Page**

- Added *Applications*, *Device Information* table, *Pin Functions* table, *ESD Ratings* table, *Thermal Information* table, *Typical Characteristics*, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section. 1
- Deleted *Ordering Information* table. 1

Product Folder Links: *uA7805 uA7808 uA7810 uA7812 uA7815 uA7824*

6 Pin Configuration and Functions

KC (TO-220) PACKAGE
(TOP VIEW)

COMMON

OUTPUT
COMMON
INPUT

KCS OR KCT (TO-220) PACKAGE
(TOP VIEW)

COMMON

OUTPUT
COMMON
INPUT

KTE (PowerFLEX™) PACKAGE
(TOP VIEW)

COMMON

OUTPUT

COMMON

INPUT

KTT (TO-263) PACKAGE
(TOP VIEW)

COMMON

OUTPUT
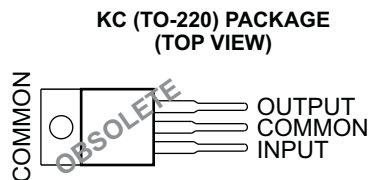
COMMON

INPUT

Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
COMMON	2	—	Ground
INPUT	1	I	Supply Input
OUTPUT	3	O	Voltage Output

7 Specifications

7.1 Absolute Maximum Ratings

over virtual junction temperature range (unless otherwise noted)

			MIN	MAX	UNIT
V_I	Input voltage	µA7824C		40	V
		All others		35	
T_J	Operating virtual junction temperature			150	°C
	Lead temperature	1,6 mm (1/16 in) from case for 10 s		260	°C
T_{stg}	Storage temperature range		–65	150	°C

7.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins[1]	3000	V
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins[2]	2000	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

7.3 Recommended Operating Conditions

			MIN	MAX	UNIT
V_I	Input voltage	µA7805	7	25	V
		µA7808	10.5	25	
		µA7810	12.5	28	
		µA7812	14.5	30	
		µA7815	17.5	30	
		µA7824	27	38	
I_O	Output current			1.5	A
T_J	Operating virtual junction temperature		0	125	°C

7.4 Thermal Information

THERMAL METRIC[1]		µA78XX			UNIT
		KTE	KCS, KCT, KC	KTT	
		3 PINS	3 PINS	3 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	23	19	25.3	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	3	17	18	
$R_{\theta JP(top)}$	Junction-to-exposed-pad thermal resistance	2.7	3	1.94	

(1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report (SPRA953).

7.5 Electrical Characteristics — uA7805

at specified virtual junction temperature, V_I = 10 V, I_O = 500 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J [1]	µA7805C MIN	µA7805C TYP	µA7805C MAX	UNIT
Output voltage	I_O = 5 mA to 1 A, V_I = 7 V to 20 V, P_D ≤ 15 W	25°C	4.8	5	5.2	V
		0°C to 125°C	4.75		5.25	
Input voltage regulation	V_I = 7 V to 25 V	25°C		3	100	mV
	V_I = 8 V to 12 V			1	50	
Ripple rejection [2]	V_I = 8 V to 12 V, f = 120 Hz	0°C to 125°C	62	78		dB
	V_I = 8 V to 12 V, f = 120 Hz (KCT)			68		
Output voltage regulation	I_O = 5 mA to 1.5 A	25°C		15	100	mV
	I_O = 250 mA to 750 mA			5	50	
Output resistance	f = 1 kHz	0°C to 125°C		0.017		Ω
Temperature coefficient of output voltage	I_O = 5 mA	0°C to 125°C		−1.1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz	25°C		40		µV
Dropout voltage	I_O = 1 A	25°C		2		V
Bias current		25°C		4.2	8	mA
Bias current change	V_I = 7 V to 25 V	0°C to 125°C			1.3	mA
	I_O = 5 mA to 1 A				0.5	
Short-circuit output current		25°C		750		mA
Peak output current		25°C		2.2		A

(1) Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-µF capacitor across the input and a 0.1-µF capacitor across the output.

(2) This parameter is validated by design and verified during product characterization. It is not tested in production.

7.6 Electrical Characteristics — uA7808

at specified virtual junction temperature, V_I = 14 V, I_O = 500 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J [1]	µA7808C MIN	µA7808C TYP	µA7808C MAX	UNIT
Output voltage	I_O = 5 mA to 1 A, V_I = 10.5 V to 23 V, P_D ≤ 15 W	25°C	7.7	8	8.3	V
		0°C to 125°C	7.6		8.4	
Input voltage regulation	V_I = 10.5 V to 25 V	25°C		6	160	mV
	V_I = 11 V to 17 V			2	80	
Ripple rejection [2]	V_I = 11.5 V to 21.5 V, f = 120 Hz	0°C to 125°C	55	72		dB
	V_I = 11.5 V to 21.5 V, f = 120 Hz (KCT)			62		
Output voltage regulation	I_O = 5 mA to 1.5 A	25°C		12	160	mV
	I_O = 250 mA to 750 mA			4	80	
Output resistance	f = 1 kHz	0°C to 125°C		0.016		Ω
Temperature coefficient of output voltage	I_O = 5 mA	0°C to 125°C		−0.8		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz	25°C		52		µV
Dropout voltage	I_O = 1 A	25°C		2		V
Bias current		25°C		4.3	8	mA
Bias current change	V_I = 10.5 V to 25 V	0°C to 125°C			1	mA
	I_O = 5 mA to 1 A				0.5	
Short-circuit output current		25°C		450		mA
Peak output current		25°C		2.2		A

(1) Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-µF capacitor across the input and a 0.1-µF capacitor across the output.

(2) This parameter is validated by design and verified during product characterization. It is not tested in production.

7.7 Electrical Characteristics — uA7810

at specified virtual junction temperature, V_I = 17 V, I_O = 500 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J [1]	µA7810C MIN	TYP	MAX	UNIT
Output voltage	I_O = 5 mA to 1 A, V_I = 12.5 V to 25 V, $P_D \leq$ 15 W	25°C	9.6	10	10.4	V
		0°C to 125°C	9.5		10.5	
Input voltage regulation	V_I = 12.5 V to 28 V	25°C		7	200	mV
	V_I = 14 V to 20 V			2	100	
Ripple rejection [2]	V_I = 13 V to 23 V, f = 120 Hz	0°C to 125°C	55	71		dB
Output voltage regulation	I_O = 5 mA to 1.5 A	25°C		12	200	mV
	I_O = 250 mA to 750 mA			4	100	
Output resistance	f = 1 kHz	0°C to 125°C		0.018		Ω
Temperature coefficient of output voltage	I_O = 5 mA	0°C to 125°C		−1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz	25°C		70		µV
Dropout voltage	I_O = 1 A	25°C		2		V
Bias current		25°C		4.3	8	mA
Bias current change	V_I = 12.5 V to 28 V	0°C to 125°C			1	mA
	I_O = 5 mA to 1 A				0.5	
Short-circuit output current		25°C		400		mA
Peak output current		25°C		2.2		A

(1)   Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-µF capacitor across the input and a 0.1-µF capacitor across the output.
(2)   This parameter is validated by design and verified during product characterization. It is not tested in production.

7.8 Electrical Characteristics — uA7812

at specified virtual junction temperature, V_I = 19 V, I_O = 500 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J [1]	μA7812C			UNIT
			MIN	TYP	MAX	
Output voltage	I_O = 5 mA to 1 A, V_I = 14.5 V to 27 V, P_D ≤ 15 W	25°C	11.5	12	12.5	V
		0°C to 125°C	11.4		12.6	
Input voltage regulation	V_I = 14.5 V to 30 V	25°C		10	240	mV
	V_I = 16 V to 22 V			3	120	
Ripple rejection [2]	V_I = 15 V to 25 V, f = 120 Hz	0°C to 125°C	55	71		dB
	V_I = 15 V to 25 V, f = 120 Hz (KCT)			61		
Output voltage regulation	I_O = 5 mA to 1.5 A	25°C		12	240	mV
	I_O = 250 mA to 750 mA			4	120	
Output resistance	f = 1 kHz	0°C to 125°C		0.018		Ω
Temperature coefficient of output voltage	I_O = 5 mA	0°C to 125°C		−1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz	25°C		75		μV
Dropout voltage	I_O = 1 A	25°C		2		V
Bias current		25°C		4.3	8	mA
Bias current change	V_I = 14.5 V to 30 V	0°C to 125°C			1	mA
	I_O = 5 mA to 1 A				0.5	
Short-circuit output current		25°C		350		mA
Peak output current		25°C		2.2		A

(1) Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output.

(2) This parameter is validated by design and verified during product characterization. It is not tested in production.

Product Folder Links: *uA7805 uA7808 uA7810 uA7812 uA7815 uA7824*

7.9 Electrical Characteristics — uA7815

at specified virtual junction temperature, V_I = 23 V, I_O = 500 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J [1]	µA7815C MIN	µA7815C TYP	µA7815C MAX	UNIT
Output voltage	I_O = 5 mA to 1 A, V_I = 17.5 V to 30 V, $P_D \leq$ 15 W	25°C	14.4	15	15.6	V
		0°C to 125°C	14.25		15.75	
Input voltage regulation	V_I = 17.5 V to 30 V	25°C		11	300	mV
	V_I = 20 V to 26 V			3	150	
Ripple rejection [2]	V_I = 18.5 V to 28.5 V, f = 120 Hz	0°C to 125°C	54	70		dB
	V_I = 18.5 V to 28.5 V, f = 120 Hz (KCT)			60		
Output voltage regulation	I_O = 5 mA to 1.5 A	25°C		12	300	mV
	I_O = 250 mA to 750 mA			4	150	
Output resistance	f = 1 kHz	0°C to 125°C		0.019		Ω
Temperature coefficient of output voltage	I_O = 5 mA	0°C to 125°C		−1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz	25°C		90		µV
Dropout voltage	I_O = 1 A	25°C		2		V
Bias current		25°C		4.4	8	mA
Bias current change	V_I = 17.5 V to 30 V	0°C to 125°C			1	mA
	I_O = 5 mA to 1 A				0.5	
Short-circuit output current		25°C		230		mA
Peak output current		25°C		2.1		A

(1) Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-µF capacitor across the input and a 0.1-µF capacitor across the output.
(2) This parameter is validated by design and verified during product characterization. It is not tested in production.

7.10 Electrical Characteristics — uA7824

at specified virtual junction temperature, V_I = 33 V, I_O = 500 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J [1]	µA7824C			UNIT
			MIN	TYP	MAX	
Output voltage	I_O = 5 mA to 1 A, V_I = 27 V to 38 V, P_D ≤ 15 W	25°C	23	24	25	V
		0°C to 125°C	22.8		25.2	
Input voltage regulation	V_I = 27 V to 38 V	25°C		18	480	mV
	V_I = 30 V to 36 V			6	240	
Ripple rejection [2]	V_I = 28 V to 38 V, f = 120 Hz	0°C to 125°C	50	66		dB
Output voltage regulation	I_O = 5 mA to 1.5 A	25°C		12	480	mV
	I_O = 250 mA to 750 mA			4	240	
Output resistance	f = 1 kHz	0°C to 125°C		0.028		Ω
Temperature coefficient of output voltage	I_O = 5 mA	0°C to 125°C		−1.5		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz	25°C		170		µV
Dropout voltage	I_O = 1 A	25°C		2		V
Bias current		25°C		4.6	8	mA
Bias current change	V_I = 27 V to 38 V	0°C to 125°C			1	mA
	I_O = 5 mA to 1 A				0.5	
Short-circuit output current		25°C		150		mA
Peak output current		25°C		2.1		A

(1) Pulse-testing techniques maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.33-µF capacitor across the input and a 0.1-µF capacitor across the output.
(2) This parameter is validated by design and verified during product characterization. It is not tested in production.

7.11 Typical Characteristics
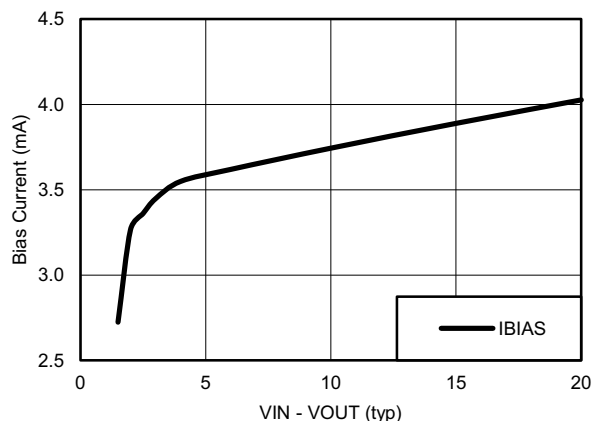
Figure 1. µA7805 Bias Current vs Voltage Differential at 25°C

Product Folder Links: *uA7805 uA7808 uA7810 uA7812 uA7815 uA7824*

8 Detailed Description

8.1 Overview

This series of fixed-voltage integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these regulators can deliver up to 1.5 A of output current. The internal current-limiting and thermal-shutdown features of these regulators essentially make them immune to overload. In addition to use as fixed-voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents, and also can be used as the power-pass element in precision regulators.

8.2 Functional Schematic
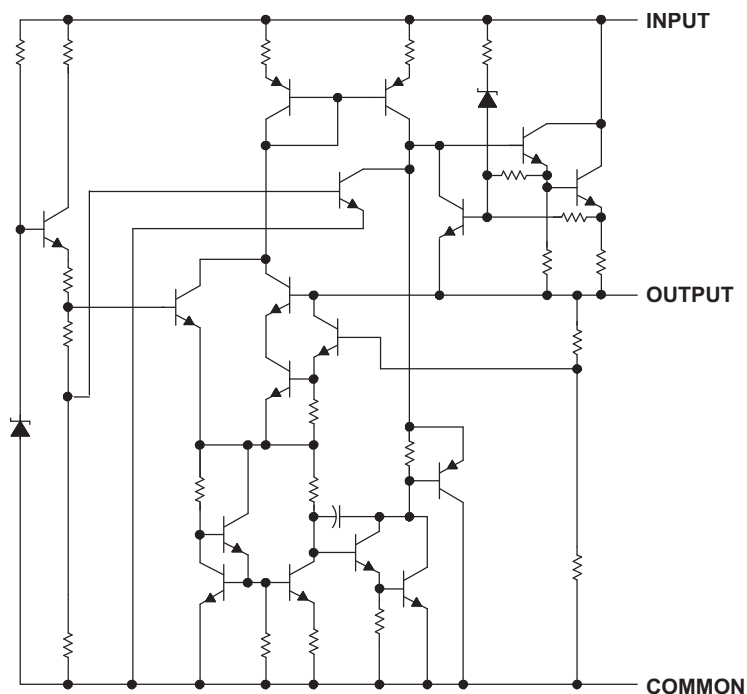
8.3 Feature Description

8.3.1 Thermal Overload

When the die temperature increases to unwanted levels, the device will reduce the output current to lower its temperature. Under heavy loads, the device may alternate between on and off output states to regulate temperature.

8.3.2 Short-Circuit Current Limiting

In the event of a short circuit, the device will limit its own current to safe levels by lowering the bias voltage of internal pass transistors. If the device becomes overheated, the thermal overload protection will take over.

8.4 Device Functional Modes

8.4.1 Fixed-Output Mode

These devices are available in fixed-output voltages. See the orderable part list for the desired output.

9 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

The following section shows application details of the µA78xx as a linear regulator.

9.2 Typical Application
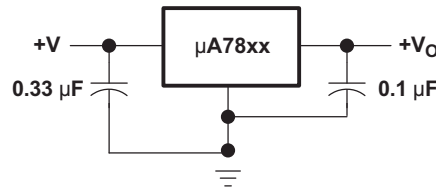
Figure 2. Fixed-Output Regulator

9.2.1 Design Requirements

- Input supply capacitor recommended for filtering noise on the input
- Output supply decoupling capacitor for stabilizing the output

9.2.2 Detailed Design Procedure

9.2.2.1 Operation With a Load Common to a Voltage of Opposite Polarity

In many cases, a regulator powers a load that is not connected to ground but, instead, is connected to a voltage source of opposite polarity (e.g., operational amplifiers, level-shifting circuits, etc.). In these cases, a clamp diode should be connected to the regulator output as shown in Figure 3. This protects the regulator from output polarity reversals during startup and short-circuit operation.
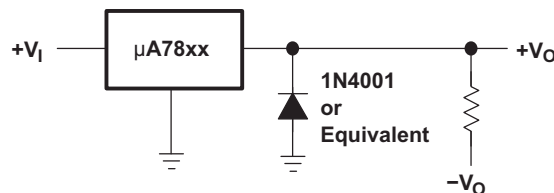
Figure 3. Output Polarity-Reversal-Protection Circuit

9.2.2.2 Reverse-Bias Protection

Occasionally, the input voltage to the regulator can collapse faster than the output voltage. This can occur, for example, when the input supply is crowbarred during an output overvoltage condition. If the output voltage is greater than approximately 7 V, the emitter-base junction of the series-pass element (internal or external) could break down and be damaged. To prevent this, a diode shunt can be used as shown in Figure 4.

Typical Application (continued)
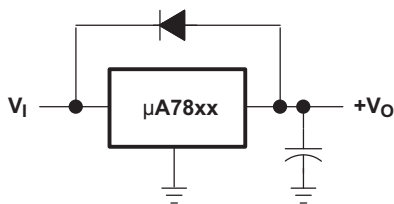
Figure 4. Reverse-Bias-Protection Circuit

9.2.3 Application Curves
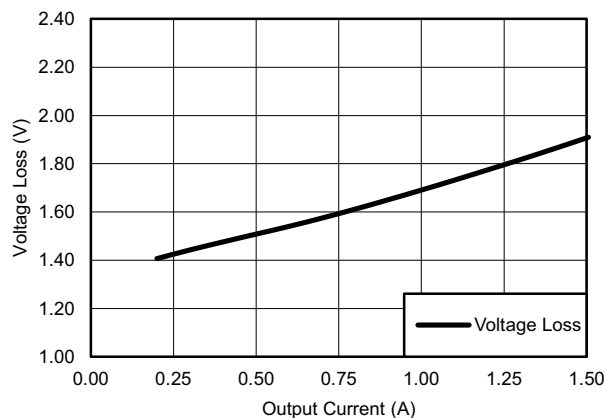
Figure 5. μA7805 Voltage Loss vs Output Current at 25°C

9.2.4 General Configurations
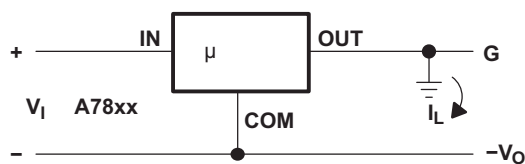
Figure 6. Positive Regulator in Negative Configuration (V$_I$ Must Float)
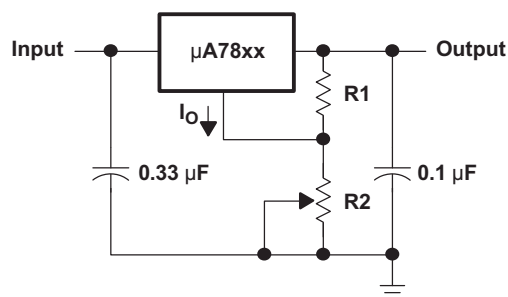
A: The following formula is used when V$_{xx}$ is the nominal output voltage (output to common) of the fixed regulators

$$V_O = V_{xx} + \left(\frac{V_{xx}}{R1} + I_Q \right) R2$$

Figure 7. Adjustable-Output Regulator

Product Folder Links: *uA7805 uA7808 uA7810 uA7812 uA7815 uA7824*

uA7805, uA7808, uA7810
uA7812, uA7815, uA7824
SLVS056P−MAY 1976−REVISED JANUARY 2015

www.ti.com

TEXAS
INSTRUMENTS

Typical Application (continued)

$$I_O = (V_O/R1) + I_O \text{ Bias Current}$$
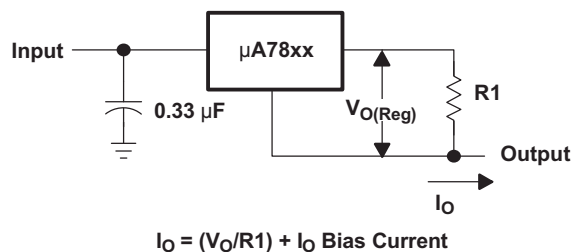
Figure 8. Current Regulator
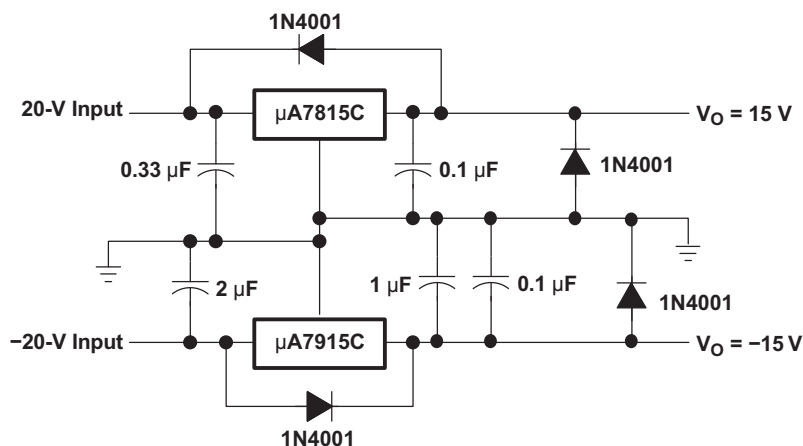
Figure 9. Regulated Dual Supply

10   Power Supply Recommendations

See *Recommended Operating Conditions* for the recommended power supply voltages for each variation of the µA78xx device. Different orderable part numbers will be able to tolerate different levels of voltage. It is also recommended to have a decoupling capacitor on the output of the µA78xx device's power supply to limit noise on the device input.

Product Folder Links: *uA7805 uA7808 uA7810 uA7812 uA7815 uA7824*

11 Layout

11.1 Layout Guidelines

Keep trace widths large enough to eliminate problematic I×R voltage drops at the input and output terminals. Input decoupling capacitors should be placed as close to the µA78XX as possible.

11.2 Layout Example
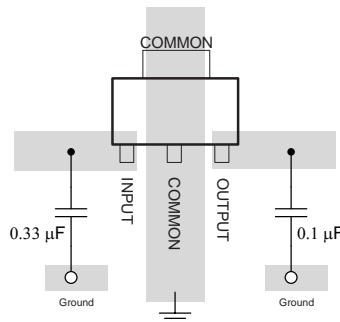
Figure 10. Layout Diagram

12 Device and Documentation Support

12.1 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

Table 1. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
µA7805	Click here	Click here	Click here	Click here	Click here
uA7808	Click here	Click here	Click here	Click here	Click here
uA7810	Click here	Click here	Click here	Click here	Click here
uA7812	Click here	Click here	Click here	Click here	Click here
uA7815	Click here	Click here	Click here	Click here	Click here
uA7924	Click here	Click here	Click here	Click here	Click here

12.2 Trademarks

12.3 Electrostatic Discharge Caution

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

12.4 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGE OPTION ADDENDUM

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
UA7805CKCS	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7805C	Samples
UA7805CKCSE3	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7805C	Samples
UA7805CKCT	ACTIVE	TO-220	KCT	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7805C	Samples
UA7805CKTTR	ACTIVE	DDPAK/ TO-263	KTT	3	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-245C-168 HR	0 to 125	UA7805C	Samples
UA7805CKTTRG3	ACTIVE	DDPAK/ TO-263	KTT	3	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-245C-168 HR	0 to 125	UA7805C	Samples
UA7808CKCS	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7808C	Samples
UA7808CKCSE3	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7808C	Samples
UA7808CKCT	ACTIVE	TO-220	KCT	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7808C	Samples
UA7808CKTTR	ACTIVE	DDPAK/ TO-263	KTT	3	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-245C-168 HR	0 to 125	UA7808C	Samples
UA7810CKCS	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7810C	Samples
UA7810CKCSE3	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7810C	Samples
UA7810CKTTR	ACTIVE	DDPAK/ TO-263	KTT	3	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-245C-168 HR	0 to 125	UA7810C	Samples
UA7810CKTTRG3	ACTIVE	DDPAK/ TO-263	KTT	3	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-245C-168 HR	0 to 125	UA7810C	Samples
UA7812CKCS	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7812C	Samples
UA7812CKCSE3	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7812C	Samples
UA7812CKCT	ACTIVE	TO-220	KCT	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7812C	Samples
UA7812CKTTR	ACTIVE	DDPAK/ TO-263	KTT	3	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-245C-168 HR	0 to 125	UA7812C	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
UA7812CKTTRG3	ACTIVE	DDPAK/ TO-263	KTT	3	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-245C-168 HR	0 to 125	UA7812C	Samples
UA7815CKCS	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7815C	Samples
UA7815CKCSE3	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7815C	Samples
UA7815CKCT	ACTIVE	TO-220	KCT	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7815C	Samples
UA7815CKTTR	ACTIVE	DDPAK/ TO-263	KTT	3	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-245C-168 HR	0 to 125	UA7815C	Samples
UA7824CKCS	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7824C	Samples
UA7824CKCSE3	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	0 to 125	UA7824C	Samples
UA7824CKTTR	ACTIVE	DDPAK/ TO-263	KTT	3	500	Green (RoHS & no Sb/Br)	CU SN	Level-3-245C-168 HR	0 to 125	UA7824C	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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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.

![Texas Instruments] **PACKAGE MATERIALS INFORMATION**

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
UA7805CKTTR	DDPAK/ TO-263	KTT	3	500	330.0	24.4	10.8	16.3	5.11	16.0	24.0	Q2
UA7805CKTTR	DDPAK/ TO-263	KTT	3	500	330.0	24.4	10.8	16.1	4.9	16.0	24.0	Q2
UA7808CKTTR	DDPAK/ TO-263	KTT	3	500	330.0	24.4	10.8	16.3	5.11	16.0	24.0	Q2
UA7810CKTTR	DDPAK/ TO-263	KTT	3	500	330.0	24.4	10.8	16.3	5.11	16.0	24.0	Q2
UA7812CKTTR	DDPAK/ TO-263	KTT	3	500	330.0	24.4	10.8	16.3	5.11	16.0	24.0	Q2
UA7812CKTTR	DDPAK/ TO-263	KTT	3	500	330.0	24.4	10.8	16.1	4.9	16.0	24.0	Q2
UA7815CKTTR	DDPAK/ TO-263	KTT	3	500	330.0	24.4	10.8	16.3	5.11	16.0	24.0	Q2
UA7824CKTTR	DDPAK/ TO-263	KTT	3	500	330.0	24.4	10.8	16.3	5.11	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)
UA7805CKTTR	DDPAK/TO-263	KTT	3	500	340.0	340.0	38.0
UA7805CKTTR	DDPAK/TO-263	KTT	3	500	350.0	334.0	47.0
UA7808CKTTR	DDPAK/TO-263	KTT	3	500	340.0	340.0	38.0
UA7810CKTTR	DDPAK/TO-263	KTT	3	500	340.0	340.0	38.0
UA7812CKTTR	DDPAK/TO-263	KTT	3	500	340.0	340.0	38.0
UA7812CKTTR	DDPAK/TO-263	KTT	3	500	350.0	334.0	47.0
UA7815CKTTR	DDPAK/TO-263	KTT	3	500	340.0	340.0	38.0
UA7824CKTTR	DDPAK/TO-263	KTT	3	500	340.0	340.0	38.0

KTT (R–PSFM–G3)   PLASTIC FLANGE–MOUNT PACKAGE

10,67 / 9,65

6,22 Min

1,68 / 1,14

4,83 / 4,06

1,40 / 1,14

6,60 Min

Exposed Thermal Tab

9,65 / 8,38

15,88 / 14,60

1   2   3

0,91 / 0,66

1,40 / 1,14

0,25 / 0,00

⊕ 0,25 Ⓜ

2,54

0,58 / 0,30

Gauge Plane

2,79 / 1,78

0–8°

0,25

Gauge Plane

2,79 / 1,78

0–8°

0,25

OPTIONAL LEAD FORM
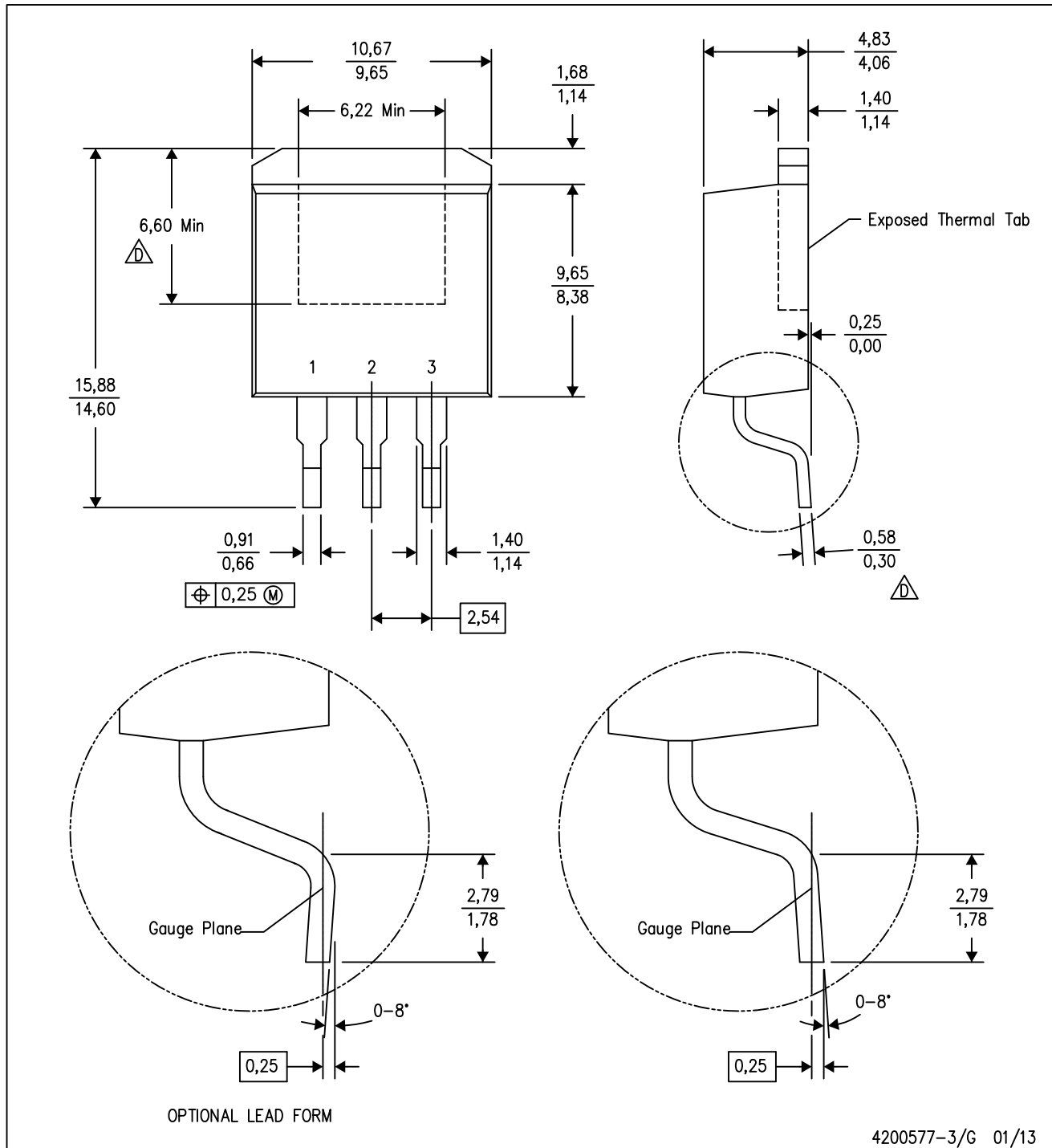
4200577–3/G 01/13

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 AA, except minimum lead thickness and minimum exposed pad length.
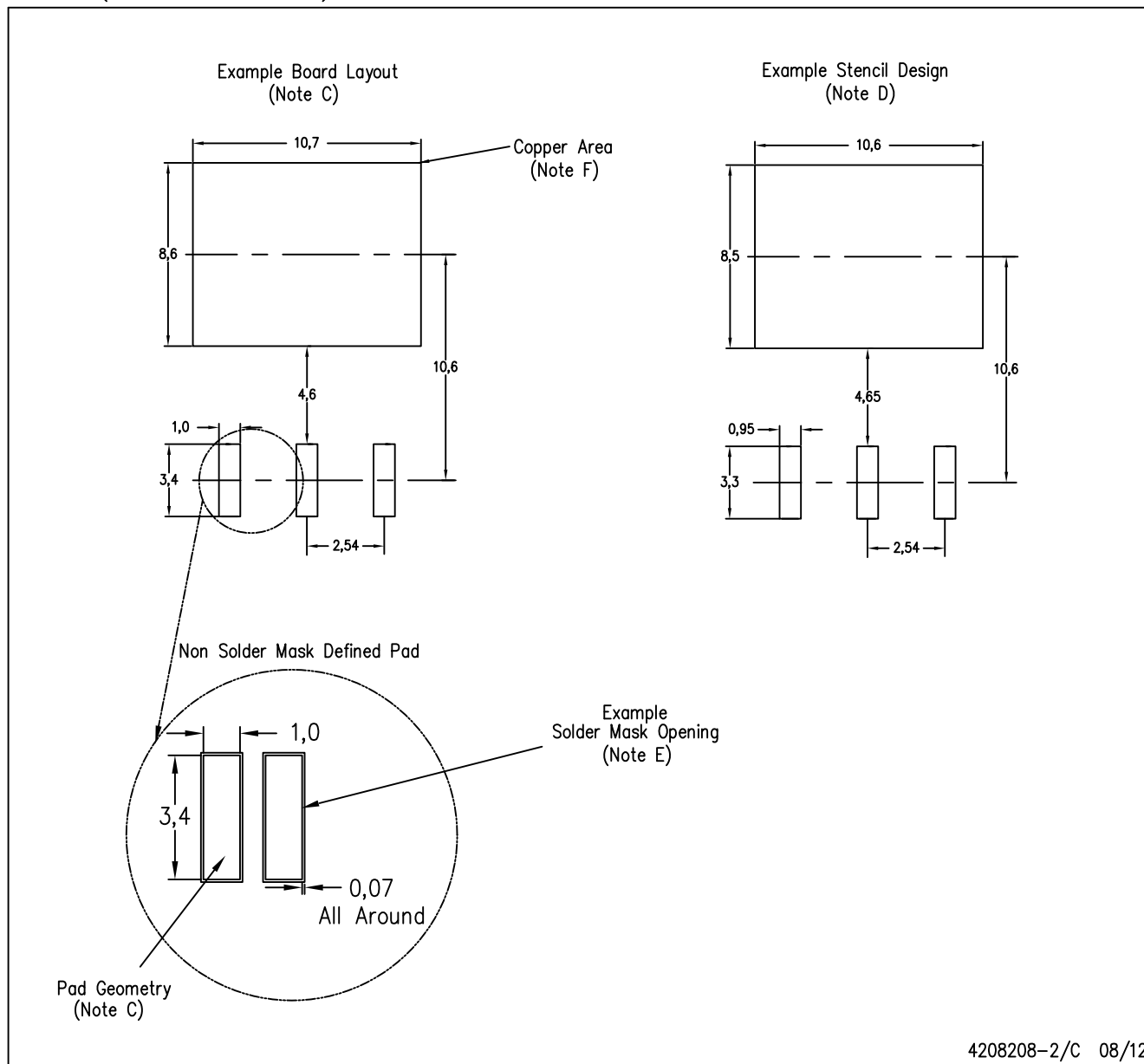
TEXAS
INSTRUMENTS
www.ti.com

KTT (R−PSFM−G3)   PLASTIC FLANGE−MOUNT PACKAGE

Example Board Layout
(Note C)

Example Stencil Design
(Note D)

10,7

Copper Area
(Note F)

8,6

10,6

4,6

1,0

3,4

2,54

10,6

8,5

0,95

3,3

4,65

10,6

2,54

Non Solder Mask Defined Pad

1,0

3,4

0,07
All Around

Example
Solder Mask Opening
(Note E)

Pad Geometry
(Note C)

4208208−2/C 08/12

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.

TEXAS
INSTRUMENTS
www.ti.com

KCT (R−PSFM−T3)   PLASTIC FLANGE−MOUNT PACKAGE

0.156 (3,96) / 0.142 (3,60) DIA

0.420 (10,67) / 0.380 (9,65) ⒢

0.120 (3,05) / 0.100 (2,54)

0.183 (4,65) / 0.167 (4,25)

0.024 (0,61) / 0.018 (0,46) ⒣

0.504 (12,80) / 0.480 (12,20) ⒢

0.270 (6,86) / 0.230 (5,84) ⒢

0.344 (8,74) / 0.320 (8,14) ⒢

0.650 (16,51) / 0.560 (14,22)

0.346 (8,79) / 0.330 (8,39)

Exposed Thermal Pad

⒡

⒞ 0.125 (3,18)

0.159 (4,04) MAX

0.580 (14,73) / 0.500 (12,70)

1 2 3

0.036 (0,91) / 0.028 (0,71)

0.070 (1,78) / 0.045 (1,14)

⊕ 0.010 (0,25) Ⓜ

0.100 (2,54)

0.200 (5,08)

0.115 (2,92) / 0.080 (2,03)

0.024 (0,61) / 0.018 (0,46)

4212513/A 02/2012
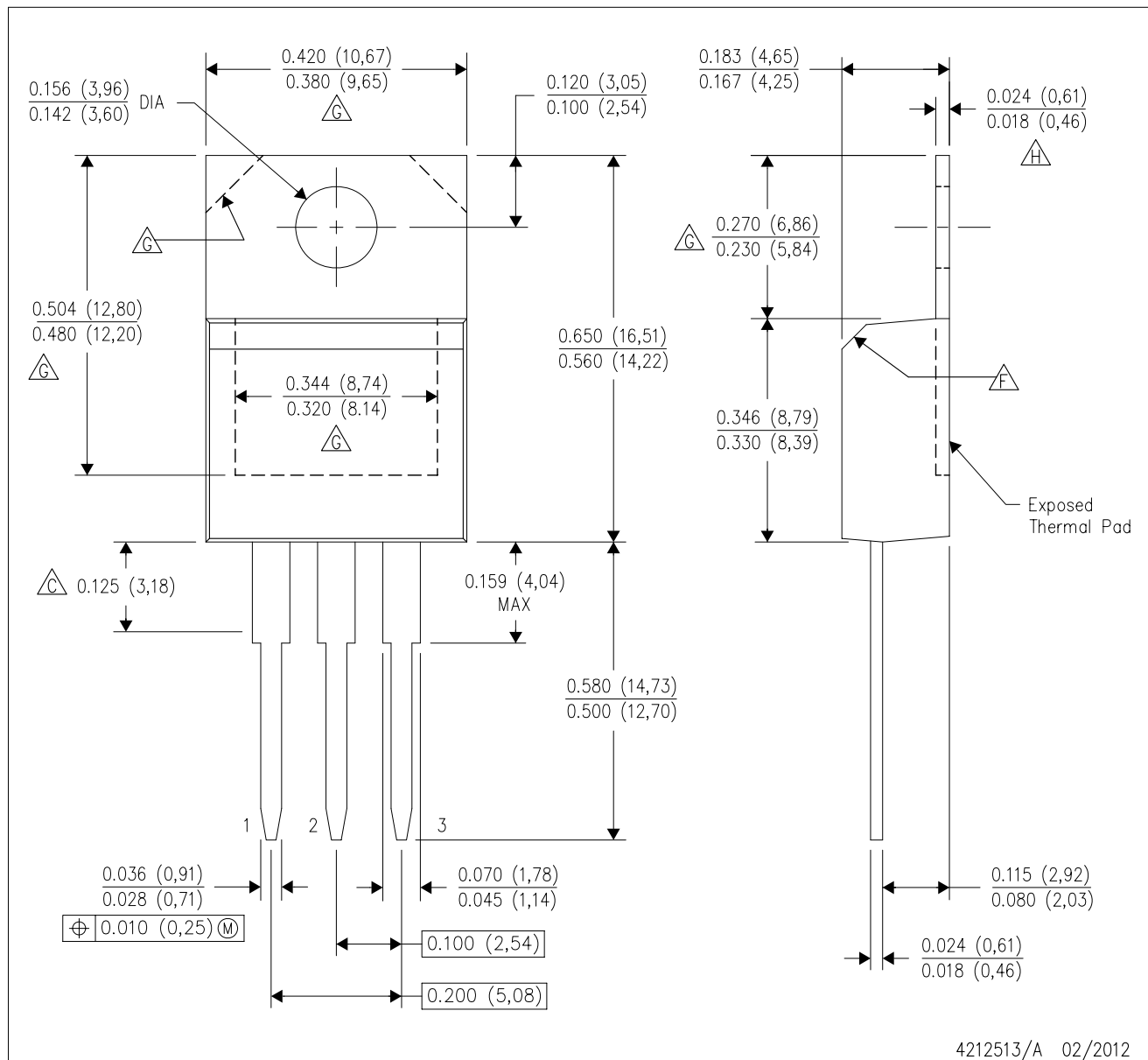
NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
⒞ Lead dimensions are not controlled within this area.
D. All lead dimensions apply before solder dip.
E. The center lead is in electrical contact with the mounting tab.
⒡ The chamfer is optional.
⒢ Thermal pad contour optional within these dimensions.
⒣ Falls within JEDEC TO−220 variation AB, except minimum tab thickness.

TEXAS INSTRUMENTS
www.ti.com
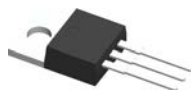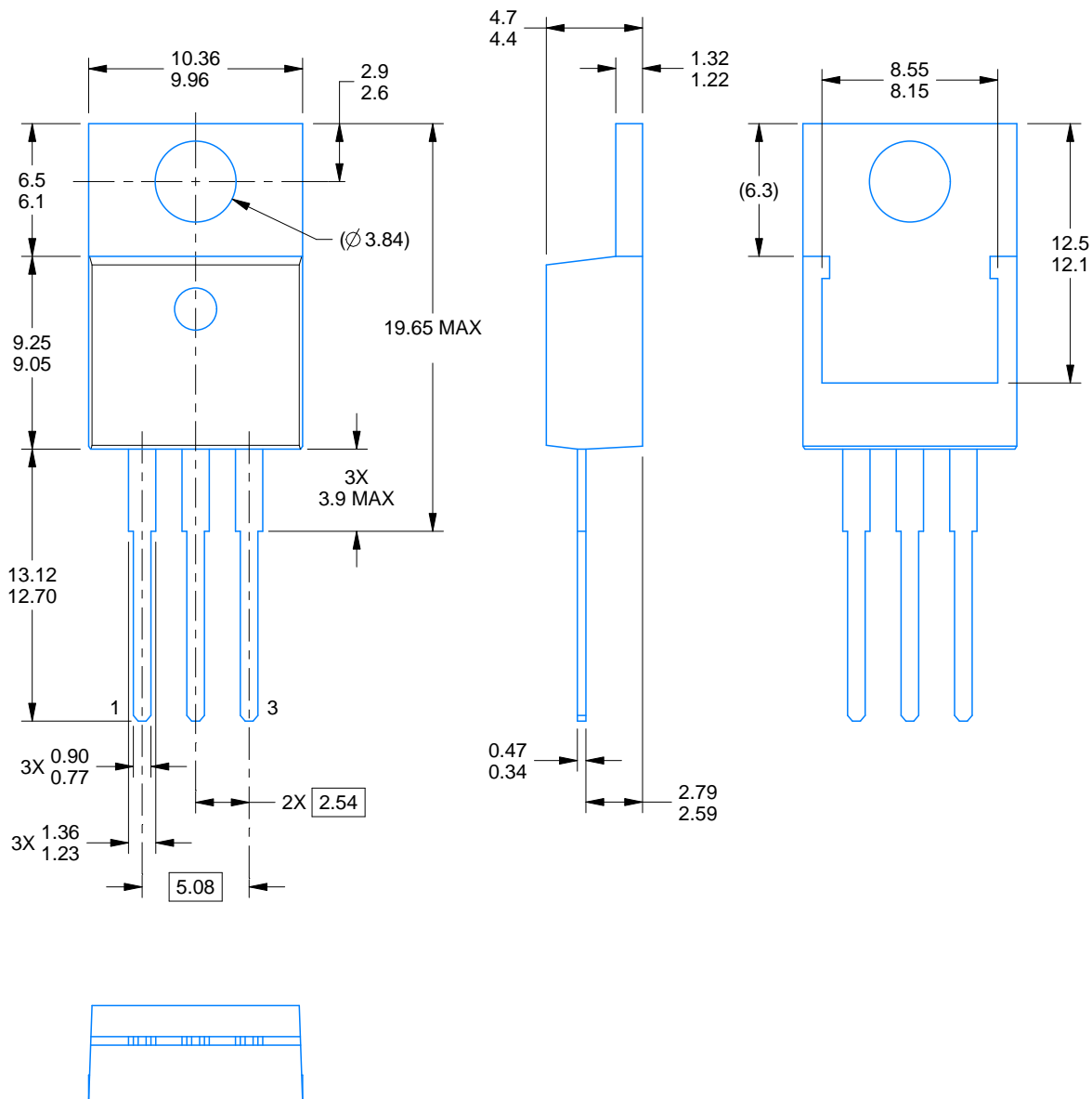
4222214/B   08/2018

NOTES:

1. Dimensions 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. Reference JEDEC registration TO-220.

TEXAS
INSTRUMENTS
www.ti.com

0.07 MAX
ALL AROUND

3X $\varnothing$ (1.2)

2X $\varnothing$ (1.7)
METAL

2X SOLDER MASK
OPENING

$\square$ (1.7)

1

2

3

0.07 MAX
ALL AROUND

R (0.05)

SOLDER MASK
OPENING

(2.54)

(5.08)
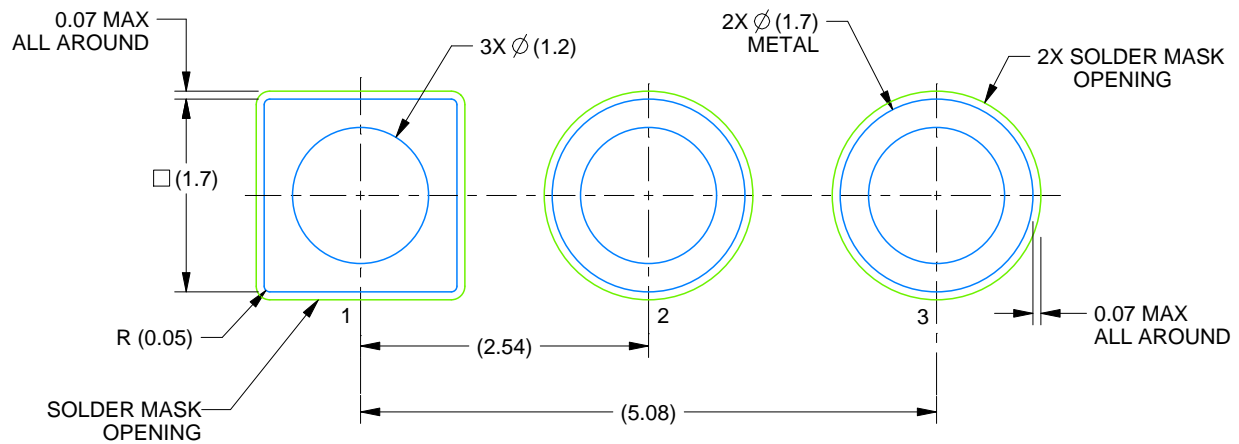
LAND PATTERN EXAMPLE
NON-SOLDER MASK DEFINED
SCALE:15X

4222214/B   08/2018

SCALE	SIZE		REV	PAGE
	A	4222214	B	4 OF 4

IMPORTANT NOTICE