Ordering number : EN2609C

SANYO Semiconductors
DATA SHEET

Monolithic Linear IC

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.

Specifications

[Common to L78M00T series]

Maximum Ratings at Ta=25°C

Parameter	Symbol	Conditions	Ratings	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

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[L78M05T]

Recommended Operating Conditions at Ta=25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V_{IN}		7.5 to 20.0	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	4.8	5.0	5.2	V
Line regulation	ΔV_O line	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
Load regulation	ΔV_O load	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_{CC} line	8V≤V_{IN}≤20V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		40		μV
Ripple rejection	Rrej	f=120Hz, 8V≤V_{IN}≤19V, Tj=25°C, I_{OUT}=100mA	62			dB
		f=120Hz, 8V≤V_{IN}≤19V, Tj=25°C, I_{OUT}=300mA	62	80		dB
Minimum input-output voltage dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	5.75	6.0	6.25	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	9V≤V_{IN}≤25V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		45		μV
Ripple rejection	Rrej	f=120Hz, 9V≤V_{IN}≤20V, Tj=25°C, I_{OUT}=100mA	59			dB
		f=120Hz, 9V≤V_{IN}≤20V, Tj=25°C, I_{OUT}=300mA	59	80		dB
Minimum input-output voltage dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	6.72	7.0	7.28	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	10V≤V_{IN}≤25V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		48		μV
Ripple rejection	Rrej	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 dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	7.7	8.0	8.3	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	11V≤V_{IN}≤25V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		50		μV
Ripple rejection	Rrej	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 dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	8.6	9.0	9.4	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	12.5V≤V_{IN}≤25V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		60		μV
Ripple rejection	Rrej	f=120Hz, 12V≤V_{IN}≤23V, Tj=25°C, I_{OUT}=100mA	56			dB
		f=120Hz, 12V≤V_{IN}≤23V, Tj=25°C, I_{OUT}=300mA	56	80		dB
Minimum input-output voltage dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	9.6	10.0	10.4	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	13.5V≤V_{IN}≤25V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		65		μV
Ripple rejection	Rrej	f=120Hz, 13V≤V_{IN}≤25V, Tj=25°C, I_{OUT}=100mA	55			dB
		f=120Hz, 13V≤V_{IN}≤25V, Tj=25°C, I_{OUT}=300mA	55	80		dB
Minimum input-output voltage dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	11.5	12.0	12.5	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	15V≤V_{IN}≤30V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		75		μV
Ripple rejection	Rrej	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 dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	14.4	15.0	15.6	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	17.5V≤V_{IN}≤30V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		90		μV
Ripple rejection	Rrej	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 dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	17.3	18.0	18.7	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	21V≤V_{IN}≤33V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		100		μV
Ripple rejection	Rrej	f=120Hz, 22V≤V_{IN}≤33V, Tj=25°C, I_{OUT}=100mA	53			dB
		f=120Hz, 22V≤V_{IN}≤33V, Tj=25°C, I_{OUT}=300mA	53	70		dB
Minimum input-output voltage dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	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.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	19.2	20.0	20.8	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	23V≤V_{IN}≤35V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		110		μV
Ripple rejection	Rrej	f=120Hz, 24V≤V_{IN}≤34V, Tj=25°C, I_{OUT}=100mA	53			dB
		f=120Hz, 24V≤V_{IN}≤34V, Tj=25°C, I_{OUT}=300mA	53	70		dB
Minimum input-output voltage dropout	Vdrop	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

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V_{IN}		27 to 35	V
Output current	I_{OUT}		5 to 500	mA

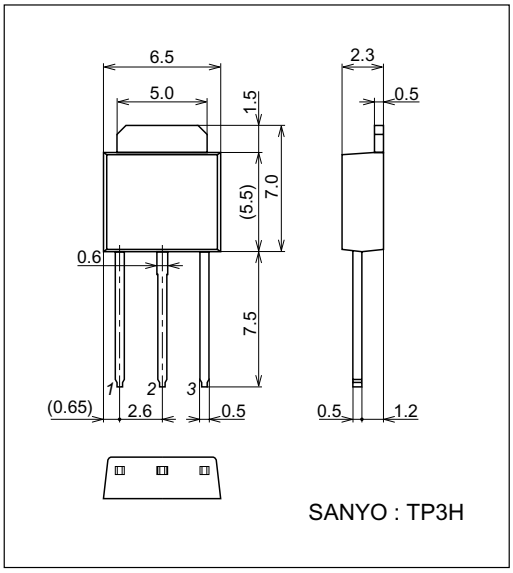
Operating Characteristics at Ta=25°C, V_{IN}=33V, I_{OUT}=350mA, See specified Test Circuit.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output voltage	V_{OUT}	Tj=25°C	23.0	24.0	25.0	V
Line regulation	ΔV_O line	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_O load	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_{CC} line	27V≤V_{IN}≤35V, I_{OUT}=200mA			0.8	mA
Current dissipation variation (Load)	ΔI_{CC} load	5mA≤I_{OUT}≤350mA			0.5	mA
Output noise voltage	V_{NO}	10Hz≤f≤100kHz		170		μV
Ripple rejection	Rrej	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 dropout	Vdrop	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

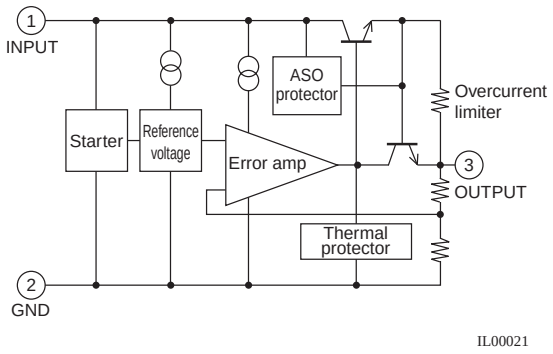
Package Dimensions

unit : mm

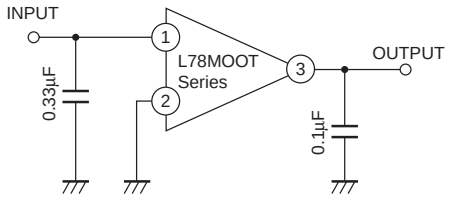
3110A



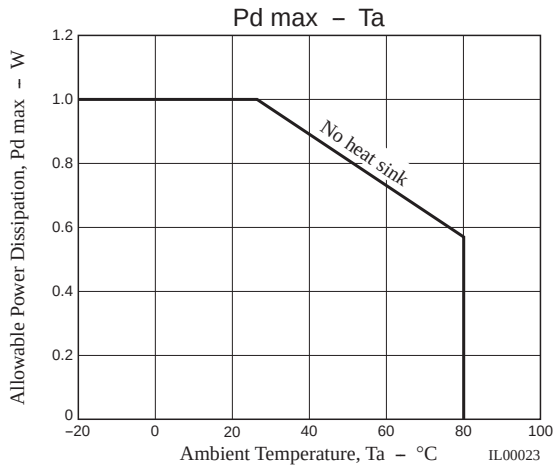
Equivalent Circuit

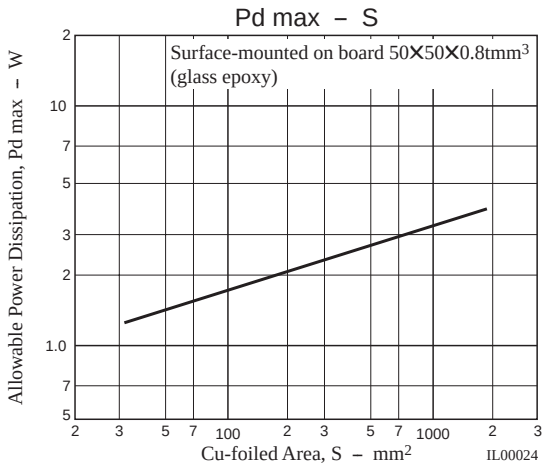


Specified Test Circuit (Common to L78M00T series)

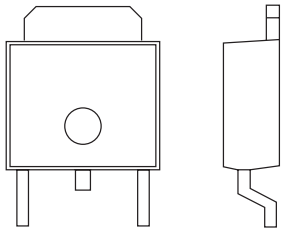


The allowable power dissipation (Pd max) is 1.0W (Ta=25°C) with no fin attached. When the L78M00T series are surface-mounted on a hybrid IC board or printed circuit board, a high allowable power dissipation can be obtained, though they are placed in a small-sized package.
Shown below is the relationship between the Cu-foiled area and the allowable power dissipation when the L78M00T series are surface-mounted on a glass epoxy board (50×50×0.8mm^3).

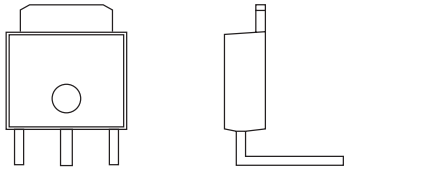




Lead Formings



FA formings



LR formings