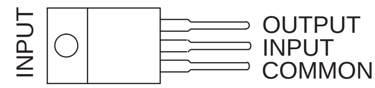
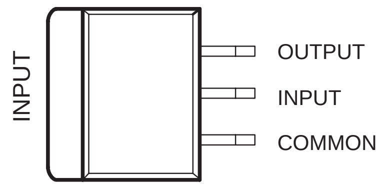
- **3-Terminal Regulators**
- **Output Current Up To 1.5 A**
- **No External Components**
- **Internal Thermal Overload Protection**
- **High-Power Dissipation Capability**
- **Internal Short-Circuit Current Limiting**
- **Output Transistor Safe-Area Compensation**

KCS (TO-220) PACKAGE
(TOP VIEW)



KTE PACKAGE
(TOP VIEW)



description/ordering information

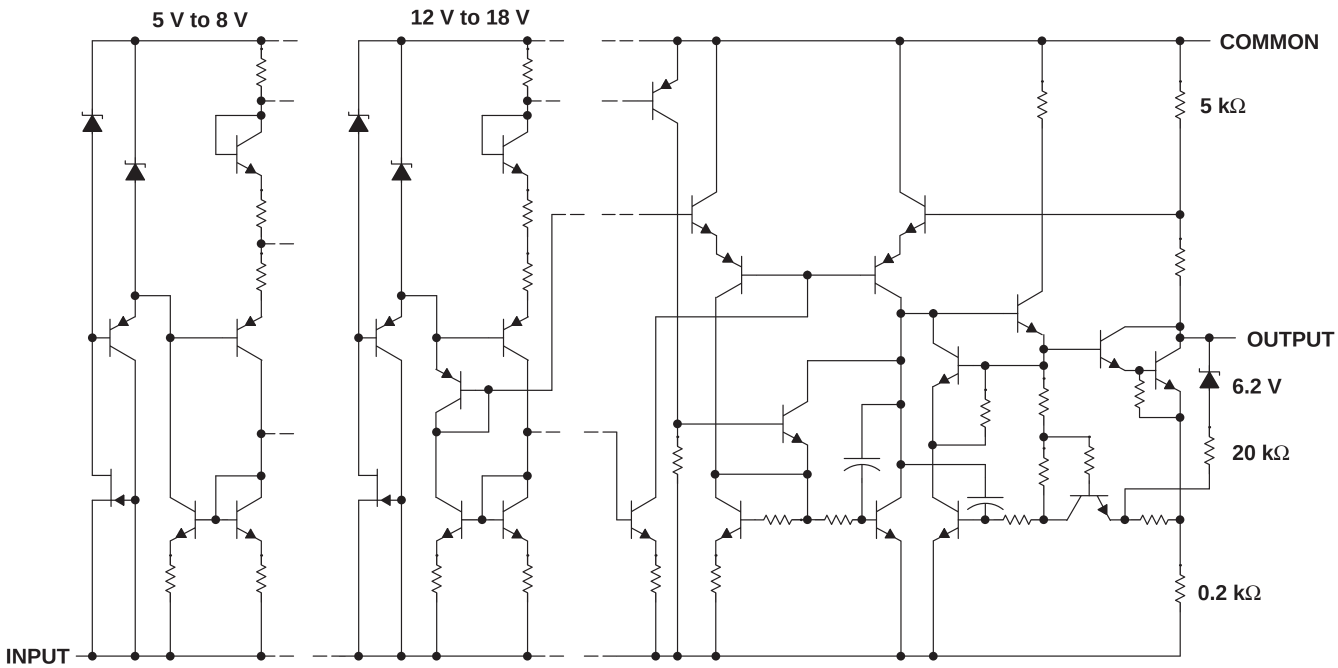
This series of fixed-negative-voltage integrated-circuit voltage regulators is designed to complement Series µA7800 in a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. Each of these 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 as the power-pass element in precision regulators.

ORDERING INFORMATION

T_J	$V_{O(NOM)}$ (V)	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 125°C	−15	PowerFLEX™ (KTE)	Reel of 2000	µA7915CKTER	µA7915C
		TO-220, short shoulder (KCS)	Tube of 50	µA7915CKCS	µA7915C
	−12	PowerFLEX (KTE)	Reel of 2000	µA7912CKTER	µA7912C
		TO-220, short shoulder (KCS)	Tube of 50	µA7912CKCS	µA7912C
	−8	PowerFLEX (KTE)	Reel of 2000	µA7908CKTER	µA7908C
		TO-220, short shoulder (KCS)	Tube of 50	µA7908CKCS	µA7908C
	−5	PowerFLEX (KTE)	Reel of 2000	µA7905CKTER	µA7905C
		TO-220, short shoulder (KCS)	Tube of 50	µA7905CKCS	µA7905C

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

schematic



All component values are nominal.

absolute maximum ratings over virtual junction temperature range (unless otherwise noted)†

Input voltage, V_I . . . . −35 V
Operating virtual junction temperature, T_J . . . . 150°C
Storage temperature range, T_{stg} . . . . −65 to 150°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.

package thermal data (see Note 1)

PACKAGE	BOARD	θ_{JC}	θ_{JA}
PowerFLEX (KTE)	High K, JESD 51-5	3°C/W	23°C/W
TO-220 (KCS)	High K, JESD 51-5	3°C/W	19°C/W

NOTE 1: Maximum power dissipation is a function of T_J(max), θ_{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	μA7905C	−7	−25	V
		μA7908C	−10.5	−25	
		μA7912C	−14.5	−25	
		μA7915C	−17.5	−25	
I_O	Output current			1.5	A
T_J	Operating virtual junction temperature		0	125	°C

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

PARAMETER	TEST CONDITIONS	T_J†	µA7905C MIN	µA7905C TYP	µA7905C MAX	UNITS
Output voltage‡		25°C	−4.8	−5	−5.2	V
	I_O = 5 mA to 1 A, V_I = −7 V to −20 V, P ≤ 15 W	0°C to 125°C	−4.75		−5.25	
Input regulation	V_I = −7 V to −25 V			12.5	50	mV
	V_I = −8 V to −12 V			4	15	
Ripple rejection	V_I = −8 V to −18 V, f = 120 Hz	0°C to 125°C	54	60		dB
Output regulation	I_O = 5 mA to 1.5 A			15	100	mV
	I_O = 250 mA to 750 mA			5	50	
Temperature coefficient of output voltage	I_O = 5 mA	0°C to 125°C		−0.4		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz	25°C		125		µV
Dropout voltage	I_O = 1 A	25°C		1.1		V
Bias current		25°C		1.5	2	mA
Bias current change	V_I = −7 V to −25 V			0.15	0.5	mA
	I_O = 5 mA to 1 A			0.08	0.5	
Peak output current		25°C		2.1		A

† Pulse-testing techniques are used to 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 2-µF capacitor across the input and a 1-µF capacitor across the output.
‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

electrical characteristics at specified virtual junction temperature, V_I = −11 V, I_O = 500 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J†	µA7906C MIN	µA7906C TYP	µA7906C MAX	UNITS
Output voltage‡		25°C	−5.75	−6	−6.25	V
	I_O = 5 mA to 1 A, V_I = −8 V to −21 V, P ≤ 15 W	0°C to 125°C	−5.7		−6.3	
Input regulation	V_I = −8 V to −25 V			12.5	120	mV
	V_I = −9 V to −13 V			4	60	
Ripple rejection	V_I = −9 V to −19 V, f = 120 Hz	0°C to 125°C	54	60		dB
Output regulation	I_O = 5 mA to 1.5 A			15	120	mV
	I_O = 250 mA to 750 mA			5	60	
Temperature coefficient of output voltage	I_O = 5 mA	0°C to 125°C		−0.4		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz	25°C		150		µV
Dropout voltage	I_O = 1 A	25°C		1.1		V
Bias current		25°C		1.5	2	mA
Bias current change	V_I = −8 V to −25 V			0.15	1.3	mA
	I_O = 5 mA to 1 A			0.08	0.5	
Peak output current		25°C		2.1		A

† Pulse-testing techniques are used to 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 2-µF capacitor across the input and a 1-µF capacitor across the output.
‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

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

PARAMETER	TEST CONDITIONS	T_J†	μA7908C MIN	μA7908C TYP	μA7908C MAX	UNITS
Output voltage‡		25°C	−7.7	−8	−8.3	V
	I_O = 5 mA to 1 A, V_I = −10.5 V to −23 V, P ≤ 15 W	0°C to 125°C	−7.6		−8.4	
Input regulation	V_I = −10.5 V to −25 V			12.5	160	mV
	V_I = −11 V to −17 V			4	80	
Ripple rejection	V_I = −11.5 V to −21.5 V, f = 120 Hz	0°C to 125°C	54	60		dB
Output regulation	I_O = 5 mA to 1.5 A			15	160	mV
	I_O = 250 mA to 750 mA			5	80	
Temperature coefficient of output voltage	I_O = 5 mA	0°C to 125°C		−0.6		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz	25°C		200		μV
Dropout voltage	I_O = 1 A	25°C		1.1		V
Bias current		25°C		1.5	2	mA
Bias current change	V_I = −10.5 V to −25 V			0.15	1	mA
	I_O = 5 mA to 1 A			0.08	0.5	
Peak output current		25°C		2.1		A

† Pulse-testing techniques are used to 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 2-μF capacitor across the input and a 1-μF capacitor across the output.
‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

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

PARAMETER	TEST CONDITIONS	T_J†	μA7912C MIN	μA7912C TYP	μA7912C MAX	UNITS
Output voltage‡		25°C	−11.5	−12	−12.5	V
	I_O = 5 mA to 1 A, V_I = −14.5 V to −27 V, P ≤ 15 W	0°C to 125°C	−11.4		−12.6	
Input regulation	V_I = −14.5 V to −25 V			5	80	mV
	V_I = −16 V to −22 V			3	30	
Ripple rejection	V_I = −15 V to −25 V, f = 120 Hz	0°C to 125°C	54	60		dB
Output regulation	I_O = 5 mA to 1.5 A			15	200	mV
	I_O = 250 mA to 750 mA			5	75	
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		300		μV
Dropout voltage	I_O = 1 A	25°C		1.1		V
Bias current		25°C		2	3	mA
Bias current change	V_I = −14.5 V to −25 V			0.04	0.5	mA
	I_O = 5 mA to 1 A			0.06	0.5	
Peak output current		25°C		2.1		A

† Pulse-testing techniques are used to 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 2-μF capacitor across the input and a 1-μF capacitor across the output.
‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

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

PARAMETER	TEST CONDITIONS	T_J†	µA7915C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	−14.4	−15	−15.6	V
	I_O = 5 mA to 1 A, V_I = −17.5 V to −25 V, P ≤ 15 W	0°C to 125°C	−14.25		−15.75	
Input regulation	V_I = −17.5 V to −25 V			5	100	mV
	V_I = −20 V to −25 V			3	50	
Ripple rejection	V_I = −18.5 V to −25 V, f = 120 Hz	0°C to 125°C	54	60		dB
Output regulation	I_O = 5 mA to 1.5 A			20	300	mV
	I_O = 250 mA to 750 mA			8	150	
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		375		µV
Dropout voltage	I_O = 1 A	25°C		1.1		V
Bias current		25°C		2	3	mA
Bias current change	V_I = −17.5 V to −25 V			0.04	0.5	mA
	I_O = 5 mA to 1 A			0.06	0.5	
Peak output current		25°C		2.1		A

† Pulse-testing techniques are used to 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 2-µF capacitor across the input and a 1-µF capacitor across the output.
‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

electrical characteristics at specified virtual junction temperature, V_I = −27 V, I_O = 500 mA (unless otherwise noted)

PARAMETER	TEST CONDITIONS	T_J†	µA7918C			UNITS
			MIN	TYP	MAX	
Output voltage‡		25°C	−17.3	−18	−18.7	V
	I_O = 5 mA to 1 A, V_I = −21 V to −33 V, P ≤ 15 W	0°C to 125°C	−17.1		−18.9	
Input regulation	V_I = −21 V to −33 V			5	360	mV
	V_I = −24 V to −30 V			3	180	
Ripple rejection	V_I = −22 V to −32 V, f = 120 Hz	0°C to 125°C	54	60		dB
Output regulation	I_O = 5 mA to 1.5 A			30	360	mV
	I_O = 250 mA to 750 mA			10	180	
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		450		µV
Dropout voltage	I_O = 1 A	25°C		1.1		V
Bias current		25°C		2	3	mA
Bias current change	V_I = −21 V to −33 V			0.04	1	mA
	I_O = 5 mA to 1 A			0.06	0.5	
Peak output current		25°C		2.1		A

† Pulse-testing techniques are used to 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 2-µF capacitor across the input and a 1-µF capacitor across the output.
‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

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

PARAMETER	TEST CONDITIONS	T_J†	μA7924C MIN	μA7924C TYP	μA7924C MAX	UNITS
Output voltage‡		25°C	−23	−24	−25	V
	I_O = 5 mA to 1 A, V_I = −27 V to −38 V, P ≤ 15 W	0°C to 125°C	−22.8		−25.2	
Input regulation	V_I = −27 V to −38 V	25°C		5	480	mV
	V_I = −30 V to −36 V			3	240	
Ripple rejection	V_I = −28 V to −38 V, f = 120 Hz	0°C to 125°C	54	60		dB
Output regulation	I_O = 5 mA to 1.5 A	25°C		85	480	mV
	I_O = 250 mA to 750 mA			25	240	
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		600		μV
Dropout voltage	I_O = 1 A	25°C		1.1		V
Bias current		25°C		2	3	mA
Bias current change	V_I = −27 V to −38 V	25°C		0.04	1	mA
	I_O = 5 mA to 1 A			0.06	0.5	
Peak output current		25°C		2.1		A

† Pulse-testing techniques are used to 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 2-μF capacitor across the input and a 1-μF capacitor across the output.
‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
UA7905CKC	OBSOLETE	TO-220	KC	3		None	Call TI	Call TI
UA7905CKCS	ACTIVE	TO-220	KCS	3	50	None	Call TI	Level-NC-NC-NC
UA7905CKTER	ACTIVE	PFM	KTE	3	2000	None	Call TI	Level-1-220C-UNLIM
UA7908CKC	OBSOLETE	TO-220	KC	3		None	Call TI	Call TI
UA7908CKCS	ACTIVE	TO-220	KCS	3	50	None	Call TI	Level-NC-NC-NC
UA7908CKTER	ACTIVE	PFM	KTE	3	2000	None	Call TI	Level-1-220C-UNLIM
UA7912CKC	OBSOLETE	TO-220	KC	3		None	Call TI	Call TI
UA7912CKCS	ACTIVE	TO-220	KCS	3	50	None	Call TI	Level-NC-NC-NC
UA7912CKTER	ACTIVE	PFM	KTE	3	2000	None	Call TI	Level-1-220C-UNLIM
UA7915CKC	OBSOLETE	TO-220	KC	3		None	Call TI	Call TI
UA7918CKC	OBSOLETE	TO-220	KC	3		None	Call TI	Call TI
UA7924CKC	OBSOLETE	TO-220	KC	3		None	Call TI	Call TI

(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 - May not be currently available - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
None: Not yet available Lead (Pb-Free).
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.
Green (RoHS & no Sb/Br): TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDECindustry standard classifications, and peak solder temperature.

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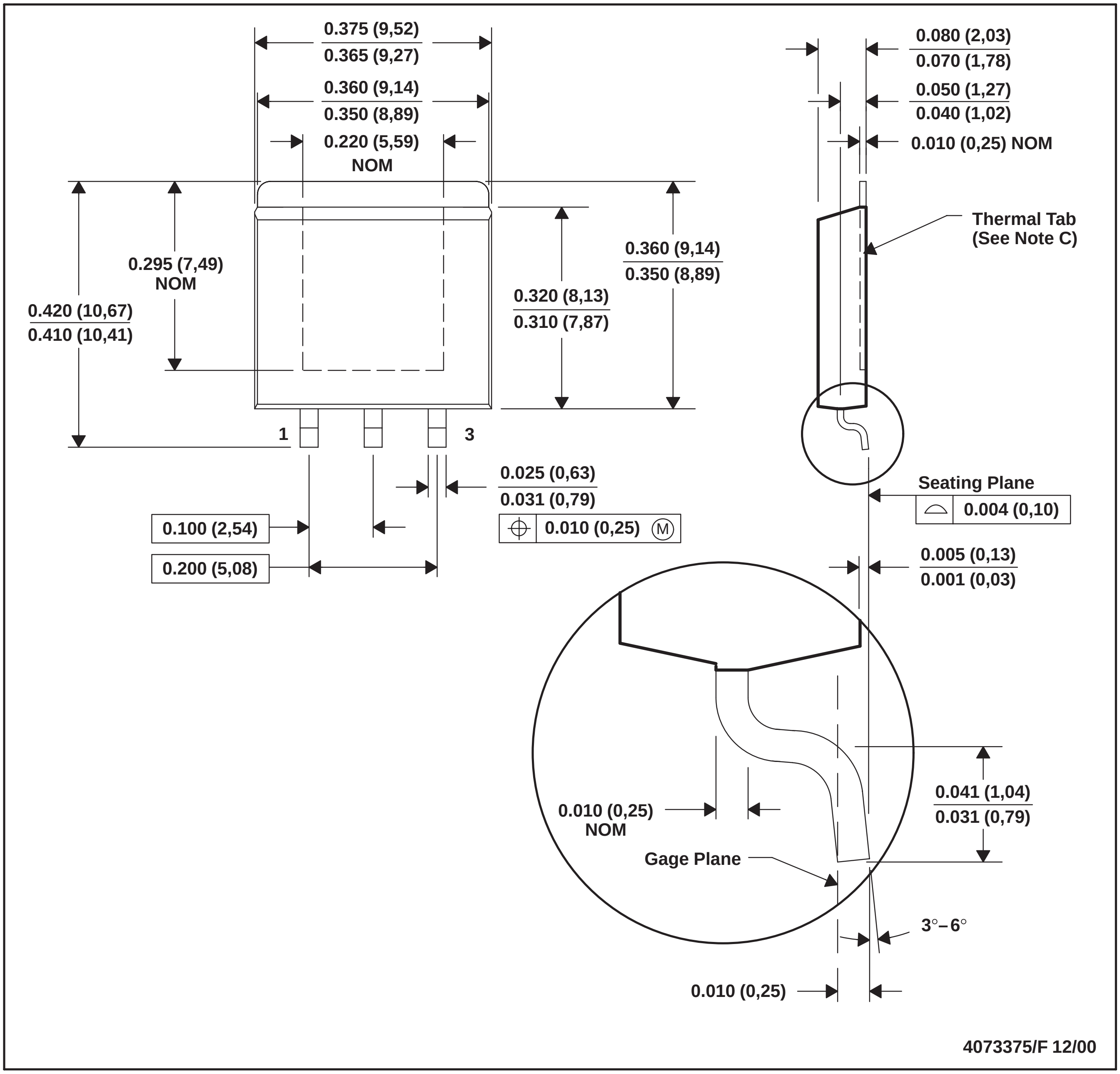
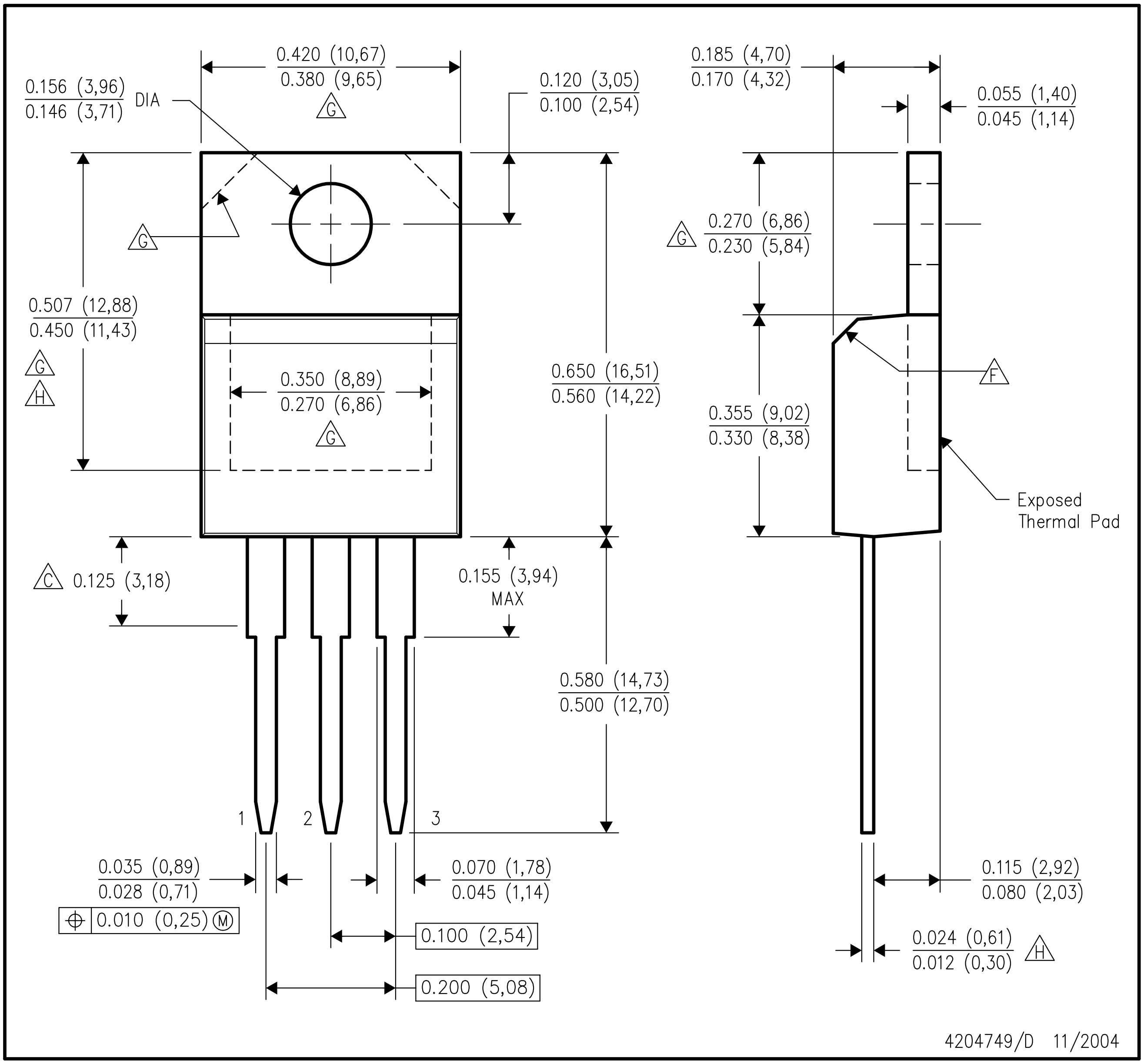
KTE (R-PSFM-G3) **PowerFLEX™ PLASTIC FLANGE-MOUNT**



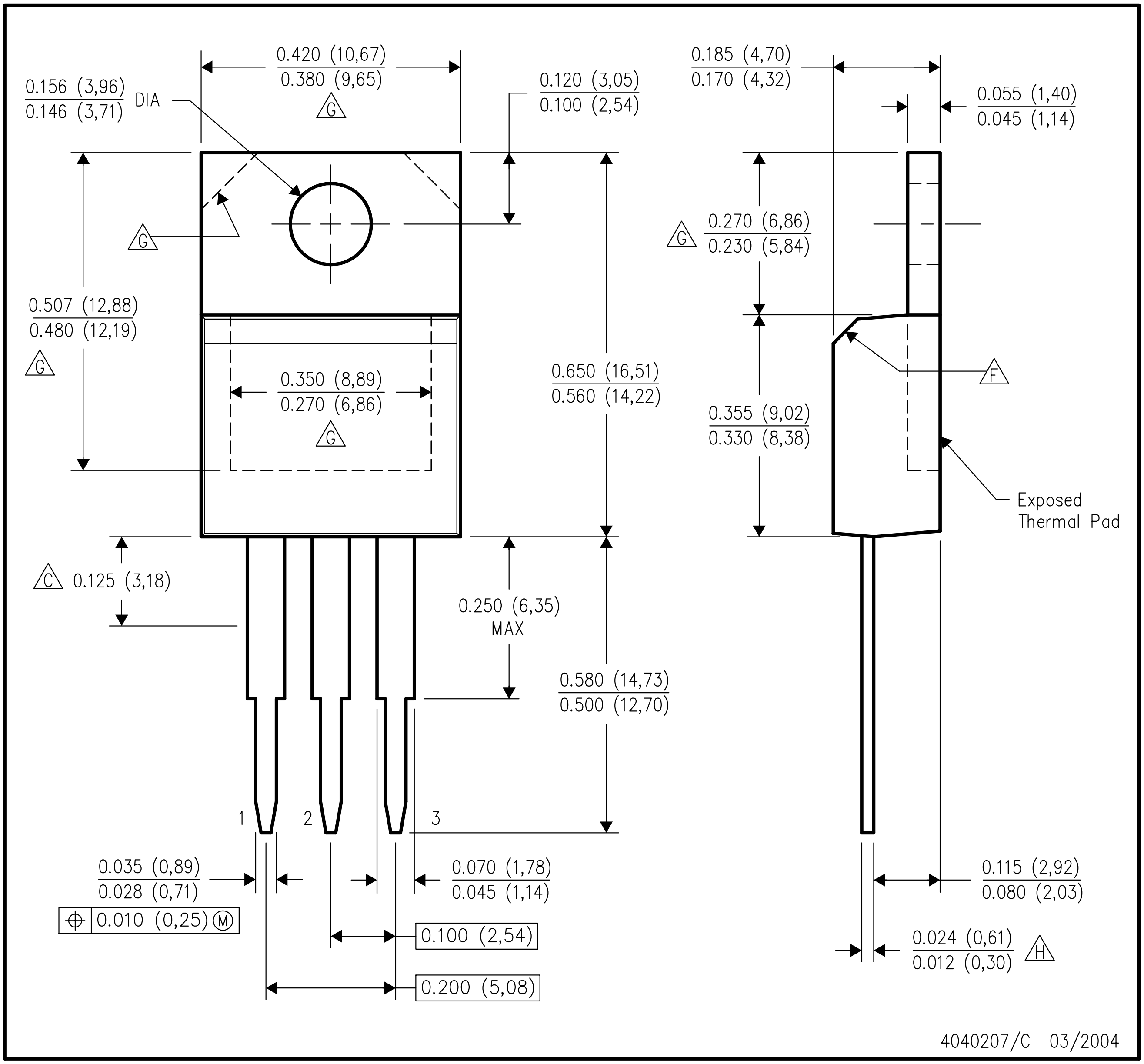
NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. The center lead is in electrical contact with the thermal tab.
D. Dimensions do not include mold protrusions, not to exceed 0.006 (0,15).
E. Falls within JEDEC MO-169

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 and minimum exposed pad length.

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.