The μ A78M10 and μ A78M15 are obsolete and are no longer supplied

SLVS059K - JUNE 1976 - REVISED FEBRUARY 2003

3-Terminal Regulators

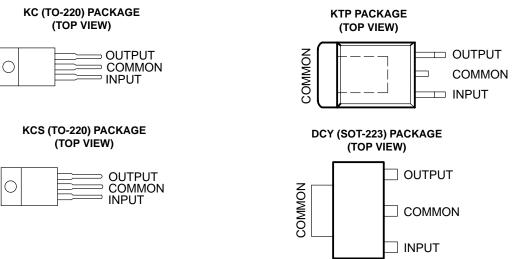
COMMON

COMMON

- **Output Current Up To 500 mA**
- **No External Components**
- **Internal Thermal-Overload Protection**



- **Internal Short-Circuit Current Limiting**
- **Output Transistor Safe-Area Compensation**



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.



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.

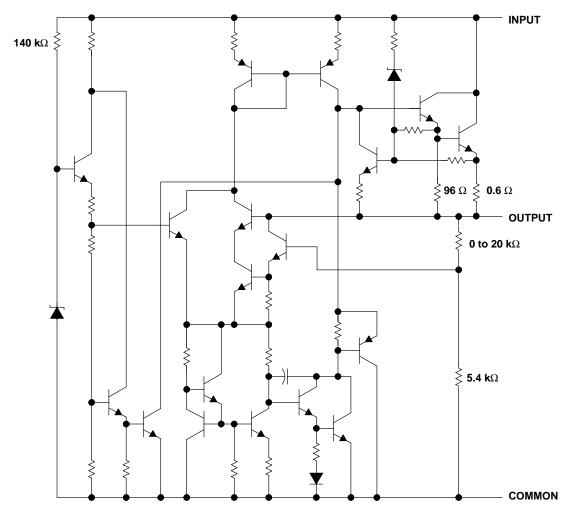


ORDERING INFORMATION

TJ	V _O (NOM) (V)	PACKAGE [†]		ORDERABLE PART NUMBER	TOP-SIDE MARKING
		Power Flex (KTP)	Reel of 3000	μΑ78M33CKTPR	UA78M33C
	3.3	SOT-223 (DCY)	Tube of 80	μΑ78M33CDCY	C3
	3.3	301-223 (DC1)	Reel of 2500	μΑ78M33CDCYR	
		TO-220 (KC)	Tube of 50	μΑ78М33СКС	UA78M33C
		Power Flex (KTP)	Reel of 3000	μΑ78M05CKTPR	UA78M05C
		COT 222 (DCV)	Tube of 80	μΑ78M05CDCY	C5
	5	SOT-223 (DCY)	Reel of 2500	μΑ78M05CDCYR	
		TO-220 (KC)	Tube of 50	μΑ78M05CKC	UA78M05C
0°C to 125°C		TO-220, short shoulder (KCS)	Tube of 20	μΑ78M05CKCS	UA/8MUSC
	6	Power Flex (KTP)	Reel of 3000	μΑ78M06CKTPR	UA78M06C
		Power Flex (KTP)	Reel of 3000	μΑ78M08CKTPR	UA78M08C
	8	SOT-223 (DCY)	Tube of 80	μΑ78M08CDCY	C8
	٥	301-223 (DC1)	Reel of 2500	μΑ78M08CDCYR	
		TO-220 (KC)	Tube of 50	μΑ78M08CKC	UA78M08C
	9	Power Flex (KTP)	Reel of 3000	μΑ78M09CKTPR	UA78M09C
	12	Power Flex (KTP)	Reel of 3000	μΑ78M12CKTPR	UA78M12C
	12	TO-220 (KC)	Tube of 50	μΑ78M12CKC	UA78M12C

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

schematic



Resistor values shown are nominal.

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

Input voltage, V _I	35 V
Package thermal impedance, θ _{JA} (see Notes 1 and 2): DCY package	53°C/W
(see Notes 1 and 3): KC/KCS package	25°C/W
(see Notes 1 and 3): KTP package	28°C/W
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.

- NOTES: 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 $P_D = (T_J(max) T_A)/\theta_{JA}$. Selecting the maximum of 150°C can affect reliability.
 - 2. The package thermal impedance is calculated in accordance with JESD 51-7.
 - 3. The package thermal impedance is calculated in accordance with JESD 51-5.

recommended operating conditions

			MIN	MAX	UNIT
		μΑ78Μ33	5.3	25	
		μΑ78Μ05	7	25	
		μΑ78Μ06	8	25	V
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	land to take me	μΑ78Μ08	10.5	25	
VI	Input voltage	μΑ78Μ09	11.5	26	
		μΑ78Μ10	12.5	28	V
		μA78M12	14.5	30	V
		μA78M15	17.5	30	v
lo	Output current			500	mA
TJ	Operating virtual junction temperature		0	125	°C

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†			78M33C	;	UNIT
PARAMETER	TES	GI CONDITIONS!	MIN	TYP	MAX	UNII
Output wells as t	$I_{O} = 5 \text{ mA to } 350 \text{ mA},$		3.2	3.3	3.4	V
Output voltage‡	V _I = 8 V to 20 V	T _J = 0°C to 125°C	3.1	3.3	3.5	V
Innut valtage regulation	I- 200 mA	V _I = 5.3 V to 25 V		9	100	mV
Input voltage regulation	I _O = 200 mA	V _I = 8 V to 25 V		3	50	IIIV
Dinnle rejection	V _I = 8 V to 18 V,	$I_{O} = 100 \text{ mA}, T_{J} = 0^{\circ}\text{C to } 125^{\circ}\text{C}$	62			dB
Ripple rejection	f = 120 Hz	I _O = 300 mA	62 8			uБ
Output voltage regulation	V _I = 8 V,	I _O = 5 mA to 500 mA		20	100	mV
Temperature coefficient of output voltage	$I_O = 5 \text{ mA},$	$T_J = 0$ °C to 125°C		-1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz			40	200	μV
Dropout voltage				2		V
Bias current				4.5	6	mA
Dies surrent change	$I_O = 200 \text{ mA},$	$V_I = 8 \text{ V to } 25 \text{ V}, T_J = 0^{\circ}\text{C to } 125^{\circ}\text{C}$			0.8	A
Bias current change	$I_O = 5 \text{ mA to } 350 \text{ mA}, T_J = 0^{\circ}\text{C to } 125^{\circ}\text{C}$				0.5	mA
Short-circuit output current	V _I = 35 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.

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†			;	UNIT
PARAMETER	TES	MIN	TYP	MAX	UNIT	
Output wellens	$I_0 = 5 \text{ mA to } 350 \text{ mA},$		4.8	5	5.2	V
Output voltage	$V_{I} = 7 \text{ V to } 20 \text{ V}$	$T_J = 0$ °C to 125°C	4.75		5.25	V
Input valtage regulation	I _O = 200 mA	V _I = 7 V to 25 V		3	100	mV
Input voltage regulation	IO = 200 IIIA	V _I = 8 V to 25 V		1	50	IIIV
Pipple rejection	$V_{I} = 8 \text{ V to } 18 \text{ V},$	$I_O = 100 \text{ mA}, T_J = 0^{\circ}\text{C} \text{ to } 125^{\circ}\text{C}$	62			dB
Ripple rejection	f = 120 Hz	I _O = 300 mA	62	80		uБ
Output voltage regulation	$I_O = 5 \text{ mA to } 500 \text{ mA}$			20	100	mV
Output voltage regulation	$I_O = 5 \text{ mA to } 200 \text{ mA}$			10	50	IIIV
Temperature coefficient of output voltage	$I_O = 5 \text{ mA},$	$T_J = 0$ °C to 125°C		-1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz			40	200	μV
Dropout voltage				2		V
Bias current				4.5	6	mA
Dies surrent change	I _O = 200 mA,	$V_{I} = 8 \text{ V to } 25 \text{ V}, T_{J} = 0^{\circ}\text{C to } 125^{\circ}\text{C}$			0.8	mA
Bias current change	$I_{O} = 5 \text{ mA to } 350 \text{ mA}, T_{J} = 0^{\circ}\text{C to } 125^{\circ}\text{C}$				0.5	IIIA
Short-circuit output current	V _I = 35 V			300		mA
Peak output current				0.7		Α

[†] 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, $V_I = 11 \text{ V}$, $I_O = 350 \text{ mA}$, $T_J = 25^{\circ}\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS [†]			μ Α	78M060	С	UNIT
PARAMETER	TEST CONDITIONS				TYP	MAX	UNII
Outout voltage	$I_{O} = 5 \text{ mA to } 350 \text{ mA},$	V _I = 8 V to 21 V		5.75	6	6.25	V
Output voltage	$\frac{10}{10} = 3 \text{ IIIA to } 330 \text{ IIIA},$	V = 0 V 10 21 V	$T_J = 0$ °C to 125°C	5.7		6.3	V
Input voltage regulation	I _O = 200 mA	$V_{I} = 8 \text{ V to } 25 \text{ V}$			5	100	mV
input voltage regulation	10 = 200 IIIA	$V_{I} = 9 \text{ V to } 25 \text{ V}$			1.5	50	1117
Ripple rejection	V _I = 9 V to 19 V,	f = 120 Hz	$I_O = 100 \text{ mA},$ $T_J = 0^{\circ}\text{C to } 125^{\circ}\text{C}$	59			dB
			I _O = 300 mA	59	80		
Output voltage regulation	$I_O = 5 \text{ mA to } 500 \text{ mA}$				20	120	mV
Output voltage regulation	$I_O = 5$ mA to 200 mA				10	60	IIIV
Temperature coefficient of output voltage	I _O = 5 mA,	$T_J = 0$ °C to 125°C			-1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz				45		μV
Dropout voltage					2		V
Bias current					4.5	6	mA
Dies surrent change	$V_{I} = 9 V \text{ to } 25 V,$	$I_O = 200 \text{ mA},$	$T_J = 0$ °C to 125°C			0.8	mA
Bias current change	$I_0 = 5 \text{ mA to } 350 \text{ mA},$	T _J = 0°C to 125°C				0.5	IIIA
Short-circuit output current	V _I = 35 V				270		mA
Peak output current					0.7		Α

TAll 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 = 14 V, I_O = 350 mA, T_J = 25°C (unless otherwise noted)

PARAMETER	TEST COMPITIONS			μ Α	78M080)	UNIT
PARAMETER		TEST CONDITIONS†		MIN	TYP	MAX	UNII
	V 10 5 V to 22 V	l = - Ε m Λ to 3Ε0 m Λ		7.7	8	8.3	V
Output voltage	$V_I = 10.5 \text{ V to } 23 \text{ V},$	$I_O = 5 \text{ mA to } 350 \text{ mA}$	$T_J = 0$ °C to 125°C	7.6		8.4	V
Input voltage regulation	lo - 200 mA	V _I = 10.5 V to 25 V			6	100	mV
Input voltage regulation	I _O = 200 mA	V _I = 11 V to 25 V			2	50	IIIV
Pinnle rejection	V _I = 11.5 V to 21.5 V,	$I_0 = 100 \text{ mA},$	$T_J = 0$ °C to 125°C	56			dB
Ripple rejection	f = 120 Hz	IO = 300 mA		56	80		иь
Output voltage regulation	$I_O = 5 \text{ mA to } 500 \text{ mA}$				25	160	mV
Output voltage regulation	$I_O = 5 \text{ mA to } 200 \text{ mA}$				10	80	IIIV
Temperature coefficient of output voltage	I _O = 5 mA,	T _J = 0°C to 125°C			-1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz				52		μV
Dropout voltage					2		V
Bias current					4.6	6	mA
Ding gurrant change	$V_I = 10.5 \text{ V to } 25 \text{ V},$	I _O = 200 mA,	$T_J = 0^{\circ}C$ to $125^{\circ}C$			0.8	A
Bias current change	$I_{O} = 5 \text{ mA to } 350 \text{ mA},$	T _J = 0°C to 125°C				0.5	mA
Short-circuit output current	V _I = 35 V				250		mA
Peak output current			_		0.7		Α

[†] 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, $V_I = 16 \text{ V}$, $I_O = 350 \text{ mA}$, $T_J = 25^{\circ}\text{C}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		μ Α	78M090	3	UNIT
PARAMETER	TEST CONDITIONS				TYP	MAX	UNIT
Outrout walks as	V _I = 11.5 V to 24 V,	I _O = 5 mA to 350 mA		8.6	9	9.4	V
Output voltage	V = 11.5 V to 24 V,	IQ = 2 IIIY 10 220 IIIY	$T_J = 0$ °C to 125°C	8.5		9.5	V
Input voltage regulation	I _O = 200 mA	V _I = 11.5 V to 26 V			6	100	mV
Input voltage regulation	10 = 200 IIIA	V _I = 12 V to 26 V			2	50	IIIV
Dinale rejection	V _I = 13 V to 23 V,	I _O = 100 mA,	$T_J = 0^{\circ}C$ to $125^{\circ}C$	56			dB
Ripple rejection	f = 120 Hz	I _O = 300 mA		56	80		uБ
Output voltage regulation	$I_O = 5 \text{ mA to } 500 \text{ mA}$		25	25	180	mV	
Output voltage regulation	$I_O = 5 \text{ mA to } 200 \text{ mA}$				10	90	IIIV
Temperature coefficient of output voltage	I _O = 5 mA,	$T_J = 0$ °C to 125°C			-1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz				58		μV
Dropout voltage					2		V
Bias current					4.6	6	mA
Dies surrent shangs	V _I = 11.5 V to 26 V,	I _O = 200 mA,	$T_J = 0$ °C to 125°C			0.8	A
Bias current change	$I_O = 5 \text{ mA to } 350 \text{ mA},$	T _J = 0°C to 125°C				0.5	mA
Short-circuit output current	V _I = 35 V				250		mA
Peak output current					0.7		Α

[†] 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)

DADAMETED		TEGT CONDITIONS [†]			78M100	2	UNIT
PARAMETER		TEST CONDITIONS [†]				MAX	UNII
O to t allows	\/. = 12.5 \/ to 25 \/	la - 5 mA to 350 mA		9.6	10	10.4	V
Output voltage	$V_1 = 12.5 \text{ V to } 25 \text{ V},$	$I_O = 5 \text{ mA to } 350 \text{ mA}$	$T_J = 0$ °C to 125°C	9.5		10.5	V
Input voltage regulation	I _O = 200 mA	V _I = 12.5 V to 28 V			7	100	mV
input voltage regulation	10 = 200 IIIA	V _I = 14 V to 28 V			2	50	IIIV
Ripple rejection	V _I = 15 V to 25 V,	I _O = 100 mA,	$T_J = 0$ °C to 125°C	59			dB
Rippie rejection	f = 120 Hz	I _O = 300 mA		55	80		uБ
Output voltage regulation	I _O = 5 mA to 500 mA				25	200	mV
Output voltage regulation	$I_O = 5 \text{ mA to } 200 \text{ mA}$				10	100	IIIV
Temperature coefficient of output voltage	I _O = 5 mA,	$T_J = 0$ °C to 125°C			-1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz				64		μV
Dropout voltage		(4)			2		V
Bias current					4.7	6	mA
Diag gurrant shangs	V _I = 12.5 V to 28 V,	I _O = 200 mA,	$T_J = 0^{\circ}C$ to $125^{\circ}C$			0.8	mA
Bias current change	$I_0 = 5 \text{ mA to } 350 \text{ mA},$	$T_J = 0$ °C to 125°C				0.5	IIIA
Short-circuit output current	V _I = 35 V				245		mA
Peak output current					0.7		Α

[†] 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, $V_I = 19 \text{ V}$, $I_O = 350 \text{ mA}$, $T_J = 25^{\circ}\text{C}$ (unless otherwise noted)

PARAMETER				μ Α	78M120	5	UNIT
PARAMETER		TEST CONDITIONS†	_	MIN	TYP	MAX	UNIT
Outoutualtana	V _I = 14.5 V to 27 V,	I _O = 5 mA to 350 mA		11.5	12	12.5	V
Output voltage	V = 14.5 V to 21 V,	10 = 3 IIIA to 330 IIIA	$T_J = 0$ °C to 125°C	11.4		12.6	V
Input voltage regulation	I _O = 200 mA	V _I = 14.5 V to 30 V			8	100	mV
Input voltage regulation	10 = 200 IIIA	V _I = 16 V to 30 V			2	50	IIIV
Pinnle rejection	V _I = 15 V to 25 V,	I _O = 100 mA,	$T_J = 0$ °C to 125°C	55			dB
Ripple rejection	f = 120 Hz	IO = 300 mA		55	80		uБ
Output voltage regulation	I _O = 5 mA to 500 mA				25	240	mV
Output voltage regulation	$I_O = 5 \text{ mA to } 200 \text{ mA}$				10	120	IIIV
Temperature coefficient of output voltage	I _O = 5 mA				-1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz				75		μV
Dropout voltage					2		V
Bias current					4.8	6	mA
Dies surrent change	V _I = 14.5 V to 30 V,	I _O = 200 mA,	$T_J = 0^{\circ}C$ to $125^{\circ}C$			0.8	A
Bias current change	$I_O = 5 \text{ mA to } 350 \text{ mA},$	T _J = 0°C to 125°C				0.5	mA
Short-circuit output current	V _I = 35 V				240		mA
Peak output current					0.7		Α

[†] 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 = 23 V, I_O = 350 mA, T_J = 25°C (unless otherwise noted)

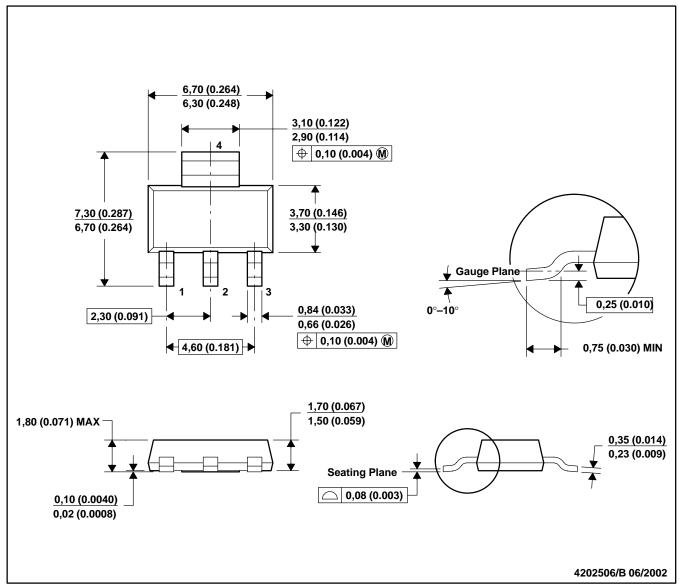
DADAMETED		TEST CONDITIONS [†]			78M15	C	UNIT
PARAMETER		TEST CONDITIONS†		MIN	TYP	MAX	UNII
Outrout walks as	\/ı = 17.5 \/ to 20 \/	lo - 5 m/ to 250 m/		14.4	15	15.6	V
Output voltage	$V_{I} = 17.5 \text{ V to } 30 \text{ V},$	$I_O = 5 \text{ mA to } 350 \text{ mA}$	T _J = 0°C to 125°C	14.25		15.75	V
Input voltage regulation	lo - 200 mA	V _I = 17.5 V to 30 V	/ /		10	100	mV
Input voltage regulation	I _O = 200 mA	V _I = 20 V to 30 V			3	50	IIIV
Ripple rejection	V _I = 18.5 V to 28.5 V,	I _O = 100 mA,	$T_J = 0$ °C to 125°C	54			dB
Ripple rejection	f = 120 Hz	I _O = 300 mA		54	70		uБ
Output voltage regulation	$I_O = 5 \text{ mA to } 500 \text{ mA}$	O = 5 mA to 500 mA		25	300	mV	
Output voltage regulation	$I_O = 5 \text{ mA to } 200 \text{ mA}$				10	150	IIIV
Temperature coefficient of output voltage	I _O = 5 mA,	$T_J = 0$ °C to 125°C			-1		mV/°C
Output noise voltage	f = 10 Hz to 100 kHz				90		μV
Dropout voltage		46			2		V
Bias current					4.8	6	mA
Dies summent about	V _I = 17.5 V to 30 V,	I _O = 200 mA,	$T_J = 0^{\circ}C$ to $125^{\circ}C$			0.8	A
Bias current change	$I_O = 5 \text{ mA to } 350 \text{ mA},$	T _J = 0°C to 125°C				0.5	mA
Short-circuit output current	V _I = 35 V				240		mA
Peak output current					0.7		Α

[†] 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.



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)

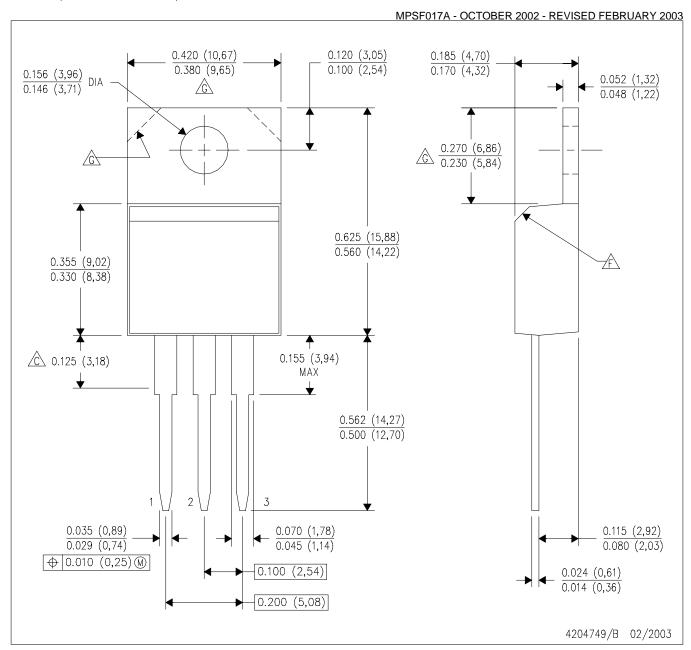
PowerFLEX™ PLASTIC FLANGE-MOUNT PACKAGE



- 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.

PowerFLEX is a trademark of Texas Instruments.





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.

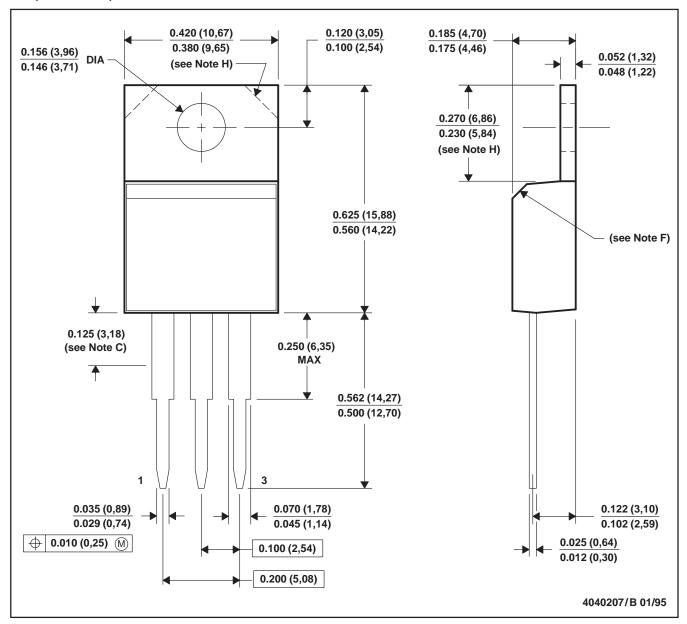
The chamfer is optional.

Tab contour optional within these dimensions.

H. Falls within JEDEC TO-220 variation AB.

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. Falls within JEDEC TO-220AB
- H. Tab contour optional within these dimensions



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Mailing Address:

Texas Instruments
Post Office Box 655303
Dallas, Texas 75265

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