

Description

The AP7381 series is a positive voltage regulator IC.

The AP7381 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 AP7381 has 2.8V, 3.3V, 5V and 7V fixed voltage version.

The AP7381 is available in space-saving SOT23, SOT89 and TO92 (Ammo Packing) packages.

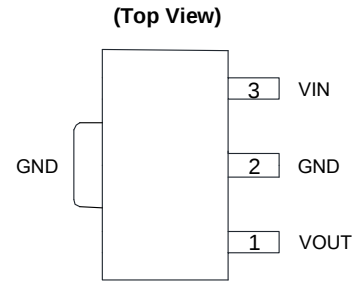
Features

- Wide Input Voltage Range: Up to 40V
- Low Dropout Voltage: $V_{DROP} = 1000\text{mV}@I_{OUT} = 100\text{mA}@V_{OUT} = 3.3\text{V}$
- 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)**

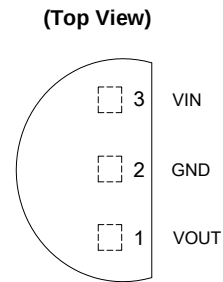
Applications

- E-Meter
- Battery-powered Equipment
- Laptop, Palmtops, Notebook Computers
- Portable Information Appliances

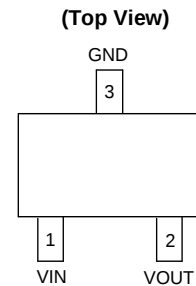
Pin Assignments



SOT89



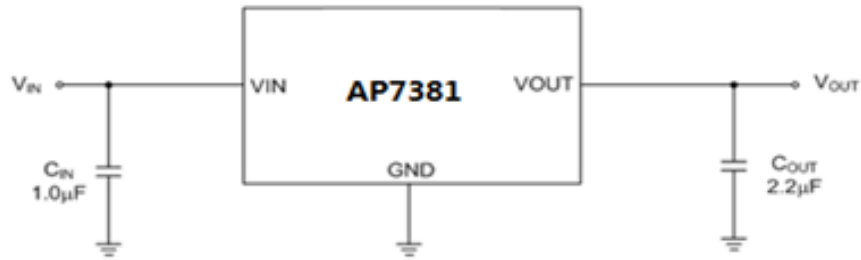
TO92 (Ammo Packing)



SOT23

- 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.

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	150		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	167	
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

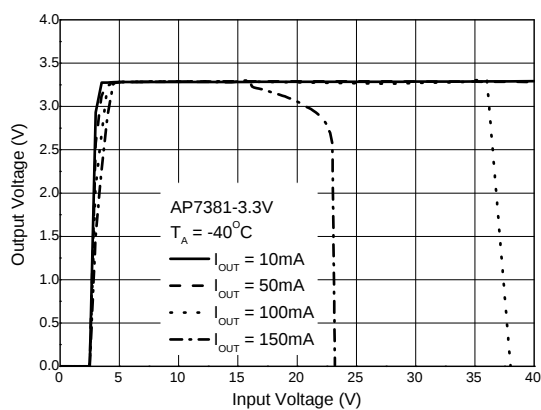
Symbol	Parameter	Min	Max	Unit
V_{IN}	Supply Input Voltage	3.3	40	V
T_J	Operating Junction Temperature	-40	+125	°C

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

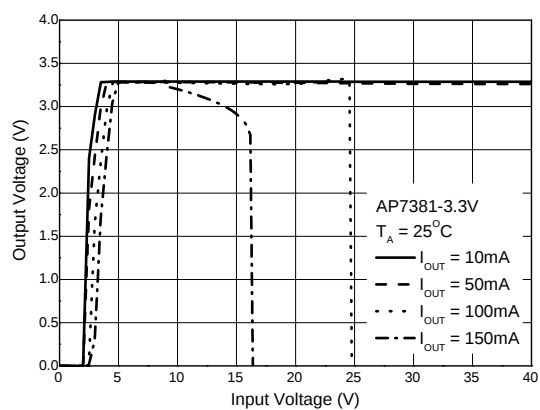
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	Variation from Specified V_{OUT}	$V_{\text{OUT}} \times 98\%$	—	$V_{\text{OUT}} \times 102\%$	V
V_{IN}	Input Voltage	—	3.3	—	40	V
I_{LIMIT}	Current Limit	$V_{\text{OUT}} = 98\% \times V_{\text{OUT}}$, $V_{\text{IN}} = V_{\text{OUT}} + 2\text{V}$	150	—	—	mA
$\Delta V_{\text{OUT}}/\Delta V_{\text{IN}}$	Line Regulation	$V_{\text{OUT}} + 2\text{V} \leq V_{\text{IN}} \leq 40\text{V}$, $I_{\text{OUT}} = 10\text{mA}$	—	0.05	—	%/V
$\Delta V_{\text{OUT}}/I_{\text{OUT}}$	Load Regulation	$1\text{mA} \leq I_{\text{OUT}} \leq 150\text{mA}$	—	0.5	—	%
V_{DROP}	Dropout Voltage	$I_{\text{OUT}} = 100\text{mA}$ @ $V_{\text{OUT}} = 3.3\text{V}$	—	1000	—	mV
I_{GND}	Ground Current	$I_{\text{OUT}} = 0\text{A}$	—	2.5	—	μA
		$I_{\text{OUT}} = 100\text{mA}$	—	25	—	
$\Delta V_{\text{OUT}}/(V_{\text{OUT}} \times \Delta T)$	Output Voltage Temperature Coefficient	$I_{\text{OUT}} = 100\mu\text{A}$, $-40^{\circ}\text{C} \leq T_J \leq +125^{\circ}\text{C}$	—	± 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	$I_{\text{OUT}} = 1\text{mA}$, $V_{\text{OUT}} = 3.3\text{V}$	—	60	—	dB

Performance Characteristics

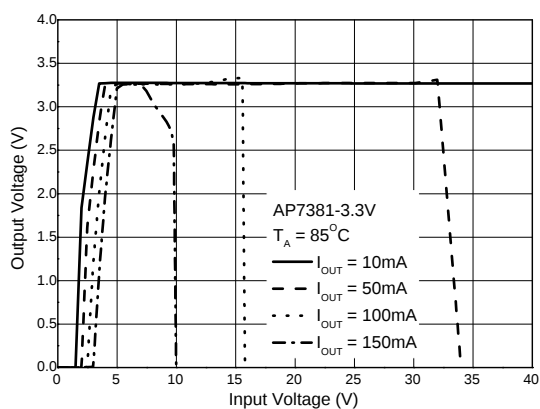
Output Voltage vs. Input Voltage @-40°C



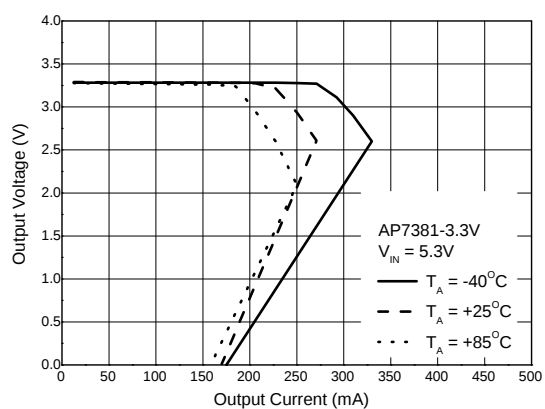
Output Voltage vs. Input Voltage @+25°C



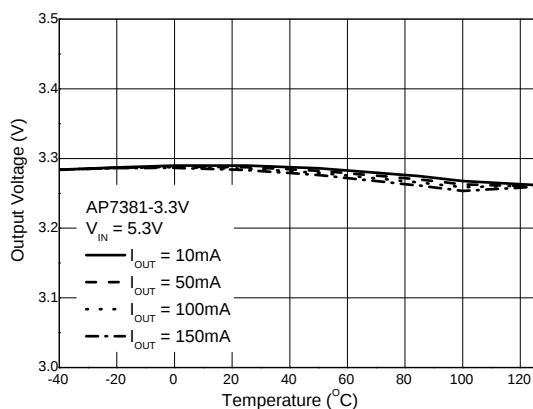
Output Voltage vs. Input Voltage @+85°C



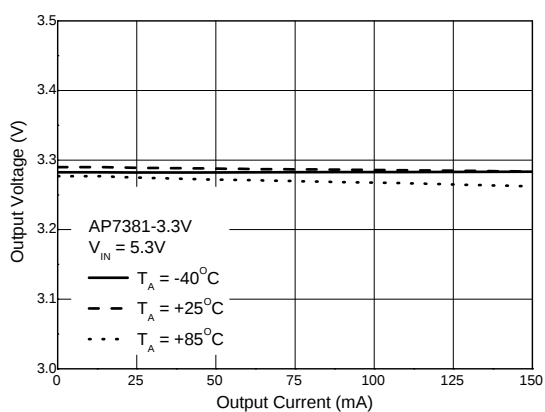
Output Voltage vs. Output Current



Output Voltage vs. Temperature

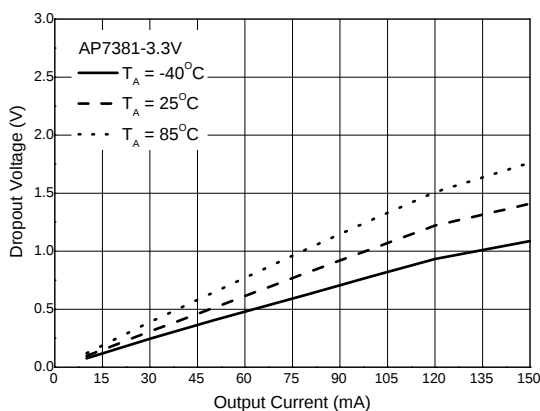


Output Voltage vs. Output Current

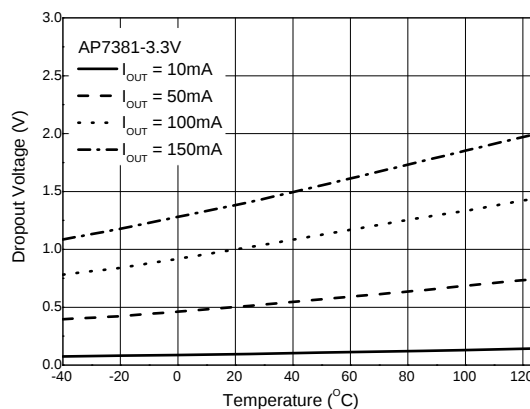
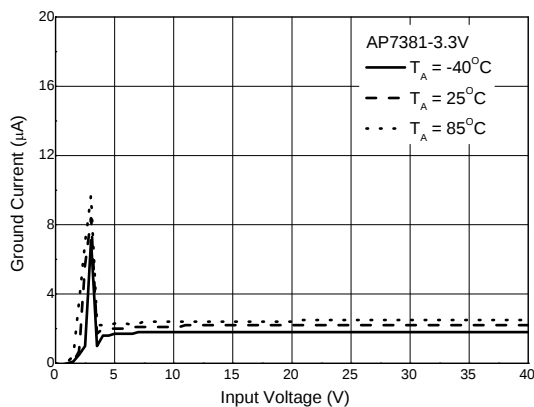
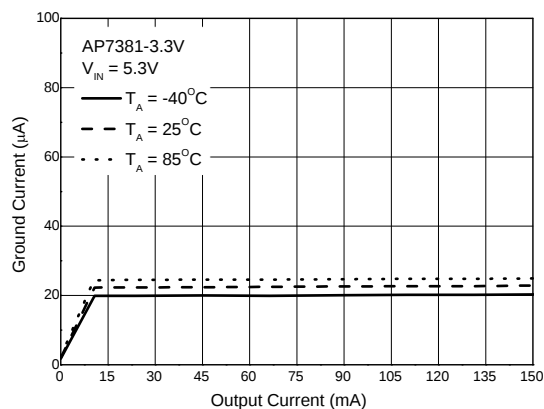
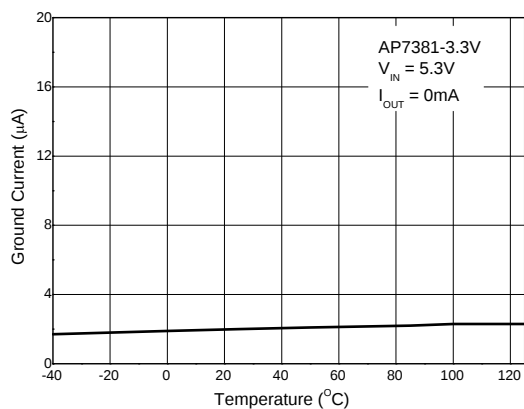


Performance Characteristics (Cont.)

Dropout Voltage vs. Output Current

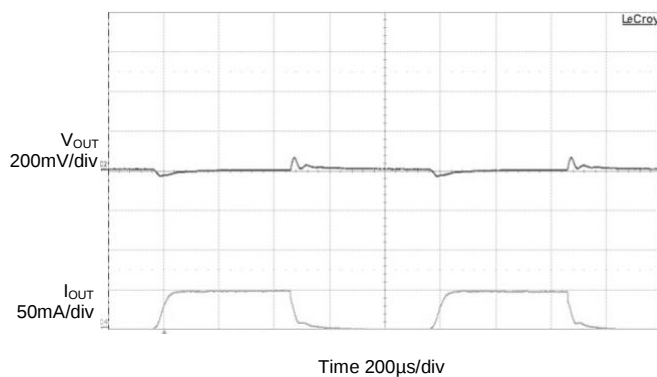


Dropout Voltage vs. Temperature

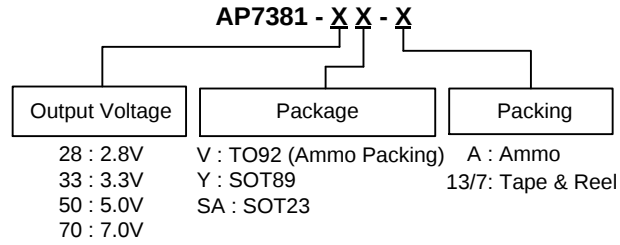
 I_{GND} vs. Input Voltage I_{GND} vs. Output Current I_{GND} vs Temperature

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

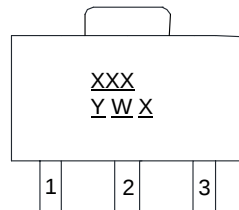


Part Number	Package Code	Packaging	7"/13" Tape and Reel/Ammo	
			Quantity	Part Number Suffix
AP7381-28V-A	V	TO92 (Ammo Packing)	2000/Ammo	-A
AP7381-33V-A	V	TO92 (Ammo Packing)	2000/Ammo	-A
AP7381-50V-A	V	TO92 (Ammo Packing)	2000/Ammo	-A
AP7381-70V-A	V	TO92 (Ammo Packing)	2000/Ammo	-A
AP7381-28Y-13	Y	SOT89	2500/Tape & Reel	-13
AP7381-33Y-13	Y	SOT89	2500/Tape & Reel	-13
AP7381-50Y-13	Y	SOT89	2500/Tape & Reel	-13
AP7381-70Y-13	Y	SOT89	2500/Tape & Reel	-13
AP7381-28SA-7	SA	SOT23	3000/Tape & Reel	-7
AP7381-33SA-7	SA	SOT23	3000/Tape & Reel	-7
AP7381-50SA-7	SA	SOT23	3000/Tape & Reel	-7
AP7381-70SA-7	SA	SOT23	3000/Tape & Reel	-7

Marking Information

(1) SOT89

(Top View)



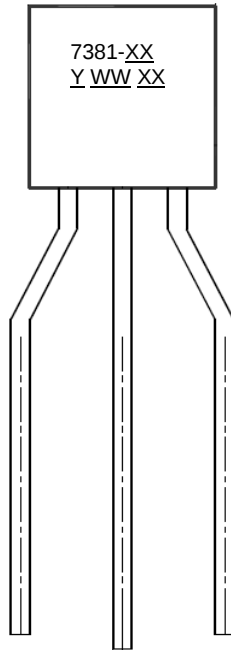
XXX : Identification Code
Y : Year : 0 ~ 9
W : Week : A ~ Z : 1 ~ 26 Week;
 a ~ z : 27 ~ 52 Week;
 z Represents 52 and 53 Week
X : Internal Code

Part Number	Package	Identification Code
AP7381-28Y-13	SOT89	D9C
AP7381-33Y-13	SOT89	D9A
AP7381-50Y-13	SOT89	D9B
AP7381-70Y-13	SOT89	D9D

Marking Information (Cont.)

(2) TO92 (Ammo Packing)

(Front View)

7381-XX : Identification CodeY : Year : 0 ~ 9WW : Week : 01 ~ 52; 52

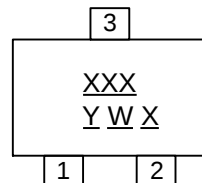
Represents 52 and 53 Week

XX : Internal Code

Part Number	Package	Identification Code
AP7381-28V-A	TO92 (Ammo Packing)	7381-28
AP7381-33V-A	TO92 (Ammo Packing)	7381-33
AP7381-50V-A	TO92 (Ammo Packing)	7381-50
AP7381-70V-A	TO92 (Ammo Packing)	7381-70

(3) SOT23

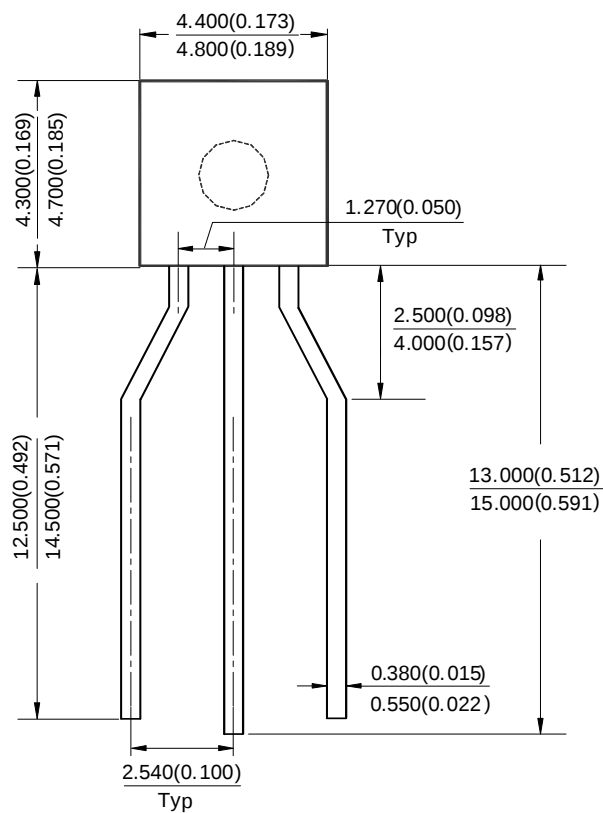
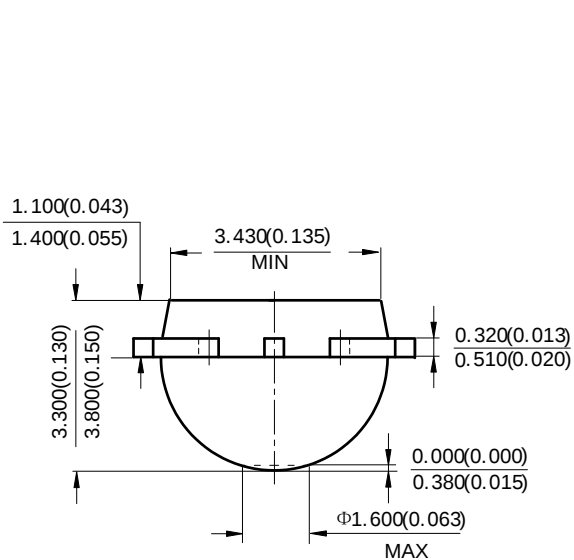
(Top View)

XXX : Identification CodeY : Year 0 to 9W : Week : A to Z : 1 to 26 week;a to z : 27 to 52 week; z represents
52 and 53 weekX : Internal Code

Part Number	Package	Identification Code
AP7381-28SA-7	SOT23	D9C
AP7381-33SA-7	SOT23	D9A
AP7381-50SA-7	SOT23	D9B
AP7381-70SA-7	SOT23	D9D

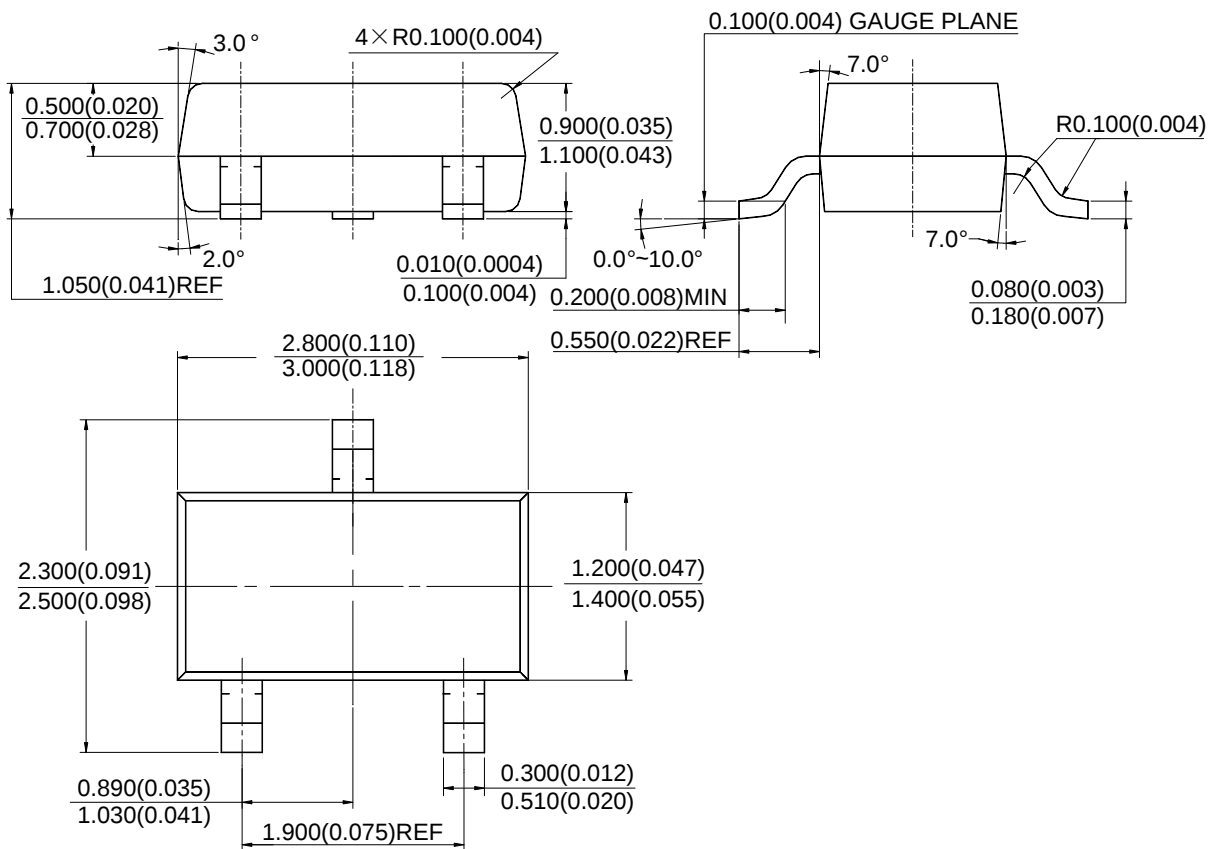
Package Outline Dimensions (Cont. All dimensions in mm.)

(2) TO92 (Ammo Packing)



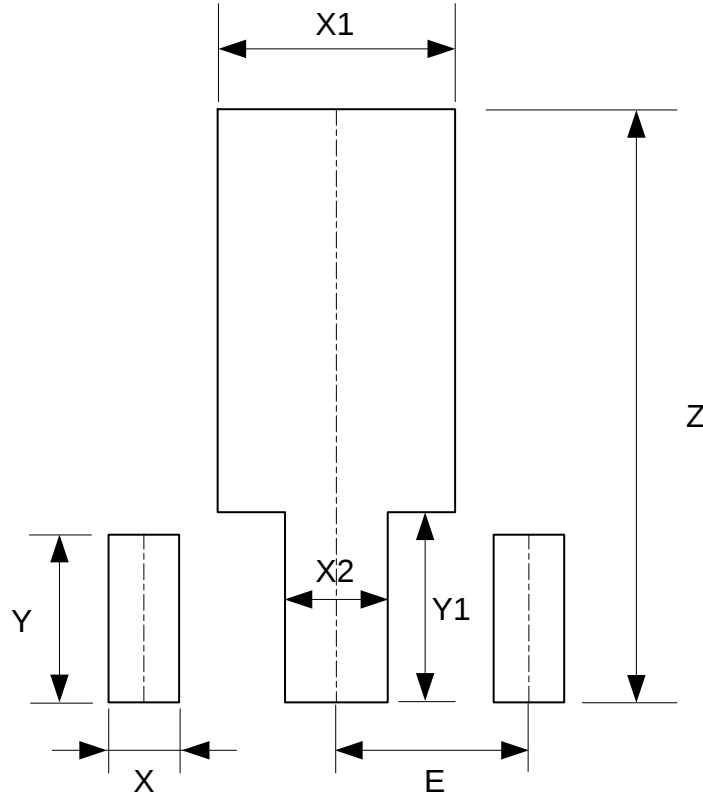
Package Outline Dimensions (Cont. All dimensions in mm.)

(3) SOT23



Suggested Pad Layout

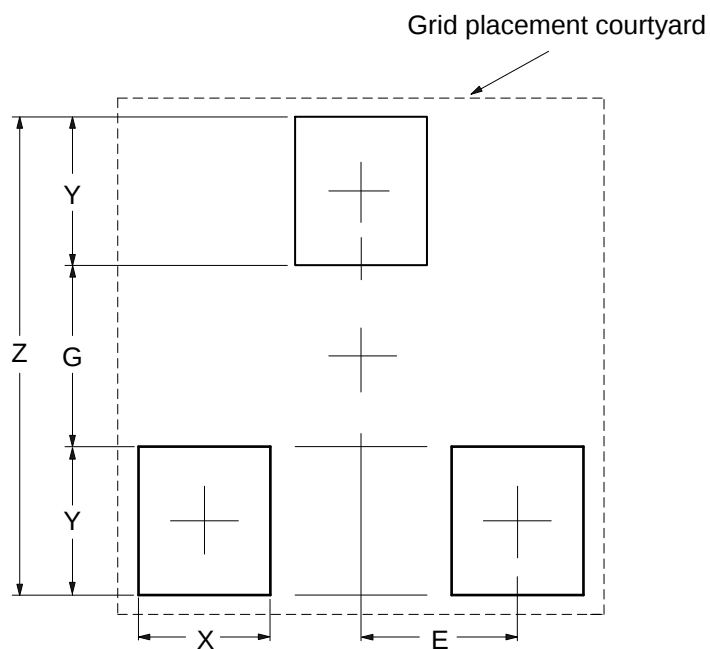
(1) Package Type: SOT89



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

Suggested Pad Layout (Cont.)

(2) SOT23



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	2.900/0.114	1.100/0.043	0.800/0.031	0.900/0.035	0.950/0.037

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