



June 2014

# KA78RH33R Low Dropout Voltage Regulator

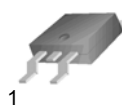
## Features

- Fixed Output Voltage of +3.3 V
- Space-Saving SMD Types of DPAK
- 1 V (Typical) Dropout at  $I_O = 800$  mA
- Output Current: 800 mA
- Thermal Shutdown Protection
- Over-Current Protection
- Output Trimmed to  $\pm 1\%$  Tolerance
- No Minimum Load Requirement

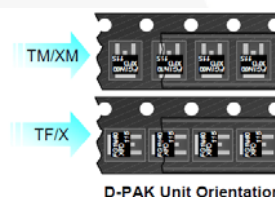
## Description

The KA78RH33 is a +3.3V, fixed, low dropout voltage regulator specifically designed for use in low-voltage operation. The maximum load current is 0.8 A and the dropout voltage is guaranteed to be 1 V (typical). The dropout voltage varies with load current. The regulator consists of composite PNP-NPN pass transistors.

### D-PAK



1. GND 2.  $V_{OUT}$  3.  $V_{IN}$



## Ordering Information

| Part Number | Operating Temperature Range | Top Mark | Package          | Packing Method |
|-------------|-----------------------------|----------|------------------|----------------|
| KA78RH33RTF | -25°C to +125°C             | KA78RH33 | TO-252 3L (DPAK) | Tape and Reel  |
| KA78RH33RTM | -25°C to +125°C             | KA78RH33 | TO-252 3L (DPAK) | Tape and Reel  |

\* Refer to above unit orientation figure for TM / TF suffix packing.

## Block Diagram

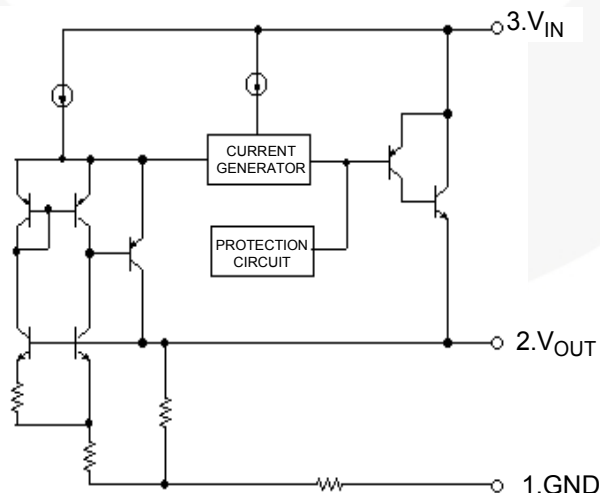


Figure 1. Block Diagram

## 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. Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol    | Parameter                      | Value      | Unit             |
|-----------|--------------------------------|------------|------------------|
| $V_{IN}$  | Power Supply Input Voltage     | 15         | V                |
| $I_O$     | Output Load Current            | 800        | mA               |
| $T_J$     | Junction Temperature           | 150        | $^\circ\text{C}$ |
| $T_{OPR}$ | Operating Junction Temperature | -25 to 125 | $^\circ\text{C}$ |
| $T_{STG}$ | Storage Temperature            | -55 to 150 | $^\circ\text{C}$ |

## Temperature Characteristics

| Symbol                  | Parameter                                 | Value      | Unit                |
|-------------------------|-------------------------------------------|------------|---------------------|
| $\Delta V_O / \Delta T$ | Temperature Coefficient of Output Voltage | $\pm 0.02$ | %/ $^\circ\text{C}$ |

## Thermal Characteristics

Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

| Symbol          | Parameter                               | Value | Unit               |
|-----------------|-----------------------------------------|-------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance, Junction to Ambient | 110   | $^\circ\text{C/W}$ |

## Electrical Characteristics

Refer to the test circuit, values are at  $V_{IN} = 5\text{ V}$ ,  $C_O = 10\text{ }\mu\text{F}$ , and  $T_A = 25^\circ\text{C}$ , unless otherwise specified.

| Symbol                  | Parameter                                 | Conditions                                                                                                                            | Min. | Typ. | Max. | Unit                 |
|-------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| $V_{OUT}$               | Output Voltage                            | $I_O = 10\text{ mA}$ , $T_J = 25^\circ\text{C}$                                                                                       | 3.27 | 3.30 | 3.33 | V                    |
| $V_{OUT}$               | Output Voltage                            | $V_{IN} = 4.8\text{ V to }12\text{ V}$ ,<br>$I_O = 10\text{ mA to }800\text{ mA}$ ,<br>$T_J = -25^\circ\text{C to }125^\circ\text{C}$ | 3.23 | 3.30 | 3.37 | V                    |
| $R_{line}$              | Line Regulation                           | $V_{IN} = 4.8\text{ V to }12\text{ V}$ , $I_O = 10\text{ mA}$                                                                         |      | 1    | 10   | mV                   |
| $R_{load}$              | Load Regulation                           | $I_O = 10\text{ mA to }800\text{ mA}$                                                                                                 |      | 1    | 20   | mV                   |
| RR                      | Ripple Rejection                          | $f = 120\text{ Hz}$ , $I_O = 500\text{ mA}$ ,<br>$V_{IN} = 6.3 \pm 1\text{ V}_{rms}$                                                  | 55   |      |      | dB                   |
| $V_{drop}$              | Dropout Voltage                           | $I_O = 100\text{ mA}$                                                                                                                 |      | 1.00 | 1.20 | V                    |
|                         |                                           | $I_O = 500\text{ mA}$                                                                                                                 |      | 1.05 | 1.25 |                      |
|                         |                                           | $I_O = 800\text{ mA}$                                                                                                                 |      | 1.10 | 1.40 |                      |
| $I_q$                   | Quiescent Current                         | $V_{IN} \leq 12\text{ V}$                                                                                                             |      | 5    | 10   | mA                   |
| $\Delta V_O / \Delta T$ | Temperature Coefficient of Output Voltage | $T_J = -25^\circ\text{C to }125^\circ\text{C}$ ,<br>$I_O = 10\text{ mA}$                                                              |      | 0.2  |      | mV/ $^\circ\text{C}$ |
| $I_{pk}$                | Peak Output Current                       | $V_{IN} = 6.3\text{ V}$                                                                                                               | 800  |      |      | mA                   |
| $V_n$                   | Output Noise Voltage                      | $f = 10\text{ Hz to }10\text{ kHz}$                                                                                                   |      | 100  |      | $\mu\text{V}_{rms}$  |

### Typical Application

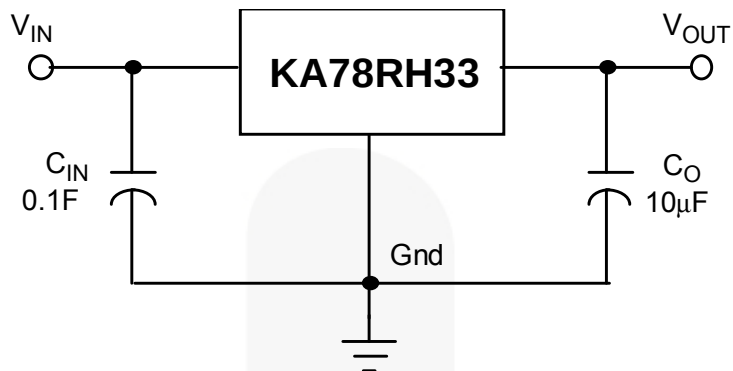


Figure 2. Typical Application<sup>(1)</sup>

**Note:**

1. An input capacitor,  $C_{IN}$  is not necessary for stability, but improves the overall performance.

## Physical Dimensions

## TO-252 3L (DPAK)

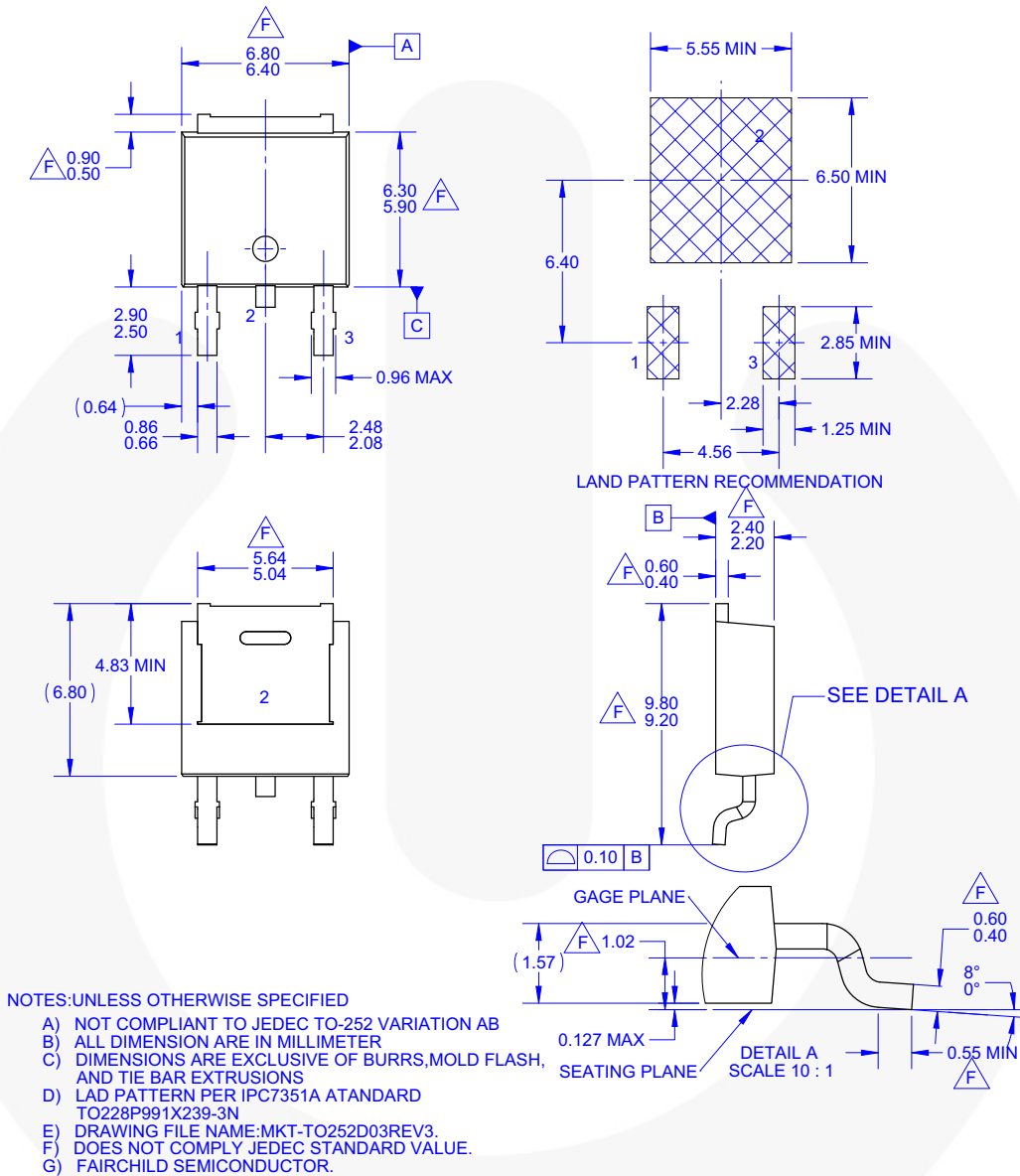


Figure 3. 3-Lead, TO-252, JEDEC TO-252 VAR. AB, SURFACE MOUNT (DPAK)

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