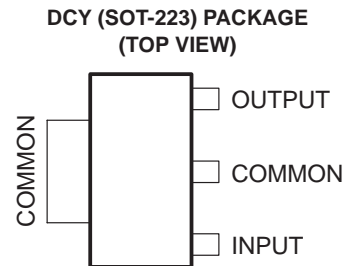
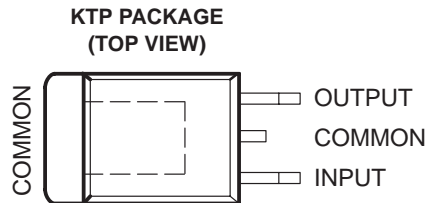


μA78Mxx-Q1 SERIES POSITIVE-VOLTAGE REGULATORS

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- Qualification in Accordance With AEC-Q100†
- Qualified for Automotive Applications
- Customer-Specific Configuration Control Can Be Supported Along With Major-Change Approval
- 3-Terminal Regulators
- Output Current Up To 500 mA
- No External Components
- Internal Thermal-Overload Protection
- High Power-Dissipation Capability
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation

† Contact factory for details. Q100 qualification data available on request.



description/ordering information

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 500 mA 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
-40°C to 125°C	3.3	PowerFLEX™ (KTP)	Reel of 3000	μA78M33QKTPRQ1	78M33CQ
		SOT-223 (DCY)	Reel of 2500	μA78M33QDCYRQ1	C3Q
	5	PowerFLEX™ (KTP)	Reel of 3000	μA78M05QKTPRQ1	78M05CQ
		SOT-223 (DCY)	Reel of 2500	μA78M05QDCYRQ1	C5Q
	8	PowerFLEX™ (KTP)	Reel of 3000	μA78M08QKTPRQ1	78M08CQ
		SOT-223 (DCY)	Reel of 2500	μA78M08QDCYRQ1	C8Q
10	PowerFLEX™ (KTP)	Reel of 3000	μA78M10QKTPRQ1	78M10CQ	

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



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PowerFLEX is a trademark of Texas Instruments.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.



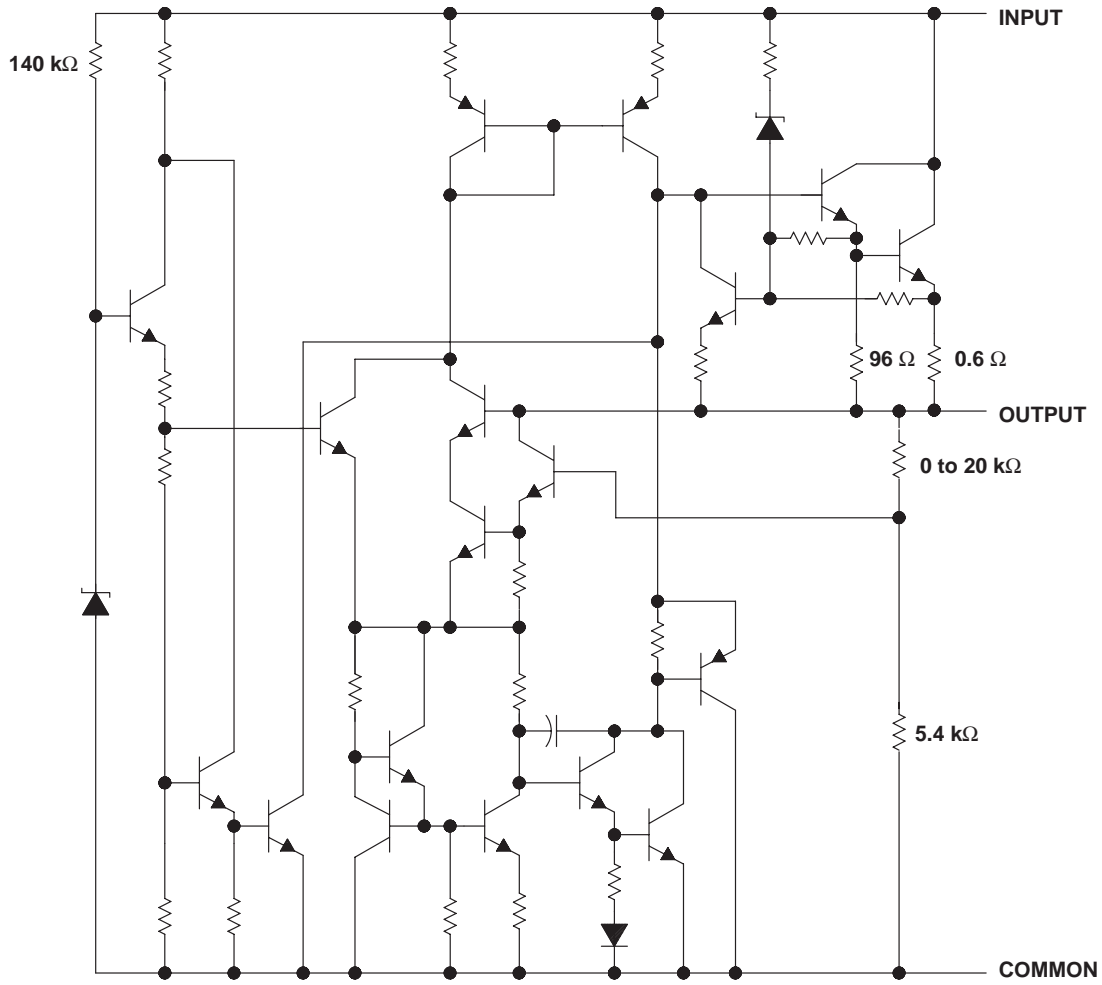
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μA78Mxx-Q1 SERIES POSITIVE-VOLTAGE REGULATORS

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schematic



Resistor values shown are nominal.

μA78Mxx-Q1 SERIES POSITIVE-VOLTAGE REGULATORS

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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
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Storage temperature range, T_{Stg}	–65°C 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 (KTP)	High K, JESD 51-5	19°C/W	28°C/W
SOT-223 (DCY)	High K, JESD 51-7	4°C/W	53°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	μA78M33	5.3	25	V
		μA78M05	7	25	
		μA78M06	8	25	
		μA78M08	10.5	25	
		μA78M09	11.5	26	
		μA78M10	12.5	28	
		μA78M12	14.5	30	
I_O	Output current		500	mA	
T_J	Operating virtual junction temperature	–40	125	°C	



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electrical characteristics at specified virtual junction temperature, $V_I = 8\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		μA78M33Q			UNIT
			MIN	TYP	MAX	
Output voltage‡	$I_O = 5\text{ mA to }350\text{ mA}$, $V_I = 8\text{ V to }20\text{ V}$		3.2	3.3	3.4	V
		$T_J = -40^\circ\text{C to }125^\circ\text{C}$	3.1	3.3	3.5	
Input voltage regulation	$I_O = 200\text{ mA}$	$V_I = 5.3\text{ V to }25\text{ V}$		9	100	mV
		$V_I = 8\text{ V to }25\text{ V}$		3	50	
Ripple rejection	$V_I = 8\text{ V to }18\text{ V}$, $f = 120\text{ Hz}$	$I_O = 100\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$	62			dB
		$I_O = 300\text{ mA}$	62	80		
Output voltage regulation	$V_I = 8\text{ V}$,	$I_O = 5\text{ mA to }500\text{ mA}$		20	100	mV
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$,	$T_J = -40^\circ\text{C to }125^\circ\text{C}$		-1		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$			40	200	μV
Dropout voltage				2		V
Bias current				4.5	6	mA
Bias current change	$I_O = 200\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$	$V_I = 8\text{ V to }25\text{ V}$,			0.8	mA
		$I_O = 5\text{ mA to }350\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$			0.5	
Short-circuit output current	$V_I = 35\text{ V}$			300		mA
Peak output current				700		mA

† All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

‡ This specification applies only for dc power dissipation permitted by absolute maximum ratings.

electrical characteristics at specified virtual junction temperature, $V_I = 10\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		μA78M05Q			UNIT
			MIN	TYP	MAX	
Output voltage	$I_O = 5\text{ mA to }350\text{ mA}$, $V_I = 7\text{ V to }20\text{ V}$		4.8	5	5.2	V
		$T_J = -40^\circ\text{C to }125^\circ\text{C}$	4.75		5.25	
Input voltage regulation	$I_O = 200\text{ mA}$	$V_I = 7\text{ V to }25\text{ V}$		3	100	mV
		$V_I = 8\text{ V to }25\text{ V}$		1	50	
Ripple rejection	$V_I = 8\text{ V to }18\text{ V}$, $f = 120\text{ Hz}$	$I_O = 100\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$	62			dB
		$I_O = 300\text{ mA}$	62	80		
Output voltage regulation	$I_O = 5\text{ mA to }500\text{ mA}$			20	100	mV
	$I_O = 5\text{ mA to }200\text{ mA}$			10	50	
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$,	$T_J = -40^\circ\text{C to }125^\circ\text{C}$		-1		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$			40	200	μV
Dropout voltage				2		V
Bias current				4.5	6	mA
Bias current change	$I_O = 200\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$	$V_I = 8\text{ V to }25\text{ V}$,			0.8	mA
		$I_O = 5\text{ mA to }350\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$			0.5	
Short-circuit output current	$V_I = 35\text{ V}$			300		mA
Peak output current				0.7		A

† All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.



μA78Mxx-Q1 SERIES POSITIVE-VOLTAGE REGULATORS

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electrical characteristics at specified virtual junction temperature, $V_I = 14\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONST		μA78M08Q			UNIT
			MIN	TYP	MAX	
Output voltage	$V_I = 10.5\text{ V to }23\text{ V}$, $I_O = 5\text{ mA to }350\text{ mA}$	$T_J = -40^\circ\text{C to }125^\circ\text{C}$	7.7	8	8.3	V
			7.6		8.4	
Input voltage regulation	$I_O = 200\text{ mA}$	$V_I = 10.5\text{ V to }25\text{ V}$		6	100	mV
		$V_I = 11\text{ V to }25\text{ V}$		2	50	
Ripple rejection	$V_I = 11.5\text{ V to }21.5\text{ V}$, $f = 120\text{ Hz}$	$I_O = 100\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$	56			dB
		$I_O = 300\text{ mA}$	56	80		
Output voltage regulation	$I_O = 5\text{ mA to }500\text{ mA}$			25	160	mV
	$I_O = 5\text{ mA to }200\text{ mA}$			10	80	
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$,	$T_J = -40^\circ\text{C to }125^\circ\text{C}$		-1		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$			52		μV
Dropout voltage				2		V
Bias current				4.6	6	mA
Bias current change	$V_I = 10.5\text{ V to }25\text{ V}$,	$I_O = 200\text{ mA}$,	$T_J = -40^\circ\text{C to }125^\circ\text{C}$		0.8	mA
	$I_O = 5\text{ mA to }350\text{ mA}$,	$T_J = -40^\circ\text{C to }125^\circ\text{C}$			0.5	
Short-circuit output current	$V_I = 35\text{ V}$			250		mA
Peak output current				0.7		A

† All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.

electrical characteristics at specified virtual junction temperature, $V_I = 17\text{ V}$, $I_O = 350\text{ mA}$, $T_J = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONST		μA78M10Q			UNIT
			MIN	TYP	MAX	
Output voltage	$V_I = 12.5\text{ V to }25\text{ V}$, $I_O = 5\text{ mA to }350\text{ mA}$	$T_J = -40^\circ\text{C to }125^\circ\text{C}$	9.6	10	10.4	V
			9.5		10.5	
Input voltage regulation	$I_O = 200\text{ mA}$	$V_I = 12.5\text{ V to }28\text{ V}$		7	100	mV
		$V_I = 14\text{ V to }28\text{ V}$		2	50	
Ripple rejection	$V_I = 15\text{ V to }25\text{ V}$, $f = 120\text{ Hz}$	$I_O = 100\text{ mA}$, $T_J = -40^\circ\text{C to }125^\circ\text{C}$	59			dB
		$I_O = 300\text{ mA}$	55	80		
Output voltage regulation	$I_O = 5\text{ mA to }500\text{ mA}$			25	200	mV
	$I_O = 5\text{ mA to }200\text{ mA}$			10	100	
Temperature coefficient of output voltage	$I_O = 5\text{ mA}$,	$T_J = -40^\circ\text{C to }125^\circ\text{C}$		-1		mV/°C
Output noise voltage	$f = 10\text{ Hz to }100\text{ kHz}$			64		μV
Dropout voltage				2		V
Bias current				4.7	6	mA
Bias current change	$V_I = 12.5\text{ V to }28\text{ V}$,	$I_O = 200\text{ mA}$,	$T_J = -40^\circ\text{C to }125^\circ\text{C}$		0.8	mA
	$I_O = 5\text{ mA to }350\text{ mA}$,	$T_J = -40^\circ\text{C to }125^\circ\text{C}$			0.5	
Short-circuit output current	$V_I = 35\text{ V}$			245		mA
Peak output current				0.7		A

† All characteristics are measured with a 0.33-μF capacitor across the input and a 0.1-μF capacitor across the output. Pulse-testing techniques maintain T_J as close to T_A as possible. Thermal effects must be taken into account separately.



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
UA78M05QDCYRQ1	ACTIVE	SOT-223	DCY	4	2500	None	SNPB	Level-2-235C-1 YEAR
UA78M05QKTPRQ1	ACTIVE	PFM	KTP	2	3000	None	Call TI	Level-1-220C-UNLIM
UA78M10QKTPRQ1	ACTIVE	PFM	KTP	2	3000	None	Call TI	Call TI
UA78M33QDCYRQ1	ACTIVE	SOT-223	DCY	4	2500	None	SNPB	Level-2-235C-1 YEAR
UA78M33QKTPRQ1	ACTIVE	PFM	KTP	2	3000	None	Call TI	Level-1-220C-UNLIM

⁽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).

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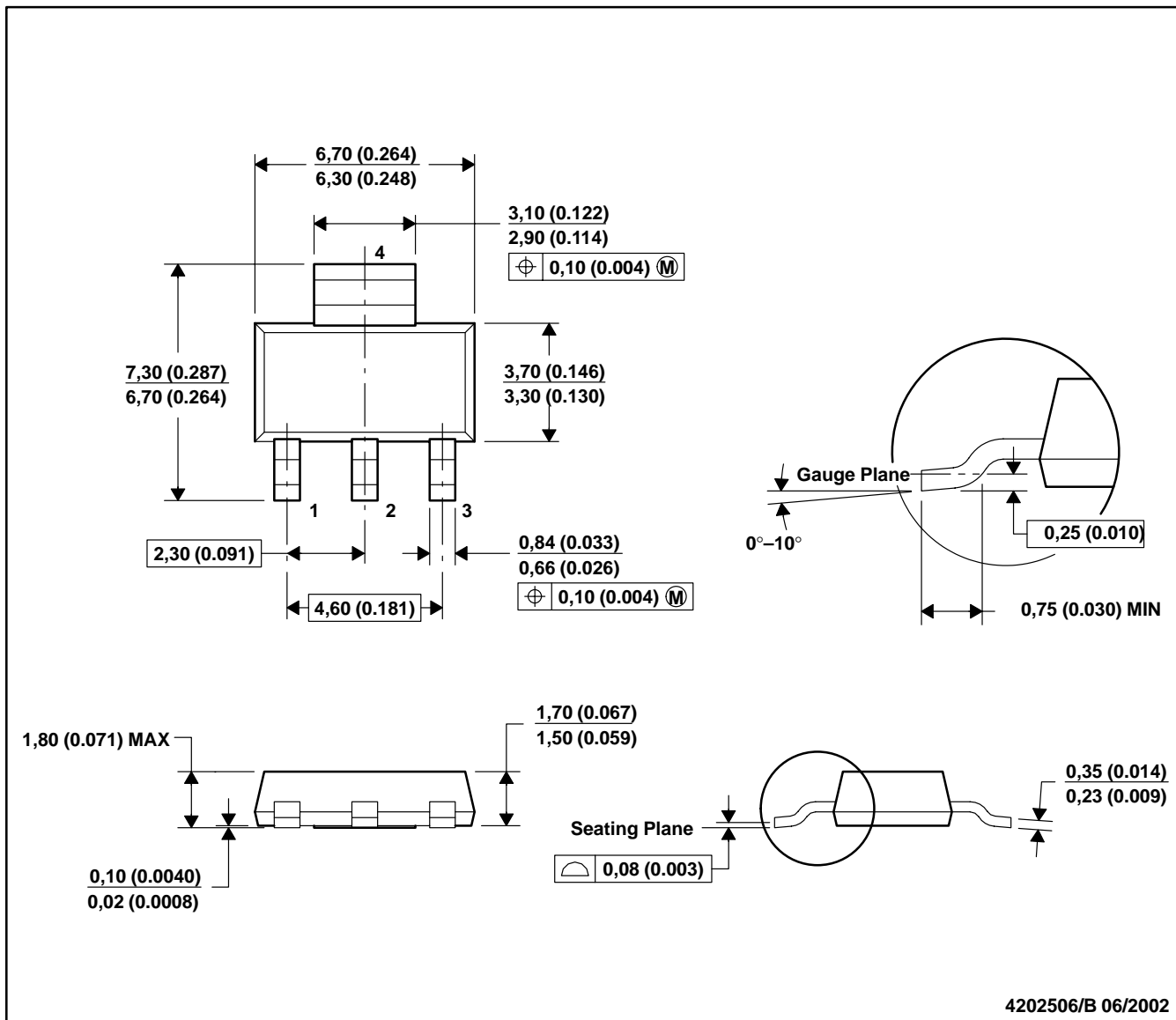
⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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DCY (R-PDSO-G4)

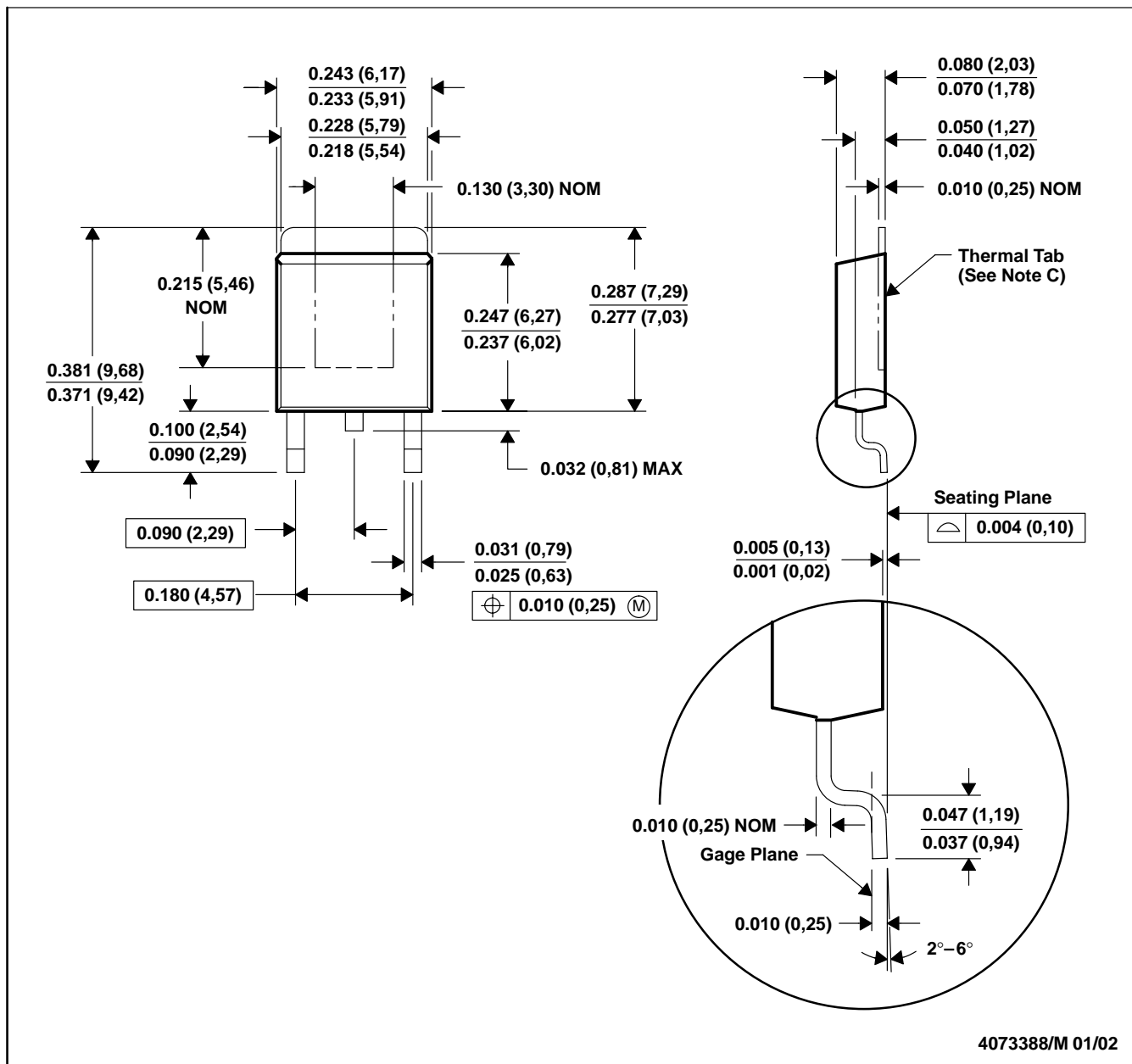
PLASTIC SMALL-OUTLINE



- NOTES: A. All linear dimensions are in millimeters (inches).
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion.
 D. Falls within JEDEC TO-261 Variation AA.

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.

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