Monolithic Linear IC

SANYO No.2609B

L78M00T Series

5 to 24V 0.5A 3-Pin Voltage Regulators

Features

- Output voltage: L78M05T: 5V, L78M06T: 6V, L78M07T: 7V, L78M08T: 8V, L78M09T: 9V, L78M10T: 10V, L78M12T: 12V, L78M15T: 15V, L78M18T: 18V, L78M20T: 20V, L78M24T: 24V
- 500mA output
- On-chip thermal protector
- On-chip overcurrent limiter
- On-chip ASO protector
- Small-sized power package TP-3H permitting the equipment to be made compact
- The allowable power dissipation can be increased by being surface-mounted on the board.
- Capable of being mounted in a variety of methods because of various lead forming versions available

[Common to L78M00T series]

Maximum Ratings at Ta=25°C

				unit
Maximum Supply Voltage	V_{CC} max	Pin 1	35	V
Allowable Power Dissipation	Pd max	No fin	1.0	W
Operating Temperature	Topr		-20 to +80	°C
Storage Temperature	Tstg		-40 to +150	°C

[L78M05T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	7.5 to 20	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=10V, I_{OUT}=350mA, See specified Test Circuit.

			min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C	4.8	5.0	5.2	V
Line Regulation	ΔV_{oline}	Tj=25°C, 7V≦V_{IN}≦25V, I_{OUT}=200mA		3.0	50	mV
		Tj=25°C, 8V≦V_{IN}≦20V, I_{OUT}=200mA		1.0	25	mV

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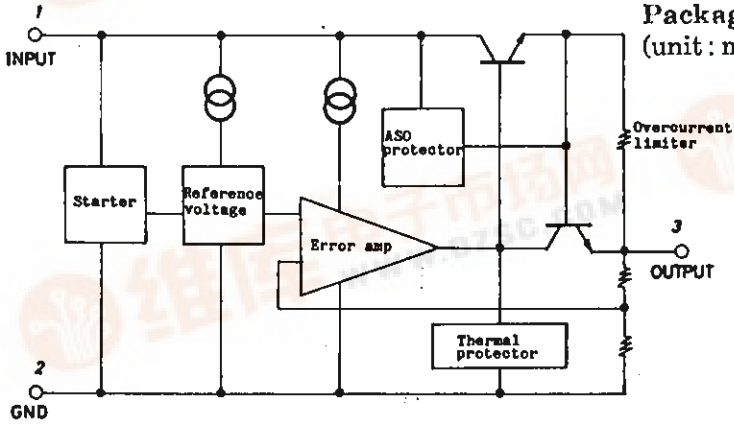
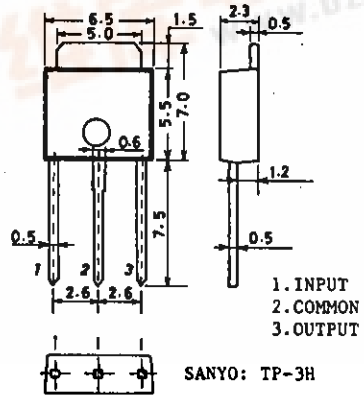
Equivalent Circuit



Package Dimensions 3110

(unit: mm)



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			min	typ	max	unit
Load Regulation	ΔV_{oload}	Tj=25°C,5mA≦I_{OUT}≦500mA			100	mV
		Tj=25°C,5mA≦I_{OUT}≦200mA			50	mV
Output Voltage	V_{OUT}	7V≦V_{IN}≦20V,5mA≦I_{OUT}≦350mA	4.75		5.25	V
Current Dissipation	I_{CC}	Tj=25°C		4.5	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	8V≦V_{IN}≦25V,I_{OUT}=200mA			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA			0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz		40		uV
Ripple Rejection	R_{rej}	f=120Hz, I_{OUT}=100mA	62			dB
		8V≦V_{IN}≦19V, I_{OUT}=300mA, Tj=25°C	62	80		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA		2.0		V
Short Current	I_{OS}	Tj=25°C,V_{IN}=35V,to GND		300		mA
Peak Output Current	I_{op}	Tj=25°C		0.7		A

[L78M06T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	8.5 to 21	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C,V_{IN}=11V,I_{OUT}=350mA, See specified Test Circuit.

			min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C	5.75	6.0	6.25	V
Line Regulation	ΔV_{oline}	Tj=25°C,8V≦V_{IN}≦25V,I_{OUT}=200mA		5.0	60	mV
		Tj=25°C,9V≦V_{IN}≦20V,I_{OUT}=200mA		1.5	30	mV
Load Regulation	ΔV_{oload}	Tj=25°C,5mA≦I_{OUT}≦500mA			120	mV
		Tj=25°C,5mA≦I_{OUT}≦200mA			60	mV
Output Voltage	V_{OUT}	8V≦V_{IN}≦21V,5mA≦I_{OUT}≦350mA	5.7		6.3	V
Current Dissipation	I_{CC}	Tj=25°C		4.5	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	9V≦V_{IN}≦25V,I_{OUT}=200mA			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA			0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz		45		uV
Ripple Rejection	R_{rej}	f=120Hz, I_{OUT}=100mA	59			dB
		9V≦V_{IN}≦20V, I_{OUT}=300mA, Tj=25°C	59	80		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA		2.0		V
Short Current	I_{OS}	Tj=25°C,V_{IN}=35V,to GND		300		mA
Peak Output Current	I_{op}	Tj=25°C		0.7		A

[L78M07T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	9.5 to 22	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=12V, I_{OUT}=350mA, See specified Test Circuit.

			min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C	6.72	7.0	7.28	V
Line Regulation	ΔV_{oline}	Tj=25°C, 9V≦V_{IN}≦25V, I_{OUT}=200mA		6.0	60	mV
		Tj=25°C, 10V≦V_{IN}≦20V, I_{OUT}=200mA		2.0	30	mV
Load Regulation	ΔV_{oload}	Tj=25°C, 5mA≦I_{OUT}≦500mA			140	mV
		Tj=25°C, 5mA≦I_{OUT}≦200mA			70	mV
Output Voltage	V_{OUT}	9V≦V_{IN}≦22V, 5mA≦I_{OUT}≦350mA	6.6		7.4	V
Current Dissipation	I_{CC}	Tj=25°C		4.6	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	10V≦V_{IN}≦25V, I_{OUT}=200mA			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA			0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz		48		uV
Ripple Rejection	R_{rej}	f=120Hz, 10V≦V_{IN}≦21V, Tj=25°C, I_{OUT}=100mA	58			dB
		f=120Hz, 10V≦V_{IN}≦21V, Tj=25°C, I_{OUT}=300mA	58	80		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA		2.0		V
Short Current	I_{OS}	Tj=25°C, V_{IN}=35V, to GND		300		mA
Peak Output Current	I_{op}	Tj=25°C		0.7		A

[L78M08T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	10.5 to 23	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=15V, I_{OUT}=350mA, See specified Test Circuit.

			min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C	7.7	8.0	8.3	V
Line Regulation	ΔV_{oline}	Tj=25°C, 10.5V≦V_{IN}≦25V, I_{OUT}=200mA		6.0	60	mV
		Tj=25°C, 11V≦V_{IN}≦20V, I_{OUT}=200mA		2.0	30	mV
Load Regulation	ΔV_{oload}	Tj=25°C, 5mA≦I_{OUT}≦500mA			160	mV
		Tj=25°C, 5mA≦I_{OUT}≦200mA			80	mV
Output Voltage	V_{OUT}	10.5V≦V_{IN}≦23V, 5mA≦I_{OUT}≦350mA	7.6		8.4	V
Current Dissipation	I_{CC}	Tj=25°C		4.6	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	11V≦V_{IN}≦25V, I_{OUT}=200mA			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA			0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz		50		uV
Ripple Rejection	R_{rej}	f=120Hz, 11.5V≦V_{IN}≦22V, Tj=25°C, I_{OUT}=100mA	56			dB
		f=120Hz, 11.5V≦V_{IN}≦22V, Tj=25°C, I_{OUT}=300mA	56	80		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA		2.0		V
Short Current	I_{OS}	Tj=25°C, V_{IN}=35V, to GND		300		mA
Peak Output Current	I_{op}	Tj=25°C		0.7		A

[L78M09T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	12 to 25	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=16V, I_{OUT}=350mA, See specified Test Circuit.

			min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C	8.6	9.0	9.4	V
Line Regulation	ΔV_{oline}	Tj=25°C, 11.5V≦V_{IN}≦25V, I_{OUT}=200mA		6.0	100	mV
		Tj=25°C, 12V≦V_{IN}≦20V, I_{OUT}=200mA		2.0	50	mV
Load Regulation	ΔV_{oload}	Tj=25°C, 5mA≦I_{OUT}≦500mA			180	mV
		Tj=25°C, 5mA≦I_{OUT}≦200mA			90	mV
Output Voltage	V_{OUT}	11.5V≦V_{IN}≦24V, 5mA≦I_{OUT}≦350mA	8.5		9.5	V
Current Dissipation	I_{CC}	Tj=25°C		4.6	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	12.5V≦V_{IN}≦25V, I_{OUT}=200mA			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA			0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz		60		uV
Ripple Rejection	R_{rej}	f=120Hz, I_{OUT}=100mA	56			dB
		12V≦V_{IN}≦23V, I_{OUT}=300mA, Tj=25°C	56	80		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA		2.0		V
Short Current	I_{OS}	Tj=25°C, V_{IN}=35V, to GND		300		mA
Peak Output Current	I_{op}	Tj=25°C		0.7		A

[L78M10T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	13 to 25	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=17V, I_{OUT}=350mA, See specified Test Circuit.

			min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C	9.6	10.0	10.4	V
Line Regulation	ΔV_{oline}	Tj=25°C, 12.5V≦V_{IN}≦25V, I_{OUT}=200mA		7.0	100	mV
		Tj=25°C, 13V≦V_{IN}≦22V, I_{OUT}=200mA		2.0	50	mV
Load Regulation	ΔV_{oload}	Tj=25°C, 5mA≦I_{OUT}≦500mA			200	mV
		Tj=25°C, 5mA≦I_{OUT}≦200mA			100	mV
Output Voltage	V_{OUT}	12.5V≦V_{IN}≦25V, 5mA≦I_{OUT}≦350mA	9.5		10.5	V
Current Dissipation	I_{CC}	Tj=25°C		4.6	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	13.5V≦V_{IN}≦25V, I_{OUT}=200mA			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA			0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz		65		uV
Ripple Rejection	R_{rej}	f=120Hz, I_{OUT}=100mA	55			dB
		13V≦V_{IN}≦25V, I_{OUT}=300mA, Tj=25°C	55	80		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA		2.0		V
Short Current	I_{OS}	Tj=25°C, V_{IN}=35V, to GND		300		mA
Peak Output Current	I_{op}	Tj=25°C		0.7		A

[L78M12T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	15 to 25	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=19V, I_{OUT}=350mA, See specified Test Circuit.

			min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C	11.5	12.0	12.5	V
Line Regulation	ΔV_{oline}	Tj=25°C, 14.5V≦V_{IN}≦30V, I_{OUT}=200mA		8.0	100	mV
		Tj=25°C, 16V≦V_{IN}≦25V, I_{OUT}=200mA		2.0	50	mV
Load Regulation	ΔV_{oload}	Tj=25°C, 5mA≦I_{OUT}≦500mA			240	mV
		Tj=25°C, 5mA≦I_{OUT}≦200mA			120	mV
Output Voltage	V_{OUT}	14.5V≦V_{IN}≦27V, 5mA≦I_{OUT}≦350mA	11.4		12.6	V
Current Dissipation	I_{CC}	Tj=25°C		4.8	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	15V≦V_{IN}≦30V, I_{OUT}=200mA			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA			0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz		75		uV
Ripple Rejection	R_{rej}	f=120Hz, 15V≦V_{IN}≦25V, Tj=25°C, I_{OUT}=100mA	55			dB
		f=120Hz, 15V≦V_{IN}≦25V, Tj=25°C, I_{OUT}=300mA	55	80		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA		2.0		V
Short Current	I_{OS}	Tj=25°C, V_{IN}=35V, to GND		300		mA
Peak Output Current	I_{op}	Tj=25°C		0.7		A

[L78M15T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	18 to 30	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=23V, I_{OUT}=350mA, See specified Test Circuit.

			min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C	14.4	15.0	15.6	V
Line Regulation	ΔV_{oline}	Tj=25°C, 17.5V≦V_{IN}≦30V, I_{OUT}=200mA		10.0	100	mV
		Tj=25°C, 19V≦V_{IN}≦30V, I_{OUT}=200mA		3.0	50	mV
Load Regulation	ΔV_{oload}	Tj=25°C, 5mA≦I_{OUT}≦500mA			300	mV
		Tj=25°C, 5mA≦I_{OUT}≦200mA			150	mV
Output Voltage	V_{OUT}	17.5V≦V_{IN}≦30V, 5mA≦I_{OUT}≦350mA	14.25		15.75	V
Current Dissipation	I_{CC}	Tj=25°C		4.8	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	17.5V≦V_{IN}≦30V, I_{OUT}=200mA			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA			0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz		90		uV
Ripple Rejection	R_{rej}	f=120Hz, 18.5V≦V_{IN}≦28.5V, Tj=25°C, I_{OUT}=100mA	54			dB
		f=120Hz, 18.5V≦V_{IN}≦28.5V, Tj=25°C, I_{OUT}=300mA	54	70		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA		2.0		V
Short Current	I_{OS}	Tj=25°C, V_{IN}=35V, to GND		300		mA
Peak Output Current	I_{op}	Tj=25°C		0.7		A

[L78M18T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	21 to 33	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=27V, I_{OUT}=350mA, See specified Test Circuit.

				min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C		17.3	18.0	18.7	V
Line Regulation	ΔV_{oline}	Tj=25°C, 21V≦V_{IN}≦35V, I_{OUT}=200mA			10.0	100	mV
		Tj=25°C, 22V≦V_{IN}≦35V, I_{OUT}=200mA			5.0	50	mV
Load Regulation	ΔV_{oload}	Tj=25°C, 5mA≦I_{OUT}≦500mA				360	mV
		Tj=25°C, 5mA≦I_{OUT}≦200mA				180	mV
Output Voltage	V_{OUT}	21V≦V_{IN}≦33V, 5mA≦I_{OUT}≦350mA		17.1		18.9	V
Current Dissipation	I_{CC}	Tj=25°C			4.9	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	21V≦V_{IN}≦33V, I_{OUT}=200mA				0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA				0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz			100		uV
Ripple Rejection	R_{rej}	f=120Hz, 22V≦V_{IN}≦33V, Tj=25°C	I_{OUT}=100mA	53			dB
			I_{OUT}=300mA	53	70		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA			2.0		V
Short Current	I_{OS}	Tj=25°C, V_{IN}=35V, to GND			300		mA
Peak Output Current	I_{op}	Tj=25°C			0.7		A

[L78M20T]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	23 to 35	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=29V, I_{OUT}=350mA, See specified Test Circuit.

				min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C		19.2	20.0	20.8	V
Line Regulation	ΔV_{oline}	Tj=25°C, 23V≦V_{IN}≦35V, I_{OUT}=200mA			10.0	100	mV
		Tj=25°C, 24V≦V_{IN}≦35V, I_{OUT}=200mA			5.0	50	mV
Load Regulation	ΔV_{oload}	Tj=25°C, 5mA≦I_{OUT}≦500mA				400	mV
		Tj=25°C, 5mA≦I_{OUT}≦200mA				200	mV
Output Voltage	V_{OUT}	23V≦V_{IN}≦35V, 5mA≦I_{OUT}≦350mA		19.0		21.0	V
Current Dissipation	I_{CC}	Tj=25°C			4.9	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	23V≦V_{IN}≦35V, I_{OUT}=200mA				0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA				0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz			110		uV
Ripple Rejection	R_{rej}	f=120Hz, 24V≦V_{IN}≦34V, Tj=25°C	I_{OUT}=100mA	53			dB
			I_{OUT}=300mA	53	70		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA			2.0		V
Short Current	I_{OS}	Tj=25°C, V_{IN}=35V, to GND			300		mA
Peak Output Current	I_{op}	Tj=25°C			0.7		A

[L78M24T]

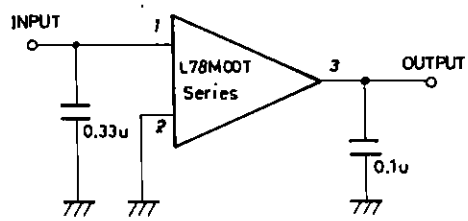
Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	27 to 35	V
Output Current	I_{OUT}	5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=33V, I_{OUT}=350mA, See specified Test Circuit.

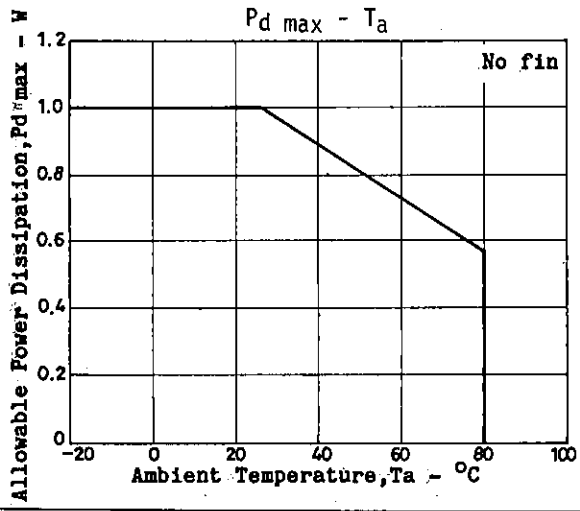
			min	typ	max	unit
Output Voltage	V_{OUT}	Tj=25°C	23.0	24.0	25.0	V
Line Regulation	ΔV_{oline}	Tj=25°C, 27V≦V_{IN}≦35V, I_{OUT}=200mA		10.0	100	mV
		Tj=25°C, 28V≦V_{IN}≦35V, I_{OUT}=200mA		5.0	50	mV
Load Regulation	ΔV_{oload}	Tj=25°C, 5mA≦I_{OUT}≦500mA			480	mV
		Tj=25°C, 5mA≦I_{OUT}≦200mA			240	mV
Output Voltage	V_{OUT}	27V≦V_{IN}≦35V, 5mA≦I_{OUT}≦350mA	22.8		25.2	V
Current Dissipation	I_{CC}	Tj=25°C		5.0	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CCline}	27V≦V_{IN}≦35V, I_{OUT}=200mA			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CCload}	5mA≦I_{OUT}≦350mA			0.5	mA
Output Noise Voltage	V_{NO}	10Hz≦f≦100kHz		170		uV
Ripple Rejection	R_{rej}	f=120Hz, 28V≦V_{IN}≦35V, Tj=25°C, I_{OUT}=100mA	50			dB
		f=120Hz, 28V≦V_{IN}≦35V, Tj=25°C, I_{OUT}=300mA	50	70		dB
Minimum Input-Output Voltage Drop	V_{drop}	I_{OUT}=350mA		2.0		V
Short Current	I_{OS}	Tj=25°C, V_{IN}=35V, to GND		300		mA
Peak Output Current	I_{op}	Tj=25°C		0.7		A

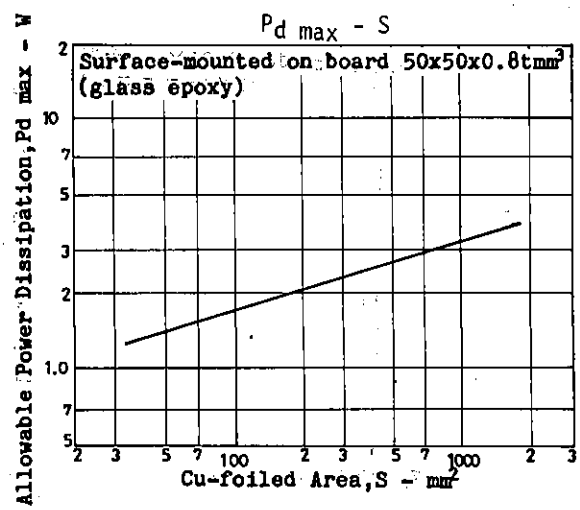
Specified Test Circuit (Common to L78M00T series)



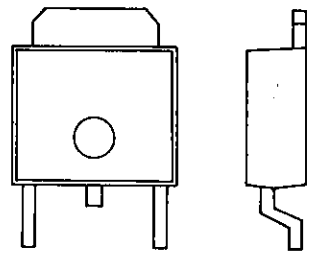
Unit (capacitance: F)

The allowable power dissipation (Pd max) is 1.0W (Ta=25°C) with no fin attached. When the L78M00T series are surface-mounted on a hybrid IC board or printed circuit board, a high allowable power dissipation can be obtained, though they are placed in a small-sized package.
Shown below is the relationship between the Cu-foiled area and the allowable power dissipation when the L78M00T series are surface-mounted on a glass epoxy board (50x50x0.8tmm^3).

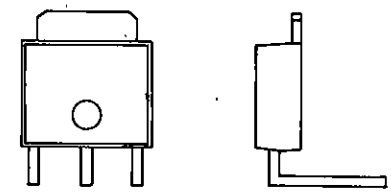




Lead Formings



FA forming



LR forming