



Description

The PJ78MxxSQ series of three-terminal positive regulators are available in SOT-89 package. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, it can deliver over 0.35A output current. Although designed as fixed voltage regulator, This device can be used with external components to obtain adjustable voltage and currents.

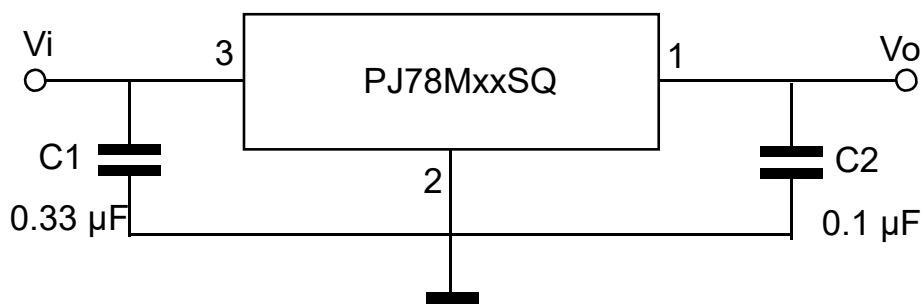
Features

- Input voltage: up to 35V
- Output voltage: 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V, 24V
- Output current up to 350 mA
- Thermal overload protection
- Short circuit current limiting

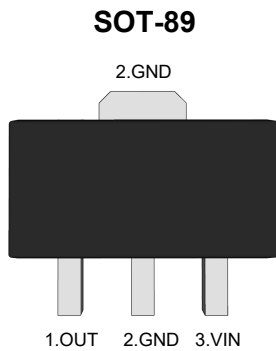
Applications

- DC motor drivers
- Household electric appliances
- Industrial power supplies
- Test and measurement equipment

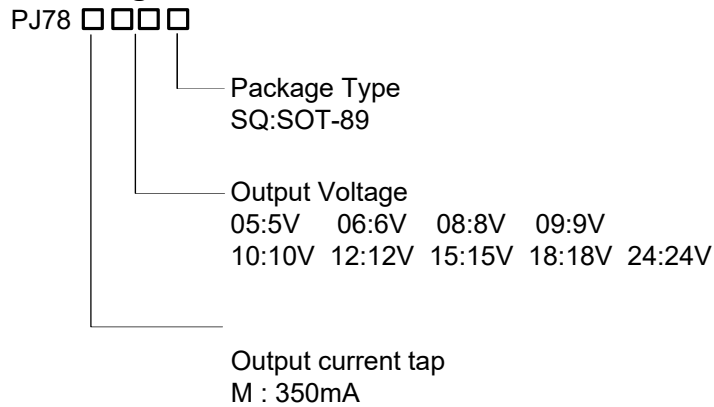
Typical Application Circuit

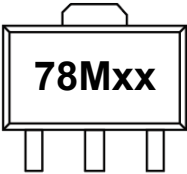


Pin Distribution



Ordering Information



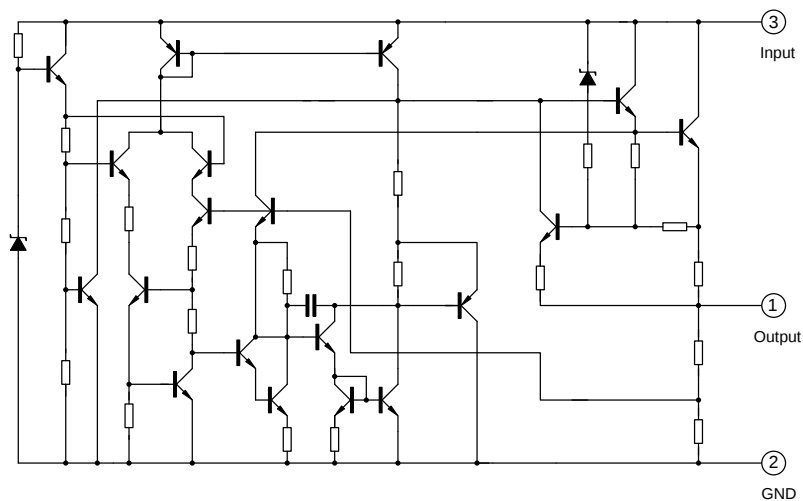
Orderable Device	Package	Reel (inch)	Package Qty (PCS)	Eco Plan ^{Note}	MSL Level	Marking Code
PJ78M05SQ	SOT-89	7/13	1000/3000	RoHS & Green	MSL1	 78Mxx: Product Code e.g. PJ78M05SQ: 78M05
PJ78M06SQ						
PJ78M08SQ						
PJ78M09SQ						
PJ78M10SQ						
PJ78M12SQ						
PJ78M15SQ						
PJ78M18SQ						
PJ78M24SQ						

Note:

RoHS: PJ defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials.

Green: PJ defines "Green" to mean Halogen-Free and Antimony-Free.

Function Block Diagram



Absolute Maximum Ratings

Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symbol	Value	Unit
Input Voltage	V_I	35	V
Output Current	I_O	350	mA
Maximum Power Dissipation	P_D	0.7	W
Operating Temperature Range	T_{OPR}	-40 to +125	°C
Storage Temperature Range	T_{STG}	-65 to +150	°C



PJ78MxxSQ

3-Terminal Voltage Regulators

PJ78M05SQ Electrical Characteristics

$V_I=10V$, $I_O=350mA$, $T_J=25^{\circ}C$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O		4.8	5.0	5.2	V
		$I_O=5mA$ to $350mA$, $V_I=7V$ to $20V$	4.75	--	5.25	V
Line Regulation	ΔV_O	$I_O=200mA$, $V_I=7V$ to $25V$	--	--	100	mV
		$I_O=200mA$, $V_I=8V$ to $25V$	--	--	50	mV
Load Regulation	ΔV_O	$I_O=5mA$ to $500mA$	--	--	100	mV
		$I_O=5mA$ to $200mA$	--	--	50	mV
Ripple Rejection	RR	$V_I=8V$ to $18V$, $f=120Hz$, $I_O=300mA$	62	--	--	dB
Dropout Voltage	V_D		--	2	--	V
Quiescent Current	I_Q		--	--	6	mA
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$, $T_J=0^{\circ}C\sim 125^{\circ}C$	--	0.5	--	mV/ $^{\circ}C$
Quiescent Current Change	ΔI_Q	$I_O=200mA$, $V_I=8V$ to $25V$	--	--	0.8	mA
		$I_O=5mA$ to $350mA$	--	--	0.5	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$	--	40	--	μV



PJ78MxxSQ

3-Terminal Voltage Regulators

PJ78M06SQ Electrical Characteristics

$V_I=11V$, $I_O=350mA$, $T_J=25^{\circ}C$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O		5.75	6.0	6.25	V
		$I_O=5mA$ to $350mA$, $V_I=8V$ to $21V$	5.7	6.0	6.3	V
Line Regulation	ΔV_O	$I_O=200mA$, $V_I=8V$ to $25V$	--	--	120	mV
		$I_O=200mA$, $V_I=9V$ to $25V$	--	--	60	mV
Load Regulation	ΔV_O	$I_O=5mA$ to $500mA$	--	--	120	mV
		$I_O=5mA$ to $200mA$	--	--	60	mV
Ripple Rejection	RR	$V_I=9V$ to $19V$, $f=120Hz$, $I_O=300mA$	59	--	--	dB
Dropout Voltage	V_D		--	2	--	V
Quiescent Current	I_Q		--	--	6	mA
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$, $T_J=0^{\circ}C\sim 125^{\circ}C$	--	0.6	--	mV/ $^{\circ}C$
Quiescent Current Change	ΔI_Q	$I_O=200mA$, $V_I=9V$ to $25V$	--	--	0.8	mA
		$I_O=5mA$ to $350mA$	--	--	0.5	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$	--	45	--	μV



PJ78MxxSQ

3-Terminal Voltage Regulators

PJ78M08SQ Electrical Characteristics

$V_I=14V$, $I_O=350mA$, $T_J=25^{\circ}C$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O		7.7	8.0	8.3	V
		$I_O=5mA$ to $350mA$, $V_I=10.5V$ to $23V$	7.6	8.0	8.4	V
Line Regulation	ΔV_O	$I_O=200mA$, $V_I=10.5V$ to $25V$	--	--	160	mV
		$I_O=200mA$, $V_I=11V$ to $25V$	--	--	80	mV
Load Regulation	ΔV_O	$I_O=5mA$ to $500mA$	--	--	160	mV
		$I_O=5mA$ to $200mA$	--	--	80	mV
Ripple Rejection	RR	$V_I=11.5V$ to $21.5V$, $f=120Hz$, $I_O=300mA$	56	--	--	dB
Dropout Voltage	V_D		--	2	--	V
Quiescent Current	I_Q		--	--	6	mA
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$, $T_J=0^{\circ}C \sim 125^{\circ}C$	--	0.7	--	mV/ $^{\circ}C$
Quiescent Current Change	ΔI_Q	$I_O=200mA$, $V_I=10V$ to $25V$	--	--	0.8	mA
		$I_O=5mA$ to $350mA$	--	--	0.5	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$	--	52	--	μV



PJ78MxxSQ

3-Terminal Voltage Regulators

PJ78M09SQ Electrical Characteristics

$V_I=15V$, $I_O=350mA$, $T_J=25^{\circ}C$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O		8.65	9.0	9.35	V
		$I_O=5mA$ to $350mA$, $V_I=11.5V$ to $24V$	8.55	9.0	9.45	V
Line Regulation	ΔV_O	$I_O=200mA$, $V_I=11.5V$ to $25V$	--	--	180	mV
		$I_O=200mA$, $V_I=12V$ to $25V$	--	--	90	mV
Load Regulation	ΔV_O	$I_O=5mA$ to $500mA$	--	--	180	mV
		$I_O=5mA$ to $200mA$	--	--	90	mV
Ripple Rejection	RR	$V_I=12.5V$ to $23V$, $f=120Hz$, $I_O=300mA$	56	--	--	dB
Dropout Voltage	V_D		--	2	--	V
Quiescent Current	I_Q		--	--	6	mA
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$, $T_J=0^{\circ}C\sim 125^{\circ}C$	--	0.9	--	mV/ $^{\circ}C$
Quiescent Current Change	ΔI_Q	$I_O=200mA$, $V_I=11.5V$ to $25V$	--	--	0.8	mA
		$I_O=5mA$ to $350mA$	--	--	0.5	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$	--	58	--	μV



PJ78MxxSQ

3-Terminal Voltage Regulators

PJ78M10SQ Electrical Characteristics

$V_I=17V$, $I_O=350mA$, $T_J=25^{\circ}C$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O		9.6	10	10.4	V
		$I_O=5mA$ to $350mA$, $V_I=12.5V$ to $25V$	9.5	10	10.5	V
Line Regulation	ΔV_O	$I_O=200mA$, $V_I=12.5V$ to $28V$	--	--	210	mV
		$I_O=200mA$, $V_I=14V$ to $20V$	--	--	120	mV
Load Regulation	ΔV_O	$I_O=5mA$ to $500mA$	--	--	210	mV
		$I_O=5mA$ to $200mA$	--	--	120	mV
Ripple Rejection	RR	$V_I=12.5V$ to $28V$, $f=120Hz$, $I_O=300mA$	55	--	--	dB
Dropout Voltage	V_D		--	2	--	V
Quiescent Current	I_Q		--	--	6	mA
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$, $T_J=0^{\circ}C\sim 125^{\circ}C$	--	1	--	mV/ $^{\circ}C$
Quiescent Current Change	ΔI_Q	$I_O=200mA$, $V_I=12.5V$ to $28V$	--	--	0.8	mA
		$I_O=5mA$ to $350mA$	--	--	0.5	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$	--	75	--	μV



PJ78MxxSQ

3-Terminal Voltage Regulators

PJ78M12SQ Electrical Characteristics

$V_I=19V$, $I_O=350mA$, $T_J=25^{\circ}C$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O		11.5	12	12.5	V
		$I_O=5mA$ to $350mA$, $V_I=14.5V$ to $27V$	11.4	12	12.6	V
Line Regulation	ΔV_O	$I_O=200mA$, $V_I=14.5V$ to $30V$	--	--	240	mV
		$I_O=200mA$, $V_I=16V$ to $30V$	--	--	120	mV
Load Regulation	ΔV_O	$I_O=5mA$ to $500mA$	--	--	240	mV
		$I_O=5mA$ to $200mA$	--	--	120	mV
Ripple Rejection	RR	$V_I=15V$ to $25V$, $f=120Hz$, $I_O=300mA$	55	--	--	dB
Dropout Voltage	V_D		--	2	--	V
Quiescent Current	I_Q		--	--	6	mA
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$, $T_J=0^{\circ}C\sim 125^{\circ}C$	--	1	--	mV/ $^{\circ}C$
Quiescent Current Change	ΔI_Q	$I_O=200mA$, $V_I=14.5V$ to $30V$	--	--	0.8	mA
		$I_O=5mA$ to $350mA$	--	--	0.5	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$	--	75	--	μV



PJ78MxxSQ

3-Terminal Voltage Regulators

PJ78M15SQ Electrical Characteristics

$V_I=23V$, $I_O=350mA$, $T_J=25^{\circ}C$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O		14.4	15	15.6	V
		$I_O=5mA$ to $350mA$, $V_I=17.5V$ to $30V$	14.25	15	15.75	V
Line Regulation	ΔV_O	$I_O=200mA$, $V_I=17.5V$ to $30V$	--	--	300	mV
		$I_O=200mA$, $V_I=20V$ to $30V$	--	--	150	mV
Load Regulation	ΔV_O	$I_O=5mA$ to $500mA$	--	--	300	mV
		$I_O=5mA$ to $200mA$	--	--	150	mV
Ripple Rejection	RR	$V_I=18.5V$ to $28.5V$, $f=120Hz$, $I_O=300mA$	53	--	--	dB
Dropout Voltage	V_D		--	2	--	V
Quiescent Current	I_Q		--	--	6	mA
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$, $T_J=0^{\circ}C \sim 125^{\circ}C$	--	1.2	--	mV/ $^{\circ}C$
Quiescent Current Change	ΔI_Q	$I_O=200mA$, $V_I=17.5V$ to $30V$	--	--	0.8	mA
		$I_O=5mA$ to $350mA$	--	--	0.5	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$	--	100	--	μV



PJ78MxxSQ

3-Terminal Voltage Regulators

PJ78M18SQ Electrical Characteristics

$V_I=26V$, $I_O=350mA$, $T_J=25^{\circ}C$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O		17.3	18	18.7	V
		$I_O=5mA$ to $350mA$, $V_I=20.5V$ to $33V$	17.1	18	18.9	V
Line Regulation	ΔV_O	$I_O=200mA$, $V_I=21V$ to $33V$	--	--	360	mV
		$I_O=200mA$, $V_I=24V$ to $33V$	--	--	180	mV
Load Regulation	ΔV_O	$I_O=5mA$ to $500mA$	--	--	360	mV
		$I_O=5mA$ to $200mA$	--	--	180	mV
Ripple Rejection	RR	$V_I=22V$ to $32V$, $f=120Hz$, $I_O=300mA$	53	--	--	dB
Dropout Voltage	V_D		--	2	--	V
Quiescent Current	I_Q		--	--	6	mA
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$, $T_J=0^{\circ}C$ ~ $125^{\circ}C$	--	-1.1	--	mV/ $^{\circ}C$
Quiescent Current Change	ΔI_Q	$I_O=200mA$, $V_I=21V$ to $33V$	--	--	0.8	mA
		$I_O=5mA$ to $350mA$	--	--	0.5	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$	--	100	--	μV



PJ78MxxSQ

3-Terminal Voltage Regulators

PJ78M24SQ Electrical Characteristics

$V_I=33V$, $I_O=350mA$, $T_J=25^{\circ}C$, $C_I=0.33\mu F$, $C_O=0.1\mu F$, unless otherwise specified.

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage	V_O		23	24	25	V
		$I_O=5mA$ to $350mA$, $V_I=27V$ to $38V$	22.8	24	25.2	V
Line Regulation	ΔV_O	$I_O=200mA$, $V_I=27V$ to $38V$	--	--	480	mV
		$I_O=200mA$, $V_I=28V$ to $38V$	--	--	240	mV
Load Regulation	ΔV_O	$I_O=5mA$ to $500mA$	--	--	480	mV
		$I_O=5mA$ to $200mA$	--	--	240	mV
Ripple Rejection	RR	$V_I=28V$ to $38V$, $f=120Hz$, $I_O=300mA$	50	--	--	dB
Dropout Voltage	V_D		--	2	--	V
Quiescent Current	I_Q		--	--	6	mA
Temperature coefficient of V_O	$\Delta V_O/\Delta T$	$I_O=5mA$, $T_J=0^{\circ}C\sim 125^{\circ}C$	--	-1.2	--	mV/ $^{\circ}C$
Quiescent Current Change	ΔI_Q	$I_O=200mA$, $V_I=27V$ to $38V$	--	--	0.8	mA
		$I_O=5mA$ to $350mA$	--	--	0.5	mA
Output Noise Voltage	V_N	$10Hz\leq f\leq 100kHz$	--	170	--	μV



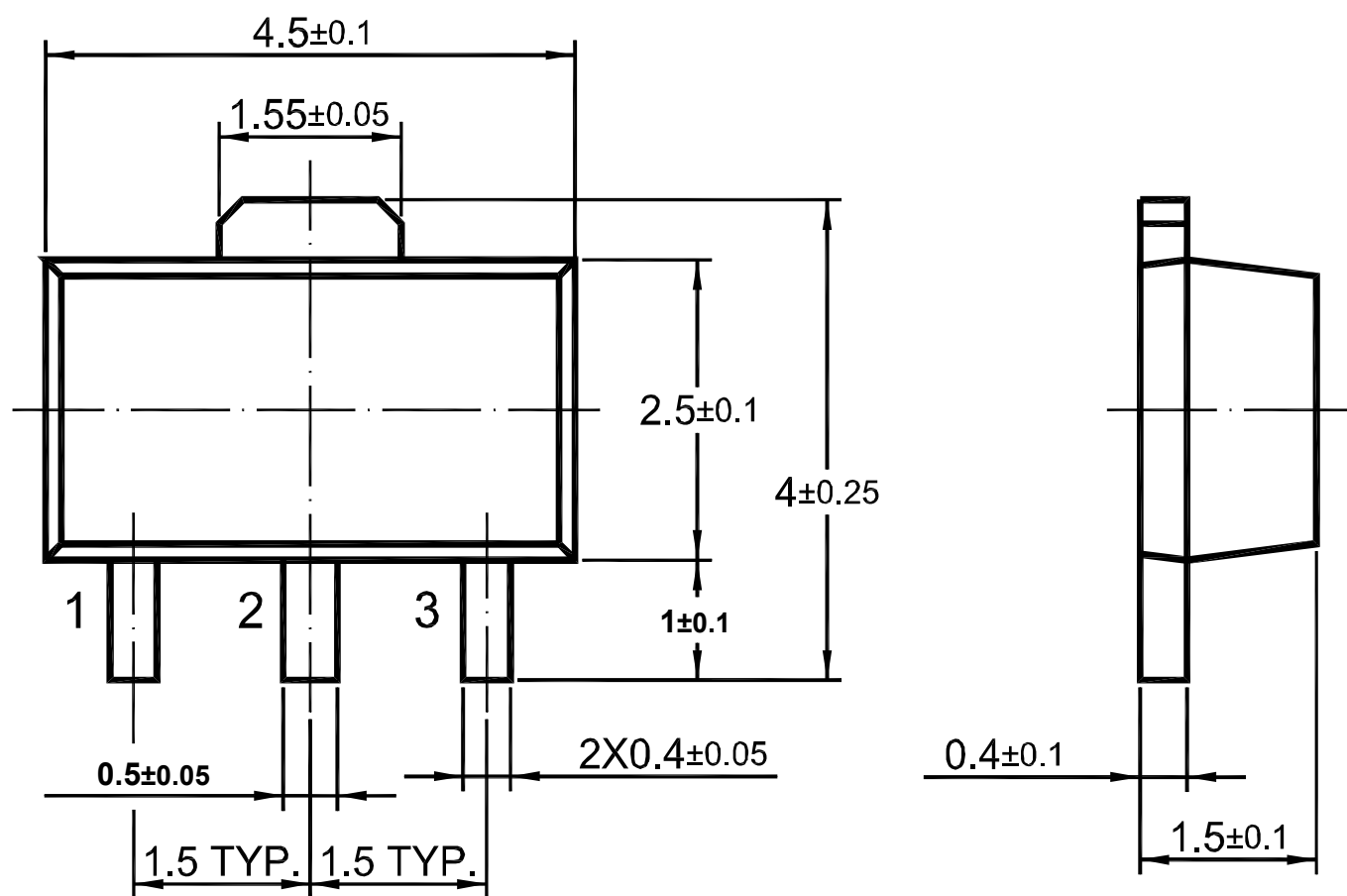
PJ78MxxSQ

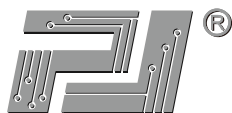
3-Terminal Voltage Regulators

Package Outline

SOT-89

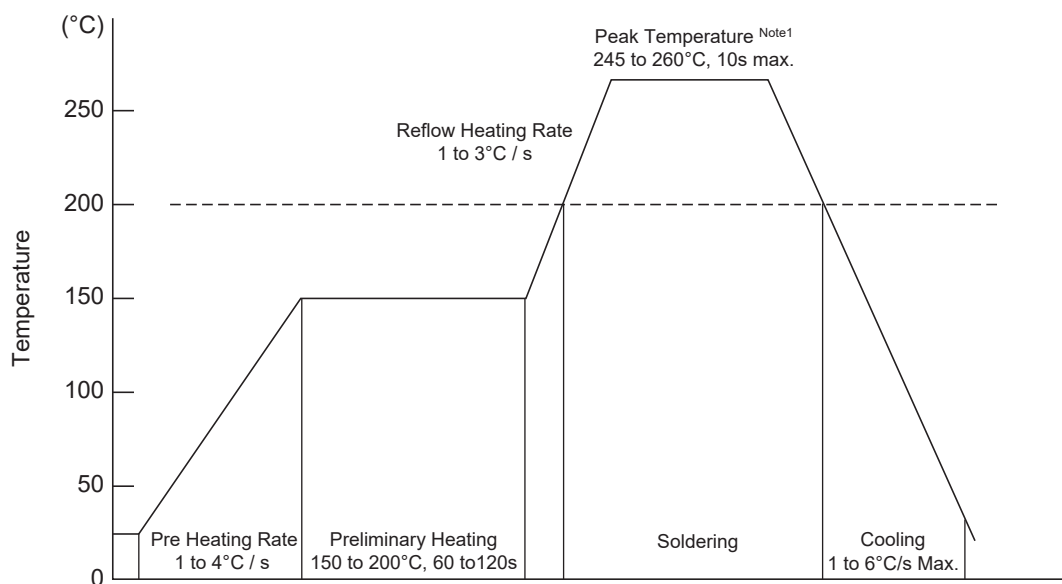
Dimensions in mm





Conditions of Soldering and Storage

◆ Recommended condition of Reflow Soldering(Pb-Free Solder)



Recommended peak temperature is over 245°C. If peak temperature is below 245°C, you may adjust the following parameters:

- Time length of peak temperature (longer)
- Time length of soldering (longer)
- Thickness of solder paste (thicker)

Note1:

Maximum thermal excursion allowed during the reflow assembly is as follow:

- Temperature: 255°C~260°C
- Duration at peak soak : 30 seconds
- Number of reflow: 3

● Conditions of hand soldering ^{Note2}

- Temperature: 320±10°C
- Time: 3s max.
- Times: one time

Note2: Not recommended for mass production, an engineering project, or re-work, it is allowed. It should be used with caution

● Storage conditions

● Temperature

5 to 30°C

● Humidity

≤ 60% RH

● Floor Life

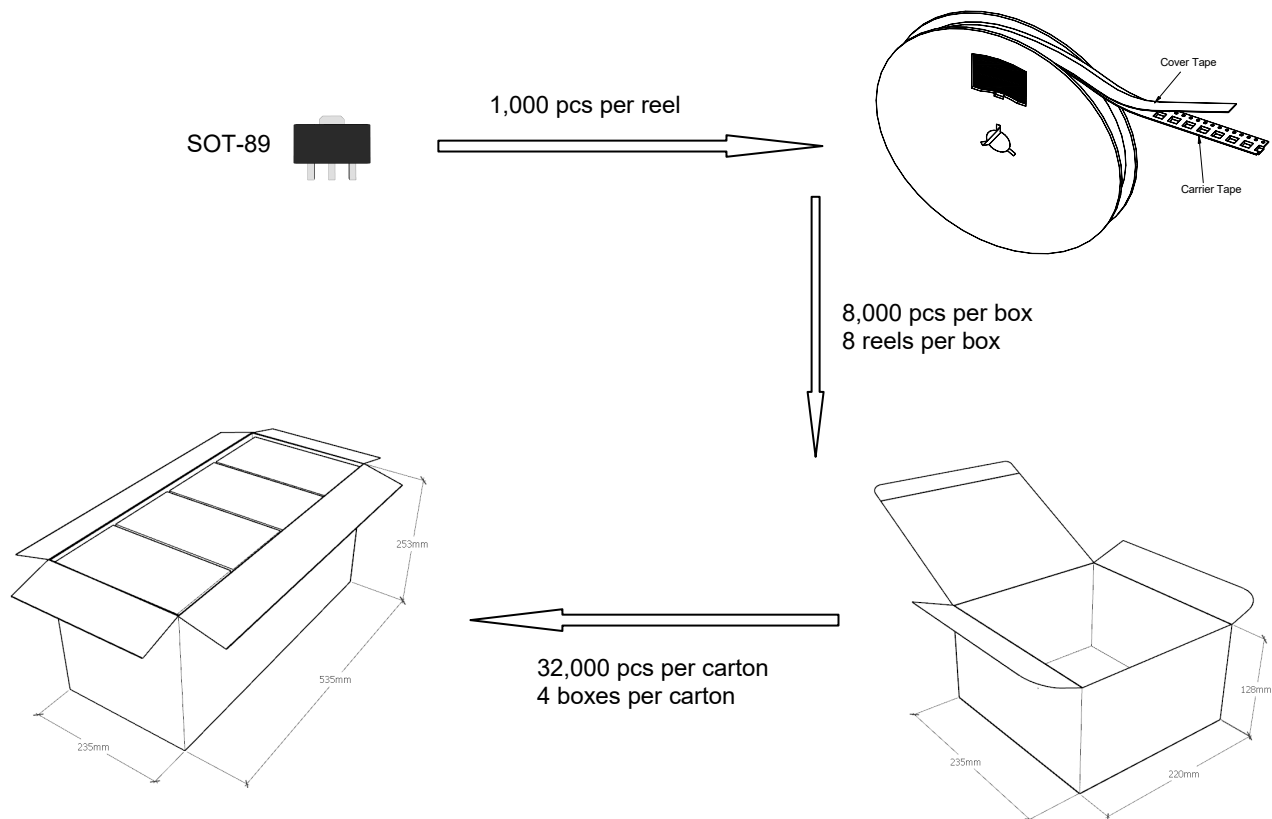
168 Hours

● Recommended period

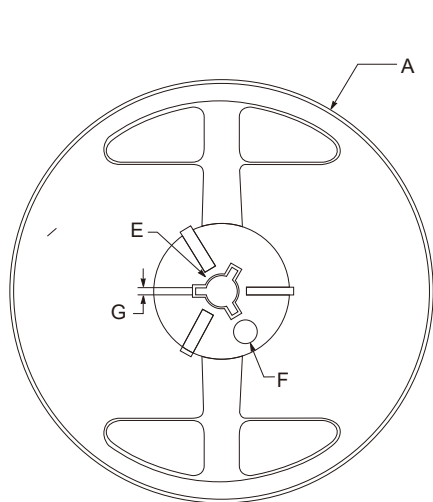
Five year after manufacturing(Depends on storage conditions)

Package Specifications

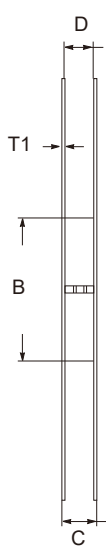
- The method of packaging (1,000PCS/Reel&7inches)



◆ reel data



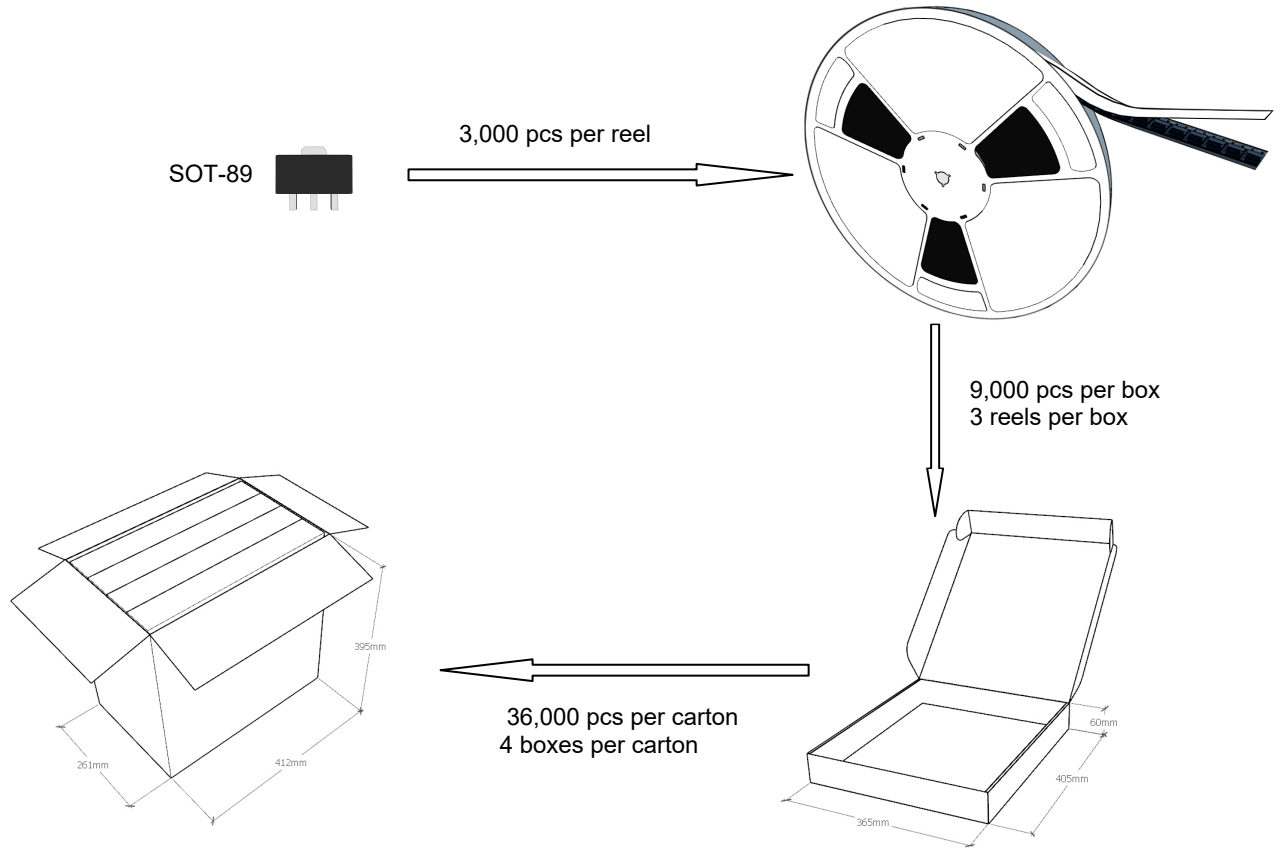
Reel (7")



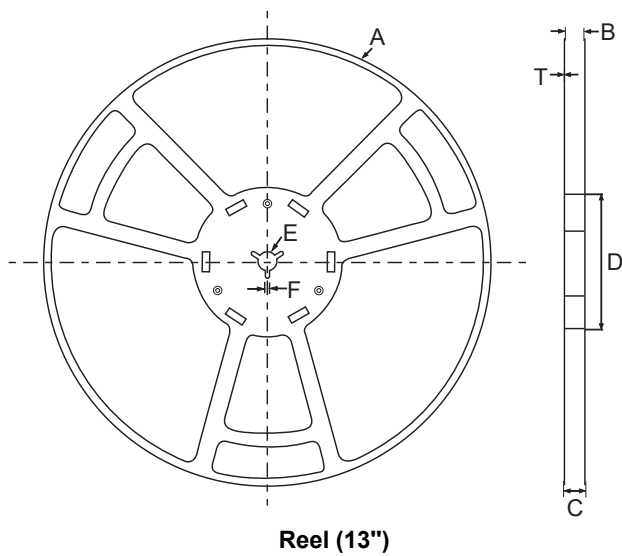
symbol	Value(unit:mm)
A	$\Phi 179 \pm 1$
B	60.5 ± 0.2
C	15.3 ± 0.3
D	$12.5 \sim 13.7$
E	$\Phi 13.5 \pm 0.2$
F	$\Phi 10.0 \pm 0.2$
G	2.7 ± 0.2
T1	1.0 ± 0.2

Package Specifications

- The method of packaging (3,000PCS/Reel&13inches)



◆ reel data



symbol	Value(unit:mm)
A	$\phi 330\pm 1$
B	12.7 ± 0.5
C	16.5 ± 0.3
D	$\phi 99.5\pm 0.5$
E	$\phi 13.6\pm 0.3$
F	2.8 ± 0.3
T	1.9 ± 0.2

◆ Embossed tape data

