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January 2015

KA78M05 / LM78M05 / MC78M05

3-Terminal 0.5 A Positive Voltage Regulator

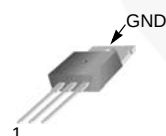
Features

- Output Current up to 0.5 A
- Output Voltages of 5 V
- Thermal Overload Protection
- Short-Circuit Protection
- Output Transistor Safe Operating Area (SOA) Protection

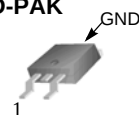
Description

The KA78M05 / LM78M05 / MC78M05 series of three-terminal positive regulators is available in the TO-220 / D-PAK packages, making it useful in a wide range of applications.

TO-220



D-PAK



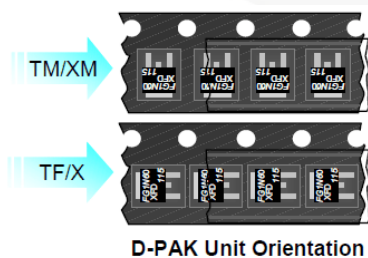
1. Input 2. GND 3. Output

Ordering Information⁽¹⁾

Product Number	Package	Packing Method	Operating Temperature
KA78M05TU	TO-220 (Dual Gauge)	Rail	-40 to +125°C
KA78M05RTM	D-PAK	Tape and Reel	
MC78M05CDTX			
LM78M05CT	TO-220 (Single Gauge)	Rail	

Note:

1. Refer to below figure for TM / TF suffix of DPAK packing option.



D-PAK Unit Orientation

KA78M05 / LM78M05 / MC78M05 — 3-Terminal 0.5 A Positive Voltage Regulator

Block Diagram

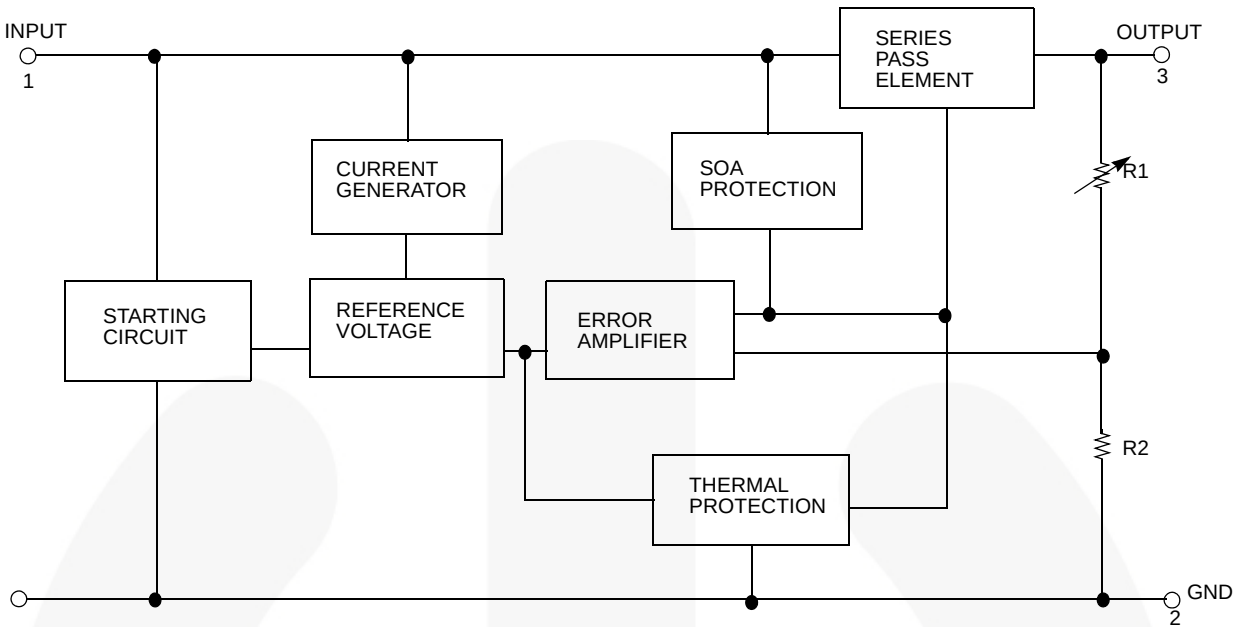


Figure 1. Block Diagram

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Value	Unit
V_I	Input Voltage (for $V_O = 5\text{ V}$)		35	V
$R_{\theta JC}$	Thermal Resistance, Junction-Case ⁽²⁾	TO-220 ($T_C = +25^\circ\text{C}$)	2.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-Air ^{(2), (3)}	TO-220 ($T_A = +25^\circ\text{C}$)	66	$^\circ\text{C/W}$
		D-PAK ($T_A = +25^\circ\text{C}$)	92	
T_{OPR}	Operating Junction Temperature Range		-40 to +125	$^\circ\text{C}$
$T_{J(MAX)}$	Maximum Junction Temperature Range		150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range		-65 to +150	$^\circ\text{C}$

Notes:

- Thermal resistance test board.
Size: 76.2 mm x 114.3 mm x 1.6 mm (1S0P)
JEDEC standard: JESD51-3, JESD51-7
- Assume no ambient airflow.

Electrical Characteristics

Refer to the test circuits, $-40 \leq T_J \leq +125^\circ\text{C}$, $I_O = 350 \text{ mA}$, $V_I = 10 \text{ V}$, $C_I = 0.33 \mu\text{F}$, $C_O = 0.1 \mu\text{F}$ unless otherwise specified.⁽⁴⁾

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
V_O	Output Voltage	$T_J = +25^\circ\text{C}$	4.8	5.0	5.2	V
		$I_O = 5 \text{ mA to } 350 \text{ mA}$, $V_I = 7 \text{ V to } 20 \text{ V}$	4.75	5.00	5.25	
ΔV_O	Line Regulation ⁽⁵⁾	$I_O = 200 \text{ mA}$ $T_J = +25^\circ\text{C}$			100	mV
		$V_I = 7 \text{ V to } 25 \text{ V}$ $V_I = 8 \text{ V to } 25 \text{ V}$			50	
ΔV_O	Load Regulation ⁽⁵⁾	$I_O = 5 \text{ mA to } 0.5 \text{ A}$, $T_J = +25^\circ\text{C}$			100	mV
		$I_O = 5 \text{ mA to } 200 \text{ mA}$, $T_J = +25^\circ\text{C}$			50	
I_Q	Quiescent Current	$T_J = +25^\circ\text{C}$		4.0	6.0	mA
ΔI_Q	Quiescent Current Change	$I_O = 5 \text{ mA to } 350 \text{ mA}$			0.5	mA
		$I_O = 200 \text{ mA}$, $V_I = 8 \text{ V to } 25 \text{ V}$			0.8	
$\Delta V/\Delta T$	Output Voltage Drift	$I_O = 5 \text{ mA}$ $T_J = -40 \text{ to } +125^\circ\text{C}$		-0.5		mV/ $^\circ\text{C}$
V_N	Output Noise Voltage	$f = 10 \text{ Hz to } 100 \text{ kHz}$		40		$\mu\text{V}/V_O$
RR	Ripple Rejection	$f = 120 \text{ Hz}$, $I_O = 300 \text{ mA}$ $V_I = 8 \text{ V to } 18 \text{ V}$, $T_J = +25^\circ\text{C}$		80		dB
V_D	Dropout Voltage	$T_J = +25^\circ\text{C}$, $I_O = 500 \text{ mA}$		2		V
I_{SC}	Short-Circuit Current	$T_J = +25^\circ\text{C}$, $V_I = 35 \text{ V}$		300		mA
I_{PK}	Peak Current	$T_J = +25^\circ\text{C}$		700		mA

Notes:

- The parameters are guaranteed across the temperature range by characterization.
- Load and line regulation are specified at constant junction temperature. Change in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Typical Applications^{(6), (7)}

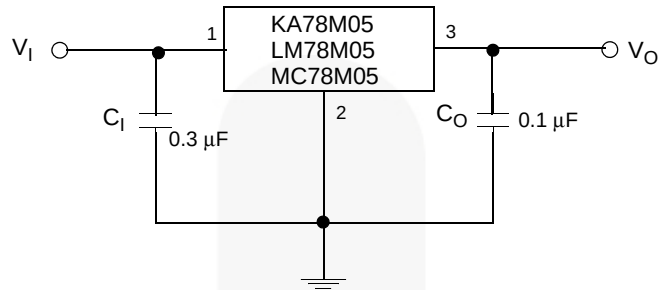


Figure 2. Fixed-Output Regulator

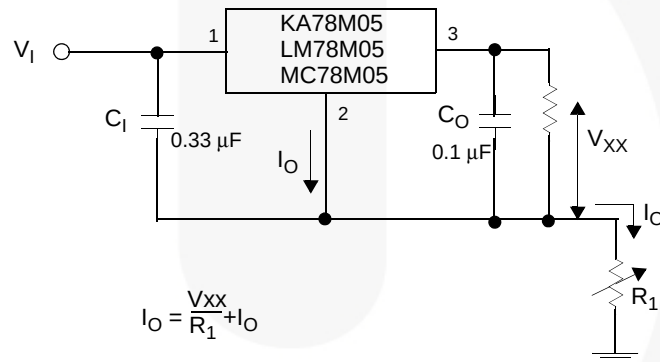


Figure 3. Constant-Current Regulator

Notes:

6. C_I is required if the regulator is located an appreciable distance from the power supply filter.
7. Although no output capacitor is needed for stability, it does improve transient response.

Typical Applications (Continued)

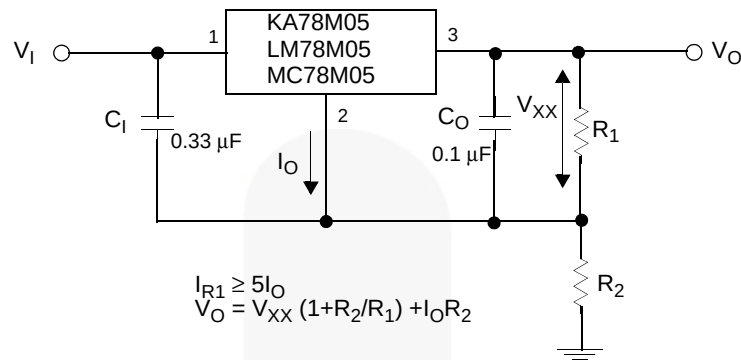


Figure 4. Circuit for Increasing Output Voltage

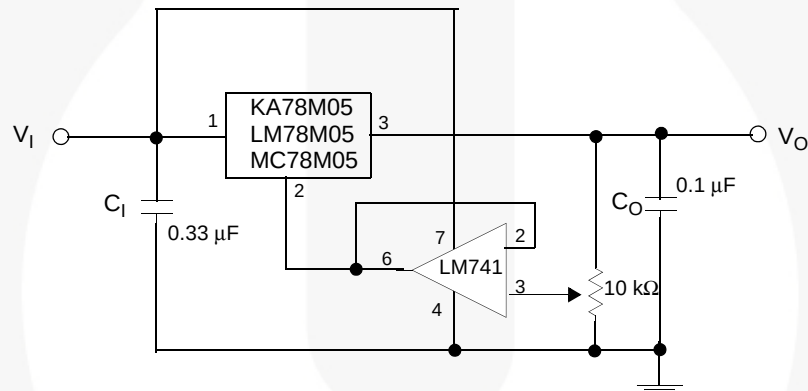


Figure 5. Adjustable Output Regulator (7 to 30 V)

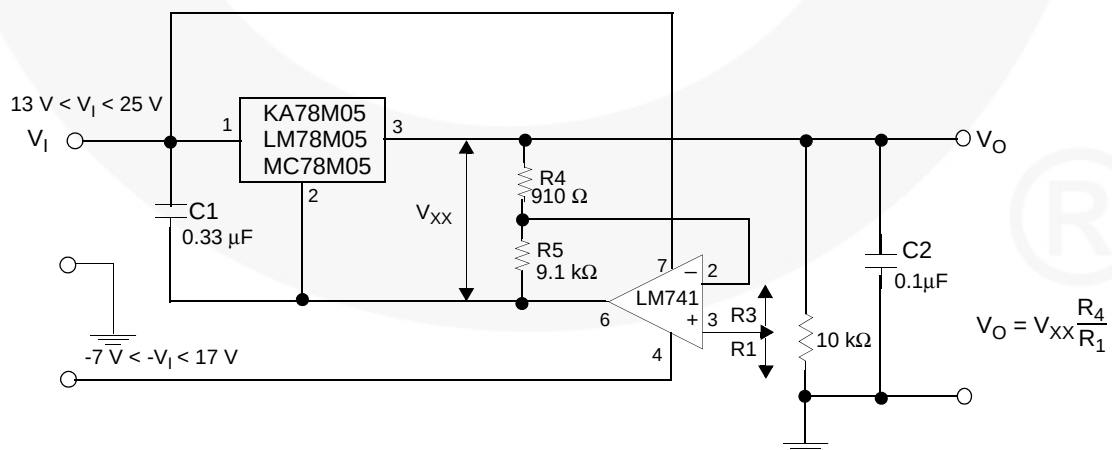


Figure 6. 0.5 to 10 V Regulator

Physical Dimensions

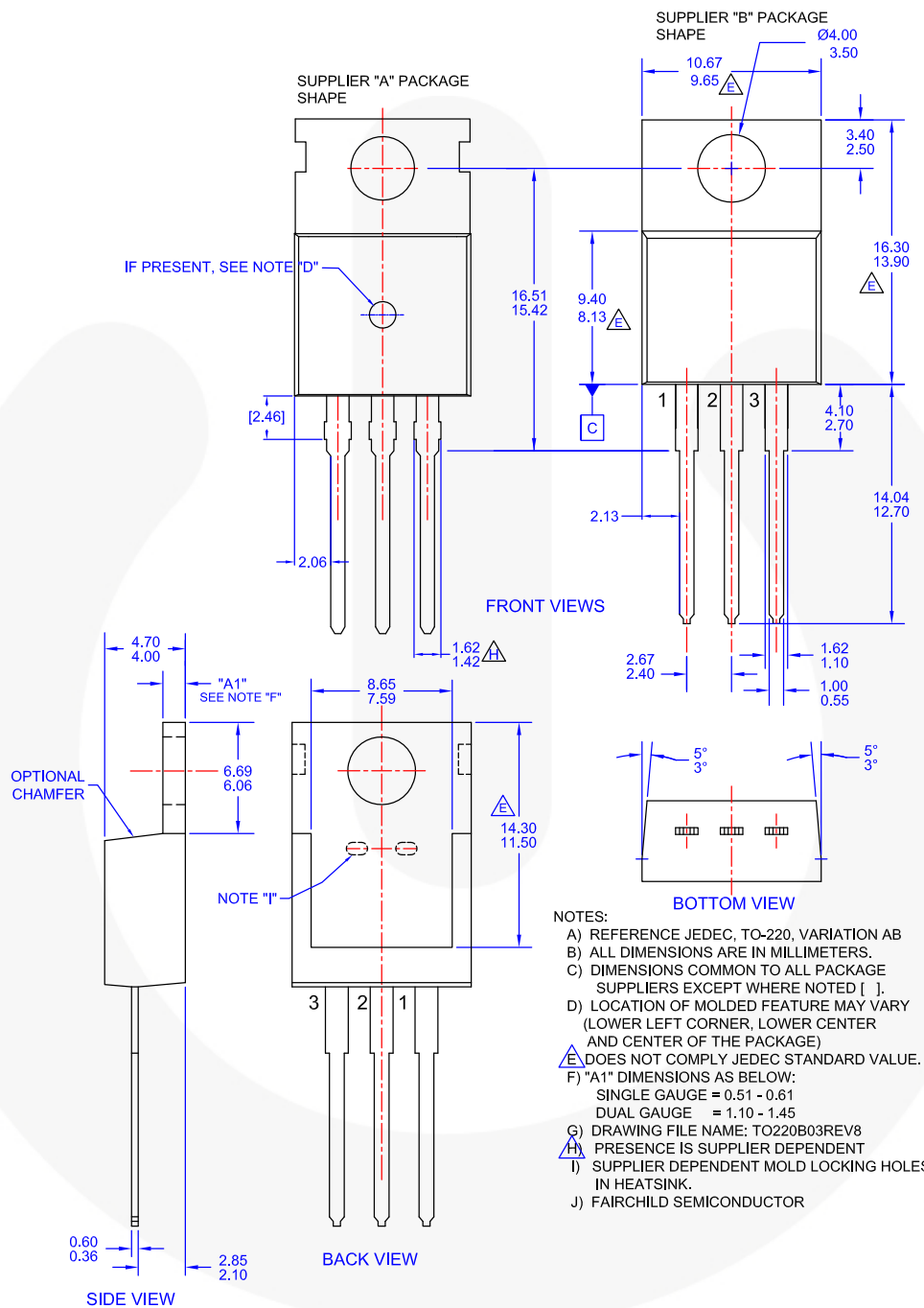


Figure 7. TO-220, MOLDED, 3LEAD, JEDEC VARIATION AB

Physical Dimensions (Continued)

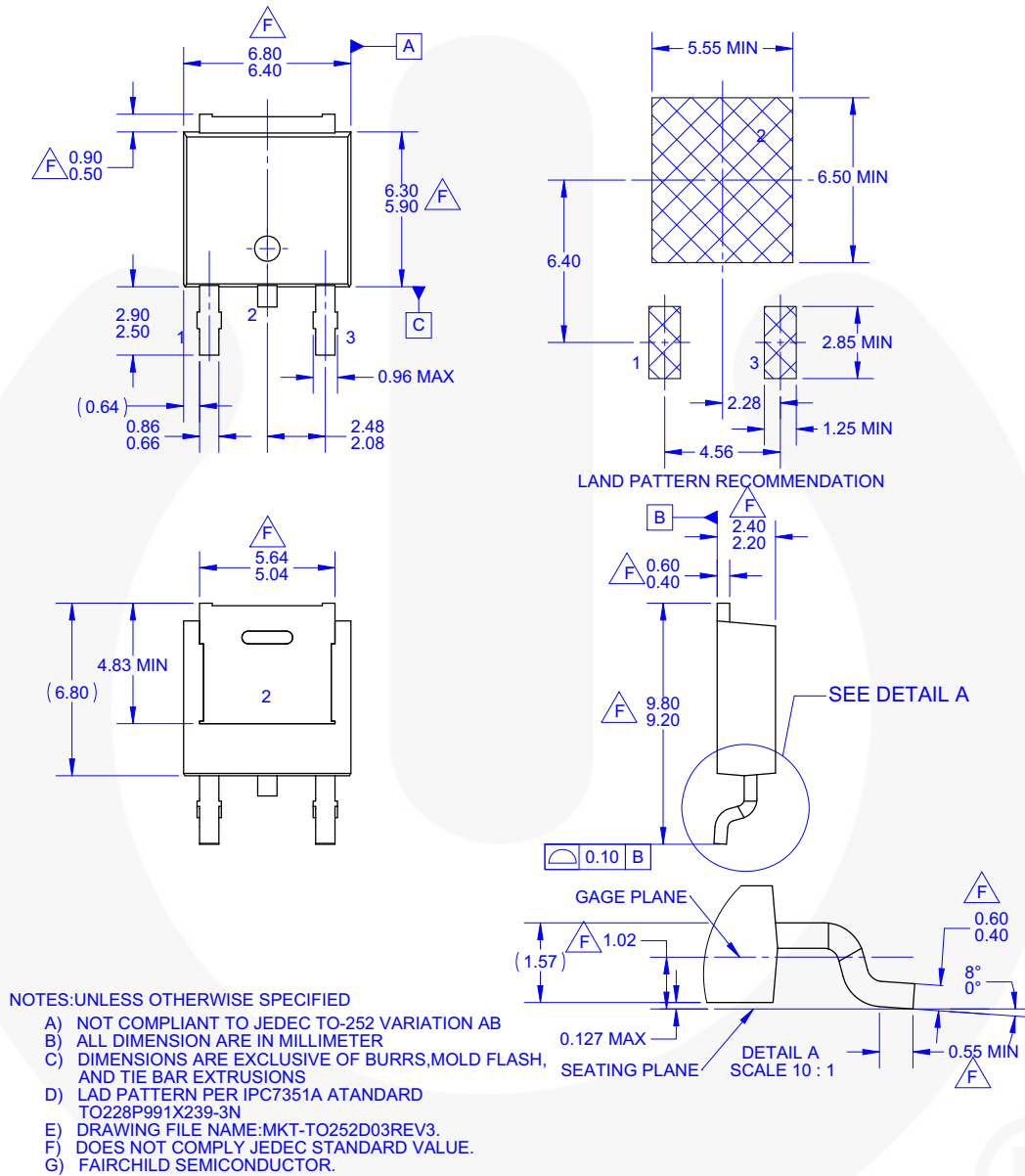


Figure 8. 3-LEAD, TO-252, JEDEC TO-252 VAR. AB, SURFACE MOUNT (DPAK)



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