

Description

The DIODES™ AP7384 series is a positive voltage regulator IC.

The AP7384 has features of wide input voltage range, high accuracy, low dropout voltage, current limit and ultra-low quiescent current which make it ideal for use in various USB and portable devices.

The IC consists of a voltage reference, an error amplifier, a resistor network for setting output voltage, a current limit circuit for current protection, and a chip enable circuit.

The AP7384 has 2.8V, 3.3V, 5V and 7V fixed voltage version.

The AP7384 is available in space-saving SOT89, SOT23 and TO92 (Ammo Packing) packages.

Features

- Wide Input Voltage Range: Up to 40V
- Low Dropout Voltage: $V_{DROP} = 500mV@I_{OUT} = 50mA$
@ $V_{OUT} = 3.3V$
- Low Ground Current
- High Output Voltage Accuracy
- Compatible with Low ESR Ceramic Capacitor
- Excellent Line/Load Regulation
- Thermal Shutdown Function
- Short Current Protection Function
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**
- **For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/104/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](#) or your local Diodes representative. <https://www.diodes.com/quality/product-definitions/>**

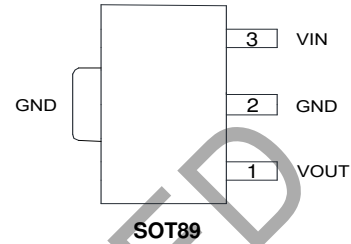
Applications

- E-meters
- Battery-powered equipments
- Laptop, palmtops, notebook computers
- Portable information appliances

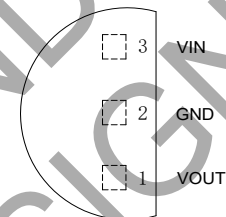
- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
 2. See <https://www.diodes.com/quality/lead-free/> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Assignments

(Top View)

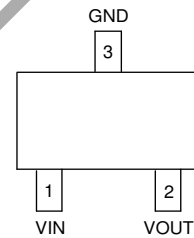


(Top View)



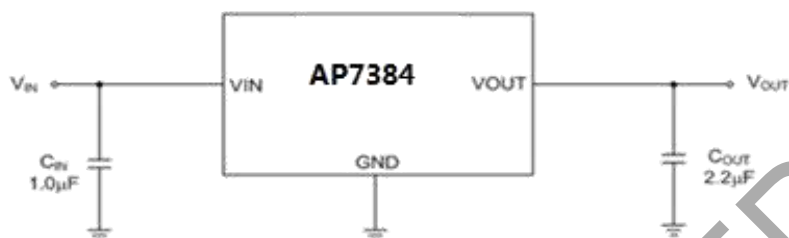
TO92 (Ammo Packing)

(Top View)



SOT23

Typical Applications Circuit



Pin Descriptions

| Pin Number | | | Pin Name | Function |
|------------------------|-------|-------|----------|--------------------------|
| TO92 (Ammo Packing) | SOT89 | SOT23 | | |
| 3 | 3 | 1 | VIN | Input voltage |
| 2 | 2 | 3 | GND | Ground |
| 1 | 1 | 2 | VOUT | Regulated output voltage |

Absolute Maximum Ratings

| Symbol | Parameter | Rating | Unit | |
|-------------------|-------------------------------------|---------------------|------|------|
| V _{IN} | Supply Input Voltage | 45 | V | |
| I _{OUT} | Output Current | 50 | mA | |
| T _{LEAD} | Lead Temperature (Soldering, 10sec) | +260 | °C | |
| T _J | Operating Junction Temperature | +150 | °C | |
| θ _{JA} | Thermal Resistance | SOT89 | 125 | °C/W |
| | | TO92 (Ammo Packing) | 165 | |
| | | SOT23 | 166 | |
| T _{STG} | Storage Temperature Range | -65 to +150 | °C | |
| CDM | ESD (Change Device Model) | 2000 | V | |
| HBM | ESD (Human Body Model) | 4000 | V | |

Recommended Operating Conditions

| Symbol | Parameter | Min | Max | Unit |
|-----------------|--------------------------------|-----|------|------|
| V _{IN} | Supply Input Voltage | 3.3 | 40 | V |
| T _J | Operating Junction Temperature | -40 | +125 | °C |

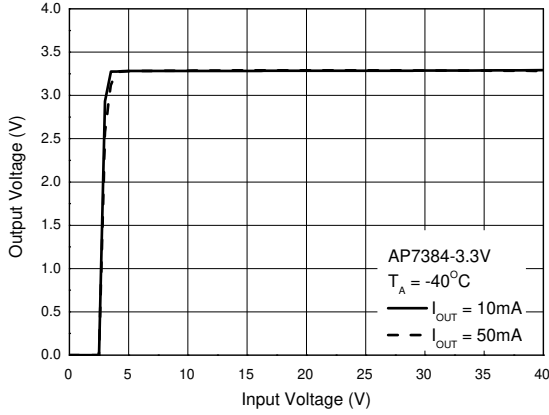
Electrical Characteristics ($T_J = +25^\circ\text{C}$, $I_{OUT} = 1\text{mA}$, $C_{IN} = 1.0\mu\text{F}$, $C_{OUT} = 2.2\mu\text{F}$, $V_{IN} = V_{OUT} + 2\text{V}$, **Bold** typeface applies over $-40^\circ\text{C} \leq T_J \leq +125^\circ\text{C}$, unless otherwise specified.)

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|-------------------------------------|--|---|-----------------------|-----------------------------|------------------------|-----------------------|
| V_{OUT} | Output Voltage | Variation from Specified V_{OUT} | $V_{OUT} \times 98\%$ | — | $V_{OUT} \times 102\%$ | V |
| V_{IN} | Input Voltage | — | 3.3 | — | 40 | V |
| I_{LIMIT} | Current Limit | $V_{OUT} = 98\% \times V_{OUT}$, $V_{IN} = V_{OUT} + 2\text{V}$ | 50 | — | — | mA |
| $\Delta V_{OUT}/\Delta V_{IN}$ | Line Regulation | $V_{OUT} + 2\text{V} \leq V_{IN} \leq 40\text{V}$, $I_{OUT} = 10\text{mA}$ | — | 0.05 | — | %/V |
| $\Delta V_{OUT}/V_{OUT}$ | Load Regulation | $1\text{mA} \leq I_{OUT} \leq 50\text{mA}$ | — | 0.5 | — | % |
| V_{DROP} | Dropout Voltage | $I_{OUT} = 50\text{mA}$ @ $V_{OUT} = 3.3\text{V}$ | — | 500 | — | mV |
| I_{GND} | Ground Current | $I_{OUT} = 0\text{A}$ | — | 2.5 | — | μA |
| | | $I_{OUT} = 50\text{mA}$ | — | 25 | — | |
| $\Delta V_{OUT}/(V_{OUT} \Delta T)$ | Output Voltage Temperature Coefficient | $I_{OUT} = 100\mu\text{A}$, $-40^\circ\text{C} \leq T_J \leq +125^\circ\text{C}$ | — | ± 100 | — | ppm/ $^\circ\text{C}$ |
| T_{OTSD} | Thermal Shutdown Temperature | — | — | +160 | — | $^\circ\text{C}$ |
| T_{HYOTSD} | Thermal Shutdown Hysteresis | — | — | +20 | — | $^\circ\text{C}$ |
| PSRR | Power Supply Rejection Ratio | $I_{OUT} = 1\text{mA}$, $V_{OUT} = 3.3\text{V}$ | — | 60 | — | dB |

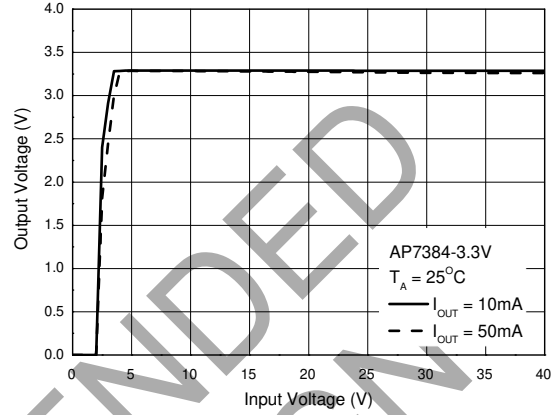
NOT RECOMMENDED FOR NEW DESIGN

Performance Characteristics

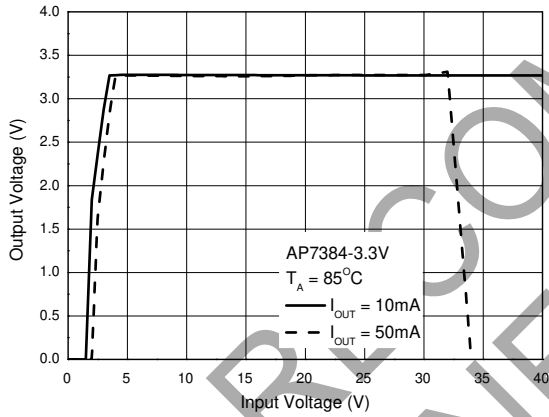
Output Voltage vs. Input Voltage @-40°C



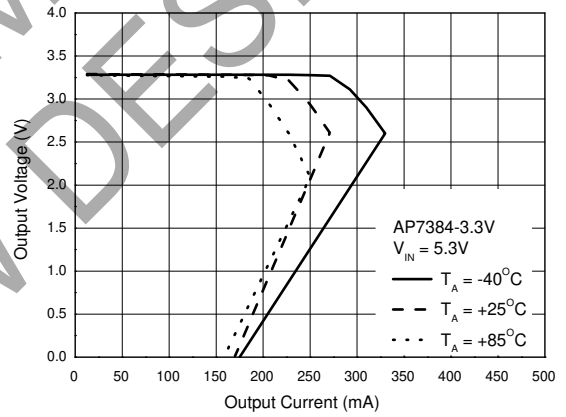
Output Voltage vs. Input Voltage @+25°C



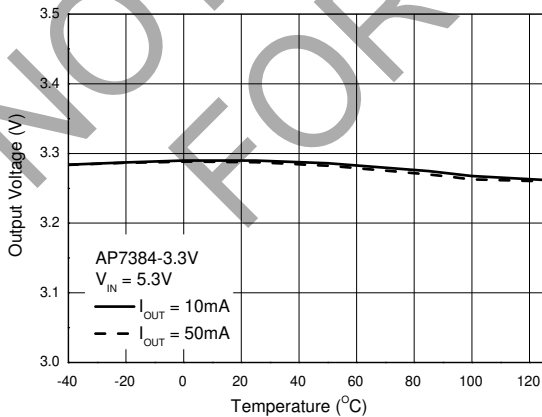
Output Voltage vs. Input Voltage @+85°C



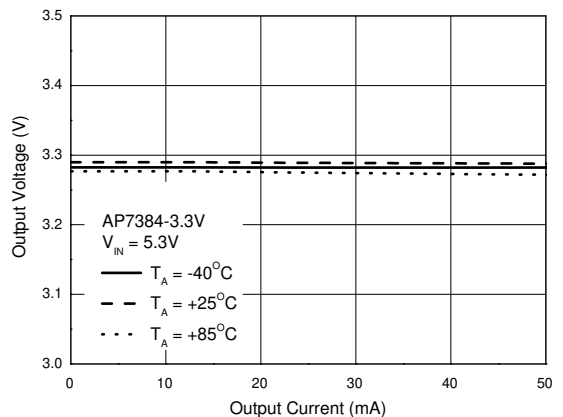
Output Voltage vs. Output Current



Output Voltage vs. Temperature

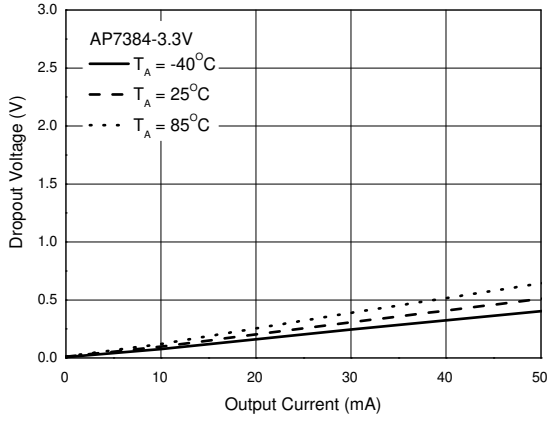


Output Voltage vs. Output Current

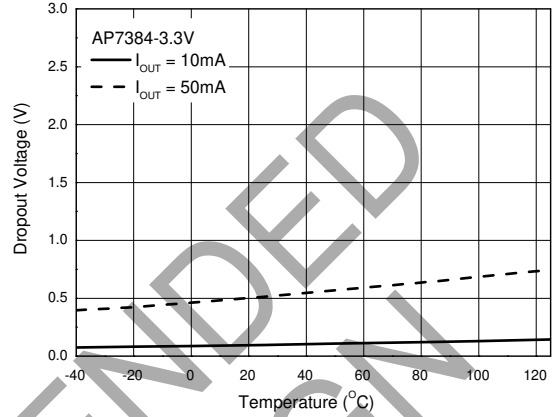


Performance Characteristics (continued)

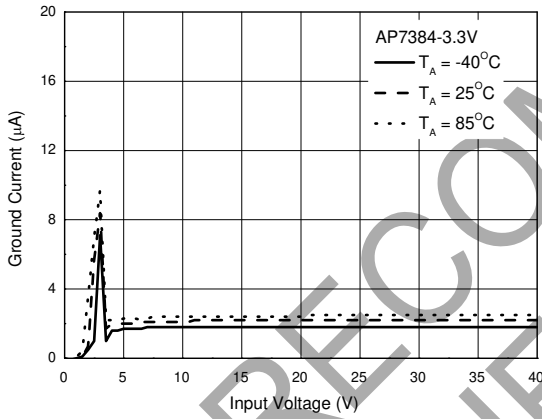
Dropout Voltage vs. Output Current



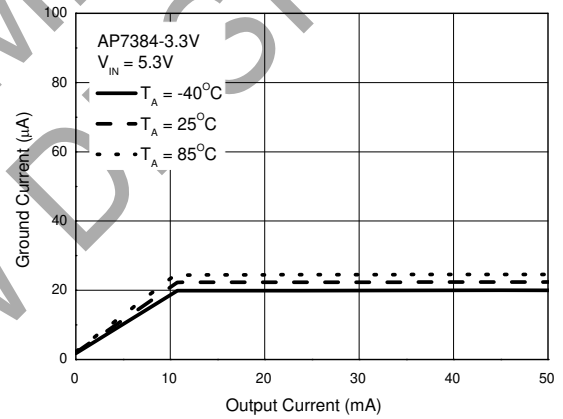
Dropout Voltage vs. Temperature



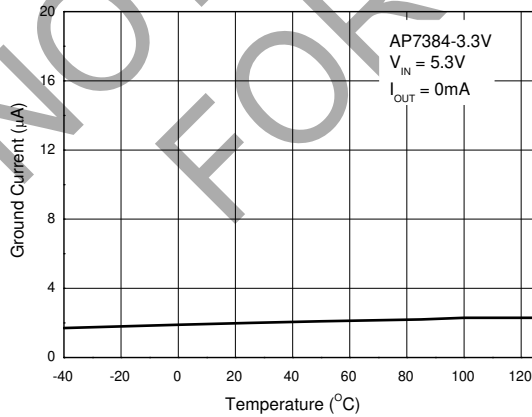
I_{GND} vs. Input Voltage



I_{GND} vs. Output Current

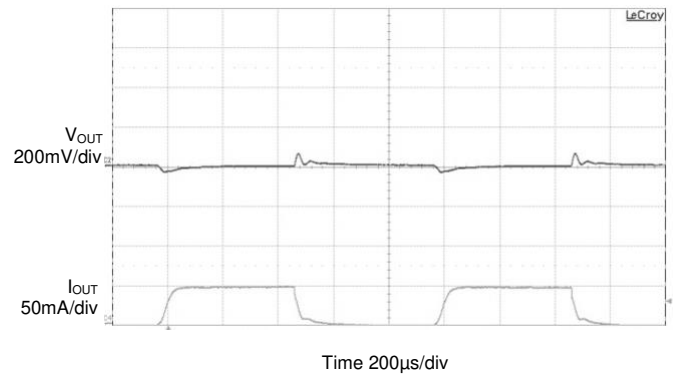


I_{GND} vs. Temperature

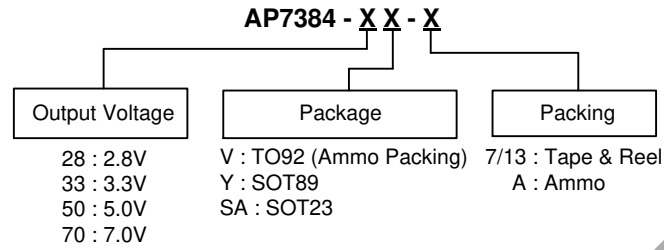


Load Transient

$C_{IN} = 1\mu\text{F}$, $C_{OUT} = 2.2\mu\text{F}$, $V_{IN} = V_{OUT} + 2\text{V}$, $I_{OUT} = 0$ to 50mA



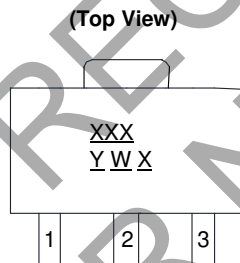
Ordering Information



| Part Number | Package Code | Package | Packing | | Part Number Suffix |
|---------------|--------------|----------------------|----------|-------------|--------------------|
| | | | Quantity | Carrier | |
| AP7384-28V-A | V | TO92 (Ammo Packing) | 2000 | Ammo | -A |
| AP7384-33V-A | V | TO92 (Ammo Packing) | 2000 | Ammo | -A |
| AP7384-50V-A | V | TO92 (Ammo Packing) | 2000 | Ammo | -A |
| AP7384-70V-A | V | TO92 (Ammo Packing) | 2000 | Ammo | -A |
| AP7384-28Y-13 | Y | SOT89 | 2500 | Tape & Reel | -13 |
| AP7384-33Y-13 | Y | SOT89 | 2500 | Tape & Reel | -13 |
| AP7384-50Y-13 | Y | SOT89 | 2500 | Tape & Reel | -13 |
| AP7384-70Y-13 | Y | SOT89 | 2500 | Tape & Reel | -13 |
| AP7384-28SA-7 | SA | SOT23 | 3000 | Tape & Reel | -7 |
| AP7384-33SA-7 | SA | SOT23 | 3000 | Tape & Reel | -7 |
| AP7384-50SA-7 | SA | SOT23 | 3000 | Tape & Reel | -7 |
| AP7384-70SA-7 | SA | SOT23 | 3000 | Tape & Reel | -7 |

Marking Information

(1) SOT89



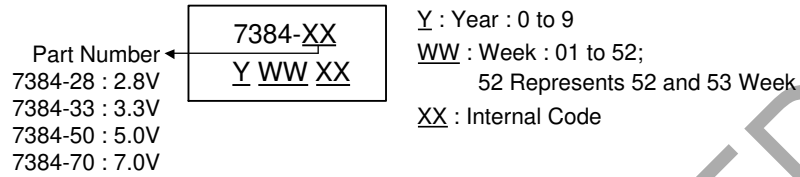
XXX : Identification Code
 Y : Year : 0 to 9
 W : Week : A to Z : 1 to 26 Week;
 a to z : 27 to 52 Week;
 z Represents 52 and 53 Week
 X : Internal Code

| Part Number | Package | Identification Code |
|---------------|---------|---------------------|
| AP7384-28Y-13 | SOT89 | F4A |
| AP7384-33Y-13 | SOT89 | F4B |
| AP7384-50Y-13 | SOT89 | F4C |
| AP7384-70Y-13 | SOT89 | F4D |

Marking Information (continued)

(2) TO92 (Ammo Packing)

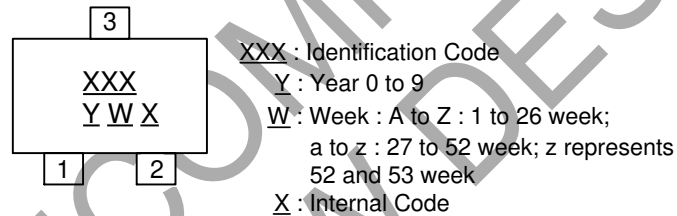
(Top View)



| Part Number | Package | Identification Code |
|--------------|---------------------|---------------------|
| AP7384-28V-A | TO92 (Ammo Packing) | 7384-28 |
| AP7384-33V-A | TO92 (Ammo Packing) | 7384-33 |
| AP7384-50V-A | TO92 (Ammo Packing) | 7384-50 |
| AP7384-70V-A | TO92 (Ammo Packing) | 7384-70 |

(3) SOT23

(Top View)

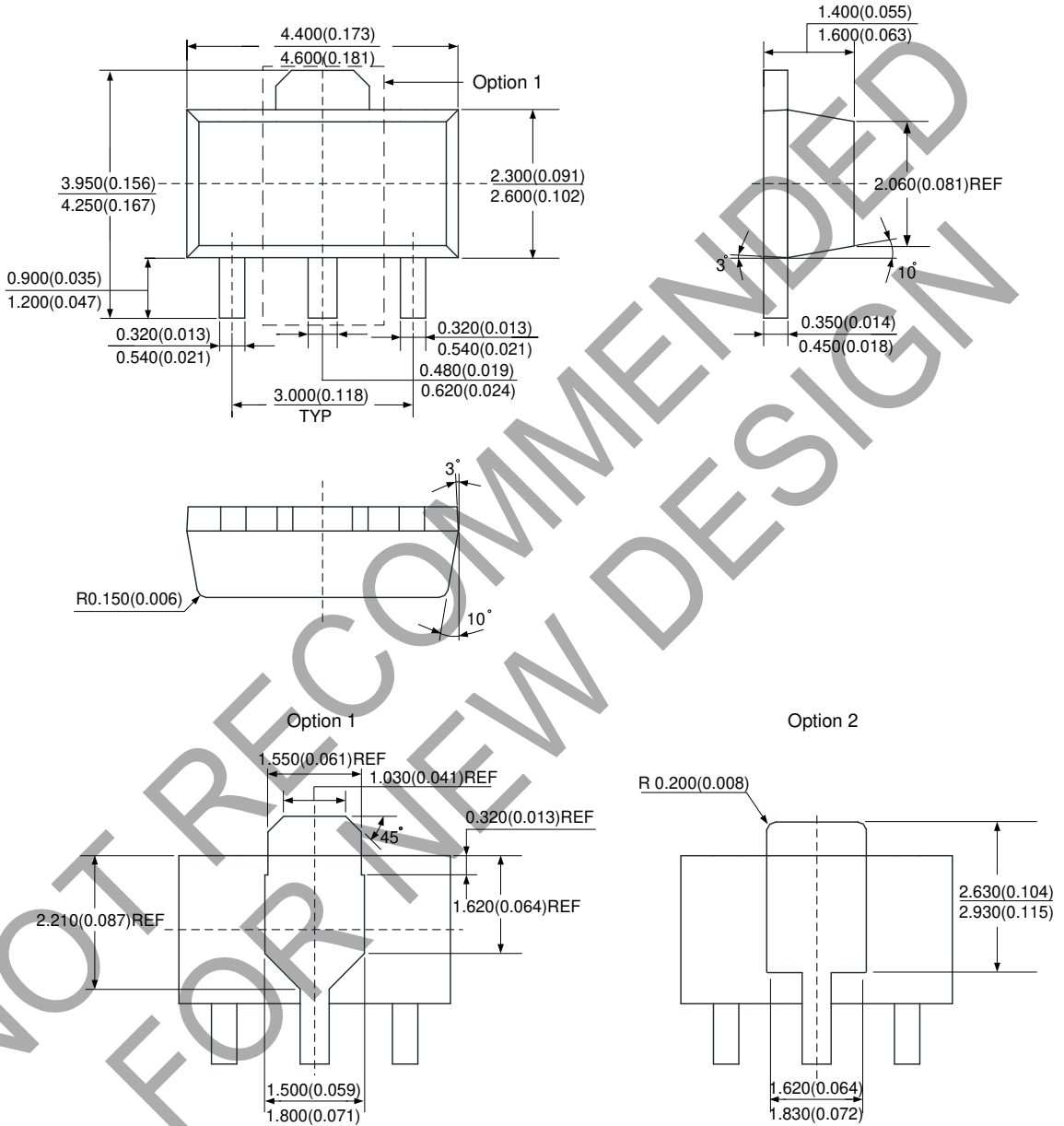


| Part Number | Package | Identification Code |
|---------------|---------|---------------------|
| AP7384-28SA-7 | SOT23 | F4A |
| AP7384-33SA-7 | SOT23 | F4B |
| AP7384-50SA-7 | SOT23 | F4C |
| AP7384-70SA-7 | SOT23 | F4D |

Package Outline Dimensions (All dimensions in mm.)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

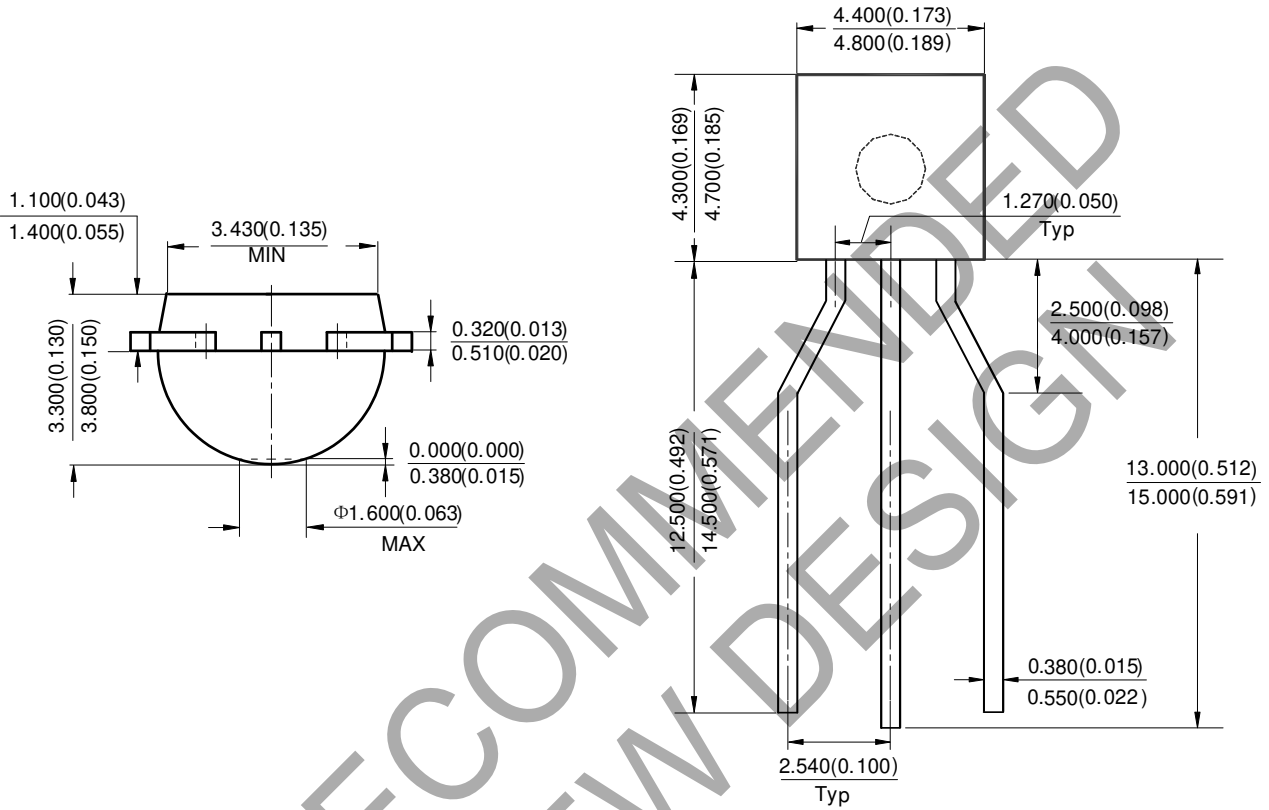
(1) Package Type: SOT89



Package Outline Dimensions (continued. All dimensions in mm.)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(2) TO92 (Ammo Packing)

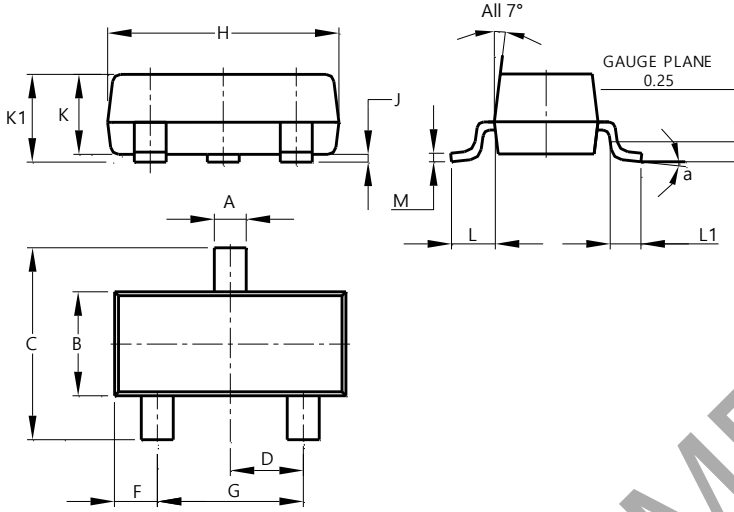


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Package Outline Dimensions (continued. All dimensions in mm.)

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(3) Package Type: SOT23



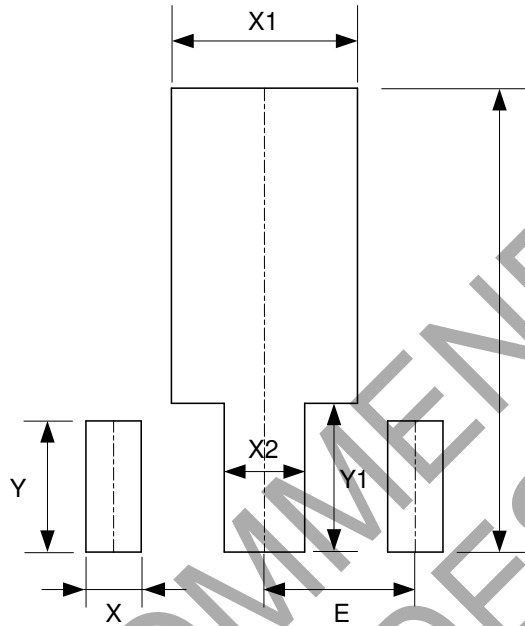
| SOT23 | | | |
|----------------------|-------|-------|-------|
| Dim | Min | Max | Typ |
| A | 0.37 | 0.51 | 0.40 |
| B | 1.20 | 1.40 | 1.30 |
| C | 2.30 | 2.50 | 2.40 |
| D | 0.89 | 1.03 | 0.915 |
| F | 0.45 | 0.60 | 0.535 |
| G | 1.78 | 2.05 | 1.83 |
| H | 2.80 | 3.00 | 2.90 |
| J | 0.013 | 0.10 | 0.05 |
| K | 0.890 | 1.00 | 0.975 |
| K1 | 0.903 | 1.10 | 1.025 |
| L | 0.45 | 0.61 | 0.55 |
| L1 | 0.25 | 0.55 | 0.40 |
| M | 0.085 | 0.150 | 0.110 |
| a | 0° | 8° | -- |
| All Dimensions in mm | | | |

NOT RECOMMENDED FOR NEW DESIGN

Suggested Pad Layout

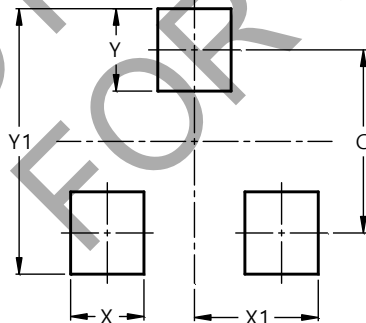
Please see <http://www.diodes.com/package-outlines.html> for the latest version.

(1) Package Type: SOT89



| Dimensions | Z (mm)/(inch) | X (mm)/(inch) | X1 (mm)/(inch) | X2 (mm)/(inch) | Y (mm)/(inch) | Y1 (mm)/(inch) | E (mm)/(inch) |
|------------|------------------|------------------|-------------------|-------------------|------------------|-------------------|------------------|
| Value | 4.600/0.181 | 0.550/0.022 | 1.850/0.073 | 0.800/0.031 | 1.300/0.051 | 1.475/0.058 | 1.500/0.059 |

(2) Package Type: SOT23



| Dimensions | Value (in mm) |
|------------|---------------|
| C | 2.0 |
| X | 0.8 |
| X1 | 1.35 |
| Y | 0.9 |
| Y1 | 2.9 |

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