

100mA POSITIVE VOLTAGE REGULATOR

78LXX

General Description

The 78LXX 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 78LXX series are available in TO-92 and SOT-89-3 packages.

Features

- Output Current up to 100mA
- Fixed Output Voltages of 5V, 12V, 15V, 18V and 24V
- Output Voltage Accuracy of $\pm 5\%$ over the Full Temperature Range
- Internal Short Circuit Current Limiting
- Internal Thermal Overload Protection
- No External Components
- Output Transistor Safe-area Protection

Applications

- Consumer Electronics
- Microprocessor Power Supply
- Mother Board

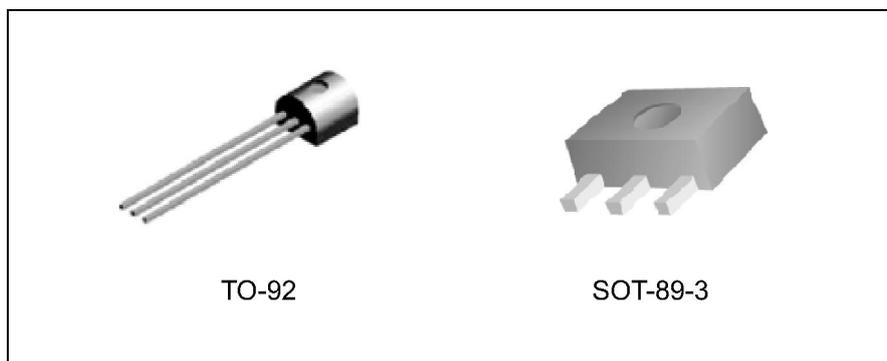


Figure 1. Package Types of 78LXX

Pin Configuration

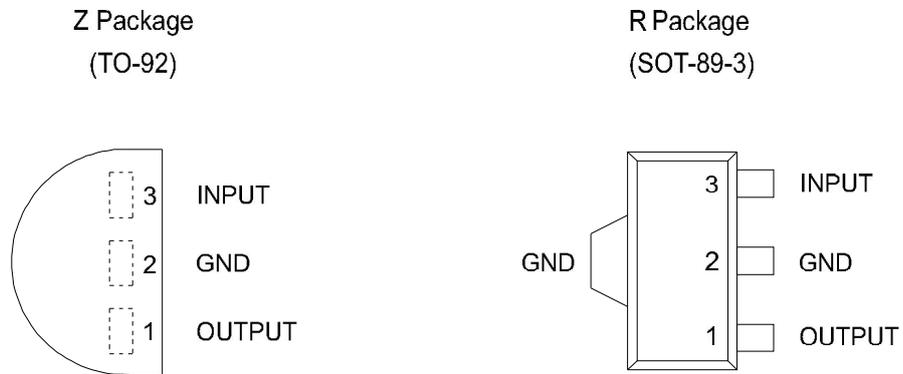


Figure 2. Pin Configuration of 78LXX (Top View)

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Functional Block Diagram

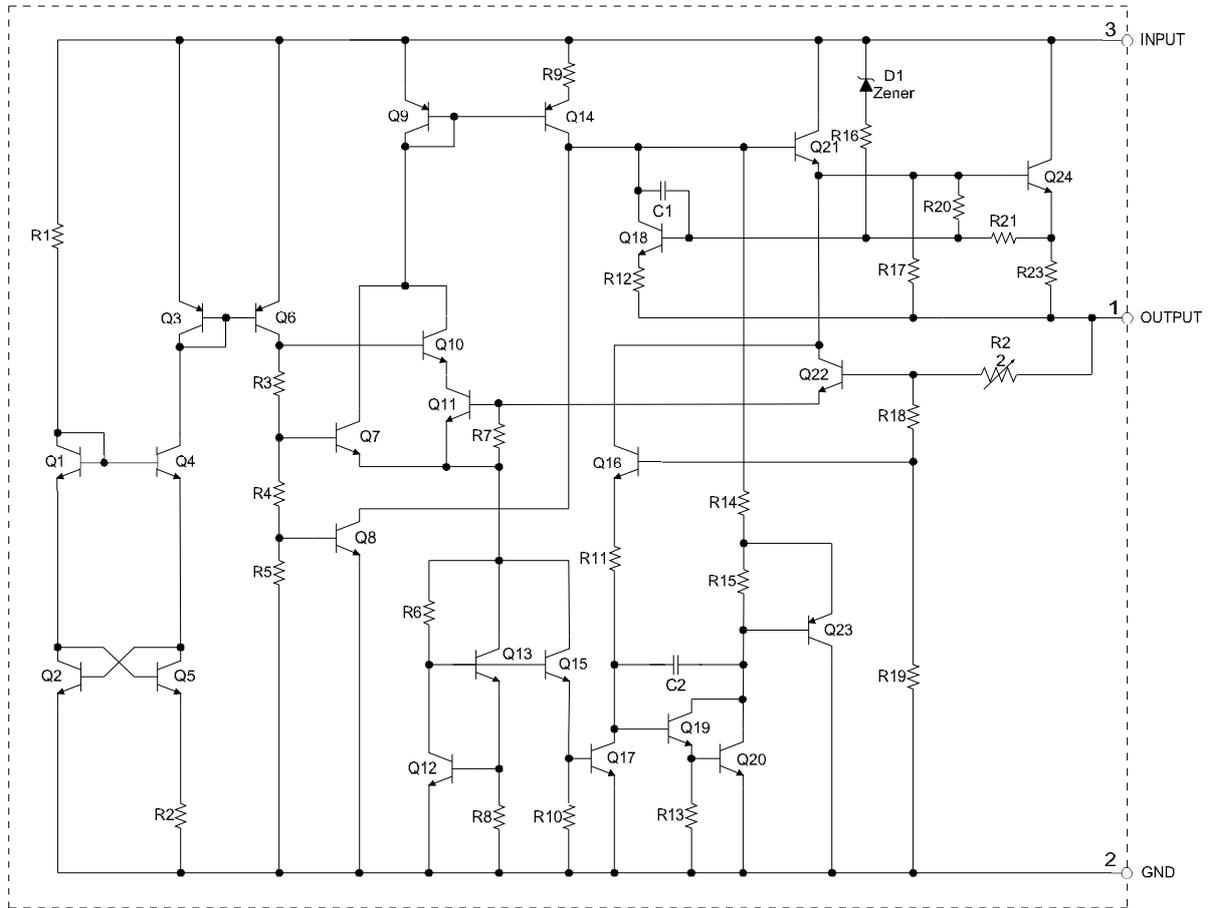


Figure 3. Functional Block Diagram of 78LXX

**100mA POSITIVE VOLTAGE REGULATOR****78LXX****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	30	V
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	°C
Power Dissipation	P_D	750	mW
Storage Temperature Range	T_{STG}	-40 to 150	°C
ESD (Machine Model)	ESD	250	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

Parameter	Symbol	Min	Max	Unit
Operating Junction Temperature Range	T_J	-40	125	°C

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Electrical Characteristics

78L05 ($V_{IN}=10V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, **Bold** typeface applies over $-40^\circ C \leq T_J \leq 125^\circ C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		4.8	5.0	5.2	V
		$7V \leq V_{IN} \leq 20V$, $1mA \leq I_{OUT} \leq 100mA$, $P_D \leq 0.75W$	4.75		5.25	
Line Regulation	V_{RLINE}	$7V \leq V_{IN} \leq 20V$		8	150	mV
Load Regulation	V_{RLOAD}	$1mA \leq I_{OUT} \leq 100mA$		10	60	mV
Quiescent Current	I_Q			3	5.5	mA
Quiescent Current Change	ΔI_Q	$8V \leq V_{IN} \leq 20V$			1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$			0.1	
Ripple Rejection	PSRR	$f=120Hz$, $8V \leq V_{IN} \leq 18V$	47	62		dB
Dropout Voltage	V_{DROP}	$I_{OUT}=40mA$		1.7		V
		$I_{OUT}=100mA$		1.8		
Output Noise Voltage	N_O	$10Hz \leq f \leq 100kHz$ (Note 2)		40		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		0.42		$mV/^\circ C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/ $^\circ C$

Note 2: 0.01 μF minimum load capacitance is recommended to limit high frequency noise.

78L12 ($V_{IN}=19V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, **Bold** typeface applies over $-40^\circ C \leq T_J \leq 125^\circ C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		11.5	12.0	12.5	V
		$14.5V \leq V_{IN} \leq 27V$, $1mA \leq I_{OUT} \leq 100mA$, $P_D \leq 0.75W$	11.4		12.6	
Line Regulation	V_{RLINE}	$14.5V \leq V_{IN} \leq 27V$		20	250	mV
Load Regulation	V_{RLOAD}	$1mA \leq I_{OUT} \leq 100mA$		20	100	mV
Quiescent Current	I_Q			3	6	mA
Quiescent Current Change	ΔI_Q	$16V \leq V_{IN} \leq 27V$			1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$			0.1	
Ripple Rejection	PSRR	$f=120Hz$, $15V \leq V_{IN} \leq 25V$	37	42		dB
Dropout Voltage	V_{DROP}	$I_{OUT}=40mA$		1.7		V
		$I_{OUT}=100mA$		1.8		
Output Noise Voltage	N_O	$10Hz \leq f \leq 100kHz$ (Note 2)		80		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		1		$mV/^\circ C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/ $^\circ C$

Note 2: 0.01 μF minimum load capacitance is recommended to limit high frequency noise.

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Electrical Characteristics (Continued)

78L15 ($V_{IN}=23V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, **Bold** typeface applies over $-40^\circ C \leq T_J \leq 125^\circ C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		14.4	15.0	15.6	V
		$17.5V \leq V_{IN} \leq 30V$, $1mA \leq I_{OUT} \leq 100mA$, $P_D \leq 0.75W$	14.25		15.75	
Line Regulation	V_{RLINE}	$17.5V \leq V_{IN} \leq 30V$		25	250	mV
Load Regulation	V_{RLOAD}	$1mA \leq I_{OUT} \leq 100mA$		25	150	mV
Quiescent Current	I_Q			3	6	mA
Quiescent Current Change	ΔI_Q	$20V \leq V_{IN} \leq 30V$			1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$			0.1	
Ripple Rejection	PSRR	$f=120Hz$, $18.5V \leq V_{IN} \leq 28.5V$	34	39		dB
Dropout Voltage	V_{DROP}	$I_{OUT}=40mA$		1.7		V
		$I_{OUT}=100mA$		1.8		
Output Noise Voltage	N_O	$10Hz \leq f \leq 100kHz$ (Note 2)		90		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		1.25		$mV/^\circ C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/ $^\circ C$

Note 2: 0.01 μF minimum load capacitance is recommended to limit high frequency noise.

78L18 ($V_{IN}=27V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, **Bold** typeface applies over $-40^\circ C \leq T_J \leq 125^\circ C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		17.3	18.0	18.7	V
		$22V \leq V_{IN} \leq 33V$, $1mA \leq I_{OUT} \leq 100mA$, $P_D \leq 0.75W$	17.1		18.9	
Line Regulation	V_{RLINE}	$22V \leq V_{IN} \leq 33V$		30	300	mV
Load Regulation	V_{RLOAD}	$1mA \leq I_{OUT} \leq 100mA$		30	170	mV
Quiescent Current	I_Q			3	6	mA
Quiescent Current Change	ΔI_Q	$23V \leq V_{IN} \leq 33V$			1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$			0.1	
Ripple Rejection	PSRR	$f=120Hz$, $23V \leq V_{IN} \leq 33V$	33	38		dB
Dropout Voltage	V_{DROP}	$I_{OUT}=40mA$		1.7		V
		$I_{OUT}=100mA$		1.8		
Output Noise Voltage	N_O	$10Hz \leq f \leq 100kHz$ (Note 2)		150		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		1.5		$mV/^\circ C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/ $^\circ C$

Note 2: 0.01 μF minimum load capacitance is recommended to limit high frequency noise.

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Electrical Characteristics (Continued)

78L24 ($V_{IN}=33V$, $I_{OUT}=40mA$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_J=25^\circ C$, **Bold** typeface applies over $-40^\circ C \leq T_J \leq 125^\circ C$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V_{OUT}		23	24.0	25	V
		$27V \leq V_{IN} \leq 36V$, $1mA \leq I_{OUT} \leq 100mA$, $P_D \leq 0.75W$	22.8		25.2	
Line Regulation	V_{RLINE}	$27V \leq V_{IN} \leq 36V$		50	300	mV
Load Regulation	V_{RLOAD}	$1mA \leq I_{OUT} \leq 100mA$		40	200	mV
Quiescent Current	I_Q			3	6	mA
Quiescent Current Change	ΔI_Q	$28V \leq V_{IN} \leq 36V$			1.5	mA
		$1mA \leq I_{OUT} \leq 40mA$			0.1	
Ripple Rejection	PSRR	$f=120Hz$, $29V \leq V_{IN} \leq 35V$	31	37		dB
Dropout Voltage	V_{DROP}	$I_{OUT}=40mA$		1.7		V
		$I_{OUT}=100mA$		1.8		
Output Noise Voltage	N_O	$10Hz \leq f \leq 100kHz$ (Note 2)		200		μV
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T$	$I_{OUT}=5mA$		2		$mV/^\circ C$
	$(\Delta V_{OUT}/V_{OUT})/\Delta T$			84		ppm/ $^\circ C$

Note 2: 0.01 μF minimum load capacitance is recommended to limit high frequency noise.

Typical Performance Characteristics

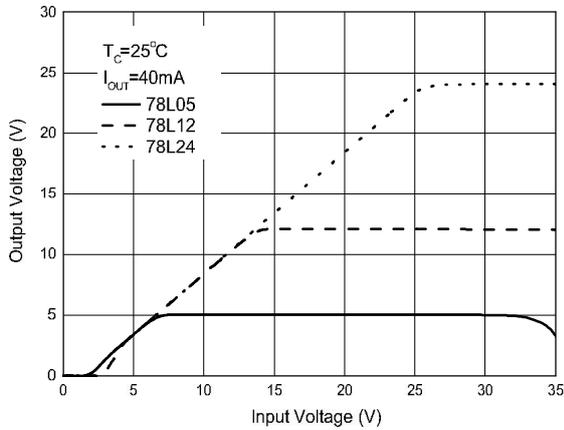


Figure 4. Output Voltage vs. Input Voltage

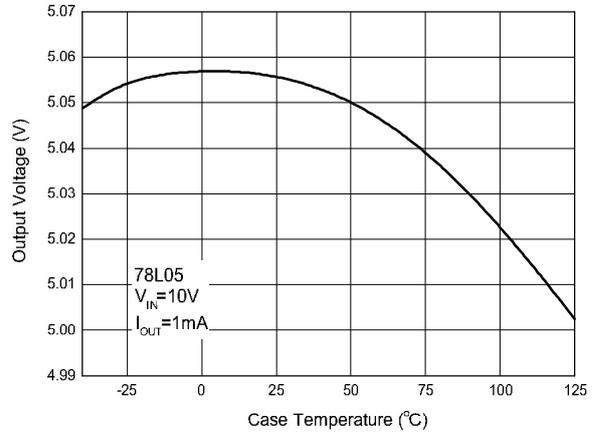


Figure 5. Output Voltage vs. Case Temperature

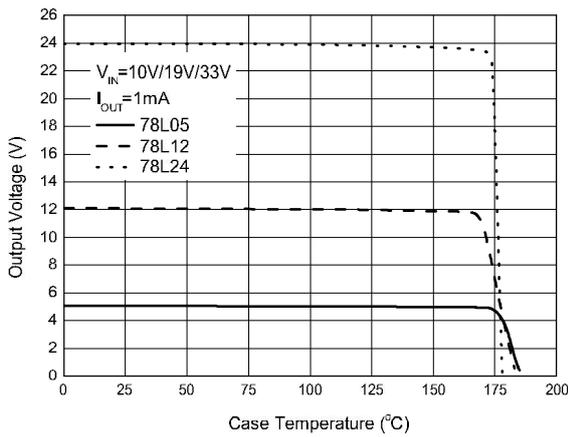


Figure 6. Over Temperature Protection

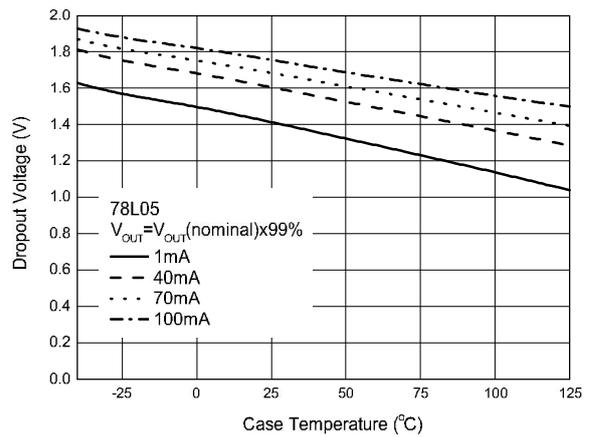


Figure 7. Dropout Voltage vs. Case Temperature

Typical Performance Characteristics (Continued)

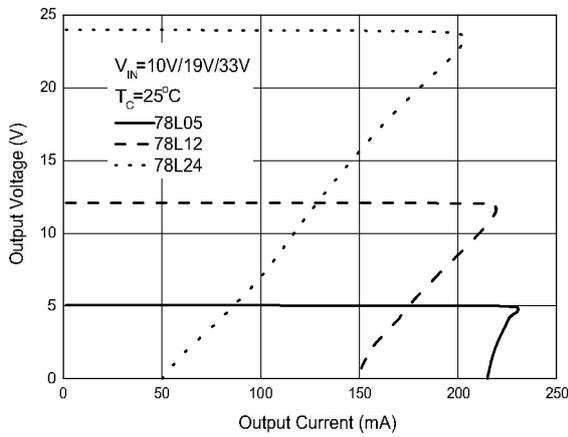


Figure 8. Output Voltage vs. Output Current

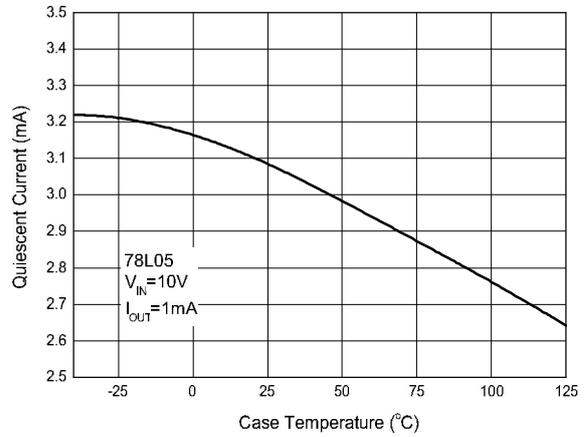


Figure 9. Quiescent Current vs. Case Temperature

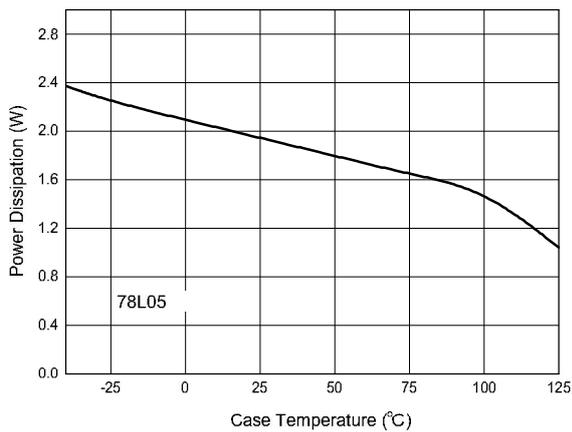


Figure 10. Power Dissipation vs. Case Temperature

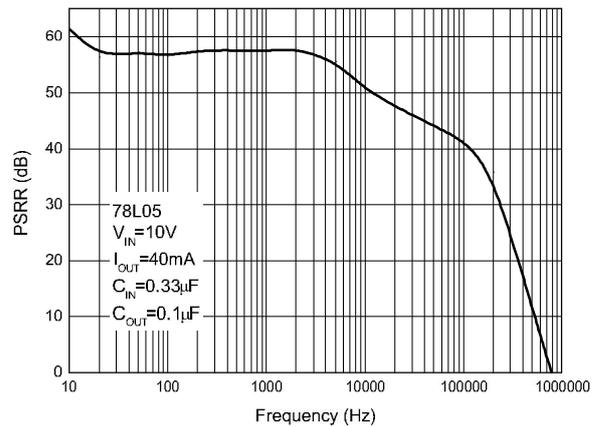


Figure 11. PSRR vs. Frequency

Typical Performance Characteristics (Continued)

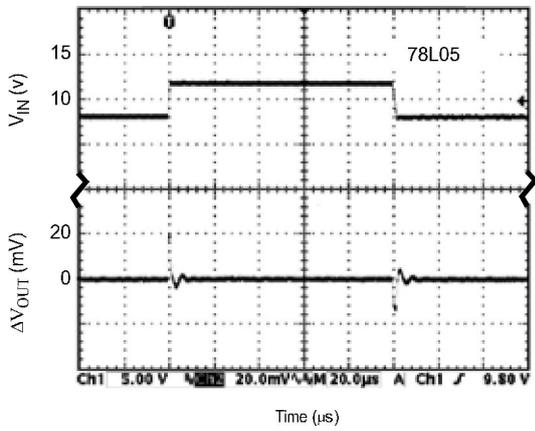


Figure 12. Line Transient
 (Conditions: $I_{OUT}=40\text{mA}$, $C_{IN}=0.33\mu\text{F}$, $C_{OUT}=0.1\mu\text{F}$)

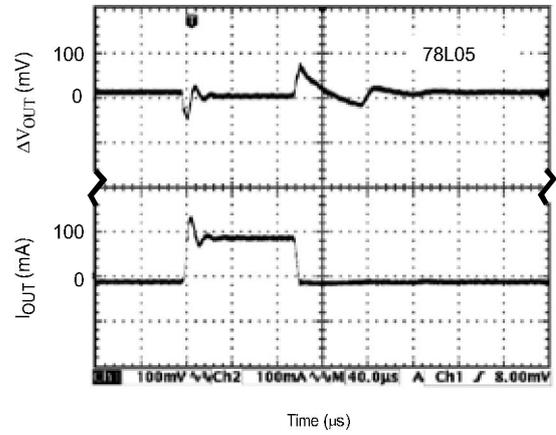


Figure 13. Load Transient
 (Conditions: $V_{IN}=10\text{V}$, $C_{IN}=0.33\mu\text{F}$, $C_{OUT}=0.1\mu\text{F}$)

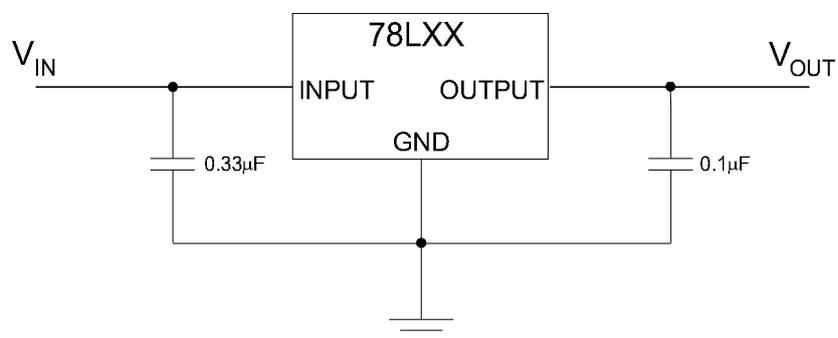
Typical Application

Figure 14. Typical Application of 78LXX

100mA POSITIVE VOLTAGE REGULATOR

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Mechanical Dimensions

TO-92

Unit: mm(inch)

