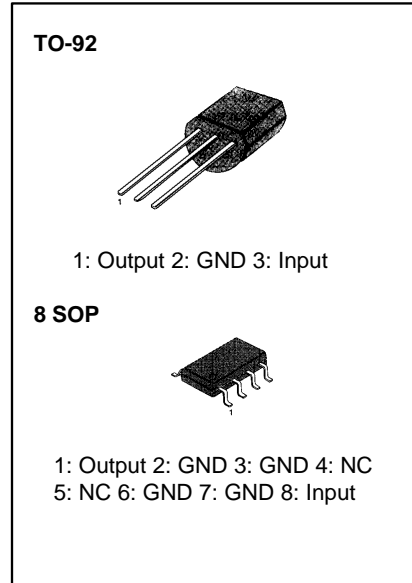


**3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS**

The MC78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for application that required supply up to 100mA.

**FEATURES**

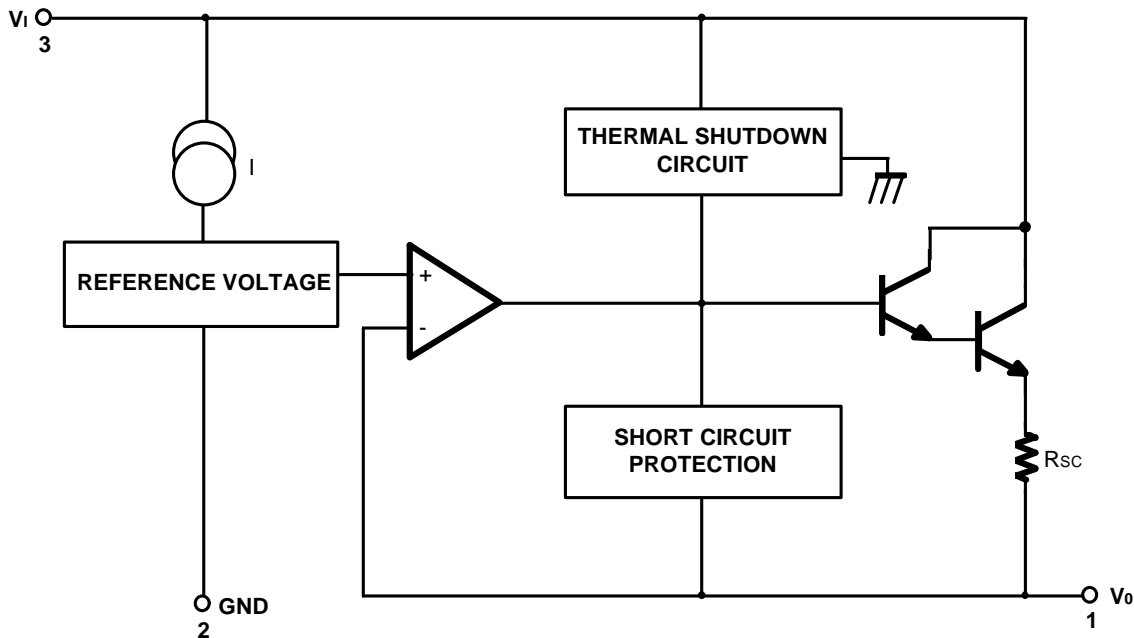
- Maximum Output Current of 100mA
- Output Voltage of 5V, 6V, 8V, 9V, 10V, 12V, 15V, 18V and 24V
- Thermal Overload Protection
- Short Circuit Current Limiting
- Output Voltage Offered in  $\pm 5\%$  Tolerance



**ORDERING INFORMATION**

Device	Package	Operating Temperature
MC78LXXACP (LM78LXXACZ) (KA78LXXAZ)	TO-92	- 45 ~ + 125°C
MC78LXXACD (KA78LXXAD)	8 SOP	0 ~ + 125°C

**BLOCK DIAGRAM**



**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

Characteristic	Symbol	Value	Unit
Input Voltage (for $V_O = 5\text{V}, 8\text{V}$ )	$V_I$	30	V
(for $V_O = 12\text{V}, 15\text{V}$ )		35	V
Operating Junction Temperature Range	$T_J$	0 ~ +150	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{STG}}$	-65 ~ +150	$^\circ\text{C}$

**LM78L05 ELECTRICAL CHARACTERISTICS**

( $V_I = 10\text{V}$ ,  $I_O = 40\text{mA}$ ,  $0^\circ\text{C} \leq T_J \leq 125^\circ\text{C}$ ,  $C_I = 0.33\ \mu\text{F}$ ,  $C_O = 0.1\ \mu\text{F}$ , unless otherwise specified. (Note 1))

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage	$V_O$	$T_J = 25^\circ\text{C}$	4.8	5.0	5.2	V
Line Regulation	$\Delta V_O$	$T_J = 25^\circ\text{C}$	$7\text{V} \leq V_I \leq 20\text{V}$	8	150	mV
			$8\text{V} \leq V_I \leq 20\text{V}$	6	100	mV
Load Regulation	$\Delta V_O$	$T_J = 25^\circ\text{C}$	$1\text{mA} \leq I_O \leq 100\text{mA}$	11	60	mV
			$1\text{mA} \leq I_O \leq 40\text{mA}$	5.0	30	mV
Output Voltage	$V_O$	$7\text{V} \leq V_I \leq 0\text{V}$ $7\text{V} \leq V_I \leq V_{\text{MAX}}$ (Note 2)	$1\text{mA} \leq I_O \leq 40\text{mA}$		5.25	V
			$1\text{mA} \leq I_O \leq 70\text{mA}$	4.75	5.25	V
Quiescent Current	$I_Q$	$T_J = 25^\circ\text{C}$		2.0	5.5	mA
Quiescent Current Change	with line	$\Delta I_Q$	$8\text{V} \leq V_I \leq 20\text{V}$		1.5	mA
	with load	$\Delta I_Q$	$1\text{mA} \leq I_O \leq 40\text{mA}$		0.1	mA
Output Noise Voltage	$V_N$	$T_A = 25^\circ\text{C}$ , $10\text{Hz} \leq f \leq 100\text{kHz}$		40		$\mu\text{V}/V_O$
Temperature Coefficient of $V_O$	$\Delta V_O/\Delta T$	$I_O = 5\text{mA}$		-0.65		$\text{mV}/^\circ\text{C}$
Ripple Rejection	RR	$f = 120\text{Hz}$ , $8\text{V} \leq V_I \leq 18\text{V}$ , $T_J = 25^\circ\text{C}$	41	80		dB
Dropout Voltage	$V_D$	$T_J = 25^\circ\text{C}$		1.7		V

**LM78L06 ELECTRICAL CHARACTERISTICS**(V<sub>I</sub> = 12V, I<sub>O</sub> = 40mA, 0°C ≤ T<sub>J</sub> ≤ 125°C, C<sub>I</sub> = 0.33μF, C<sub>O</sub> = 0.1μF, unless otherwise specified. (Note 1))

Characteristic		Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage		V <sub>O</sub>	T <sub>J</sub> = 25°C	5.75	6.0	6.25	V
Line Regulation		ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	8.5V < V <sub>I</sub> < 20V	64	175	mV
				9V ≥ V <sub>I</sub> ≥ 20V	54	125	mV
Load Regulation		ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	1mA < I <sub>O</sub> < 100mA	12.8	80	mV
				1mA < I <sub>O</sub> < 70mA	5.8	40	mV
Output Voltage		V <sub>O</sub>	8.5 < V <sub>I</sub> < 20V, 1mA < I <sub>O</sub> < 40mA	5.7		6.3	V
			8.5 < V <sub>I</sub> < V <sub>MAX</sub> (Note), 1mA < I <sub>O</sub> < 70mA	5.7		6.3	
Quiescent Current		I <sub>Q</sub>	T <sub>J</sub> = 25°C		3.9	6.0	mA
			T <sub>J</sub> = 125°C			5.5	
Quiescent Current Change	with line	ΔI <sub>Q</sub>	9 < V <sub>I</sub> < 20V			1.5	mA
	with load	ΔI <sub>Q</sub>	1mA < I <sub>O</sub> < 40mA			0.1	
Output Noise Voltage		V <sub>N</sub>	T <sub>A</sub> = 25°C, 10Hz < f < 100KHz		40		μV/V <sub>O</sub>
Temperature Coefficient of V <sub>O</sub>		ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5mA		0.75		mV/°C
Ripple Rejection		RR	f = 120Hz, 10V < V <sub>I</sub> < 20V, T <sub>J</sub> = 25°C	40	46		dB
Dropout Voltage		V <sub>D</sub>	T <sub>J</sub> = 25°C		1.7		V

**LM78L08 ELECTRICAL CHARACTERISTICS**(V<sub>I</sub> = 14V, I<sub>O</sub> = 40mA, 0°C ≤ T<sub>J</sub> ≤ 125°C, C<sub>I</sub> = 0.33 μF, C<sub>O</sub> = 0.1μF, unless otherwise specified. (Note 1))

Characteristic		Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage		V <sub>O</sub>	T <sub>J</sub> = 25°C	7.7	8.0	8.3	V
Line Regulation		ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	10.5V ≤ V <sub>I</sub> ≤ 23V	10	175	mV
				11V ≤ V <sub>I</sub> ≤ 23V	8	125	mV
Load Regulation		ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	1mA ≤ I <sub>O</sub> ≤ 100mA	15	80	mV
				1mA ≤ I <sub>O</sub> ≤ 40mA	8.0	40	mV
Output Voltage		V <sub>O</sub>	10.5V ≤ V <sub>I</sub> ≤ 23V	7.6		8.4	V
			10.5V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> (Note 2)	7.6		8.4	V
Quiescent Current		I <sub>Q</sub>	T <sub>J</sub> = 25°C		2.0	5.5	mA
Quiescent Current Change	with line	ΔI <sub>Q</sub>	11V ≤ V <sub>I</sub> ≤ 23V			1.5	mA
	with load	ΔI <sub>Q</sub>	1mA ≤ I <sub>O</sub> ≤ 40mA			0.1	
Output Noise Voltage		V <sub>N</sub>	T <sub>A</sub> = 25°C, 10Hz ≤ f ≤ 100KHz		60		μV/V <sub>O</sub>
Temperature Coefficient of V <sub>O</sub>		ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5mA		-0.8		mV/°C
Ripple Rejection		RR	f = 120Hz, 11V ≤ V <sub>I</sub> ≤ 21V, T <sub>J</sub> = 25°C	39	70		dB
Dropout Voltage		V <sub>D</sub>	T <sub>J</sub> = 25°C		1.7		V

**LM78L09 ELECTRICAL CHARACTERISTICS**(V<sub>I</sub> = 15V, I<sub>O</sub> = 40mA, 0°C ≤ T<sub>J</sub> ≤ 125°C, C<sub>I</sub> = 0.33 μF, C<sub>O</sub> = 0.1μF, unless otherwise specified. (Note 1))

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = 25°C	8.64	9.0	9.36	V	
Line Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	11.5V ≤ V <sub>I</sub> ≤ 24V		90	200	mV
			13V ≤ V <sub>I</sub> ≤ 24V		100	150	mV
Load Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	1mA ≤ I <sub>O</sub> ≤ 100mA		20	90	mV
			1mA ≤ I <sub>O</sub> ≤ 40mA		10	45	mV
Output Voltage	V <sub>O</sub>	11.5V ≤ V <sub>I</sub> ≤ 24V	1mA ≤ I <sub>O</sub> ≤ 40mA	8.55		9.45	V
		11.5V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> (Note 2)	1mA ≤ I <sub>O</sub> ≤ 70mA	8.55		9.45	V
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> = 25°C		2.1	6.0	mA	
Quiescent Current Change	with line	ΔI <sub>Q</sub>	13V ≤ V <sub>I</sub> ≤ 24V			1.5	mA
	with load	ΔI <sub>Q</sub>	1mA ≤ I <sub>O</sub> ≤ 40mA			0.1	mA
Output Noise Voltage	V <sub>N</sub>	T <sub>A</sub> = 25°C, 10Hz ≤ f ≤ 100KHz		70		μV/V <sub>O</sub>	
Temperature Coefficient of V <sub>O</sub>	ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5mA		-0.9		mV/°C	
Ripple Rejection	RR	f = 120Hz, 12V ≤ V <sub>I</sub> ≤ 22V, T <sub>J</sub> = 25°C	38	44		dB	
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> = 25°C		1.7		V	

**LM78L10 ELECTRICAL CHARACTERISTICS**(V<sub>I</sub> = 16V, I<sub>O</sub> = 40mA, 0°C < T<sub>J</sub> < 125°C, C<sub>I</sub> = 0.33 μF, C<sub>O</sub> = 0.1μF, unless otherwise specified. (Note 1))

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = 25°C	9.6	10.0	10.4	V	
Line Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	12.5 < V <sub>I</sub> < 25V		100	220	mV
			14V ≥ V <sub>I</sub> ≥ 25V		100	170	mV
Load Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	1mA < I <sub>O</sub> < 100mA		20	94	mV
			1mA < I <sub>O</sub> < 70mA		10	47	mV
Output Voltage	V <sub>O</sub>	12.5 < V <sub>I</sub> < 25V, 1mA < I <sub>O</sub> < 40mA	9.5		10.5	V	
		12.5 < V <sub>I</sub> < V <sub>MAX</sub> (Note), 1mA < I <sub>O</sub> < 70mA	9.5		10.5		
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> = 25°C		4.2	6.5	mA	
		T <sub>J</sub> = 125°C			6.0		
Quiescent Current Change	with line	ΔI <sub>Q</sub>	12.5 < V <sub>I</sub> < 25V			mA	
	with load	ΔI <sub>Q</sub>	1mA < I <sub>O</sub> < 40mA				0.1
Output Noise Voltage	V <sub>N</sub>	T <sub>A</sub> = 25°C, 10Hz < f < 100KHz		74		μV/V <sub>O</sub>	
Temperature Coefficient of V <sub>O</sub>	ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5mA		0.95		mV/°C	
Ripple Rejection	RR	f = 120Hz, 15V < V <sub>I</sub> < 25V, T <sub>J</sub> = 25°C	38	43		dB	
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> = 25°C		1.7		V	

**LM78L12 ELECTRICAL CHARACTERISTICS**(V<sub>I</sub> = 19V, I<sub>O</sub> = 40mA, 0°C ≤ T<sub>J</sub> ≤ 125°C, C<sub>I</sub> = 0.33 μF, C<sub>O</sub> = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = 25°C	11.5	12	12.5	V	
Line Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	14.5V ≤ V <sub>I</sub> ≤ 27V		20	250	mV
			16V ≤ V <sub>I</sub> ≤ 27V		15	200	mV
Load Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	1mA ≤ I <sub>O</sub> ≤ 100mA		20	100	mV
			1mA ≤ I <sub>O</sub> ≤ 40mA		10	50	mV
Output Voltage	V <sub>O</sub>	14.5V ≤ V <sub>I</sub> ≤ 27V	1mA ≤ I <sub>O</sub> ≤ 40mA	11.4		12.6	V
		14.5V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> (Note 2)	1mA ≤ I <sub>O</sub> ≤ 70mA	11.4		12.6	V
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> = 25°C		2.1	6.0	mA	
Quiescent Current Change	with line	ΔI <sub>Q</sub>	16V ≤ V <sub>I</sub> ≤ 27V		1.5	mA	
	with load	ΔI <sub>Q</sub>	1mA ≤ I <sub>O</sub> ≤ 40mA		0.1	mA	
Output Noise Voltage	V <sub>N</sub>	T <sub>A</sub> = 25°C, 10Hz ≤ f ≤ 100KHz		80		μV/V <sub>O</sub>	
Temperature Coefficient of V <sub>O</sub>	ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5mA		-1.0		mV/°C	
Ripple Rejection	RR	f = 120Hz, 15V ≤ V <sub>I</sub> ≤ 25V, T <sub>J</sub> = 25°C	37	65		dB	
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> = 25°C		1.7		V	

**LM78L15 ELECTRICAL CHARACTERISTICS**(V<sub>I</sub> = 23V, I<sub>O</sub> = 40mA, 0°C ≤ T<sub>J</sub> ≤ 125°C, C<sub>I</sub> = 0.33 μF, C<sub>O</sub> = 0.1 μF, unless otherwise specified. (Note 1))

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = 25°C	14.4	15	15.6	V	
Line Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	17.5V ≤ V <sub>I</sub> ≤ 30V		25	300	mV
			20V ≤ V <sub>I</sub> ≤ 30V		20	250	mV
Load Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	1mA ≤ I <sub>O</sub> ≤ 100mA		25	150	mV
			1mA ≤ I <sub>O</sub> ≤ 40mA		12	75	mV
Output Voltage	V <sub>O</sub>	17.5V ≤ V <sub>I</sub> ≤ 30V	1mA ≤ I <sub>O</sub> ≤ 40mA	14.25		15.75	V
		17.5V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> (Note 2)	1mA ≤ I <sub>O</sub> ≤ 70mA	14.25		15.75	V
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> = 25°C		2.1	6.0	mA	
Quiescent Current Change	with line	ΔI <sub>Q</sub>	20V ≤ V <sub>I</sub> ≤ 30V		1.5	mA	
	with load	ΔI <sub>Q</sub>	1mA ≤ I <sub>O</sub> ≤ 40mA		0.1	mA	
Output Noise Voltage	V <sub>N</sub>	T <sub>A</sub> = 25°C, 10Hz ≤ f ≤ 100KHz		90		μV/V <sub>O</sub>	
Temperature Coefficient of V <sub>O</sub>	ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5mA		-1.3		mV/°C	
Ripple Rejection	RR	f = 120Hz, 18.5V ≤ V <sub>I</sub> ≤ 28.5V, T <sub>J</sub> = 25°C	34	60		dB	
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> = 25°C		1.7		V	

**LM78L18 ELECTRICAL CHARACTERISTICS**(V<sub>I</sub> = 27V, I<sub>O</sub> = 40mA, 0°C ≤ T<sub>J</sub> ≤ 125°C, C<sub>I</sub> = 0.33 μF, C<sub>O</sub> = 0.1μF, unless otherwise specified. (Note 1))

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = 25°C	17.3	18	18.7	V	
Line Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	21V ≤ V <sub>I</sub> ≤ 33V		145	300	mV
			22V ≤ V <sub>I</sub> ≤ 33V		135	250	mV
Load Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	1mA ≤ I <sub>O</sub> ≤ 100mA		30	170	mV
			1mA ≤ I <sub>O</sub> ≤ 40mA		15	85	mV
Output Voltage	V <sub>O</sub>	21V ≤ V <sub>I</sub> ≤ 33V	1mA ≤ I <sub>O</sub> ≤ 40mA	17.1		18.9	V
		21V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> (Note 2)	1mA ≤ I <sub>O</sub> ≤ 70mA	17.1		18.9	V
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> = 25°C		2.2	6.0	mA	
Quiescent Current Change	with line	ΔI <sub>Q</sub>	21V ≤ V <sub>I</sub> ≤ 33V		1.5	mA	
	with load	ΔI <sub>Q</sub>	1mA ≤ I <sub>O</sub> ≤ 40mA		0.1	mA	
Output Noise Voltage	V <sub>N</sub>	T <sub>A</sub> = 25°C, 10Hz ≤ f ≤ 100KHz		150		μV/V <sub>O</sub>	
Temperature Coefficient of V <sub>O</sub>	ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5mA		-1.8		mV/°C	
Ripple Rejection	RR	f = 120Hz, 23V ≤ V <sub>I</sub> ≤ 33V, T <sub>J</sub> = 25°C	34	48		dB	
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> = 25°C		1.7		V	

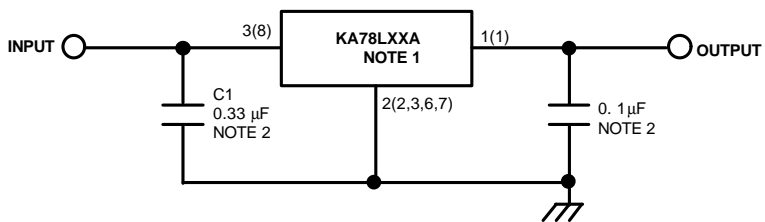
**LM78L24 ELECTRICAL CHARACTERISTICS**(V<sub>I</sub> = 33V, I<sub>O</sub> = 40mA, 0°C ≤ T<sub>J</sub> ≤ 125°C, C<sub>I</sub> = 0.33 μF, C<sub>O</sub> = 0.1μF, unless otherwise specified. (Note 1))

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit	
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = 25°C	23	24	25	V	
Line Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	27V ≤ V <sub>I</sub> ≤ 38V		160	300	mV
			28V ≤ V <sub>I</sub> ≤ 38V		150	250	mV
Load Regulation	ΔV <sub>O</sub>	T <sub>J</sub> = 25°C	1mA ≤ I <sub>O</sub> ≤ 100mA		40	200	mV
			1mA ≤ I <sub>O</sub> ≤ 40mA		20	100	mV
Output Voltage	V <sub>O</sub>	27V ≤ V <sub>I</sub> ≤ 38V	1mA ≤ I <sub>O</sub> ≤ 40mA	22.8		25.2	V
		27V ≤ V <sub>I</sub> ≤ V <sub>MAX</sub> (Note 2)	1mA ≤ I <sub>O</sub> ≤ 70mA	22.8		25.2	V
Quiescent Current	I <sub>Q</sub>	T <sub>J</sub> = 25°C		2.2	6.0	mA	
Quiescent Current Change	with line	ΔI <sub>Q</sub>	28V ≤ V <sub>I</sub> ≤ 38V		1.5	mA	
	with load	ΔI <sub>Q</sub>	1mA ≤ I <sub>O</sub> ≤ 40mA		0.1	mA	
Output Noise Voltage	V <sub>N</sub>	T <sub>A</sub> = 25°C, 10Hz ≤ f ≤ 100KHz		200		μV/V <sub>O</sub>	
Temperature Coefficient of V <sub>O</sub>	ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5mA		-2.0		mV/°C	
Ripple Rejection	RR	f = 120Hz, 28V ≤ V <sub>I</sub> ≤ 38V, T <sub>J</sub> = 25°C	34	45		dB	
Dropout Voltage	V <sub>D</sub>	T <sub>J</sub> = 25°C		1.7		V	

**Notes**

- The maximum steady state usable output current and input voltage are very dependent on the heat sinking and/or lead length of the package. The data above represent pulse test conditions with junction temperature as indicated at the initiation of tests.
- Power dissipation ≤ 0.75W.

TYPICAL APPLICATION



'( )' : 8SOP Type

Notes

- 1. To specify an output voltage, substitute voltage value for "XX".
- 2. Bypass Capacitors are recommend for optimum stability and transient response and should be located as close as possible to the regulator