FC62 Series Positive Voltage Regulator

❖ Application

- Battery Powered Equipment
- Palmtops
- Portable Cameras and Video Recorders
- Reference Voltage Sources

❖ Features

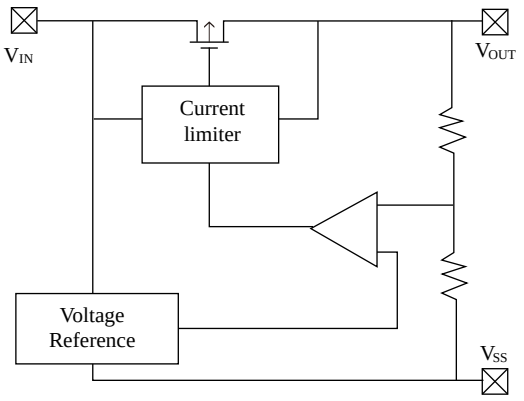
- CMOS Low Power Consumption :
  Typical 3.3uA at Vout=5.0V
- Output Voltage Range : 1.1V to 6.0V in 0.1V increments
- Highly Accurate:
  Output Voltage ±3% for 1.1V to 1.9V
  Output Voltage ±2% for 2.0V to 6.0V
- Maximum Output Current: 250mA
  (within the maximum power dissipation, Vout=5.0V)
- Small Input-Output Voltage Differential:
  0.12V at 100mA and 0.38V at 200mA
- Input stability: Typ. 0.2%/V
- Package Available:
  SOT-23 (150mW), SOT-89 (500mW) &
  TO-92 (300mW)

❖ General Description

The FC62 is a group of positive voltage output, three-pin regulator which provides high output current even when the input/output voltage differential is small.

The FC62 consists of a high-precision voltage reference, an error correction circuit, and a current limited output driver.

❖ Block Diagram

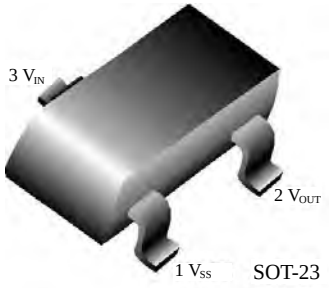


❖ Absolute Maximum Ratings

Parameter		Symbol	Ratings	Units
Input Voltage		V_{IN}	12	V
Output Current		I_{OUT}	500	mA
Output Voltage		V_{OUT}	V_{SS}-0.3 ~V_{IN}+0.3	V
Continuous Total Power Dissipation	SOT-23	P_d	150	mW
	SOT-89		500	
	TO-92		300	
Operating Ambient Temperature		T_{opr}	-40 ~ +85	°C
Storage Temperature		T_{stg}	-55 ~ +125	°C

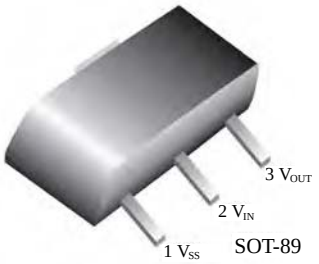
❖ Pin Configuration

SOT-23



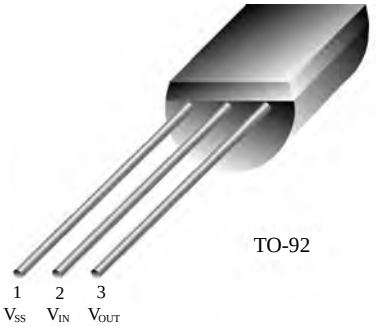
SOT-23

SOT-89



SOT-89

TO-92



Package Pin Number			Pin Name	Function
SOT-23-3	SOT-89-3	TO-92		
1	1	1	V_{SS}	Ground
3	2	2	V_{IN}	Power Input
2	3	3	V_{OUT}	Output

❖ Standard Circuit

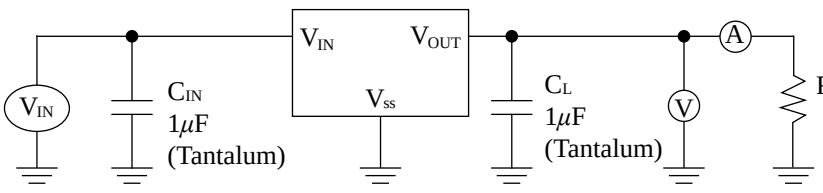
Note on Use

1. Oscillation may occur as a result of the impedance present between the power supply and the IC's input. Please use a capacitor (CIN) of at least 1uF, when the impedance is 10 ohm or more.
   With a large output current, Voltage output can be stabilised by increasing capacitor (CIN) size. If CIN is small and capacitor (CL) size is increased, oscillation may occur. In such cases, Voltage output can be stabilised by either increasing the size of CIN or decreasing the size of CL.

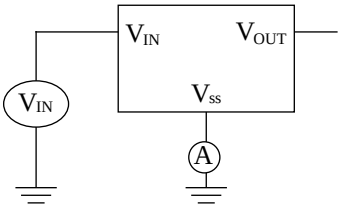
2. Please ensure that output current (IOUT) is less than Pd / (VIN-VOUT) and does not exceed the stipulated Continuous Total Power Dissipation value (Pd).

❖ Test Circuit

Test Circuit 1



Test Circuit 2



❖ Electrical Characteristic

FC62502 VOUT(T)=5.0V(Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	VOUT(E) (Note 2)	IOUT=40mA VIN=6.0V	4.900	5.000	5.100	V	1
Maximum Output Current	IOUT max	VIN=6.0V, VOUT(E)≥4.5V	250			mA	1
Load Stability	⊿VOUT	VIN=6.0V, 1mA≤IOUT≤100mA		40	80	mV	1
Input –Output Voltage Differential (Note 3)	Vdif1	IOUT=100mA		120	400	mV	1
	Vdif2	IOUT=200mA		380	750	mV	1
Supply Current	ISS	VIN=6.0V		3.3	4.5	uA	2
Input Stability	$\frac{\Delta VOUT}{\Delta VIN * VOUT}$	IOUT=40mA 6.0V≤VIN≤10.0V		0.2	0.3	%V	1
Input Voltage	VIN				10	V	-

FC62402 VOUT(T)=4.0V(Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	VOUT(E) (Note 2)	IOUT=40mA VIN=5.0V	3.920	4.000	4.080	V	1
Maximum Output Current	IOUT max	VIN=5.0V, VOUT(E)≥3.6V	200			mA	1
Load Stability	⊿VOUT	VIN=5.0V, 1mA≤IOUT≤100mA		45	90	mV	1
Input –Output Voltage Differential (Note 3)	Vdif1	IOUT=90mA		170	400	mV	1
	Vdif2	IOUT=180mA		400	750	mV	1
Supply Current	ISS	VIN=5.0V		3.0	4.5	uA	2
Input Stability	$\frac{\Delta VOUT}{\Delta VIN * VOUT}$	IOUT=40mA 5.0V≤VIN≤10.0V		0.2	0.3	%V	1
Input Voltage	VIN				10	V	-

FC62302 VOUT(T)=3.0V(Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	VOUT(E) (Note 2)	IOUT=40mA VIN=4.0V	2.940	3.000	3.060	V	1
Maximum Output Current	IOUT max	VIN=4.0V, VOUT(E)≥2.7V	150			mA	1
Load Stability	⊿VOUT	VIN=4.0V, 1mA≤IOUT≤80mA		45	90	mV	1
Input –Output Voltage Differential (Note 3)	Vdif1	IOUT=80mA		180	450	mV	1
	Vdif2	IOUT=150mA		400	850	mV	1
Supply Current	ISS	VIN=4.0V		2.8	4.5	uA	2
Input Stability	$\frac{\Delta VOUT}{\Delta VIN * VOUT}$	IOUT=40mA 4.0V≤VIN≤10.0V		0.2	0.3	%V	1
Input Voltage	VIN				10	V	-

FC62202 VOUT(T)=2.0V(Note 1)

Parameter	Symbol	Conditions	Min	Typ	Max	Units	Circuit
Output Voltage	VOUT(E) (Note 2)	IOUT=40mA VIN=3.0V	1.960	2.000	2.040	V	1
Maximum Output Current	IOUT max	VIN=3.0V, VOUT(E)≥1.8V	100			mA	1
Load Stability	⊿VOUT	VIN=3.0V, 1mA≤IOUT≤60mA		45	90	mV	1
Input –Output Voltage Differential (Note 3)	Vdif1	IOUT=60mA		180	450	mV	1
	Vdif2	IOUT=100mA		400	850	mV	1
Supply Current	ISS	VIN=3.0V		2.5	4.5	uA	2
Input Stability	$\frac{\Delta VOUT}{\Delta VIN * VOUT}$	IOUT=40mA 3.0V≤VIN≤10.0V		0.2	0.3	%V	1
Input Voltage	VIN				10	V	-

Note : 1. VOUT(T) = Specified Output Voltage.

2. VOUT(E) = Effective Output Voltage (i.e. the output voltage when (VOUT(T)+1.0V) is provided at the VIN pin while maintaining a certain IOUT value).

3. Vdif = VIN1(Note 4) – VOUT(E)
4. VIN1 = The input voltage at the time 98% of VOUT (E) is output (input voltage has been gradually reduced).

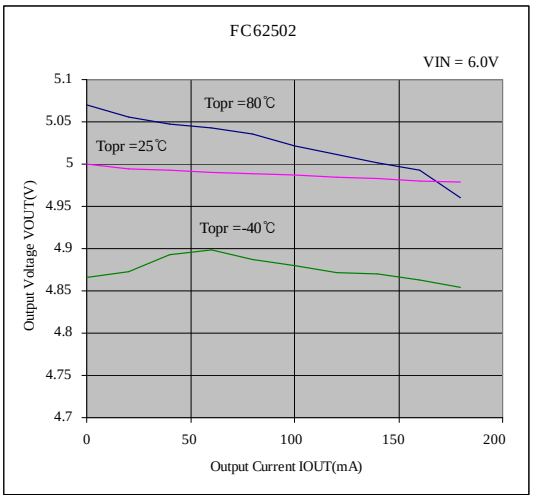
❖ Electrical Characteristics by Output Voltage

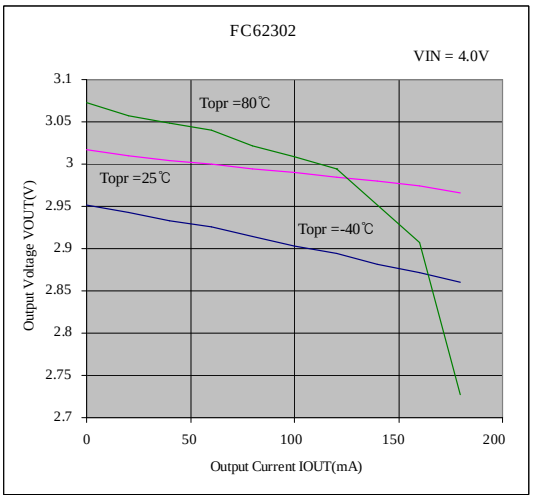
Part Number	Output voltage V_{OUT}(V)				Max Output Current $I_{OUT\ max}$(mA)		Load Stability ΔV_{OUT}(mV)			I-O Voltage Differential V_{dif1}(mV)		
	Conditions	MIN.	TYP.	MAX.	Conditions	MIN.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.
FC62113	I_{OUT}=40mA V_{IN}=V_{OUT}(T)+1V	1.067	1.100	1.133	V_{IN}=V_{OUT}(T)+1V V_{OUT}(E)≥ V_{OUT}(T)*0.9	80	VIN=VOUT(T)+1V 1mA<IOUT<40mA	45	90	IOUT=20mA	250	450
FC62123		1.164	1.200	1.236								
FC62133		1.261	1.300	1.339						IOUT=30mA	250	450
FC62143		1.358	1.400	1.442								
FC62153		1.455	1.500	1.545								
FC62163		1.552	1.600	1.648								
FC62173		1.649	1.700	1.751						IOUT=40mA	250	450
FC62183		1.746	1.800	1.854								
FC62193		1.843	1.900	1.957								
FC62202		1.960	2.000	2.040		100	V_{IN}=V_{OUT}(T)+1V 1mA≤I_{OUT}≤60mA	45	90	I_{OUT}=60mA	180	450
FC62212		2.058	2.100	2.142								
FC62222		2.156	2.200	2.244								
FC62232		2.254	2.300	2.346								
FC62242		2.352	2.400	2.448								
FC62252		2.450	2.500	2.550								
FC62262		2.548	2.600	2.652								
FC62272		2.646	2.700	2.754								
FC62282		2.744	2.800	2.856								
FC62292		2.842	2.900	2.958								
FC62302		2.940	3.000	3.060		150	V_{IN}= V_{OUT}(T)+1V 1mA≤I_{OUT}≤80mA	45	90	I_{OUT}=80mA	180	450
FC62312		3.038	3.100	3.162								
FC62322		3.136	3.200	3.264								
FC62332		3.234	3.300	3.366								
FC62342		3.332	3.400	3.468								
FC62352		3.430	3.500	3.570								
FC62362		3.528	3.600	3.672								
FC62372		3.626	3.700	3.774								
FC62382		3.724	3.800	3.876								
FC62392		3.822	3.900	3.978								
FC62402		3.920	4.000	4.080		200	V_{IN}=V_{OUT}(T)+1V 1mA≤I_{OUT}≤100mA	45	90	I_{OUT}=90mA	170	400
FC62412		4.018	4.100	4.182								
FC62422		4.116	4.200	4.284								
FC62432		4.214	4.300	4.386								
FC62442		4.312	4.400	4.488								
FC62452		4.410	4.500	4.590								
FC62462		4.508	4.600	4.692								
FC62472		4.606	4.700	4.794								
FC62482		4.704	4.800	4.896								
FC62492		4.802	4.900	4.998								
FC62502		4.900	5.000	5.100		250	V_{IN}=V_{OUT}+1V 1mA≤I_{OUT}≤100mA	40	80	I_{OUT}=100mA	120	400
FC62512		4.998	5.100	5.202								
FC62522		5.096	5.200	5.304								
FC62532		5.194	5.300	5.406								
FC62542		5.292	5.400	5.508								
FC62552		5.390	5.500	5.610								
FC62562		5.488	5.600	5.712								
FC62572		5.586	5.700	5.814								
FC62582		5.684	5.800	5.916								
FC62592		5.782	5.900	6.018								
FC62602		5.880	6.000	6.120								

Part Number	I-O Voltage Differential			Supply Current			Input Stability			Input Voltage
	V_{dif2}(mV)			I_{SS}(uA)			$\Delta V_{OUT}/(\Delta V_{IN}*V_{OUT})$ (%V)			V_{IN}(V)
	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.	Conditions	TYP.	MAX.	MAX.
FC62113	IOUT=40mA	450	850	$V_{IN}=V_{OUT}(T)+1V$	2.0	4.5	I_{OUT}=40mA $V_{OUT}(T)+1V \le V_{IN} \le 10V$	0.2	0.4	12
FC62123										
FC62133	IOUT=60mA	450	850							
FC62143										
FC62153										
FC62163										
FC62173	IOUT=80mA	450	850							
FC62183										
FC62193										
FC62202	I_{OUT}=100mA	400	850		2.5	4.5		0.2	0.3	
FC62212										
FC62222										
FC62232										
FC62242										
FC62252										
FC62262										
FC62272										
FC62282										
FC62292										
FC62302	I_{OUT}=150mA	400	850		2.8	4.5				
FC62312										
FC62322										
FC62332										
FC62342										
FC62352										
FC62362										
FC62372										
FC62382										
FC62392										
FC62402	I_{OUT}=180mA	400	750		3.0	4.5				
FC62412										
FC62422										
FC62432										
FC62442										
FC62452										
FC62462										
FC62472										
FC62482										
FC62492										
FC62502	I_{OUT}=200mA	380	750		3.3	4.5				
FC62512										
FC62522										
FC62532										
FC62542										
FC62552										
FC62562										
FC62572										
FC62582										
FC62592										
FC62602										

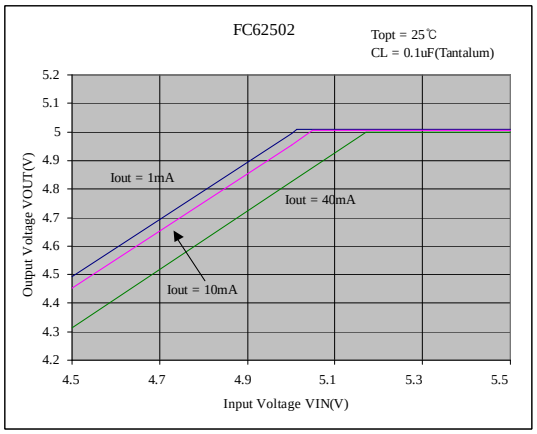
❖ Typical Performance Characteristics

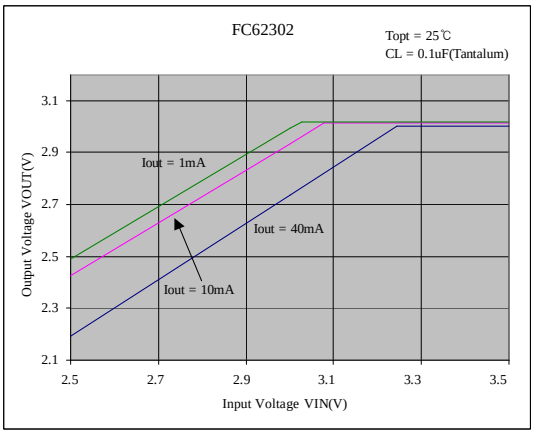
1) Output Voltage vs. Output Current



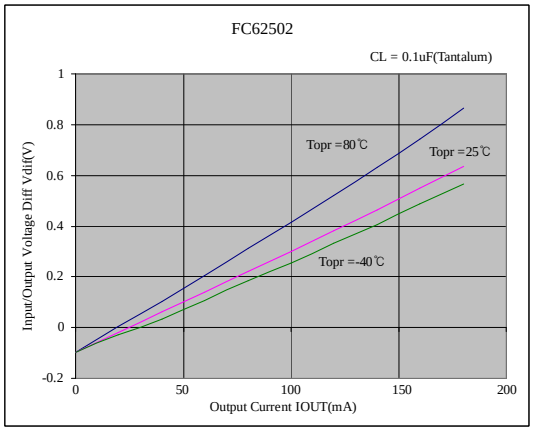


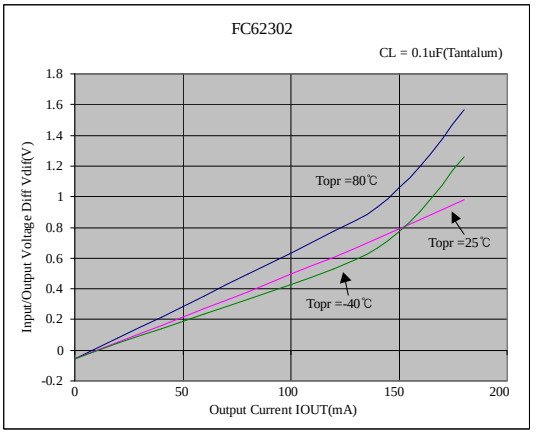
2) Output Voltage vs. Input Voltage



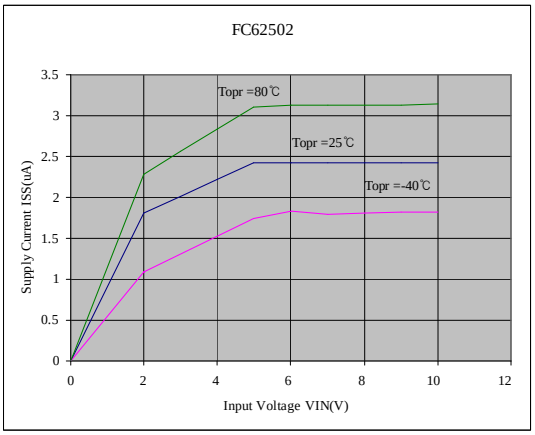


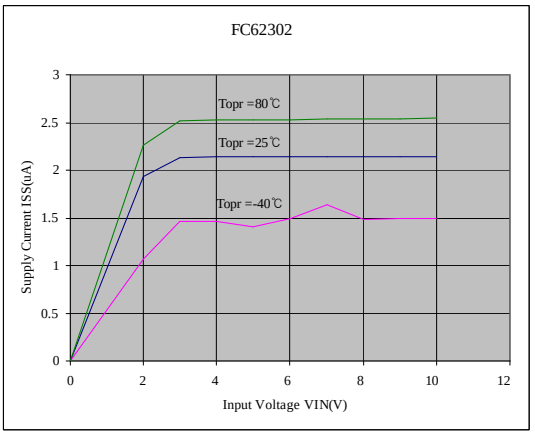
3) Input/Output Voltage Differential vs. Output Current



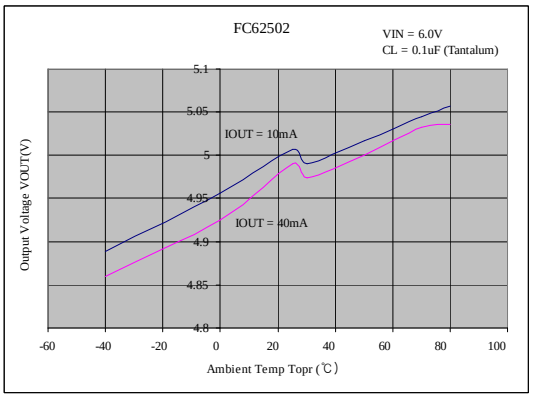


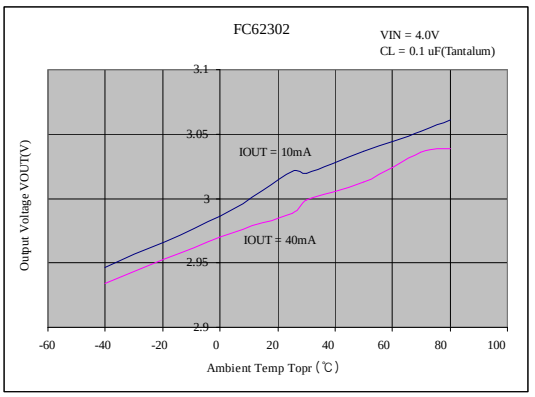
4) Supply Current vs. Input Voltage



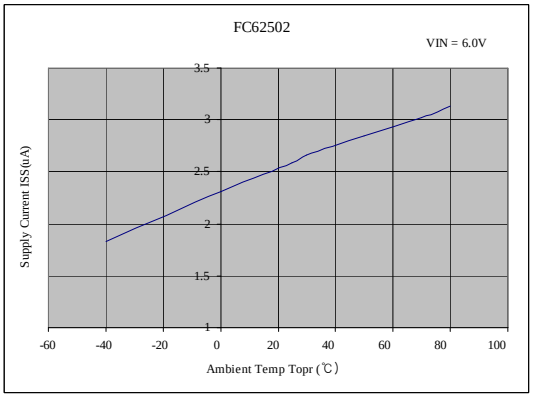


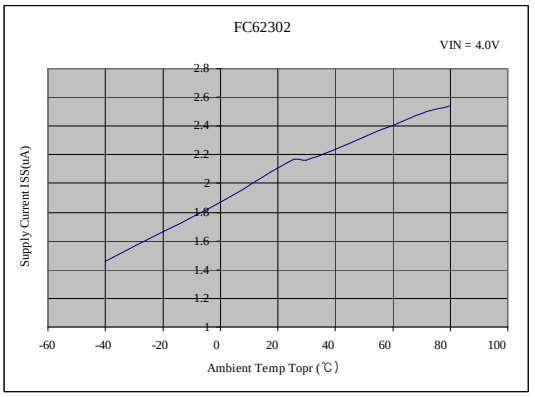
5) Output Voltage vs. Ambient Temperature





6) Supply Current vs. Ambient Temperature





❖ Ordering Informa tion

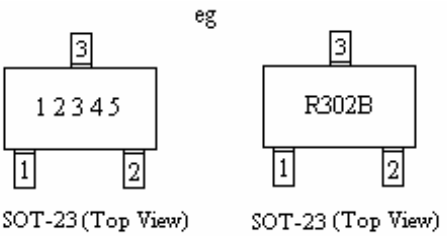
Designator	Description
a	Output Voltage eg. 30=3.0V 50=5.0V
b	Output Voltage Accuracy 2 = ±2.0% 3 = ±3.0%
c	Package Type M = SOT-23 P = SOT-89 T = TO-92
d	Device Orientation R = Embossed Tape (Orientation of Device : Right) L = Embossed Tape (Orientation of Device : Left) B = Bag (TO-92) H = Paper Tape (TO-92)
G	G = Lead Free Part

FC62xxxxxxG
a b c d e

❖ Marking

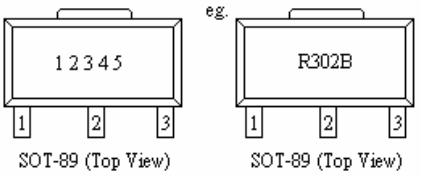
SOT-23 :

Designator	Description
1	Type R = Positive Voltage Regulator
2,3	Output Voltage eg. 30 = 3.0V
4	Internal Code



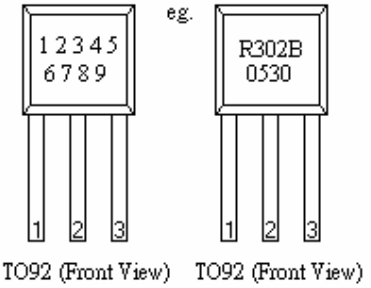
SOT-89 :

Designator	Description
1	Type R = Positive Voltage Regulator
2,3	Output Voltage eg. 30 = 3.0V
4	Output Voltage Accuracy 2 = ± 2.0% 3 = ± 3.0%
5	Internal Code



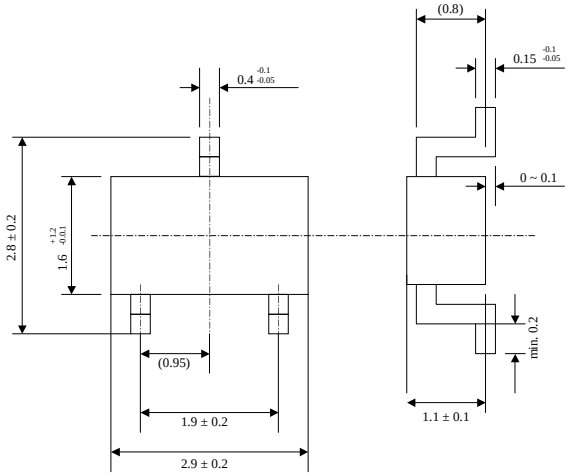
TO-92 :

Designator	Description
1	Type R = Positive Voltage Regulator
2,3	Output Voltage eg. 30 = 3.0V
4	Output Voltage Accuracy 2 = ± 2.0% 3 = ± 3.0%
5	Internal code
6, 7	Year Code eg. 05 = Year 2005
8, 9	Week Code eg. 30 = Week 30

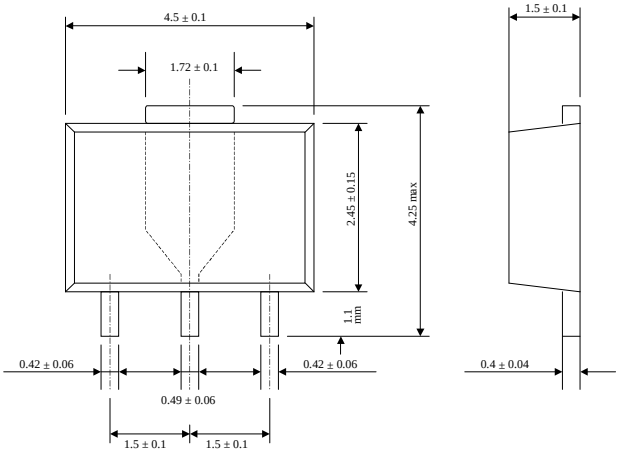


❖ Packaging Information

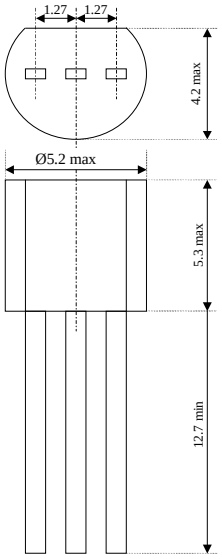
SOT-23 :



SOT-89 :



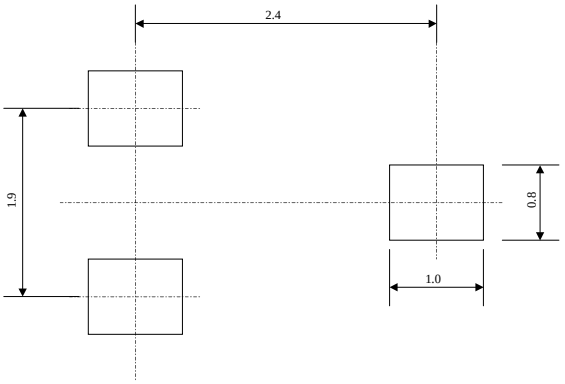
TO-92 :



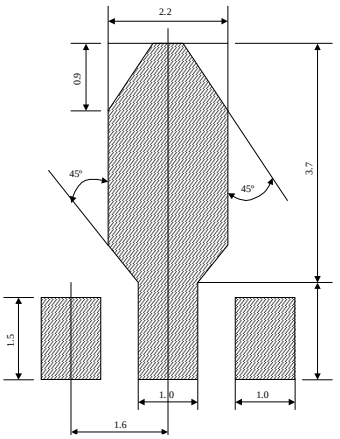
Units : mm

❖ Recommended Pattern Layout

SOT-23 :

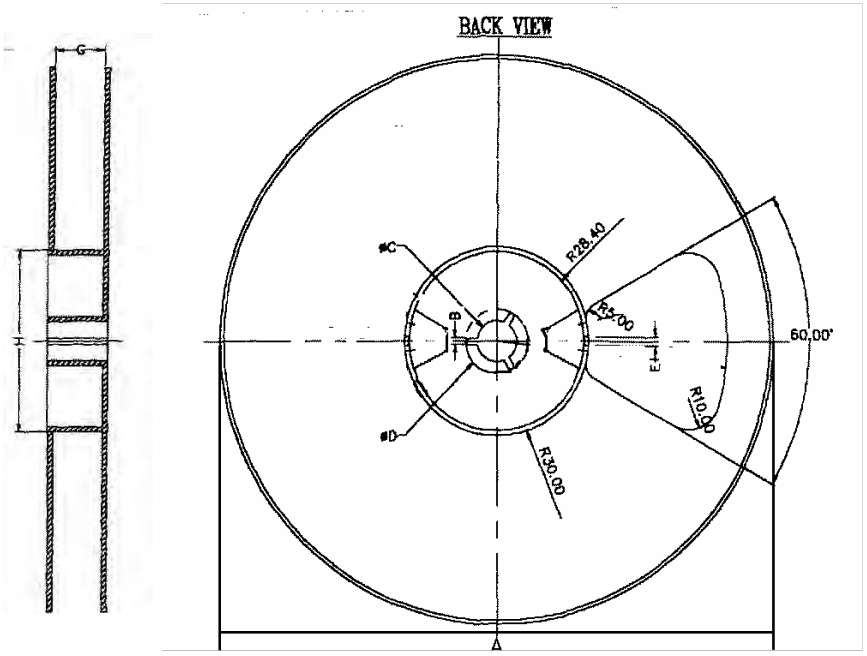


SOT-89



❖ Tape and Reel Information

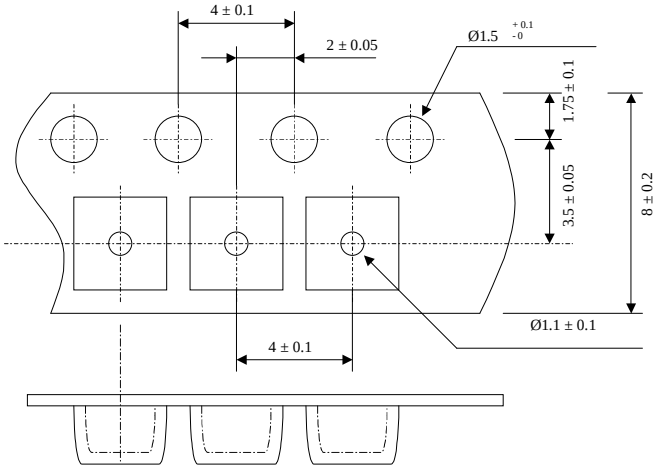
SOT-23 :

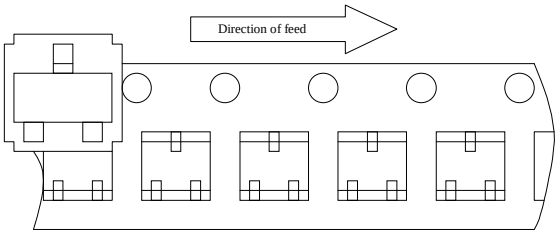


	SIZE (mm)
A	Ø178 ± 0.8
B	2 ± 0.2
C	Ø13 ± 0.2
D	Ø21 ± 0.8
G	8 ± 0.5
H	Ø60

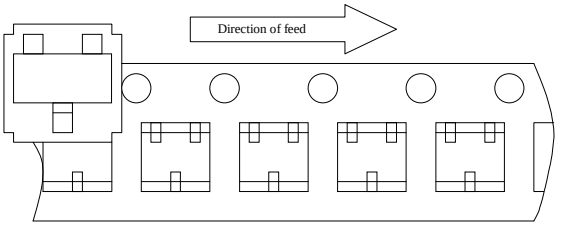
3,000 pcs / reel

SOT-23 Taping Specifications :



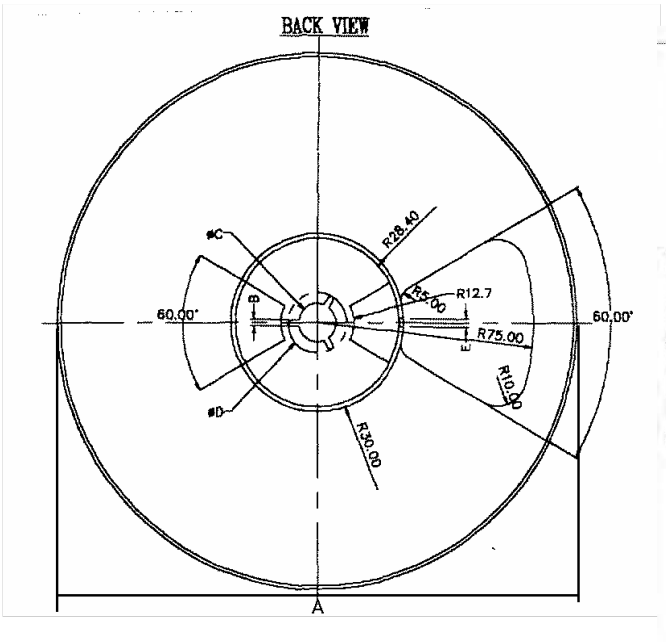


"R" type [Orientation of Device: Right]
Standard Type



"L" type [Orientation of Device: Left]
Reverse Type

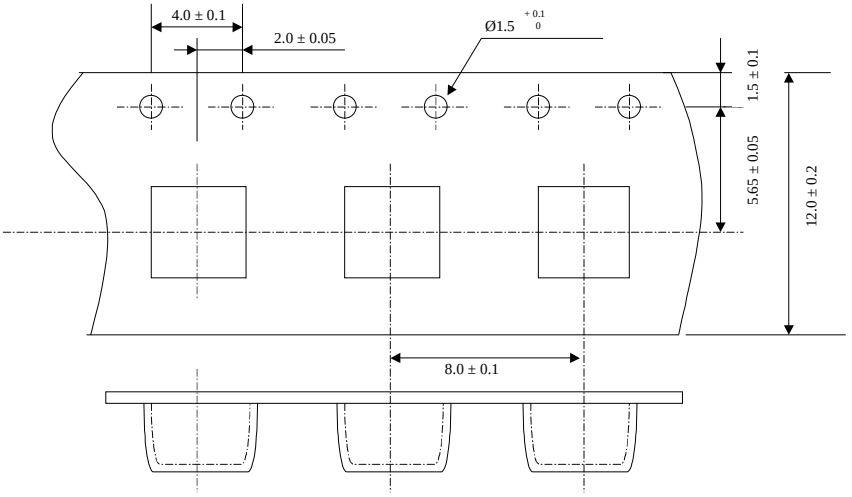
SOT-89 :

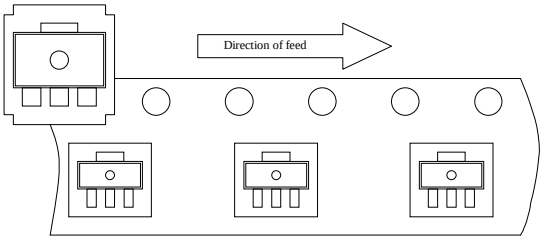


	SIZE (mm)
A	Ø178 ± 0.8
B	2 ± 0.2
C	Ø13 ± 0.2
D	Ø21 ± 0.8
G	12 ± 0.5
H	Ø60

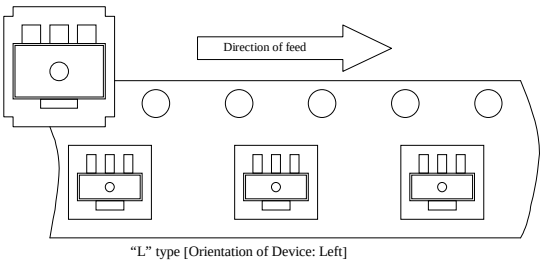
1,000 pcs / reel

SOT-89 Taping Specifications :



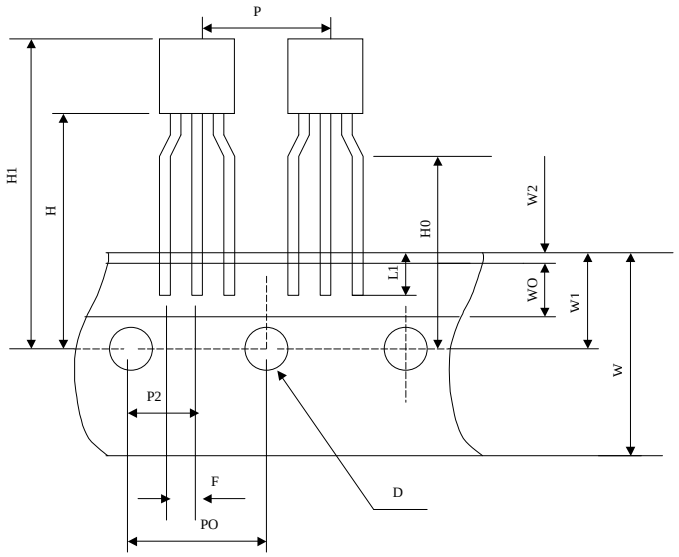


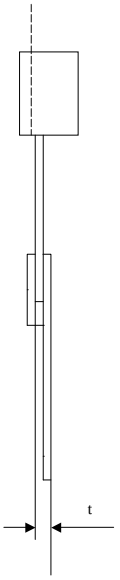
"R" type [Orientation of Device: Right]
Standard Type



"L" type [Orientation of Device: Left]
Reverse Type

TO-92 Taping Specifications :





	SIZE (mm)
P	12.7 ± 1.0
PO	12.7 ± 0.3
P2	6.35 ± 0.4
F	$2.5^{+0.45}_{-0.15}$
W	18.0 ± 1.0
WO	6.0 ± 0.3
W1	9.0 ± 0.5
W2	0.5 MAX
H	19.0 ± 0.5
H0	16.0 ± 0.5
H1	32.25 MAX
D	Ø4.0 ± 0.2
t	0.6 ± 0.2
L1	3.5 MIN

2,000 pcs / box