

# KA78RXXC-Series

## 1A Output Low Dropout Voltage Regulators

### Features

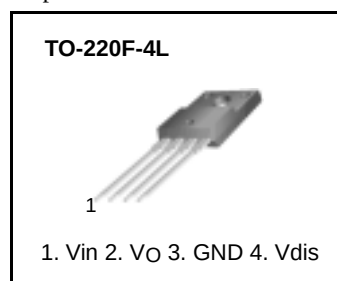
- 1A/3.3V, 5V, 8V, 9V, 12V, 15V output low dropout voltage regulator
- TO-220 full-mold package (4pin)
- Overcurrent protection, thermal shutdown
- Overvoltage protection, short circuit protection
- With output disable function

### Description

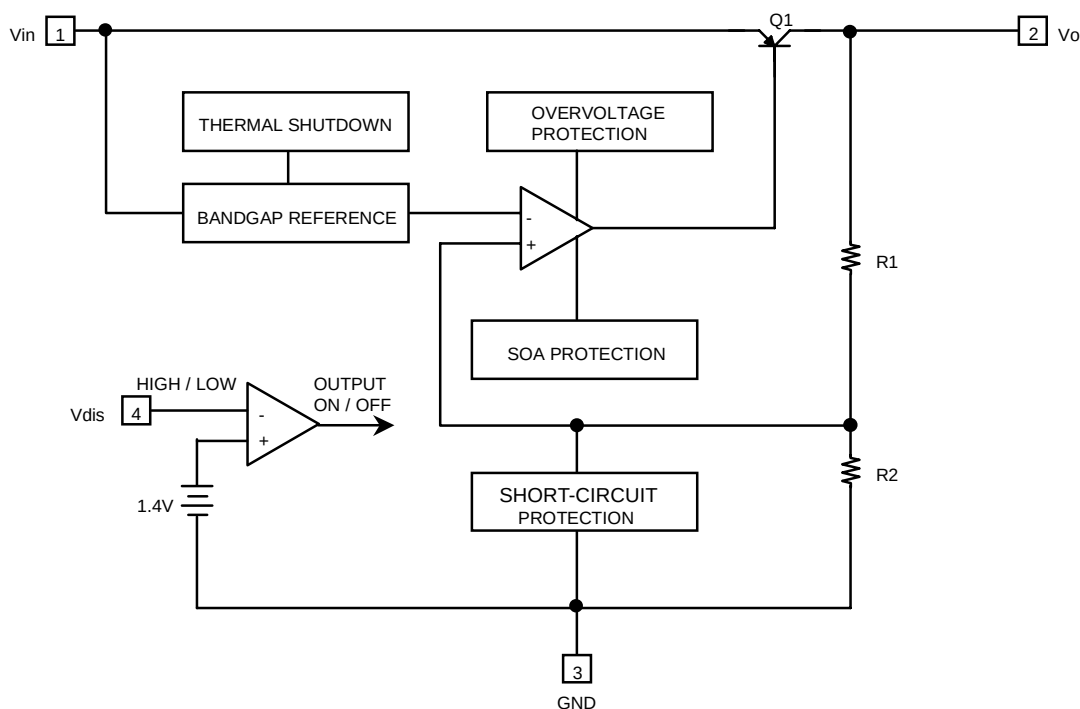
The KA78RXXC is a low-dropout voltage regulator suitable for various electronic equipments.

It provides constant voltage power source with TO-220-4 lead full mold package. Dropout voltage of KA78RXXC is below 0.5V in full rated current(1A).

This regulator has various functions such as peak current protection, thermal shut down, overvoltage protection and output disable function.



### Internal Block Diagram



Rev. 1.0.0

## Absolute Maximum Ratings

### KA78RXXC

| Parameter                                    | Symbol           | Value     | Unit | Remark        |
|----------------------------------------------|------------------|-----------|------|---------------|
| Input voltage                                | V <sub>in</sub>  | 35        | V    | -             |
| Disable voltage                              | V <sub>dis</sub> | 35        | V    | -             |
| Output current                               | I <sub>o</sub>   | 1.0       | A    | -             |
| Power dissipation 1                          | P <sub>d1</sub>  | 1.5       | W    | No heatsink   |
| Power dissipation 2                          | P <sub>d2</sub>  | 15        | W    | With heatsink |
| Junction temperature                         | T <sub>j</sub>   | +150      | °C   | -             |
| Operating temperature                        | T <sub>opr</sub> | -20 ~ +80 | °C   | -             |
| Thermal resistance, junction-to case (Note2) | R <sub>θjc</sub> | 4.31      | °C/W | -             |
| Thermal resistance, junction-to-air (Note2)  | R <sub>θja</sub> | 48.83     | °C/W | -             |

## Electrical Characteristics

( $V_{in}$  = Note3,  $I_o$  = 0.5A,  $T_a$  = 25°C, unless otherwise specified)

| Parameter                 |          | Symbol     | Conditions       | Min. | Typ. | Max. | Unit    |
|---------------------------|----------|------------|------------------|------|------|------|---------|
| Output voltage            | KA78R33C | $V_o$      | -                | 3.22 | 3.3  | 3.38 | V       |
|                           | KA78R05C |            | -                | 4.88 | 5    | 5.12 |         |
|                           | KA78R08C |            | -                | 7.8  | 8    | 8.2  |         |
|                           | KA78R09C |            | -                | 8.78 | 9    | 9.22 |         |
|                           | KA78R12C |            | -                | 11.7 | 12   | 12.3 |         |
|                           | KA78R15C |            | -                | 14.6 | 15   | 15.4 |         |
| Load regulation           |          | $R_{load}$ | $5mA < I_o < 1A$ | -    | 0.1  | 2.0  | %       |
| Line regulation           |          | $R_{line}$ | Note4            | -    | 0.5  | 2.5  | %       |
| Ripple rejection ratio    |          | RR         | Note1            | 45   | 55   | -    | dB      |
| Dropout voltage           |          | $V_{drop}$ | $I_o = 1A$       | -    | -    | 0.5  | V       |
| Disable voltage high      |          | $V_{disH}$ | Output active    | 2.0  | -    | -    | V       |
| Disable voltage low       |          | $V_{disL}$ | Output disabled  | -    | -    | 0.8  | V       |
| Disable bias current high |          | $I_{disH}$ | $V_{dis} = 2.7V$ | -    | -    | 20   | $\mu A$ |
| Disable bias current low  |          | $I_{disL}$ | $V_{dis} = 0.4V$ | -    | -    | -0.4 | mA      |
| Quiescent current         |          | $I_q$      | $I_o = 0A$       | -    | -    | 10   | mA      |

### Note:

- These parameters, although guaranteed, are not 100% tested in production.
- Junction -to -case thermal resistance test environments.
  - Pneumatic heat sink fixture.
  - Clamping pressure 60psi through 12mm diameter cylinder.
  - Thermal grease applied between PKG and heat sink fixture.
- KA78R33C :  $V_{in} = 5V$   
 KA78R05C :  $V_{in} = 7V$   
 KA78R08C :  $V_{in} = 10V$   
 KA78R09C :  $V_{in} = 11V$   
 KA78R12C :  $V_{in} = 15V$   
 KA78R15C :  $V_{in} = 20V$
- KA78R33C :  $V_{in} = 4V$  to 10V  
 KA78R05C :  $V_{in} = 6V$  to 12V  
 KA78R08C :  $V_{in} = 9V$  to 25V  
 KA78R09C :  $V_{in} = 10V$  to 25V  
 KA78R12C :  $V_{in} = 13V$  to 29V  
 KA78R15C :  $V_{in} = 16V$  to 30V

## Typical Performance Characteristics

### KA78R33

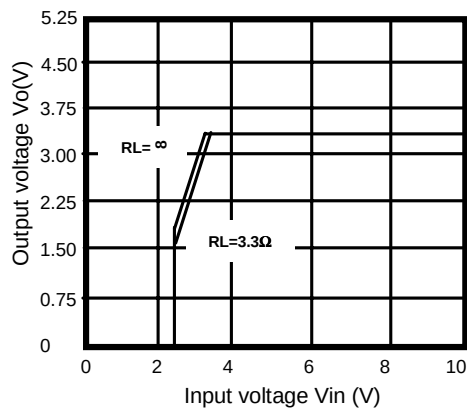


Figure 1. Output Voltage vs. Input Voltage

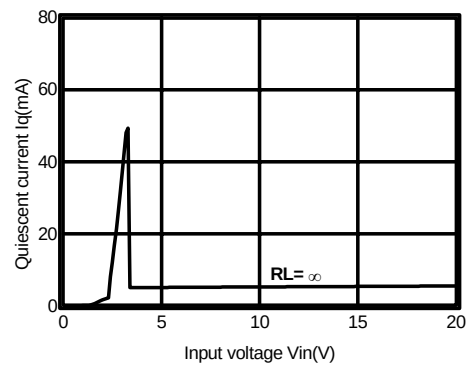


Figure 2. Quiescent Current vs. Input Voltage

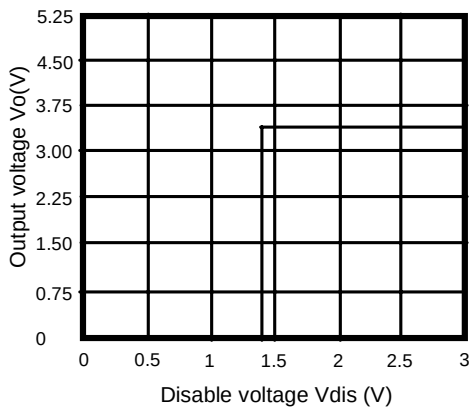


Figure 3. Output Voltage vs. Disable Voltage

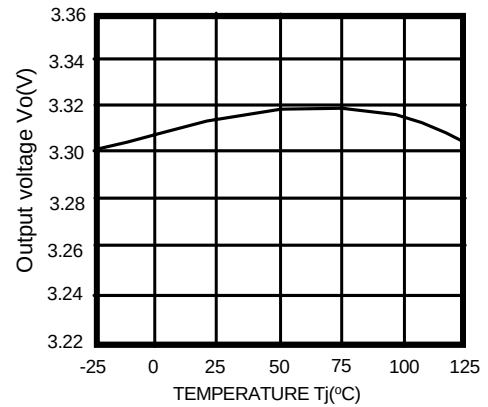


Figure 4. Output Voltage vs. Temperature(Tj)

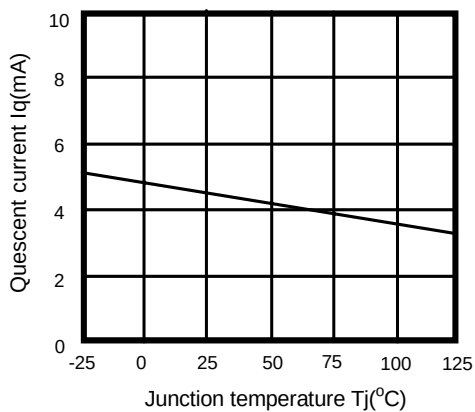


Figure 5. Quiescent Current vs. Temperature(Tj)

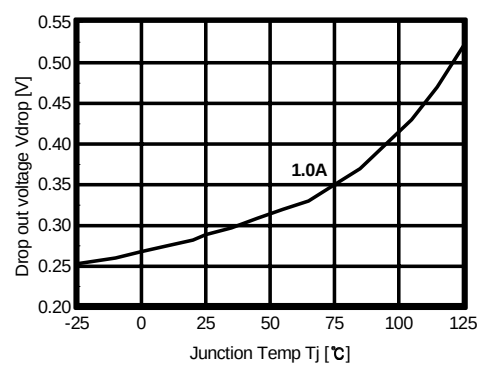


Figure 6. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

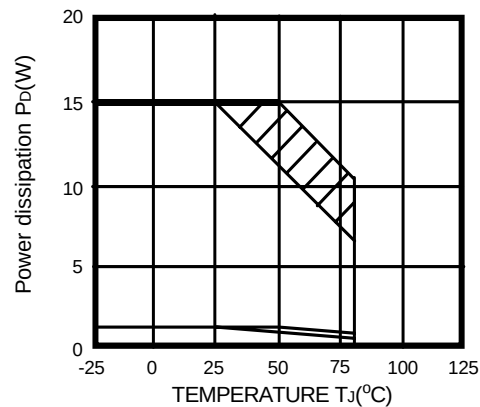


Figure 7. Power Dissipation vs. Temperature( $T_j$ )

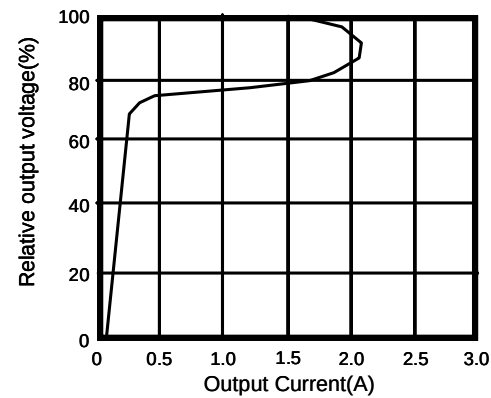


Figure 8. Overcurrent Protection Characteristics (Typical Value)

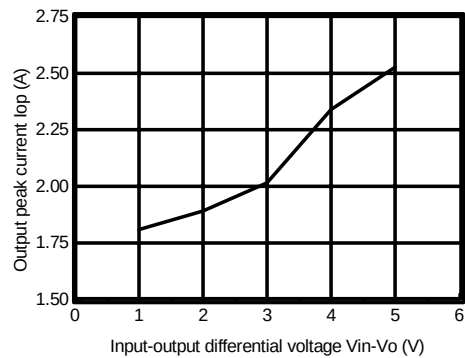


Figure 9. Output Peak Current vs. Input-Output Differential Voltage

Typical Performance Characteristics

KA78R05C

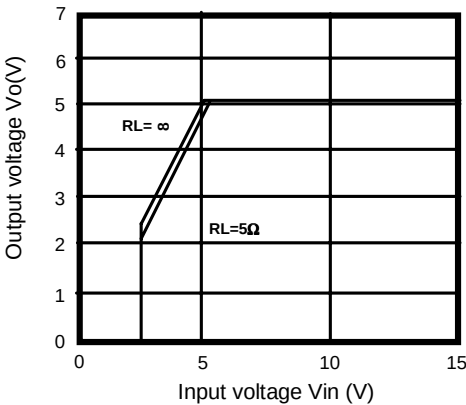


Figure 1. Output Voltage vs. Input Voltage

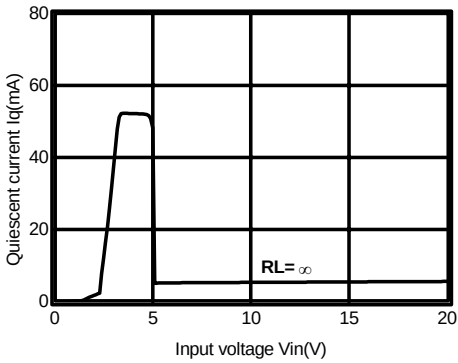


Figure 2. Quiescent Current vs. Input Voltage

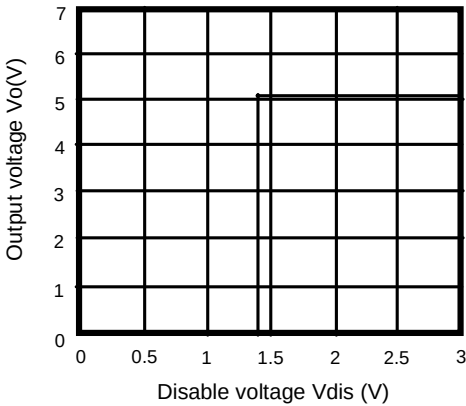


Figure 3. Output Voltage vs. Disable Voltage

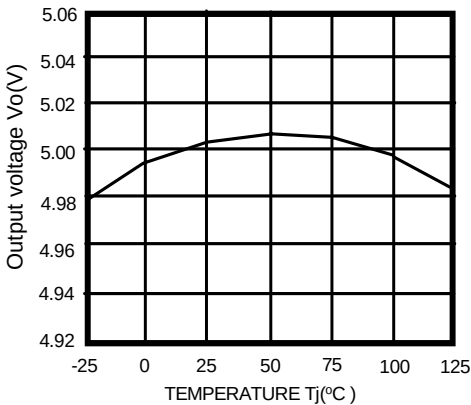


Figure 4. Output Voltage vs. Temperature( $T_j$ )

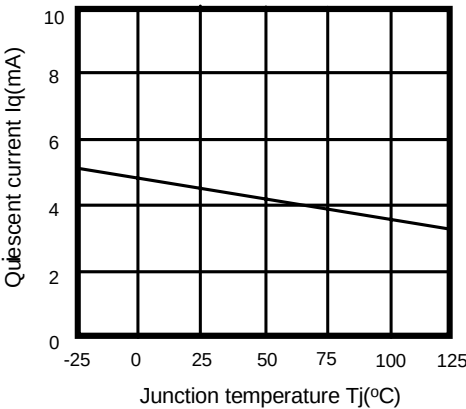


Figure 5. Quiescent Current vs. Temperature( $T_j$ )

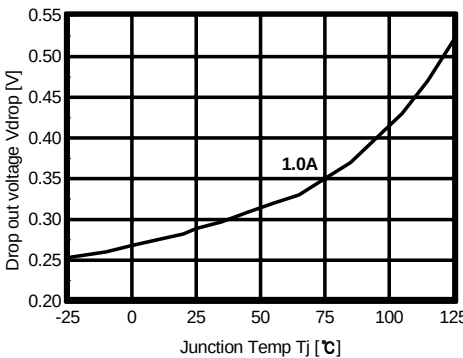


Figure 6. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

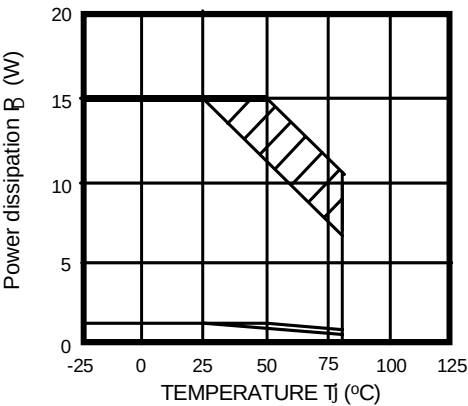


Figure 7. Power Dissipation vs. Temperature( $T_J$ )

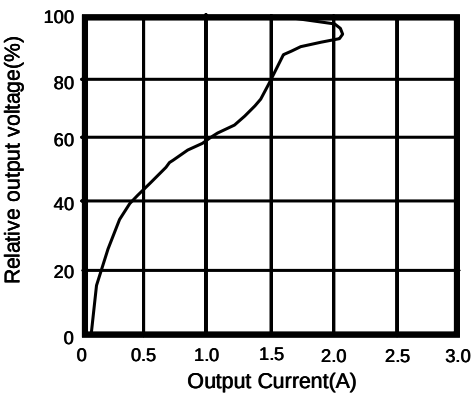


Figure 8. Overcurrent Protection Characteristics (Typical Value)

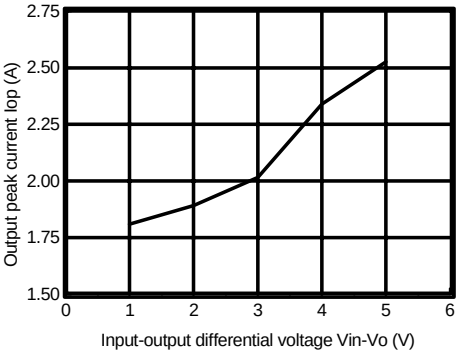


Figure 9. Output Peak Current vs. Input-Output Differential Voltage

Typical Performance Characteristics (Continued)

KA78R08C

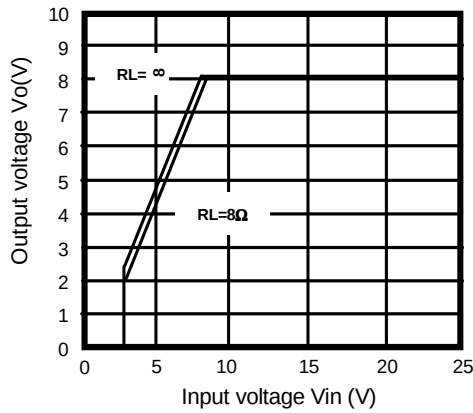


Figure 1. Output Voltage vs. Input Voltage

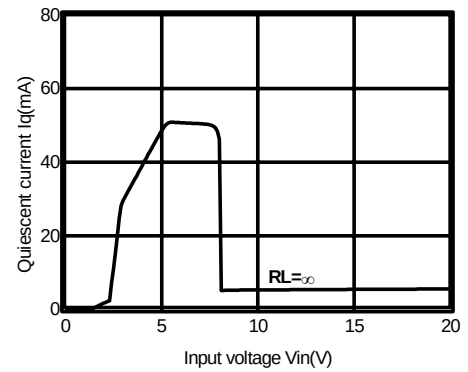


Figure 2. Quiescent Current vs. Input Voltage

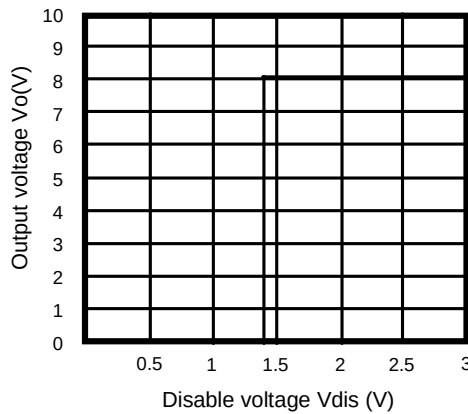


Figure 3. Output Voltage vs. Disable Voltage

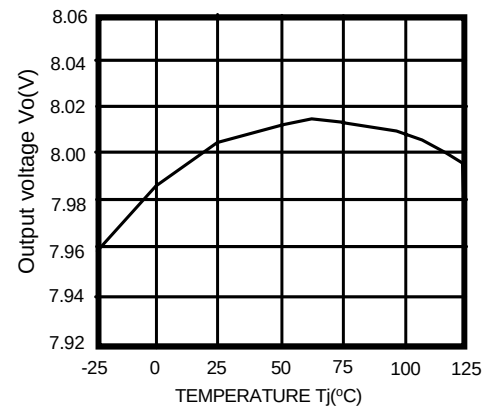


Figure 4. Output Voltage vs. Temperature( $T_j$ )

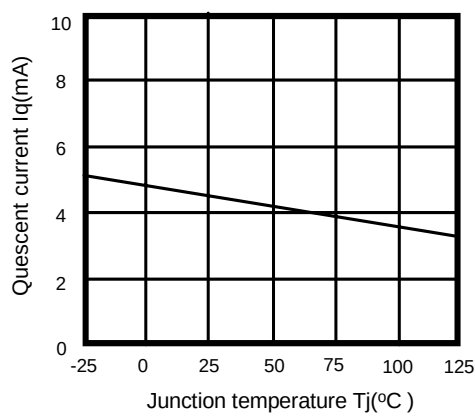


Figure 5. Quiescent Current vs. Temperature( $T_j$ )

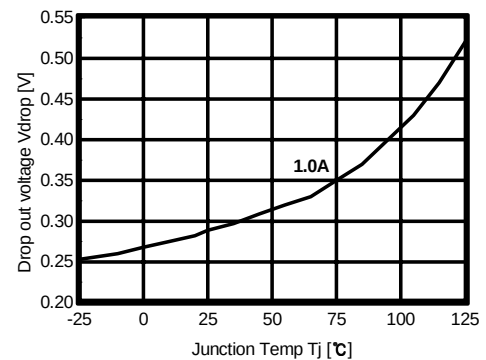


Figure 6. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

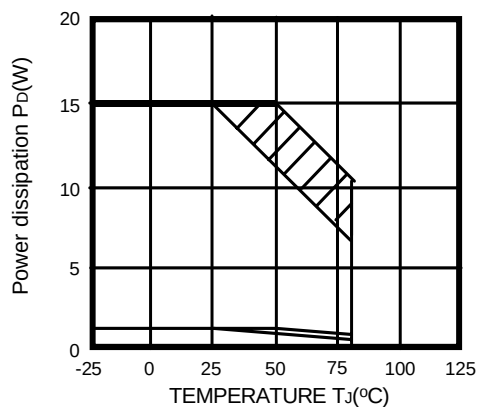


Figure 7. Power Dissipation vs. Temperature( $T_j$ )

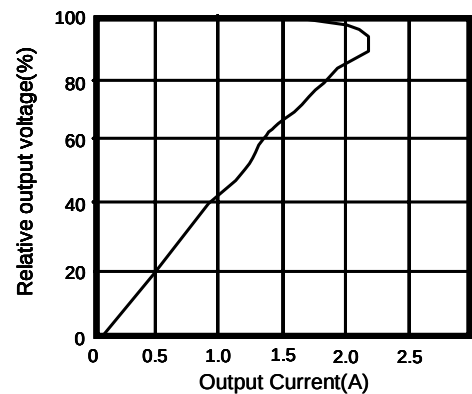


Figure 8. Overcurrent Protection Characteristics (Typical Value)

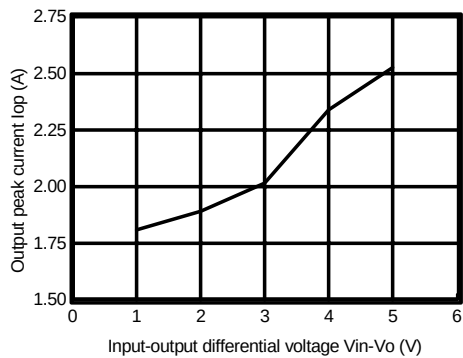


Figure 9. Output Peak Current vs. Input-Output Differential Voltage

## Typical Performance Characteristics (Continued)

### KA78R09C

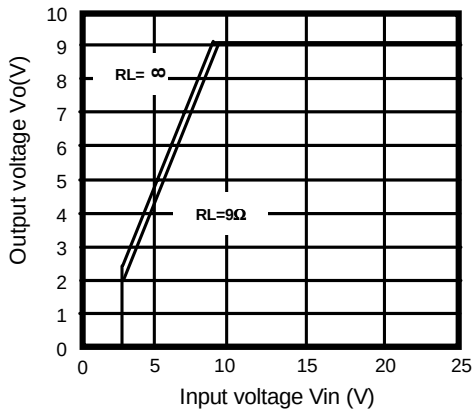


Figure 1. Output Voltage vs. Input Voltage

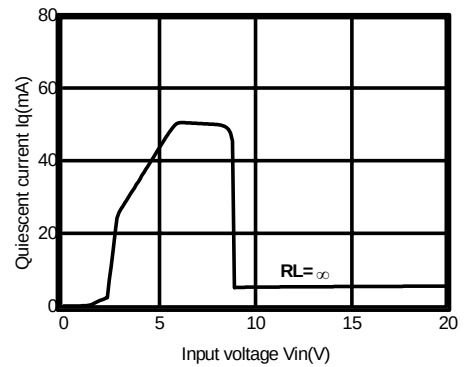


Figure 2. Quiescent Current vs. Input Voltage

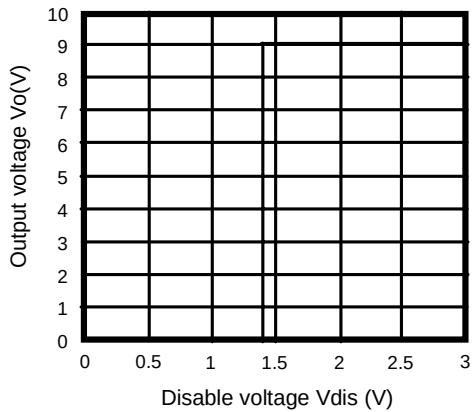


Figure 3. Output Voltage vs. Disable Voltage

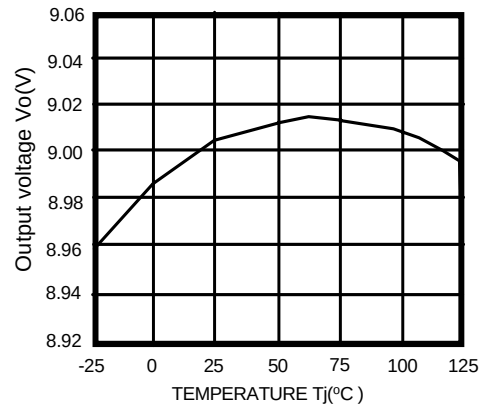


Figure 4. Output Voltage vs. Temperature(Tj)

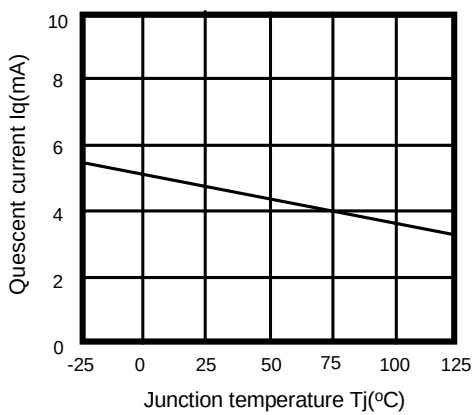


Figure 5. Quiescent Current vs. Temperature(Tj)

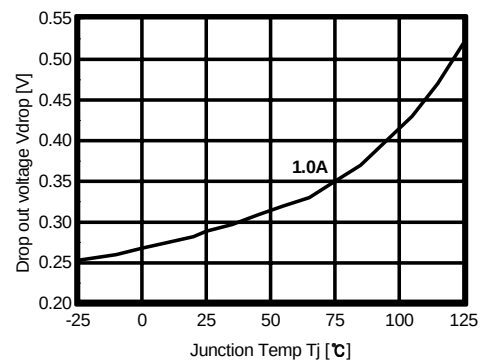


Figure 6. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

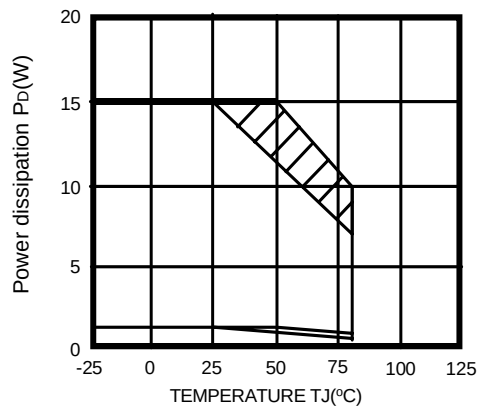


Figure 7. Power Dissipation vs. Temperature( $T_J$ )

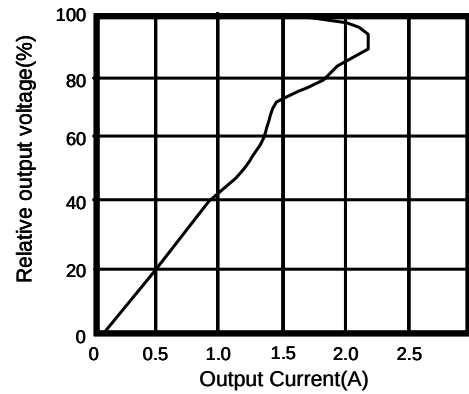


Figure 8. Overcurrent Protection Characteristics (Typical Value)

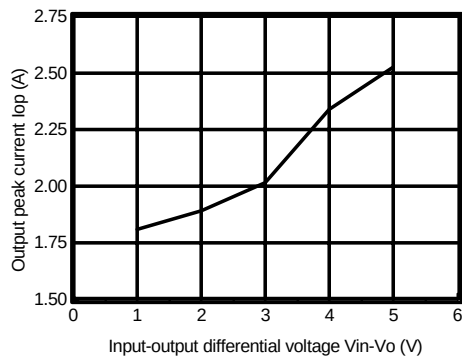


Figure 9. Output Peak Current vs. Input-Output Differential Voltage

# Typical Performance Characteristics (Continued)

## KA78R12C

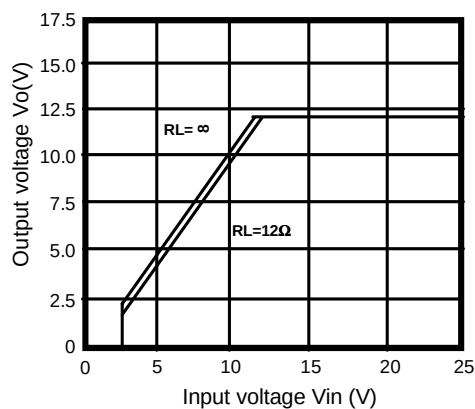


Figure 1. Output Voltage vs. Input Voltage

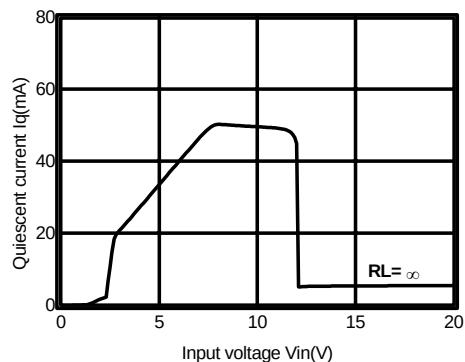


Figure 2. Quiescent Current vs. Input Voltage

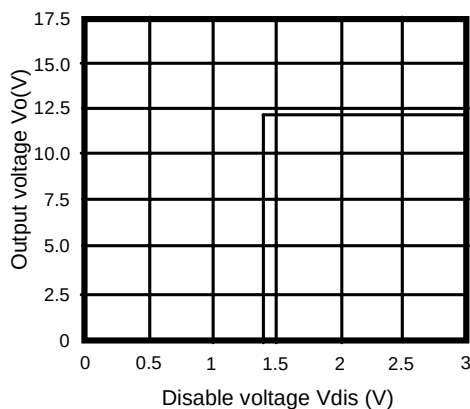


Figure 3. Output Voltage vs. Disable Voltage

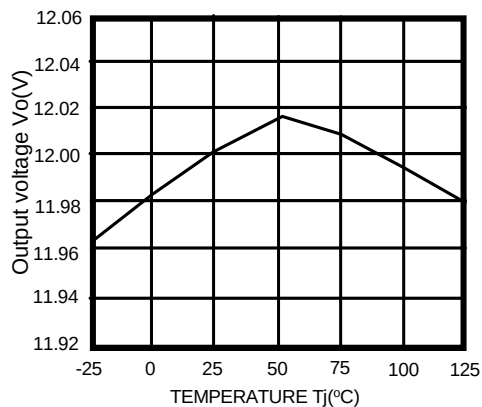
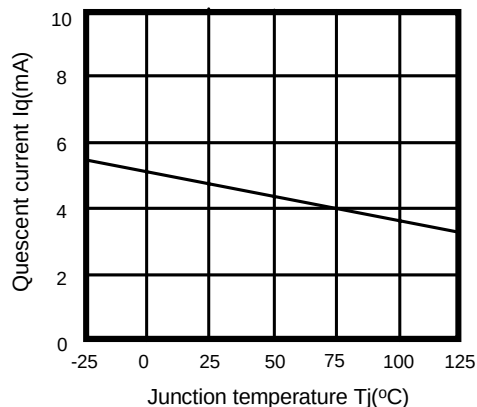
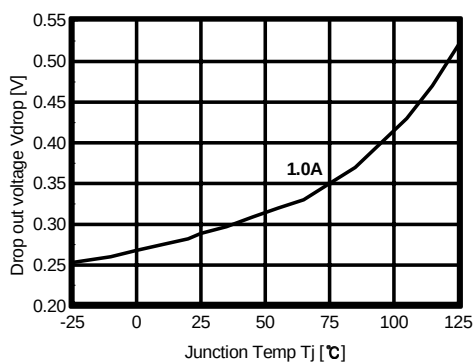
Figure 4. Output Voltage vs. Temperature( $T_j$ )Figure 5. Quiescent Current vs. Temperature( $T_j$ )

Figure 6. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

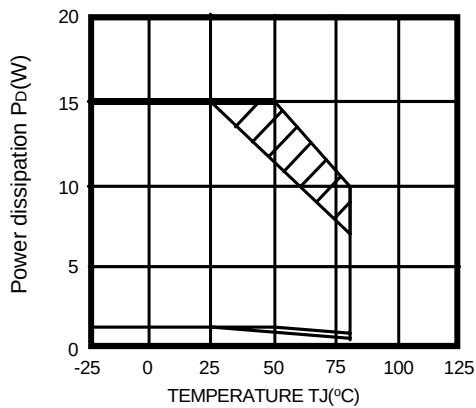


Figure 7. Power Dissipation vs. Temperature( $T_j$ )

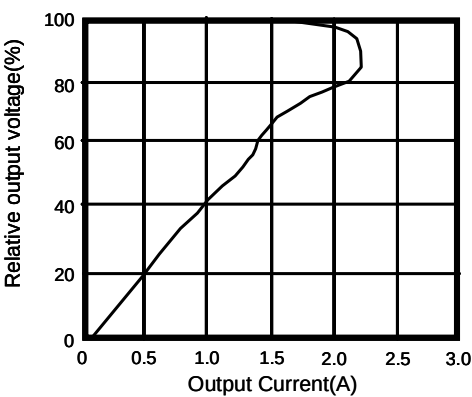


Figure 8. Overcurrent Protection Characteristics (Typical Value)

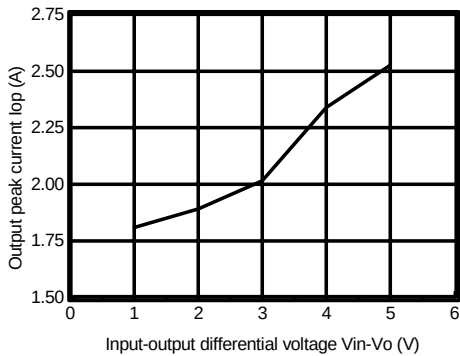


Figure 9. Output Peak Current vs. Input-Output Differential Voltage

## Typical Performance Characteristics (Continued)

### KA78R15C

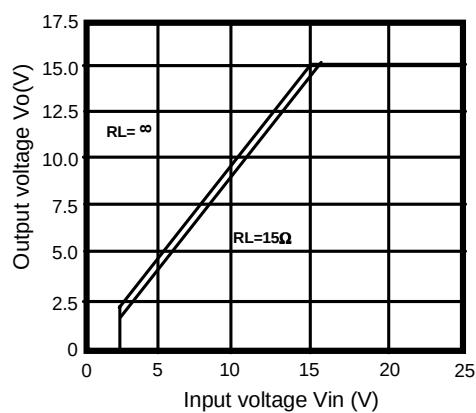


Figure 1. Output Voltage vs. Input Voltage

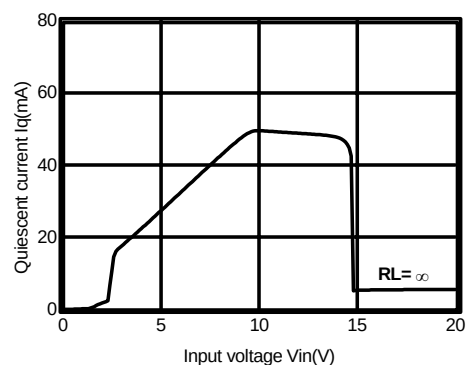


Figure 2. Quiescent Current vs. Input Voltage

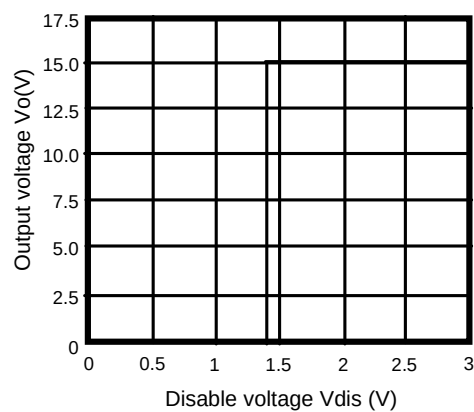


Figure 3. Output Voltage vs. Disable Voltage

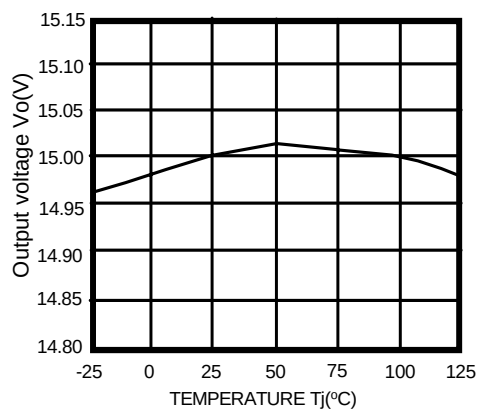


Figure 4. Output Voltage vs. Temperature( $T_j$ )

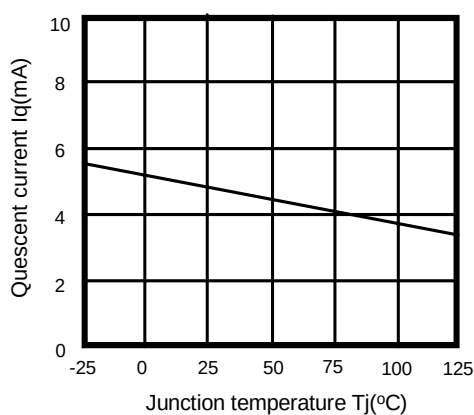


Figure 5. Quiescent Current vs. Temperature( $T_j$ )

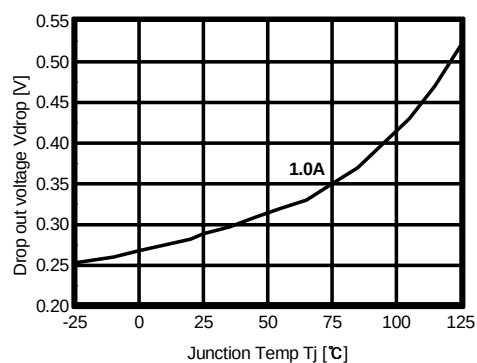


Figure 6. Dropout Voltage vs. Junction Temperature

Typical Performance Characteristics (Continued)

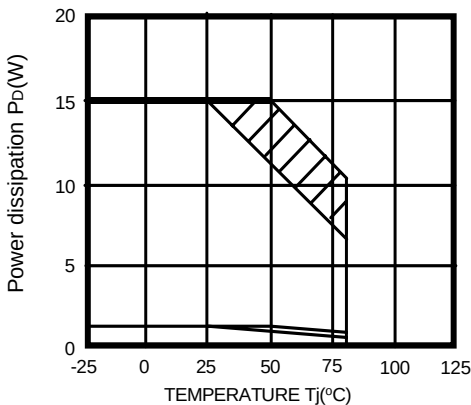


Figure 7. Power Dissipation vs. Temperature( $T_j$ )

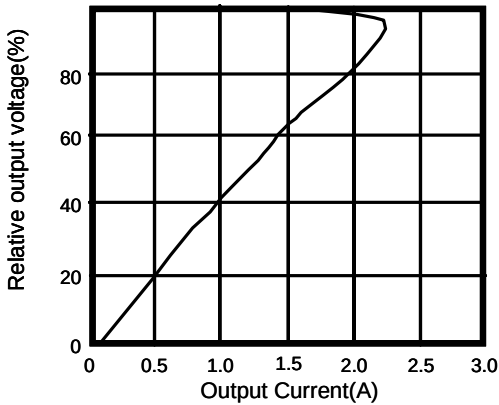


Figure 8. Overcurrent Protection Characteristics (Typical Value)

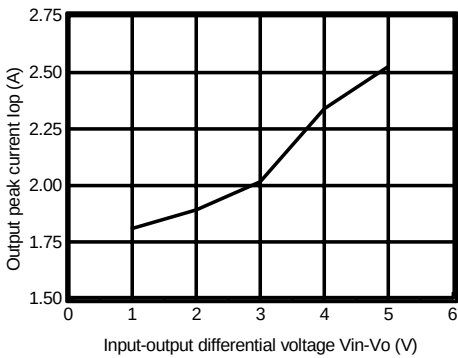


Figure 9. Output Peak Current vs. Input-Output Differential Voltage

## Typical Application

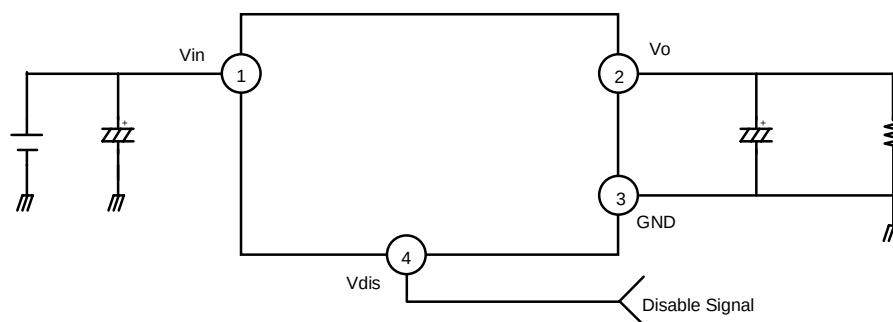


**Figure 1. Application Circuit**

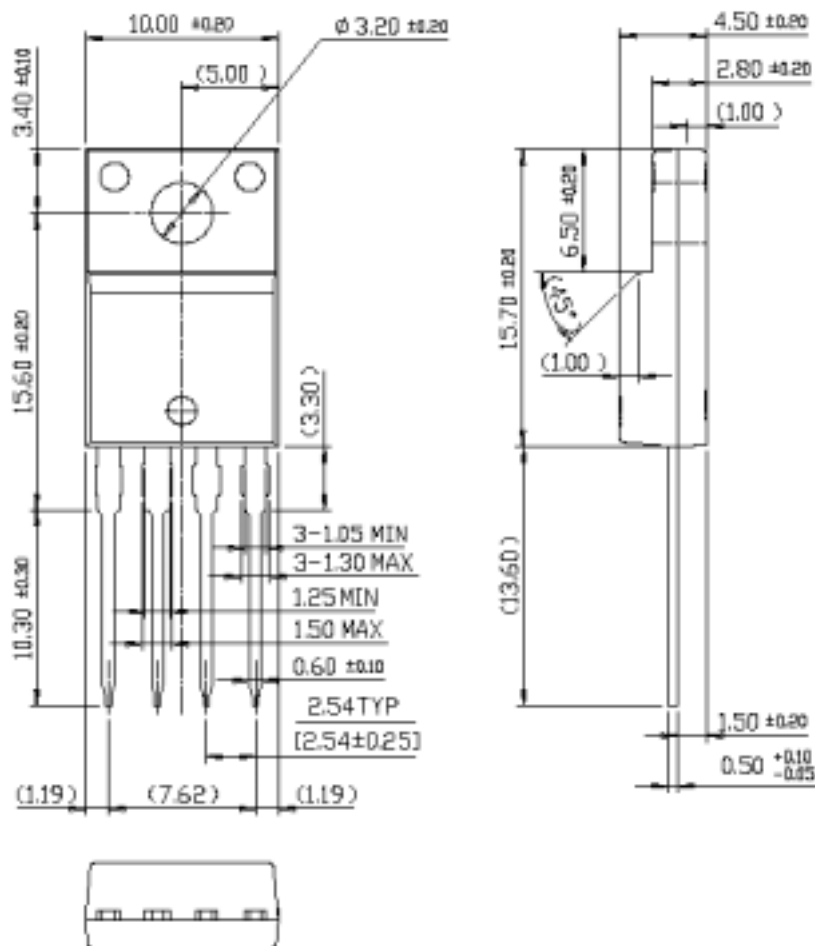
- $C_i$  is required if regulator is located at an appreciable distance from power supply filter.
- $C_o$  improves stability and transient response. ( $C_o > 47\mu F$ )

## Mechanical Dimensions

### Package

Dimensions in millimeters

### TO-220F-4L

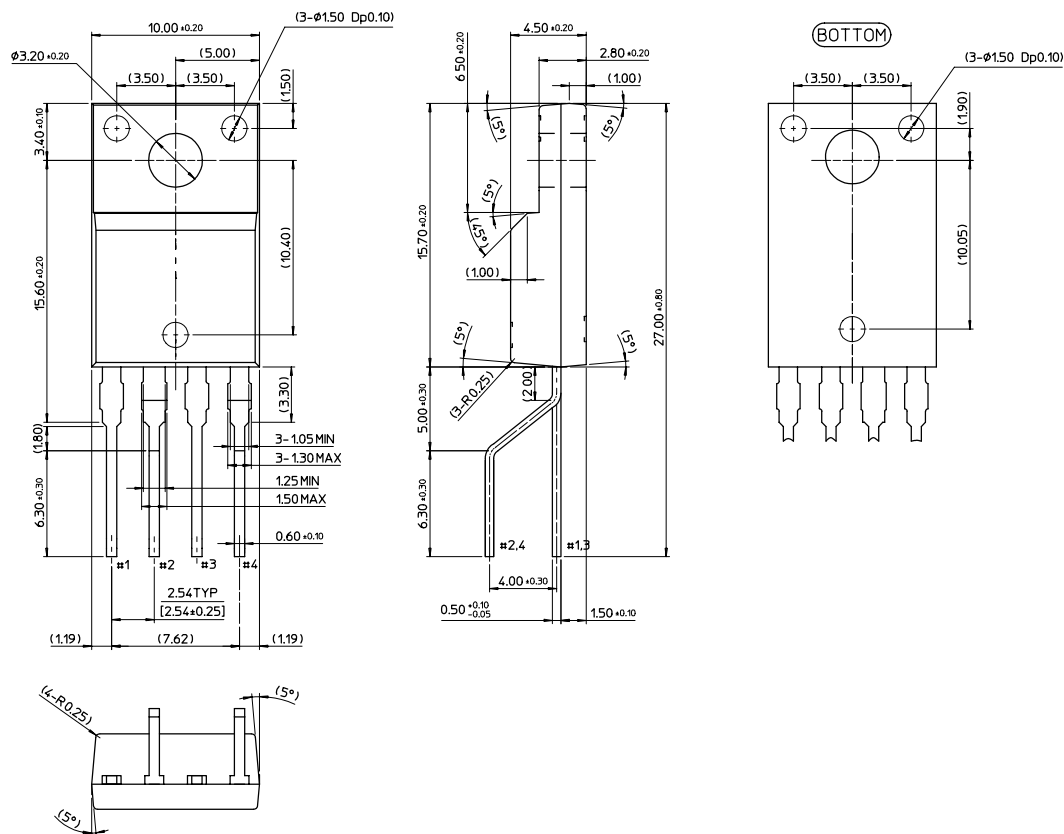


## Mechanical Dimensions (Continued)

### Package

Dimensions in millimeters

## TO-220F-4L(Forming)





## Ordering Information

| Product Number | Package                | Operating Temperature |
|----------------|------------------------|-----------------------|
| KA78R33CTU     | TO-220F-4L             | -20°C to +80°C        |
| KA78R05CTU     |                        |                       |
| KA78R08CTU     |                        |                       |
| KA78R09CTU     |                        |                       |
| KA78R12CTU     |                        |                       |
| KA78R15CTU     |                        |                       |
| KA78R33CYDTU   | TO-220F-4L(Forming)    |                       |
| KA78R05CYDTU   |                        |                       |
| KA78R09CYDTU   |                        |                       |
| KA78R33CTSTU   | TO-220F-4L(Short Lead) |                       |
| KA78R05CTSTU   |                        |                       |
| KA78R08CTSTU   |                        |                       |
| KA78R09CTSTU   |                        |                       |
| KA78R12CTSTU   |                        |                       |

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1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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