XH78Lxx

Descriptions

The XH78Lxx series are three terminal positive regulators designed for a wide variety of applications including local, on-card regulation. This series of regulators are complete with internal current limiting, thermal shutdown protection, and safe-area compensation which make them virtually immune from output overload. If adequate heat sinking are provided, these regulators can deliver output currents up to 100mA.

The XH78Lxx series are available in SOT-89, TO92 packages.

Features

- Output Current up to 100mA
- Fixed Output Voltages of 05V, 06V,08V,09V,12V and 15V
- Output Voltage Accuracy of ±5% over the Full Temperature Range
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components
- Output Transistor Safe-area Protection
- Lead-Free Packages: SOT-89 , TO92
 - Totally Lead-Free; ROHS Compliant

Applications

- Consumer Electronics
- Microprocessor Power Supply
- Mother Board

Pin Assignments
Top View

Z Package
(TO-92(Ammo Packing))

3 INPUT
2 GND
1 OUTPUT
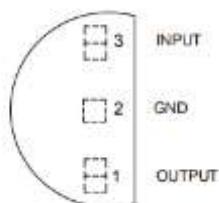
Z Package
(TO-92(Bulk Packing))

3 INPUT
2 GND
1 OUTPUT
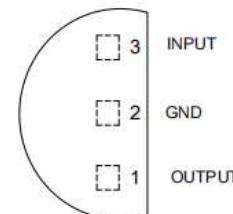
R Package
(SOT-89 Option 2)

GND

3 INPUT
2 GND
1 OUTPUT
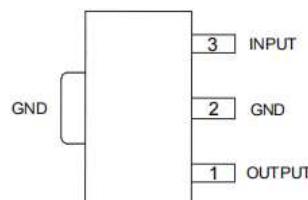
Typical Applications Circuit

V_{IN} 3 XH78LXX 1 V_{OUT}
INPUT OUTPUT
GND
0.33μF 2 0.1μF
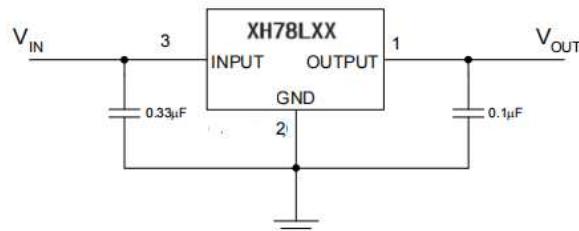
Absolute Maximum Ratings

Symbol	Parameter	Rating		Unit
Vin	Input Voltage	36		V
T_j	Operating Junction Temperature	+150		℃
T_{lead}	Lead Temperature (Soldering, 10sec)	+260		℃
TSTG	Storage Temperature Range	-65 to +150		℃
θ_{JA}	Thermal Resistance	SOT-89	165	℃/W
θ_{JA}	Thermal Resistance	TO-92	180	℃/W
PD	Power Dissipation	0.75		W
ESD	ESD (Human Body Model)	5000		V
ESD	ESD (Charged Device Model)	2000		V

Note 1： Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

Recommended Operating Conditions

Symbol	Parameter		Min	Max	Unit
V_{in}	Input Voltage	XH78L05	–	30	V
		XH78L06	–	30	
		XH78L08	–	30	
		XH78L09	–	30	
		XH78L12	–	36	
		XH78L15	–	36	
		XH78L18	–	36	
T_j	Operating Junction Temperature Range		-40	+125	°C

Electrical Characteristics

XH78L05

(@ V_{IN} = 10V, I_{OUT} = 40mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = +25℃, **Bold** typeface applies over -40℃ ≤ T_J ≤ +125℃, unless otherwise specified.)

Note2：0.01μF minimum load capacitance is recommended to limit high frequency noise.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{out}	Output Voltage	–	4.8	5.0	5.2	V
		7V ≤ V_{IN} ≤ 20V, 1mA ≤ I_{OUT} ≤ 100mA, PD ≤ 0.75W	**4.75**	–	**5.25**	
V_{Rline}	Line Regulation	7V ≤ V_{IN} ≤ 20V	–	8	150	mV
V_{Rload}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	–	10	60	mV
I_Q	Quiescent Current	–	–	3	5.5	mA
ΔI_Q	Quiescent Current Change	8V ≤ V_{IN} ≤ 20V	–	–	**1.5**	mA
		1mA ≤ I_{OUT} ≤ 40mA	–	–	**0.1**	
PSRR	Ripple Rejection	f = 120Hz, 8V ≤ V_{IN} ≤ 18V	47	62	–	dB
V_{Drop}	Dropout Voltage	I_{OUT} = 40mA	–	1.7	2.0	V
		I_{OUT} = 100mA	–	1.8	2.3	
N_O	Output Noise Voltage	10Hz ≤ f ≤ 100kHz (Note 4)	–	40	–	μV
$\Delta V_{out}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	–	0.42	–	mV/°C
$(\Delta V_{out}/V_{out})/\Delta T$			–	84	–	ppm/°C
θ_{Jc}	Thermal Resistance	SOT-89		28.3		°C/W
		TO-92		40		°C/W

XH78L05A

(@ V_{IN} = 10V, I_{OUT} = 40mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = +25℃, **Bold** typeface applies over -40℃ ⩽ T_J ⩽ +125℃, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{out}	Output Voltage	–	5.0	–	5.1	V
		7V ≤ V_{IN} ≤ 20V, 1mA ≤ I_{OUT} ≤ 100mA, P_D ≤ 0.75W	**4.75**	–	**5.25**	
V_{Rline}	Line Regulation	7V ≤ V_{IN} ≤ 20V	–	8	150	mV
V_{Rload}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	–	10	60	mV
I_Q	Quiescent Current	–	–	3	5.5	mA
ΔI_Q	Quiescent Current Change	8V ≤ V_{IN} ≤ 20V	–	–	**1.5**	mA
		1mA ≤ I_{OUT} ≤ 40mA	–	–	**0.1**	
PSRR	Ripple Rejection	F = 120Hz, 8V ≤ V_{IN} ≤ 18V	47	62	–	dB
V_{Drop}	Dropout Voltage	I_{OUT} = 40mA	–	1.7	–	V
		I_{OUT} = 100mA	–	1.8	–	
N_O	Output Noise Voltage	10Hz ≤ f ≤ 100kHz (Note 4)	–	40	–	μV
$\Delta V_{out}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	–	0.42	–	mV/°C
$(\Delta V_{out}/V_{out})/\Delta T$			–	84	–	ppm/°C
θ_{Jc}	Thermal Resistance	SOT-89	–	28.3	–	°C/W
		TO-92		40		°C/W

XH78L06

(@ V_{IN} = 12V, I_{OUT} = 40mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = +25° C, **Bold** typeface applies over -40° C $\leqslant$ T_J $\leqslant$ +125° C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{out}	Output Voltage	–	5.76	6.0	6.24	V
		8V $\leqslant$ V_{IN} $\leqslant$ 20V, 1mA $\leqslant$ I_{OUT} $\leqslant$100mA, P_D $\leqslant$ 0.75W	**5.7**	–	**6.3**	
V_{Rline}	Line Regulation	8V $\leqslant$ V_{IN} $\leqslant$ 20V	–	10	160	mV
V_{Rload}	Load Regulation	1mA $\leqslant$ I_{OUT} $\leqslant$ 100mA	–	10	60	mV
I_Q	Quiescent Current	–	–	3	6	mA
ΔI_Q	Quiescent Current Change	9V $\leqslant$ V_{IN} $\leqslant$ 20V	–	–	**1.5**	mA
		1mA $\leqslant$ I_{OUT} $\leqslant$ 40mA	–	–	**0.1**	
PSRR	Ripple Rejection	f = 120Hz, 8V $\leqslant$ V_{IN} $\leqslant$ 18V	45	56	–	dB
V_{Drop}	Dropout Voltage	I_{OUT} = 40mA	–	1.7	2.0	V
		I_{OUT} = 100mA	–	1.8	2.3	
N_O	Output Noise Voltage	10Hz $\leqslant$ f $\leqslant$ 100kHz (Note 4)	–	40	–	μV
$\Delta V_{out}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	–	0.5	–	mV/℃
$(\Delta V_{out}/V_{out})/ \Delta T$			–	84	–	ppm/℃
θ_{Jc}	Thermal Resistance	SOT-89		28.3		℃/W
		TO-92		40		℃/W

XH78L08

(@ V_{IN} = 14V, I_{OUT} = 40mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = +25℃, **Bold** typeface applies over -40℃ $\leqslant$ T_J $\leqslant$ +125℃, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{out}	Output Voltage	–	7.7	8.0	8.3	V
		10V $\leqslant$ V_{IN} $\leqslant$ 23V, 1mA $\leqslant$ I_{OUT} $\leqslant$ 100mA, P_D $\leqslant$ 0.75W	**7.6**	–	**8.4**	
V_{Rline}	Line Regulation	10V $\leqslant$ V_{IN} $\leqslant$ 23V	–	13	180	mV
V_{Rload}	Load Regulation	1mA $\leqslant$ I_{OUT} $\leqslant$ 100mA	–	14	70	mV
I_Q	Quiescent Current	–	–	3	6	mA
ΔI_Q	Quiescent Current Change	11V $\leqslant$ V_{IN} $\leqslant$ 23V	–	–	**1.5**	mA
		1mA $\leqslant$ I_{OUT} $\leqslant$ 40mA	–	–	**0.1**	
PSRR	Ripple Rejection	f = 120Hz, 10V $\leqslant$ V_{IN} $\leqslant$ 21V	43	50	–	dB
V_{Drop}	Dropout Voltage	I_{OUT} = 40mA	–	1.7	–	V
		I_{OUT} = 100mA	–	1.8	–	
N_O	Output Noise Voltage	10Hz $\leqslant$ f $\leqslant$ 100kHz (Note 4)	–	50	–	μV
$\Delta V_{out}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	–	0.6	–	mV/℃
$(\Delta V_{out}/V_{out})/\Delta T$			–	84	–	ppm/℃
θ_{Jc}	Thermal Resistance	SOT-89		28.3		℃/W
		TO-92		40		℃/W

XH78L09

(@ V_{IN} = 15V, I_{OUT} = 40mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = +25°C, **Bold** typeface applies over -40°C ≤ T_J ≤ +125°C, unless otherwise specified.)

| Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{out}	Output Voltage	–	8.64	9.0	9.36	V
		11V ≤ V_{IN} ≤ 23V, 1mA ≤ I_{OUT} ≤100mA, PD ≤ 0.75W	**8.55**	–	**9.45**	
V_{Rline}	Line Regulation	11V ≤ V_{IN} ≤ 23V	–	15	200	mV
V_{Rload}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	–	15	80	mV
I_Q	Quiescent Current	–	–	3	6	mA
ΔI_Q	Quiescent Current Change	12V ≤ V_{IN} ≤ 23V	–	–	**1.5**	mA
		1mA ≤ I_{OUT} ≤ 40mA	–	–	**0.1**	
PSRR	Ripple Rejection	f = 120Hz, 10V ≤ V_{IN} ≤ 21V	41	48	–	dB
V_{Drop}	Dropout Voltage	I_{OUT} = 40mA	–	1.7	–	V
		I_{OUT} = 100mA	–	1.8	–	
N_O	Output Noise Voltage	10Hz ≤ f ≤ 100kHz (Note 4)	–	60	–	μV
$\Delta V_{out}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	–	0.8	–	mV/℃
$(\Delta V_{out}/V_{out})/\Delta T$			–	84	–	ppm/℃
θ_{Jc}	Thermal Resistance	SOT-89		28.3		℃/W
		TO-92		40		℃/W

XH78L12

(@ V_{IN} = 19V, I_{OUT} = 40mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = +25°C, **Bold** typeface applies over -40°C ≤ T_J ≤ +125°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{out}	Output Voltage	–	11.5	12.0	12.5	V
		14.5V ≤ V_{IN} ≤ 27V, 1mA ≤ I_{OUT} ≤ 100mA, P_D ≤ 0.75W	**11.4**	–	**12.6**	
V_{Rline}	Line Regulation	14.5V ≤ V_{IN} ≤ 27V	–	20	250	mV
V_{Rload}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	–	20	100	mV
I_Q	Quiescent Current	–	–	3	6	mA
ΔI_Q	Quiescent Current Change	16V ≤ V_{IN} ≤ 27V	–	–	**1.5**	mA
		1mA ≤ I_{OUT} ≤ 40mA	–	–	**0.1**	
PSRR	Ripple Rejection	f = 120Hz, 15V ≤ V_{IN} ≤ 25V	37	42	–	dB
V_{Drop}	Dropout Voltage	I_{OUT} = 40mA	–	1.7	–	V
		I_{OUT} = 100mA	–	1.8	–	
N_O	Output Noise Voltage	10Hz ≤ f ≤ 100kHz (Note 4)	–	80	–	μV
$\Delta V_{out}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	–	1	–	mV/℃
$(\Delta V_{out}/V_{out})/\Delta T$			–	84	–	ppm/℃
θ_{Jc}	Thermal Resistance	SOT-89		28.3		℃/W
		TO-92		40		℃/W

XH78L15

(@ V_{IN} = 23V, I_{OUT} = 40mA, C_{IN} = 0.33μF, C_{OUT} = 0.1μF, T_J = +25°C, **Bold** typeface applies over -40°C ≤ T_J ≤ +125°C, unless otherwise specified.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{out}	Output Voltage	–	14.4	15.0	15.6	V
		17.5V ≤ V_{IN} ≤ 30V, 1mA ≤ I_{OUT} ≤ 100mA, PD ≤ 0.75W	**14.25**	–	**15.75**	
V_{Rline}	Line Regulation	17.5V ≤ V_{IN} ≤ 30V	–	25	250	mV
V_{Rload}	Load Regulation	1mA ≤ I_{OUT} ≤ 100mA	–	25	150	mV
I_Q	Quiescent Current	–	–	3	6	mA
ΔI_Q	Quiescent Current Change	20V ≤ V_{IN} ≤ 30V	–	–	**1.5**	mA
		1mA ≤ I_{OUT} ≤ 40mA	–	–	**0.1**	
PSRR	Ripple Rejection	f = 120Hz, 18.5V ≤ V_{IN} ≤ 28.5V	34	39	–	dB
V_{Drop}	Dropout Voltage	I_{OUT} = 40mA	–	1.7	–	V
		I_{OUT} = 100mA	–	1.8	–	
N_O	Output Noise Voltage	10Hz ≤ f ≤ 100kHz (Note 4)	–	90	–	μV
$\Delta V_{out}/\Delta T$	Output Voltage Temperature Coefficient	I_{OUT} = 5mA	–	1.25	–	mV/℃
$(\Delta V_{out}/V_{out})/\Delta T$			–	84	–	ppm/℃
θ_{Jc}	Thermal Resistance	SOT-89	–	28.3	–	℃/W
		TO-92		40		℃/W

Performance Characteristics

Output Voltage vs. Input Voltage
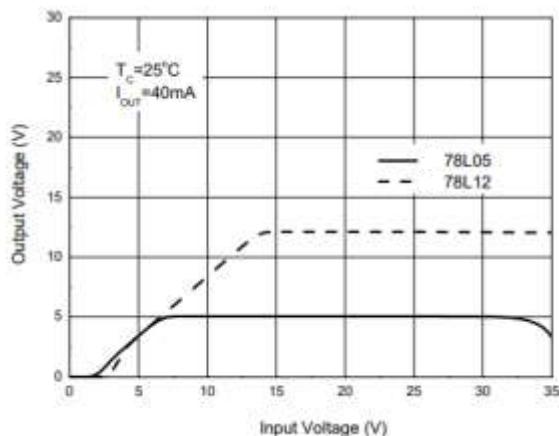
Output Voltage vs. Case Temperature
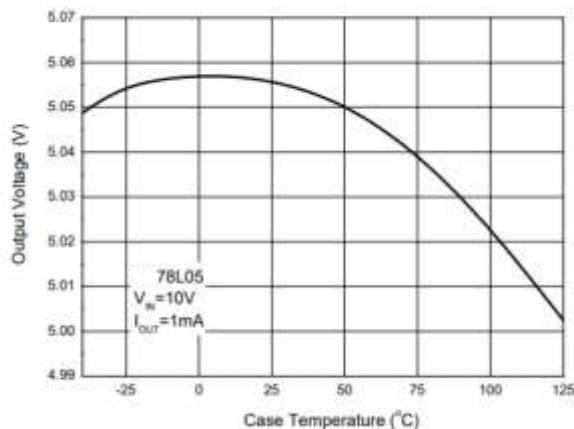
### Over Temperature Protection
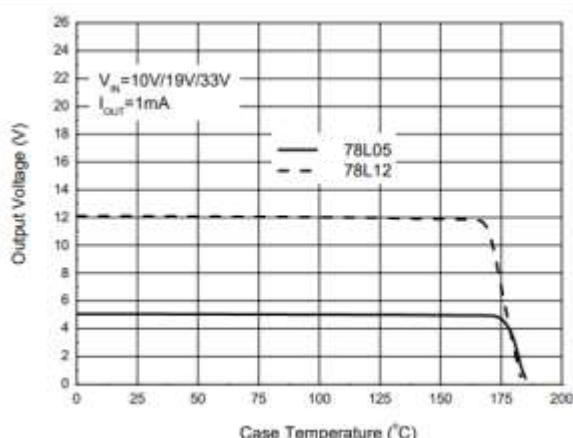
### Dropout Voltage vs. Case Temperature
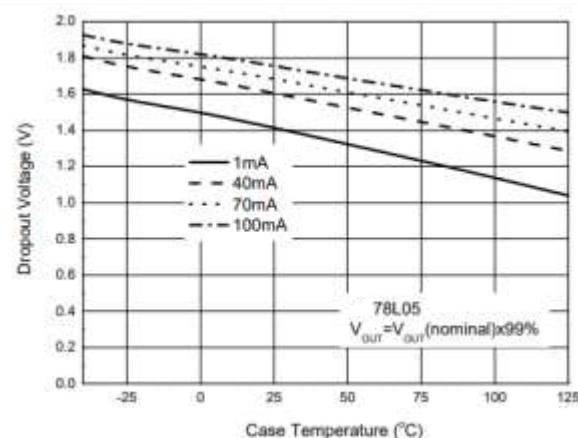
### Output Voltage vs. Output Current
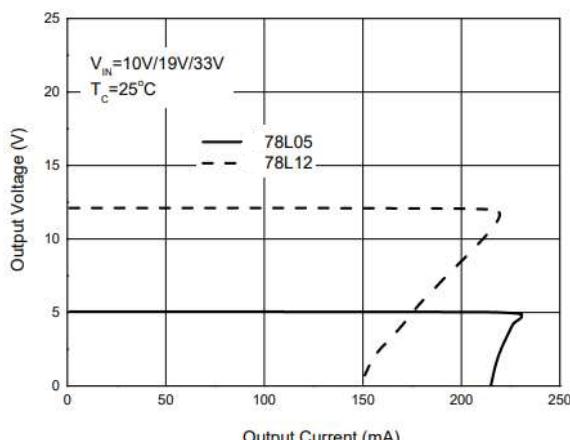
Quiescent Current vs. Case Temperature
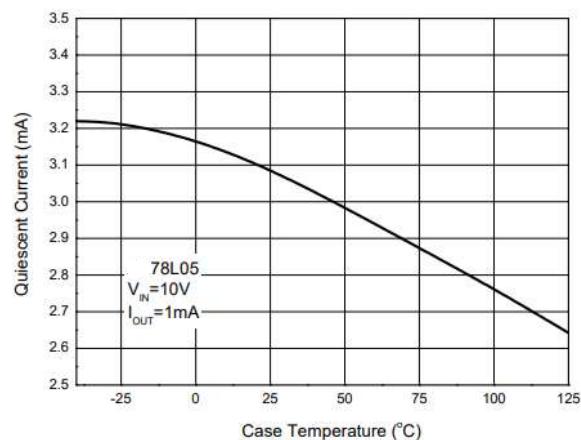
**Power Dissipation vs. Case Temperature**
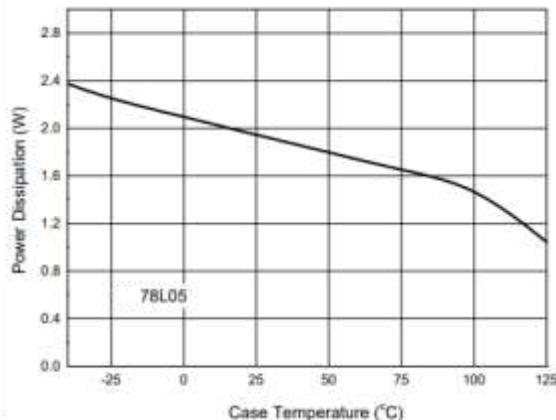
PSRR vs. Frequency
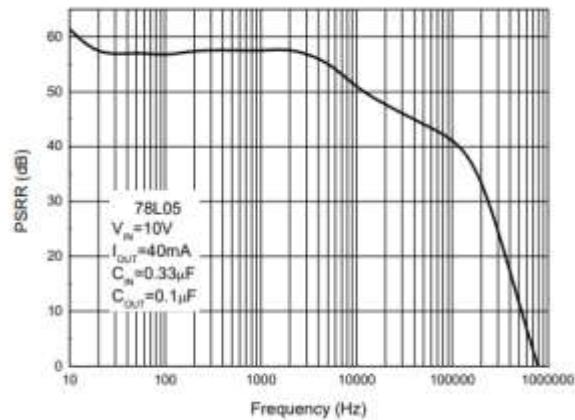
Line Transient

(Conditions: I_{OUT}=40mA, C_{IN}=0.33μF, C_{OUT}=0.1μF)
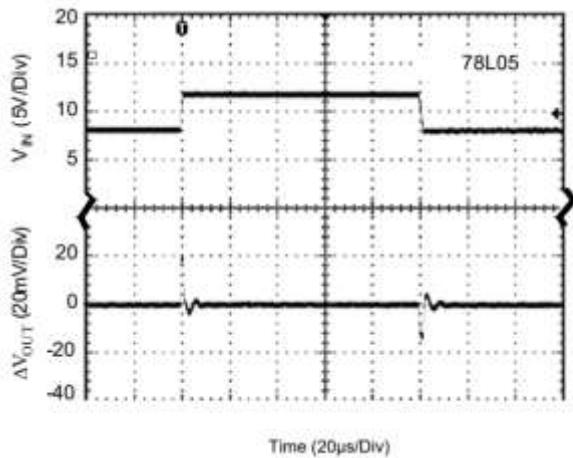
Load Transient

(Conditions: V_{IN}=10V, C_{IN}=0.33μF, C_{OUT}=0.1μF)
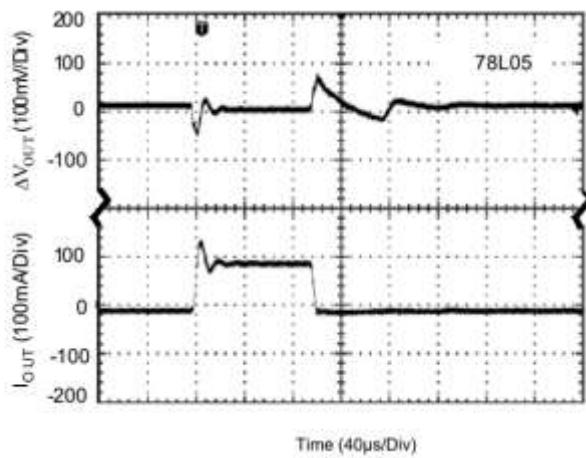
Ordering Information

Package	Temperature Range	Part Number Green	Marking ID Green	Packing
SOT-89	-40 to 125°C	XH78L05RTR-G1	RLE	1000/Tape & Reel
		XH78L05ARTR-G1	RLA	1000/Tape & Reel
		XH78L06RTR-G1	RLO	1000/Tape & Reel
		XH78L08RTR-G1	RLP	1000/Tape & Reel
		XH78L09RTR-G1	RLQ	1000/Tape & Reel
		XH78L12RTR-G1	RLF	1000/Tape & Reel
		XH78L15RTR-G1	RLG	1000/Tape & Reel
TO-92	-40 to 125°C	XH78L05ZTR-G1	78L05Z-G1	2000/Tape & Reel
		XH78L05Z-G1	78L05Z-G1	Bulk
		XH78L05AZTR-G1	78L05AZ-G1	2000/Tape & Reel
		XH78L05AZ-G1	78L05AZ-G1	Bulk
		XH78L06ZTR-G1	78L06Z-G1	2000/Tape & Reel
		XH78L06Z-G1	78L06Z-G1	Bulk
		XH78L08ZTR-G1	78L08Z-G1	2000/Tape & Reel
		XH78L08Z-G1	78L08Z-G1	Bulk
		XH78L09ZTR-G1	78L09Z-G1	2000/Tape & Reel
		XH78L09Z-G1	78L09Z-G1	Bulk
		XH78L12ZTR-G1	78L12Z-G1	2000/Tape & Reel
		XH78L12Z-G1	78L12Z-G1	Bulk
		XH78L15ZTR-G1	78L15Z-G1	2000/Tape & Reel
		XH78L15Z-G1	78L15Z-G1	Bulk

Marking Information

（1）SOT-89

（Top View）

（for XH78L05ATR-G1、XH78L05RTR-G1、

XH78L12RTR-G1、XH78L15RTR-G1）

(See Ordering Information)

Frist Line: Mark ID

Second line：Date Code

Y: Year

W: Work Week of Molding
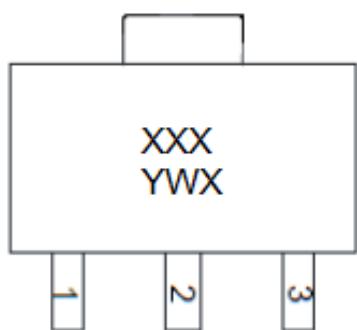
X: Internal Code

（2）SOT-89

（Top View）

（ for XH78L06RTR-G1 、 XH78L08RTR-G1、XH78L09RTR-G1）


(See Ordering Information)

Frist Line: Mark ID

Second line：Date Code

W: Work Week of Molding

X: Internal Code

（3）TO-92

（Top View）

(See Ordering Information)

Frist Line: Mark ID

Second line ： Date Code

WW: Work Week of Molding

XX: Internal Code

Package Outline Dimensions

(1) Package Type:TO-92 (Bulk Packing)
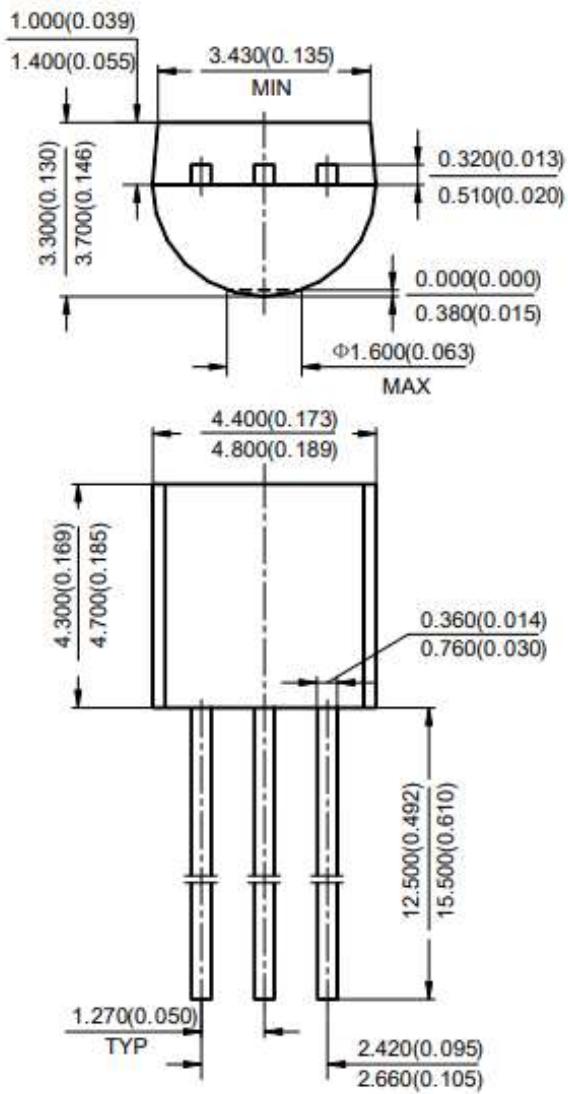
**(2) Package Type:TO-92 (Ammo Packing)**
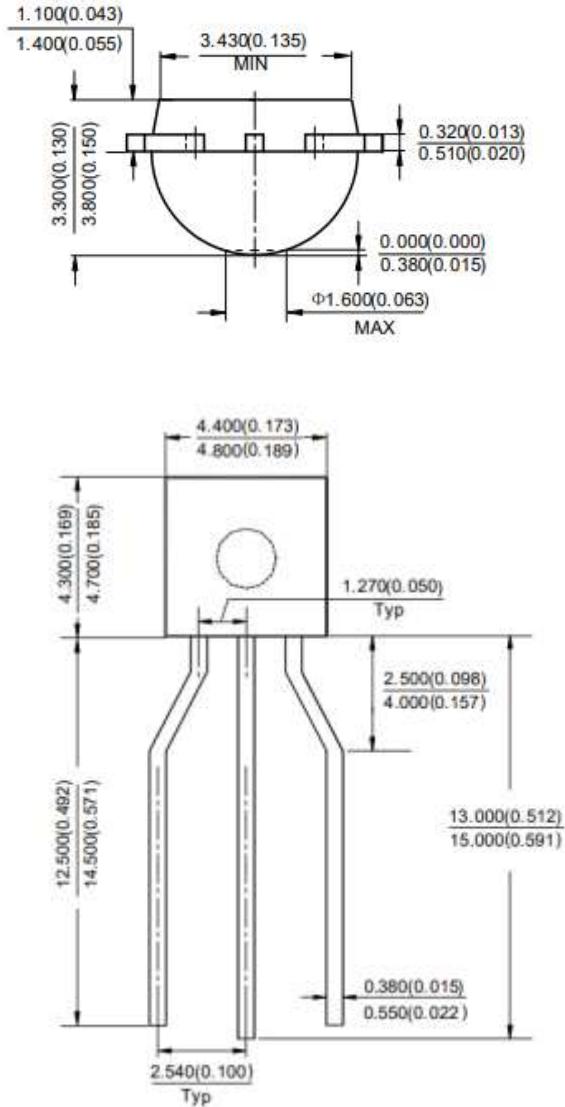
(3) Package Type: SOT-89
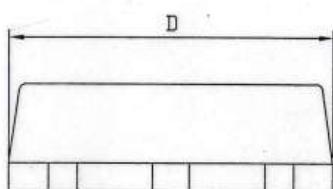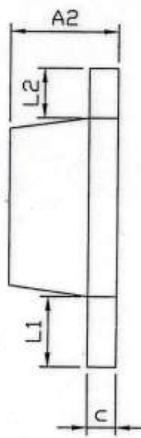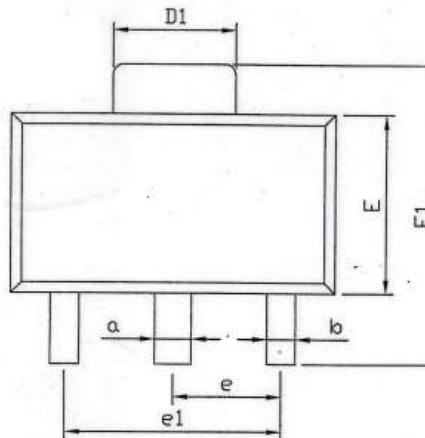
Symbol	Dimensions In Millimeters	
	Min	Max
A2	1.40	1.60
* a	0.45	0.55
b	0.38	0.47
c	0.36	0.46
* D	4.40	4.60
D1	1.60	1.80
E	2.40	2.60
* E1	4.00	4.30
e	1.00	2.00
* e1	2.95	3.05
* L1	0.80	1.00
* L2	0.65	0.75

Tape and Reel Information

Reel Dimensions
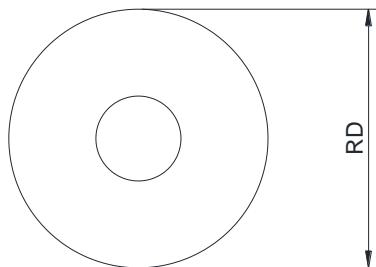
Tape Dimensions
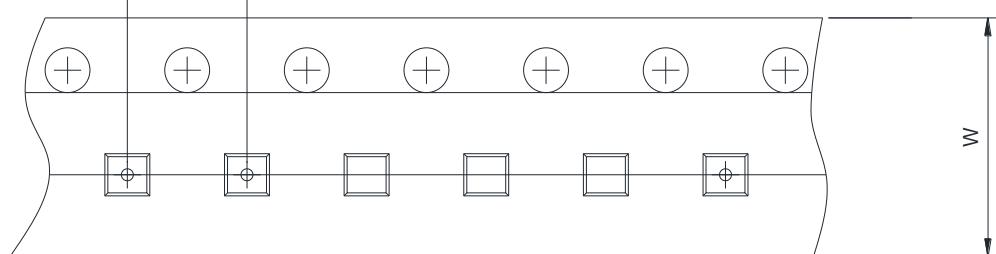
Quadrant Assignments for Pin1 Orientation in Tape

User Direction of Feed
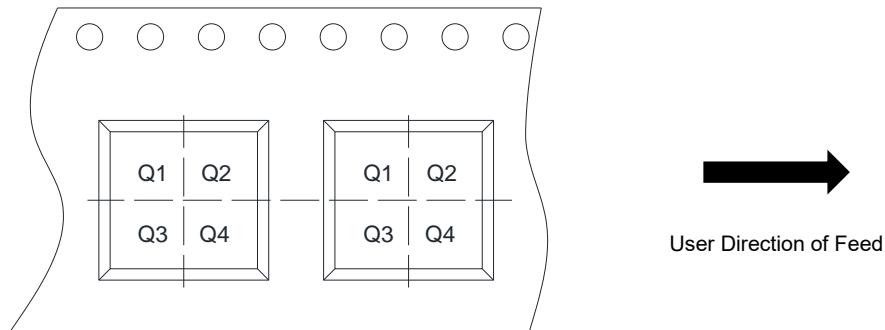
Project		SOT-89	TO-92
RD	Reel Dimension	7inch	仅纸带
W	Overall Width of the Carrier Tape	12mm	18mm
P1	Pitch between Successive Cavity Centers	8mm	12.7mm
Pin1	Pin1 Quadrant	Q3	Q1