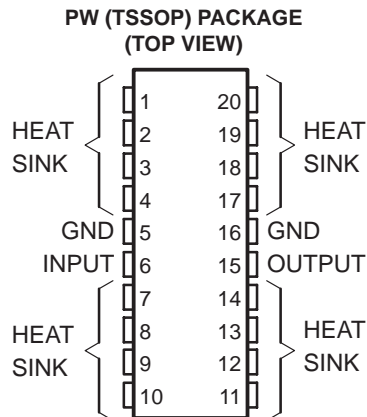


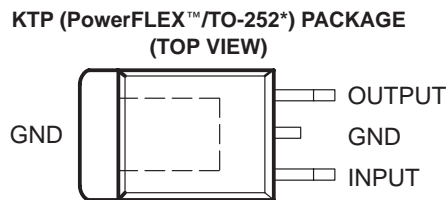
# TLV2217 LOW-DROPOUT FIXED-VOLTAGE REGULATORS

SLVS067L – MARCH 1992 – REVISED APRIL 2005

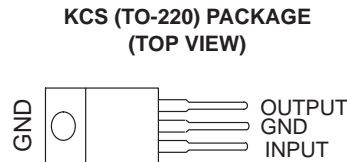
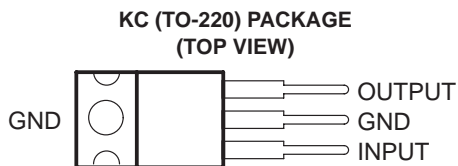
- Fixed 1.8-V, 2.5-V, and 3.3-V Outputs
- $\pm 1\%$  Maximum Output Voltage Tolerance at  $T_J = 25^\circ\text{C}$
- 500-mV Maximum Dropout Voltage at 500 mA (3.3-V Option)
- $\pm 2\%$  Output Voltage Variation Across Load and Temperature
- Internal Overcurrent Limiting
- Internal Thermal-Overload Protection
- Internal Overvoltage Protection



HEAT SINK – These terminals have an internal resistive connection to ground and should be grounded or electrically isolated.



\*Complies with JEDEC TO-252, variation AC



## description/ordering information

### ORDERING INFORMATION

$T_J$	$V_O$ (NOM)	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 125°C	1.8 V	PowerFLEX™/TO-252* (KTP)	Reel of 3000	TLV2217-18KTPR	2217-18
		TO-220 (KCS)	Tube of 50	TLV2217-18KCS	TLV2217-18
	2.5 V	TO-220 (KC)	Tube of 50	TLV2217-25KC	TLV2217-25
		PowerFLEX™/TO-252* (KTP)	Reel of 3000	TLV2217-25KTPR	2217-25
		TSSOP (PW)	Tube of 70 Reel of 2000	TLV2217-25PW TLV2217-25PWR	2217-25
	3.3 V	PowerFLEX™/TO-252* (KTP)	Reel of 3000	TLV2217-33KTPR	2217-33
		TO-220 (KC)	Tube of 50	TLV2217-33KC	TLV2217-33
		TSSOP (PW)	Reel of 2000	TLV2217-33PWR	2217-33

\*Complies to TO-252, variation AC.

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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# TLV2217 LOW-DROPOUT FIXED-VOLTAGE REGULATORS

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## description/ordering information (continued)

The TLV2217 family of low-dropout regulators offers a variety of fixed-voltage options that offer a maximum continuous input voltage of 16 V, making them more versatile than CMOS regulators. Utilizing a pnp pass element, these regulators are capable of sourcing 500 mA of current, with a specified maximum dropout of 500 mV (3.3-V and 2.5-V options), making these regulators ideal for low-voltage applications. Additionally, the TLV2217 regulators offer very tight output accuracy of  $\pm 2\%$  across operating load and temperature ranges. Other convenient features the regulators provide are internal overcurrent limiting, thermal-overload protection, and overvoltage protection. The TLV2217 family of regulators is available in fixed voltages of 1.8 V, 2.5 V, and 3.3 V.

## absolute maximum ratings over operating virtual junction temperature range (unless otherwise noted)<sup>†</sup>

Continuous input voltage,  $V_I$  ..... 16 V  
 Operating virtual junction temperature,  $T_J$  ..... 150°C  
 Storage temperature range,  $T_{stg}$  ..... -65°C to 150°C

<sup>†</sup> 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.

## package thermal data (see Note 1)

PACKAGE	BOARD	$\theta_{JP}$ <sup>‡</sup>	$\theta_{JC}$	$\theta_{JA}$
PowerFLEX™/TO-252 (KTP)	High K, JESD 51-5	1.4°C/W	19°C/W	28°C/W
TO-220 (KC/KCS)	High K, JESD 51-5	3°C/W	17°C/W	19°C/W
TSSOP (PW)	High K, JESD 51-7		32°C/W	83°C/W

<sup>‡</sup> For packages with exposed thermal pads, such as QFN, PowerPAD, and PowerFLEX,  $\theta_{JP}$  is defined as the thermal resistance between the die junction and the bottom of the exposed pad.

NOTE 1: Maximum power dissipation is a function of  $T_J(\max)$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_J(\max) - T_A)/\theta_{JA}$ . Operating at the absolute maximum  $T_J$  of 150°C can affect reliability.

## recommended operating conditions

	MIN	MAX	UNIT
$V_I$ Input voltage	3.0	12	V
$I_O$ Output current	0	500	mA
$T_J$ Operating virtual junction temperature range	0	125	°C

<sup>§</sup> Minimum  $V_I$  is equal to 3.0 V or  $V_O(\max) + 0.6$  V, whichever is greater.



# TLV2217 LOW-DROPOUT FIXED-VOLTAGE REGULATORS

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## electrical characteristics at $V_I = 4.5\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITION <sup>†</sup>	TLV2217-33			UNIT	
		MIN	TYP	MAX		
Output voltage	$I_O = 20\text{ mA to }500\text{ mA}$ , $V_I = 3.8\text{ V to }5.5\text{ V}$	$T_J = 25^\circ\text{C}$	3.267	3.30	3.333	V
		$T_J = 0^\circ\text{C to }125^\circ\text{C}$	3.234		3.366	
Input voltage regulation	$V_I = 3.8\text{ V to }5.5\text{ V}$		5	15	mV	
Ripple rejection	$f = 120\text{ Hz}$ , $V_{\text{ripple}} = 1\text{ V}_{\text{PP}}$ , $V_I = 4.5\text{ V}$		-62		dB	
Output voltage regulation	$I_O = 20\text{ mA to }500\text{ mA}$		5	30	mV	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		500		$\mu\text{V}$	
Dropout voltage	$I_O = 250\text{ mA}$			400	mV	
	$I_O = 500\text{ mA}$			500		
Bias current	$I_O = 0$		2	5	mA	
	$I_O = 500\text{ mA}$		19	49		

<sup>†</sup> Pulse-testing techniques are used to maintain the virtual junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- $\mu\text{F}$  capacitor across the input and a 22- $\mu\text{F}$  tantalum capacitor, with equivalent series resistance of 1.5  $\Omega$ , on the output.

## electrical characteristics at $V_I = 3.3\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITION <sup>†</sup>	TLV2217-25			UNIT	
		MIN	TYP	MAX		
Output voltage	$I_O = 20\text{ mA to }500\text{ mA}$ , $V_I = 3.0\text{ V to }5.5\text{ V}$	$T_J = 25^\circ\text{C}$	2.475	2.5	2.525	V
		$T_J = 0^\circ\text{C to }125^\circ\text{C}$	2.45		2.55	
Input voltage regulation	$V_I = 3.0\text{ V to }5.5\text{ V}$		4	12	mV	
Ripple rejection	$f = 120\text{ Hz}$ , $V_{\text{ripple}} = 1\text{ V}_{\text{PP}}$ , $V_I = 4.5\text{ V}$		-62		dB	
Output voltage regulation	$I_O = 20\text{ mA to }500\text{ mA}$		4	23	mV	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		500		$\mu\text{V}$	
Dropout voltage	$I_O = 250\text{ mA}$			400	mV	
	$I_O = 500\text{ mA}$			500		
Bias current	$I_O = 0$		2	5	mA	
	$I_O = 500\text{ mA}$		19	49		

<sup>†</sup> Pulse-testing techniques are used to maintain the virtual junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- $\mu\text{F}$  capacitor across the input and a 22- $\mu\text{F}$  tantalum capacitor, with equivalent series resistance of 1.5  $\Omega$ , on the output.

# TLV2217

## LOW-DROPOUT FIXED-VOLTAGE REGULATORS

SLVS067L – MARCH 1992 – REVISED APRIL 2005

### electrical characteristics at $V_I = 3.3\text{ V}$ , $I_O = 500\text{ mA}$ , $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	TLV2217-18			UNIT	
		MIN	TYP	MAX		
Output voltage	$I_O = 20\text{ mA to }500\text{ mA}$ , $V_I = 3.0\text{ V to }5.5\text{ V}$	$T_J = 25^\circ\text{C}$	1.782	1.8	1.818	V
		$T_J = 0^\circ\text{C to }125^\circ\text{C}$	1.764		1.836	
Input voltage regulation	$V_I = 3.0\text{ V to }5.5\text{ V}$		3	9	mV	
Ripple rejection	$f = 120\text{ Hz}$ , $V_{\text{ripple}} = 1\text{ V}_{\text{PP}}$ , $V_I = 4.5\text{ V}$		-62		dB	
Output voltage regulation	$I_O = 20\text{ mA to }500\text{ mA}$		3	17	mV	
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$		500		$\mu\text{V}$	
Dropout voltage	$I_O = 250\text{ mA}$		‡		mV	
	$I_O = 500\text{ mA}$		‡			
Bias current	$I_O = 0$		2	5	mA	
	$I_O = 500\text{ mA}$		19	49		

† Pulse-testing techniques are used to maintain the virtual junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately. All characteristics are measured with a 0.1- $\mu\text{F}$  capacitor across the input and a 22- $\mu\text{F}$  tantalum capacitor, with equivalent series resistance of 1.5  $\Omega$ , on the output.

‡ Dropout voltage is limited by the input voltage range, with minimum  $V_I = 3.0\text{ V}$ .

## COMPENSATION-CAPACITOR SELECTION INFORMATION

The TLV2217 is a low-dropout regulator. This means that the capacitance loading is important to the performance of the regulator because it is a vital part of the control loop. The capacitor value and the equivalent series resistance (ESR) both affect the control loop and must be defined for the load range and the temperature range. Figures 1 and 2 can be used to establish the capacitance value and ESR range for the best regulator performance.

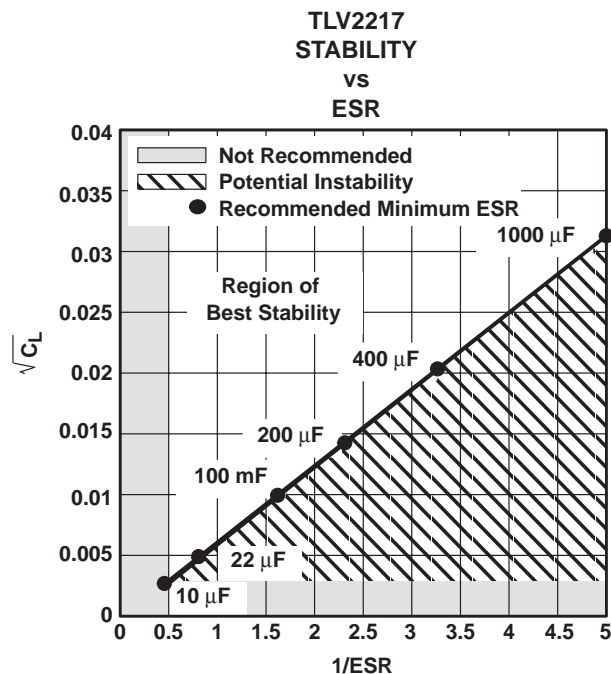
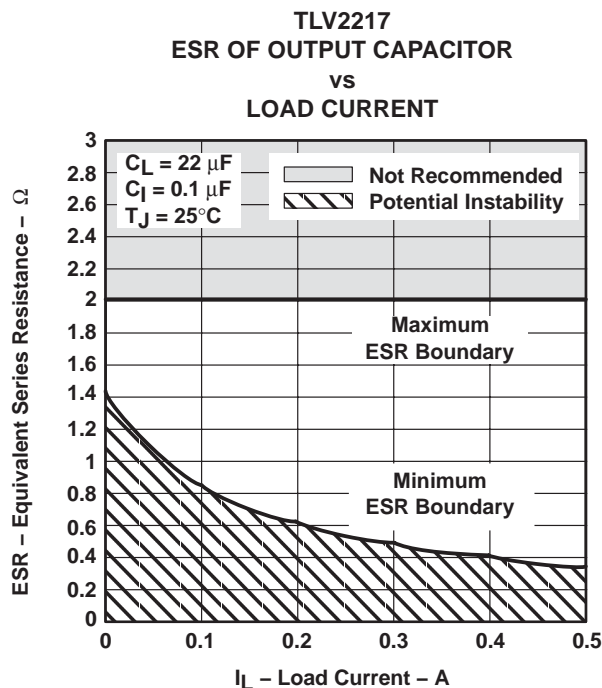


Figure 2

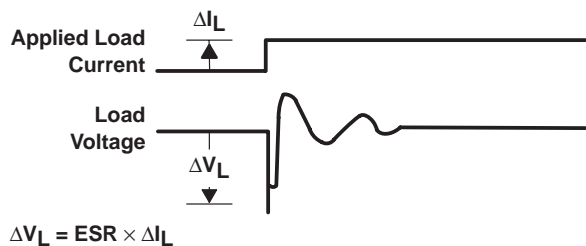


Figure 1

typical application schematic

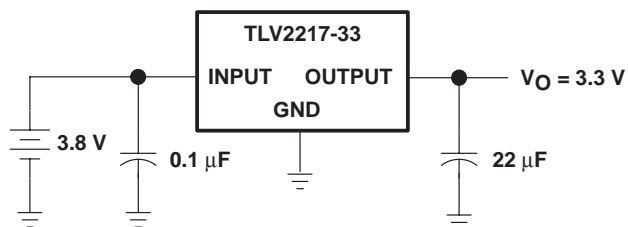


Figure 3

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>	Samples (Requires Login)
TLV2217-18KCS	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	<a href="#">Request Free Samples</a>
TLV2217-18KCE3	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	<a href="#">Request Free Samples</a>
TLV2217-18KTPR	OBSOLETE	PFM	KTP	2		TBD	Call TI	Call TI	Samples Not Available
TLV2217-18KTPRG3	OBSOLETE	PFM	KTP	2		TBD	Call TI	Call TI	Samples Not Available
TLV2217-18KVURG3	ACTIVE	PFM	KVU	3	2500	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR	<a href="#">Request Free Samples</a>
TLV2217-25KC	OBSOLETE	TO-220	KC	3		TBD	Call TI	Call TI	Samples Not Available
TLV2217-25KCE3	OBSOLETE	TO-220	KC	3		TBD	Call TI	Call TI	Samples Not Available
TLV2217-25KCE3	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	<a href="#">Request Free Samples</a>
TLV2217-25KTPR	OBSOLETE	PFM	KTP	2		TBD	Call TI	Call TI	Samples Not Available
TLV2217-25KTPRG3	OBSOLETE	PFM	KTP	2		TBD	Call TI	Call TI	Samples Not Available
TLV2217-25KVURG3	ACTIVE	PFM	KVU	3	1	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR	<a href="#">Request Free Samples</a>
TLV2217-25PW	ACTIVE	TSSOP	PW	20		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TLV2217-25PWE4	ACTIVE	TSSOP	PW	20		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TLV2217-25PWG4	ACTIVE	TSSOP	PW	20		TBD	Call TI	Call TI	<a href="#">Purchase Samples</a>
TLV2217-25PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPD	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
TLV2217-25PWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPD	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
TLV2217-25PWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPD	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
TLV2217-33KC	OBSOLETE	TO-220	KC	3		TBD	Call TI	Call TI	Samples Not Available
TLV2217-33KCE3	OBSOLETE	TO-220	KC	3		TBD	Call TI	Call TI	Samples Not Available
TLV2217-33KCE3	ACTIVE	TO-220	KCS	3	50	Pb-Free (RoHS)	CU SN	N / A for Pkg Type	<a href="#">Request Free Samples</a>
TLV2217-33KTPR	OBSOLETE	PFM	KTP	2		TBD	Call TI	Call TI	Samples Not Available
TLV2217-33KTPRG3	OBSOLETE	PFM	KTP	2		TBD	Call TI	Call TI	Samples Not Available
TLV2217-33KVURG3	ACTIVE	PFM	KVU	3	2500	Green (RoHS & no Sb/Br)	CU SN	Level-3-260C-168 HR	<a href="#">Request Free Samples</a>
TLV2217-33PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/ Ball Finish	MSL Peak Temp <sup>(3)</sup>	Samples (Requires Login)
TLV2217-33PWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office
TLV2217-33PWRG4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	Call TI	Level-1-260C-UNLIM	Contact TI Distributor or Sales Office

<sup>(1)</sup> 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.

**OBSELETE:** TI has discontinued the production of the device.

<sup>(2)</sup> 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.

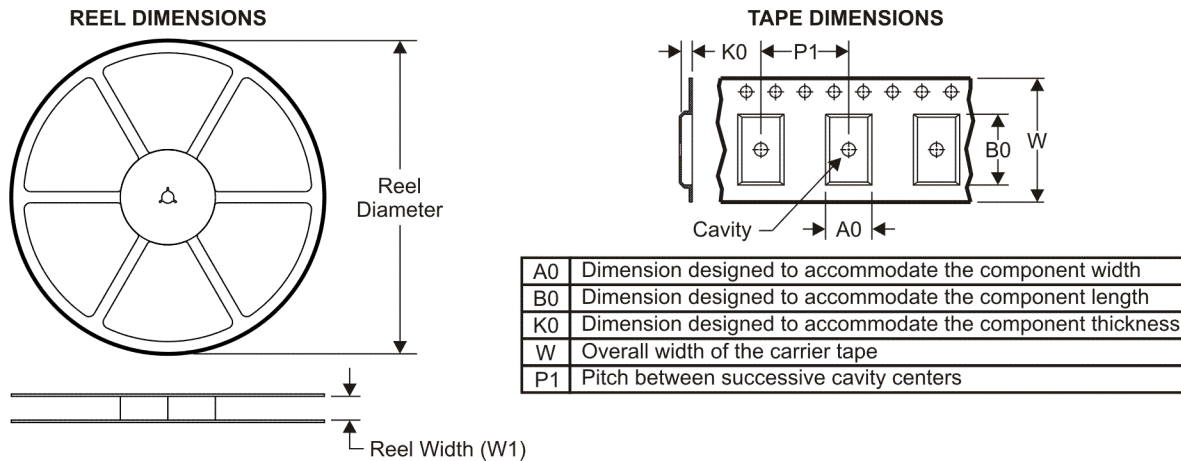
**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**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)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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**TAPE AND REEL INFORMATION**

**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
TLV2217-18KVURG3	PFM	KVU	3	2500	330.0	16.4	6.9	10.5	2.7	8.0	16.0	Q2
TLV2217-25KVURG3	PFM	KVU	3	1	330.0	16.4	6.9	10.5	2.7	8.0	16.0	Q2
TLV2217-25PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
TLV2217-33KVURG3	PFM	KVU	3	2500	330.0	16.4	6.9	10.5	2.7	8.0	16.0	Q2
TLV2217-33PWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1



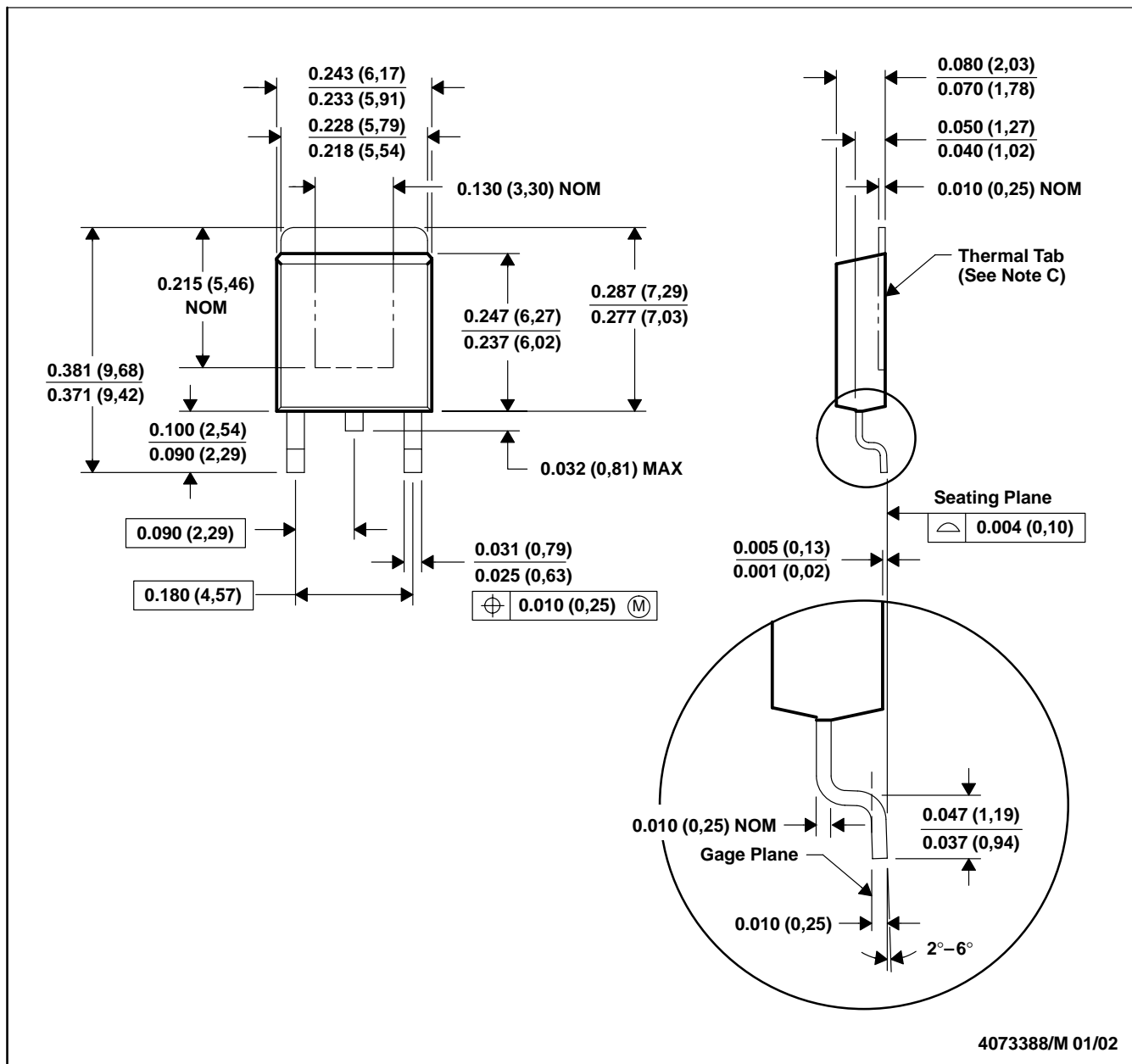
**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLV2217-18KVURG3	PFM	KVU	3	2500	340.0	340.0	38.0
TLV2217-25KVURG3	PFM	KVU	3	1	340.0	340.0	38.0
TLV2217-25PWR	TSSOP	PW	20	2000	346.0	346.0	33.0
TLV2217-33KVURG3	PFM	KVU	3	2500	340.0	340.0	38.0
TLV2217-33PWR	TSSOP	PW	20	2000	346.0	346.0	33.0

KTP (R-PSFM-G2)

PowerFLEX™ PLASTIC FLANGE-MOUNT PACKAGE



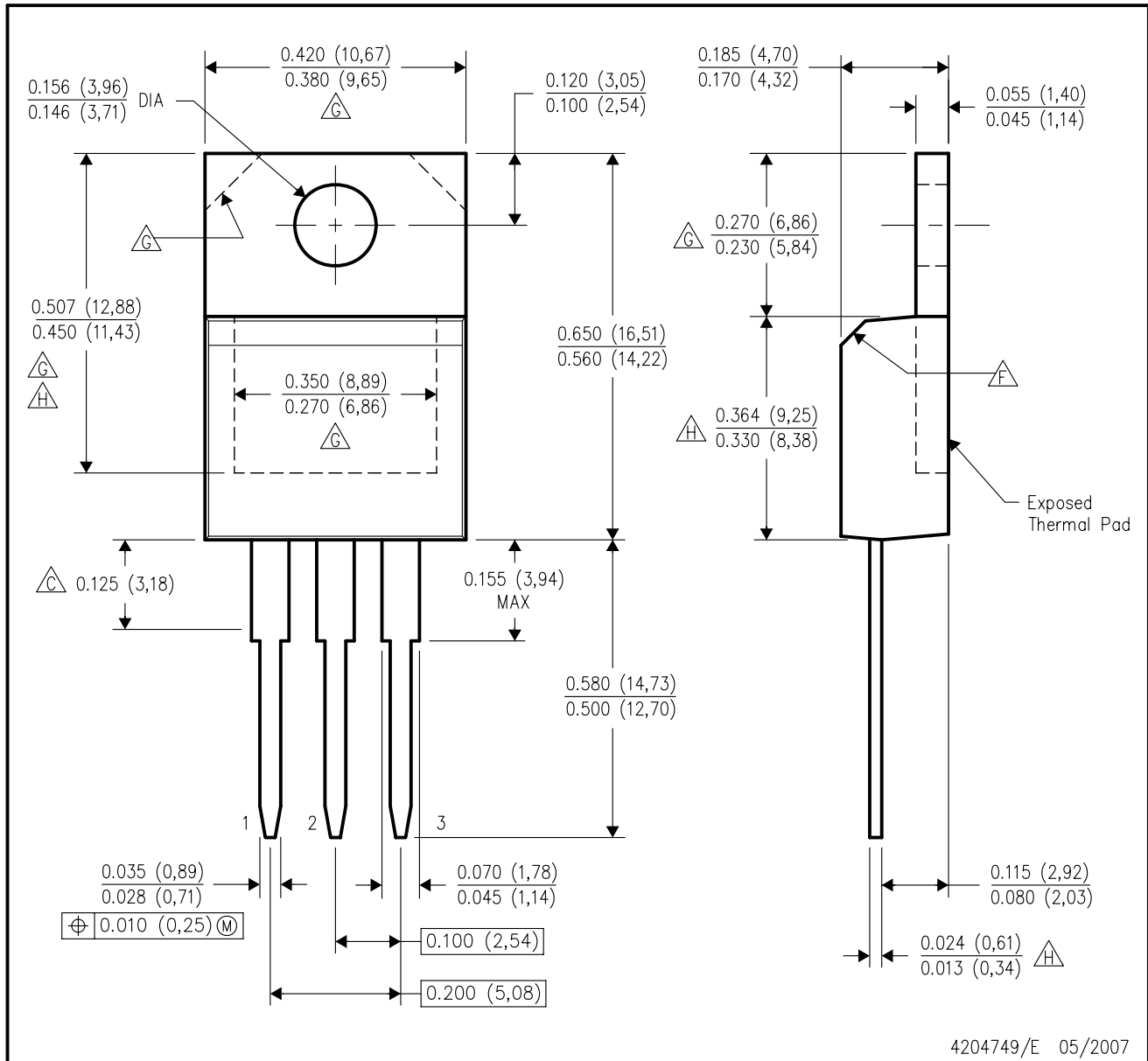
- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. The center lead is in electrical contact with the thermal tab.  
 D. Dimensions do not include mold protrusions, not to exceed 0.006 (0,15).  
 E. Falls within JEDEC TO-252 variation AC.

PowerFLEX is a trademark of Texas Instruments.



KCS (R-PSFM-T3)

PLASTIC FLANGE-MOUNT PACKAGE

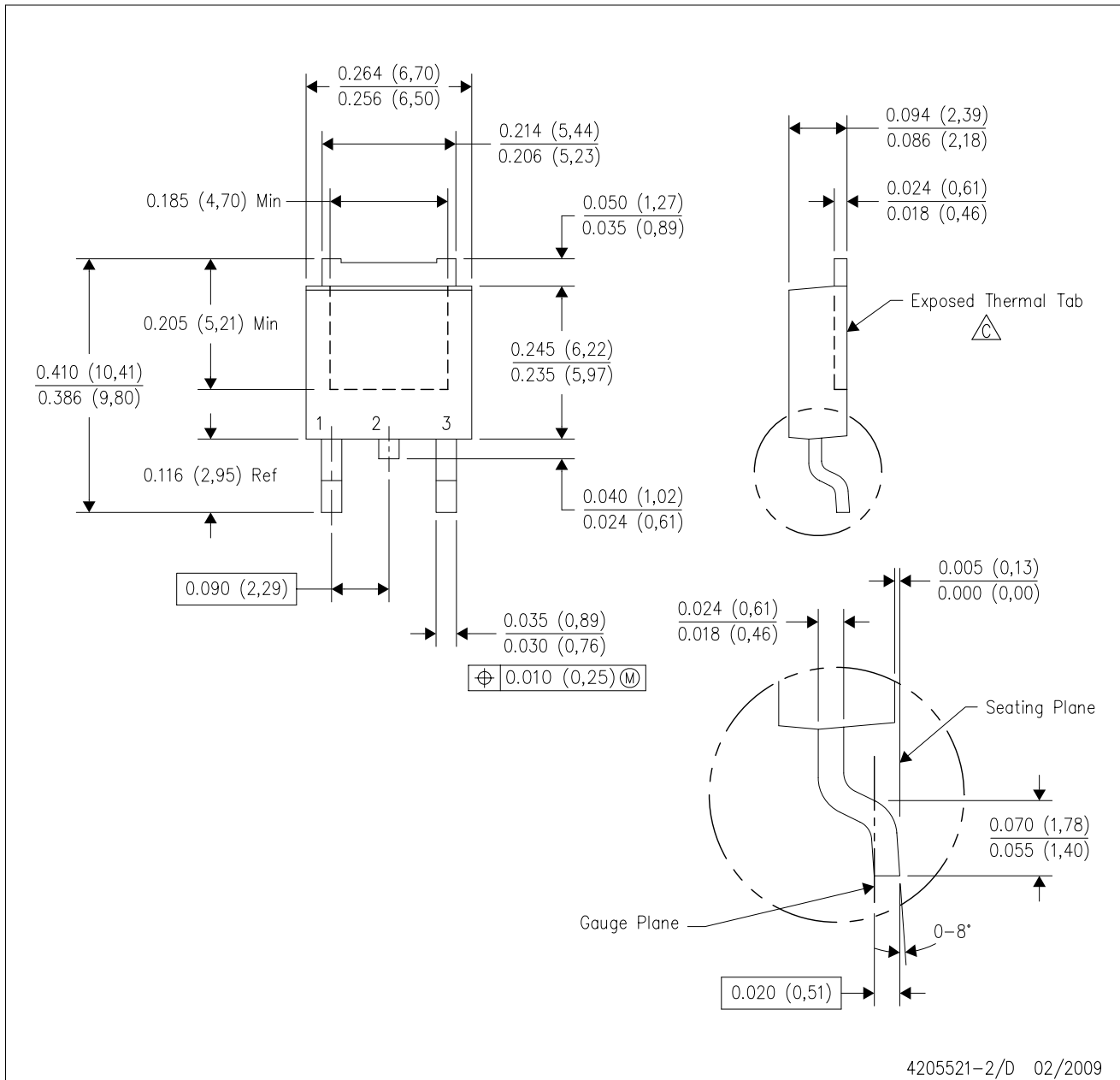



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Lead dimensions are not controlled within this area.
  - D. All lead dimensions apply before solder dip.
  - E. The center lead is in electrical contact with the mounting tab.
  - F. The chamfer is optional.
  - G. Thermal pad contour optional within these dimensions.
  - H. Falls within JEDEC TO-220 variation AB, except minimum lead thickness, minimum exposed pad length, and maximum body length.

# MECHANICAL DATA

KVU (R-PSFM-G3)

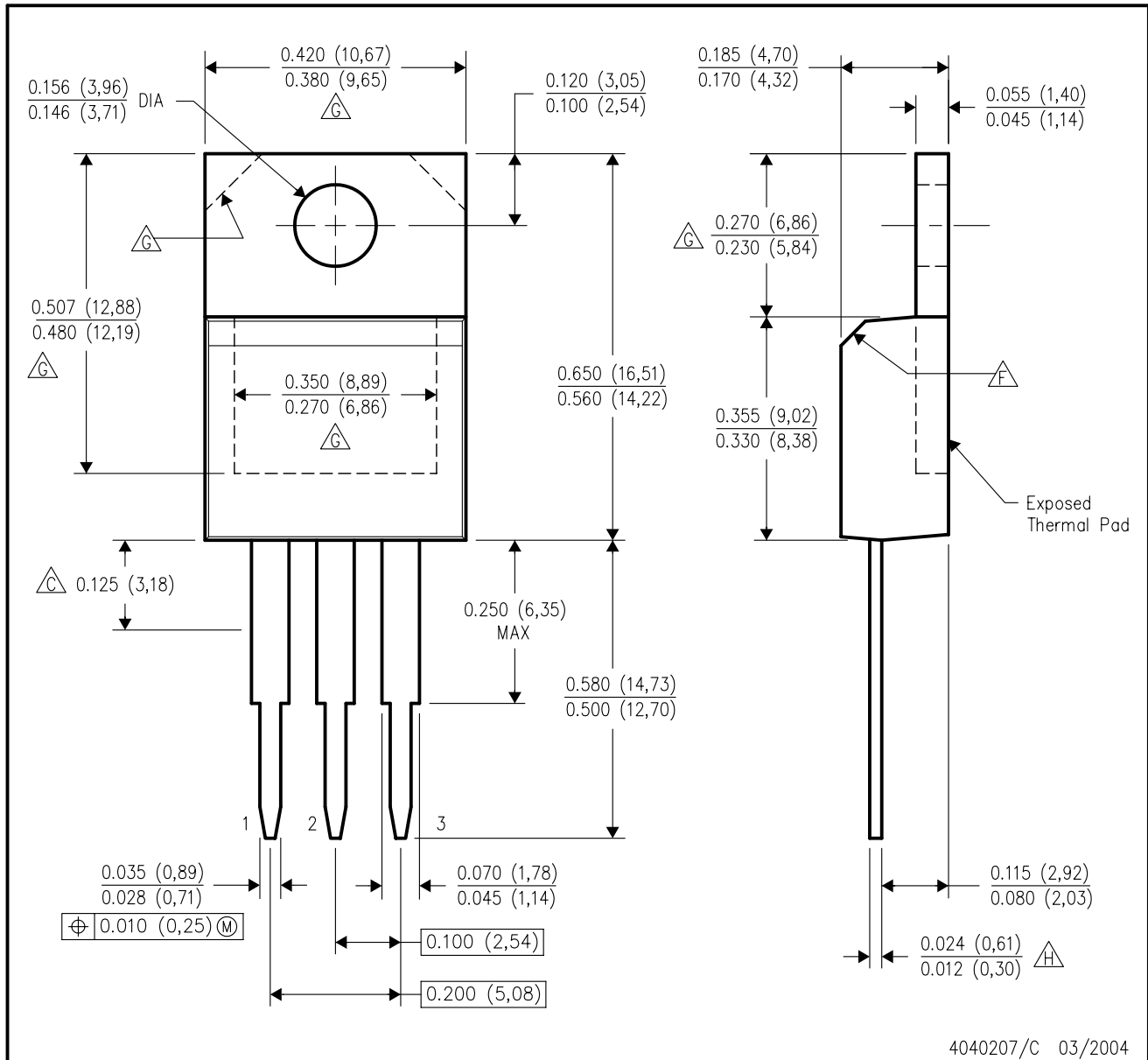
PLASTIC FLANGE-MOUNT PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  -  The center lead is in electrical contact with the exposed thermal tab.
  - D. Body Dimensions do not include mold flash or protrusions. Mold flash and protrusion shall not exceed 0.006 (0,15) per side.
  - E. Falls within JEDEC TO-252 variation AA.

KC (R-PSFM-T3)

PLASTIC FLANGE-MOUNT PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. 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.
  - F. The chamfer is optional.
  - G. Thermal pad contour optional within these dimensions.
  - H. Falls within JEDEC TO-220 variation AB, except minimum lead thickness.

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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 not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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