



## L88M00T Series

### 3.3 to 12 V, 0.5 A Low Dropout Voltage Regulator

## Overview

The L88M00T Series are low dropout voltage regulator ICs with output current of 0.5 A. Because they can operate with a low input-output voltage difference, they contribute to smaller and more efficient set power supplies, and are optimum for audio-visual and office automation equipment.

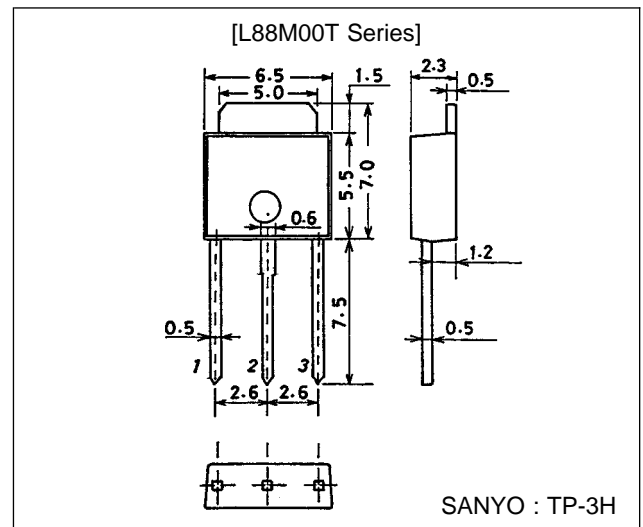
## Functions and Features

- Output voltage L88M33T: 3.3 V L88M05T: 5 V  
L88M09T: 9 V L88M12T: 12 V
- 500 mA output current
- Low minimum input-output voltage differential (0.4 V typ) enables to save energy and miniaturize transformer size.
- Set size can be miniaturized with compact TP-3H power package.
- Surface mounting on board permits allowable power dissipation to be raised.
- Enhanced mount flexibility with range of formed products.

## Package Dimensions

unit : mm

### 3103-TP-3H



## Specifications

### Maximum Ratings at $T_a = 25^\circ\text{C}$ (common to L88M00T series)

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	$V_{IN \text{ max}}$		18	V
Allowable power dissipation	$P_d \text{ max}$	$T_a \leq 25^\circ\text{C}$ , no heat sink	1	W
		$T_c = 25^\circ\text{C}$ , with infinite heat sink	6.25	W
Thermal resistance (junction-atmosphere)	$\theta_{j-a}$		125	$^\circ\text{C/W}$
Thermal resistance (junction-to-case)	$\theta_{j-c}$		20	$^\circ\text{C/W}$
Operating temperature	$T_{opr}$		-20 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

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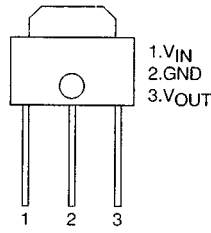
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## L88M00T Series

### Pin Assignment



Top view

### [L88M33T]

#### Operating Conditions at $T_a = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	$V_{IN}$		4 to 17	V
Output current	$I_{OUT}$		0 to 500	mA

#### Operating Characteristics at $T_j = 25\text{ }^\circ\text{C}$ , $V_{IN} = 6.3\text{ V}$ , $I_O = 500\text{ mA}$ , $C_{OUT} = 100\text{ }\mu\text{F}$ , $C_{IN} = 1\text{ }\mu\text{F}$ , see specified Test Circuit.

Parameter	Symbol	Conditions	min	typ	max	Unit
Output voltage	$V_{OUT}$		3.2	3.3	3.4	V
Dropout voltage	$V_{DROP1}$			0.4	0.6	V
	$V_{DROP2}$	$I_O = 150\text{ mA}$		0.2	0.3	V
Line regulation	$\Delta V_{OLN}$	$4\text{ V} \leq V_{IN} \leq 17\text{ V}$		10	50	mV
Load regulation	$\Delta V_{OLD}$	$5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$		24	80	mV
Peak output current	$I_{OP}$		600	900		mA
Output short-circuit current	$I_{OSC}$			100	300	mA
Quiescent current	$I_{Q1}$	$I_{OUT} = 0$		1.9	5.0	mA
	$I_{Q2}$			24	50	mA
Output noise voltage	$V_{NO}$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		30		$\mu\text{Vrms}$
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta T_j$	$T_j = 25\text{ to }125\text{ }^\circ\text{C}$		$\pm 0.4$		$\text{mV}/^\circ\text{C}$
Ripple rejection	Rrej	$f = 120\text{ Hz}$ , $4.3\text{ V} \leq V_{IN} \leq 17\text{ V}$		65		dB

### [L88M05T]

#### Operating Conditions at $T_a = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	$V_{IN}$		5.8 to 17	V
Output current	$I_{OUT}$		0 to 500	mA

#### Operating Characteristics at $T_j = 25\text{ }^\circ\text{C}$ , $V_{IN} = 8\text{ V}$ , $I_O = 500\text{ mA}$ , $C_{OUT} = 100\text{ }\mu\text{F}$ , $C_{IN} = 1\text{ }\mu\text{F}$ , see specified Test Circuit.

Parameter	Symbol	Conditions	min	typ	max	Unit
Output voltage	$V_{OUT}$		4.85	5.0	5.15	V
Dropout voltage	$V_{DROP1}$			0.4	0.6	V
	$V_{DROP2}$	$I_O = 150\text{ mA}$		0.2	0.3	V
Line regulation	$\Delta V_{OLN}$	$5.8\text{ V} \leq V_{IN} \leq 17\text{ V}$		10	50	mV
Load regulation	$\Delta V_{OLD}$	$5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$		30	100	mV
Peak output current	$I_{OP}$		600	900		mA
Output short-circuit current	$I_{OSC}$			100	300	mA
Quiescent current	$I_{Q1}$	$I_{OUT} = 0$		2.0	5.0	mA
	$I_{Q2}$			24	50	mA
Output noise voltage	$V_{NO}$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		40		$\mu\text{Vrms}$
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta T_j$	$T_j = 25\text{ to }125\text{ }^\circ\text{C}$		$\pm 0.5$		$\text{mV}/^\circ\text{C}$
Ripple rejection	Rrej	$f = 120\text{ Hz}$ , $6\text{ V} \leq V_{IN} \leq 17\text{ V}$		65		dB

## L88M00T Series

### [L88M09T]

#### Operating Conditions at $T_a = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	$V_{IN}$		9.9 to 17	V
Output current	$I_{OUT}$		0 to 500	mA

#### Operating Characteristics at $T_j = 25\text{ }^\circ\text{C}$ , $V_{IN} = 12\text{ V}$ , $I_O = 500\text{ mA}$ , $C_{OUT} = 100\text{ }\mu\text{F}$ , $C_{IN} = 1\text{ }\mu\text{F}$ , see specified Test Circuit.

Parameter	Symbol	Conditions	min	typ	max	Unit
Output voltage	$V_{OUT}$		8.73	9.0	9.27	V
Dropout voltage	$V_{DROP1}$			0.4	0.6	V
	$V_{DROP2}$	$I_O = 150\text{ mA}$		0.2	0.3	V
Line regulation	$\Delta V_{OLN}$	$9.9\text{ V} \leq V_{IN} \leq 17\text{ V}$		10	50	mV
Load regulation	$\Delta V_{OLD}$	$5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$		54	180	mV
Peak output current	$I_{OP}$		600	900		mA
Output short-circuit current	$I_{OSC}$			100	300	mA
Quiescent current	$I_{Q1}$	$I_{OUT} = 0$		2.3	5.0	mA
	$I_{Q2}$			24	50	mA
Output noise voltage	$V_{NO}$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		40		$\mu\text{Vrms}$
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta T_j$	$T_j = 25\text{ to }125\text{ }^\circ\text{C}$		$\pm 0.9$		$\text{mV}/^\circ\text{C}$
Ripple rejection	Rrej	$f = 120\text{ Hz}$ , $10\text{ V} \leq V_{IN} \leq 17\text{ V}$		59		dB

### [L88M12T]

#### Operating Conditions at $T_a = 25\text{ }^\circ\text{C}$

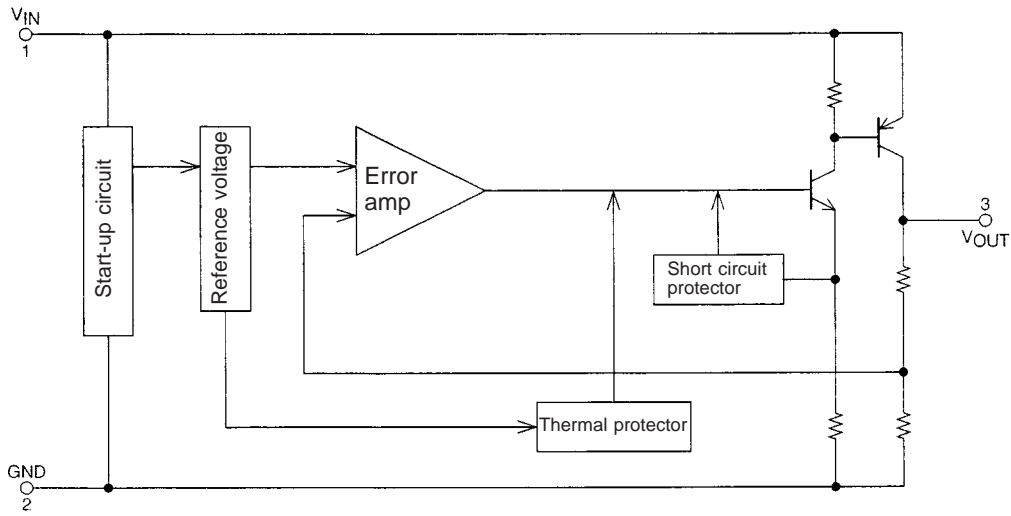
Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	$V_{IN}$		13 to 17	V
Output current	$I_{OUT}$		0 to 500	mA

#### Operating Characteristics at $T_j = 25\text{ }^\circ\text{C}$ , $V_{IN} = 15\text{ V}$ , $I_O = 500\text{ mA}$ , $C_{OUT} = 100\text{ }\mu\text{F}$ , $C_{IN} = 1\text{ }\mu\text{F}$ , see specified Test Circuit.

Parameter	Symbol	Conditions	min	typ	max	Unit
Output voltage	$V_{OUT}$		11.64	12.0	12.36	V
Dropout voltage	$V_{DROP1}$			0.4	0.6	V
	$V_{DROP2}$	$I_O = 150\text{ mA}$		0.2	0.3	V
Line regulation	$\Delta V_{OLN}$	$13\text{ V} \leq V_{IN} \leq 17\text{ V}$		10	50	mV
Load regulation	$\Delta V_{OLD}$	$5\text{ mA} \leq I_{OUT} \leq 500\text{ mA}$		70	240	mV
Peak output current	$I_{OP}$		600	900		mA
Output short-circuit current	$I_{OSC}$			100	300	mA
Quiescent current	$I_{Q1}$	$I_{OUT} = 0$		2.6	5.0	mA
	$I_{Q2}$			24	50	mA
Output noise voltage	$V_{NO}$	$10\text{ Hz} \leq f \leq 100\text{ kHz}$		40		$\mu\text{Vrms}$
Temperature coefficient of output voltage	$\Delta V_{OUT}/\Delta T_j$	$T_j = 25\text{ to }125\text{ }^\circ\text{C}$		$\pm 1.2$		$\text{mV}/^\circ\text{C}$
Ripple rejection	Rrej	$f = 120\text{ Hz}$ , $13\text{ V} \leq V_{IN} \leq 17\text{ V}$		58		dB

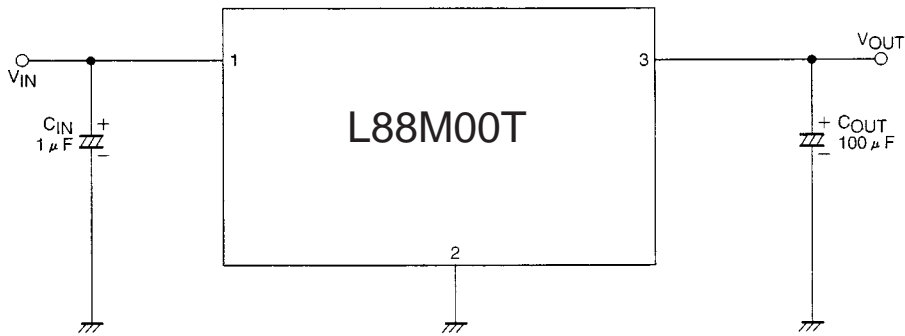
## L88M00T Series

### Equivalent Circuit Block Diagram (Common to L88M00T Series)



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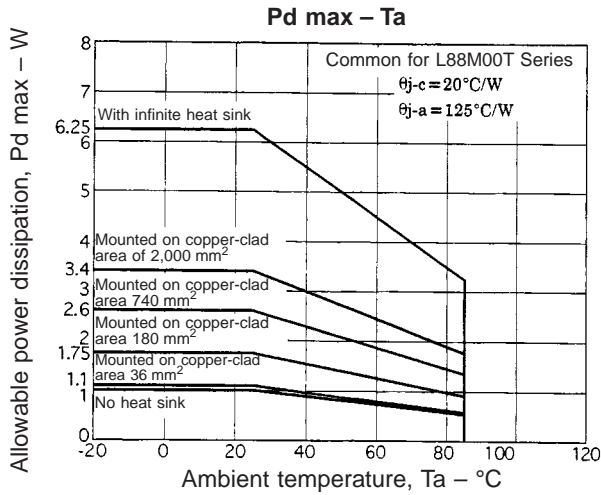
### Test Circuit (Common to L88M00T Series)



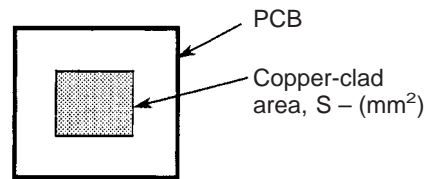
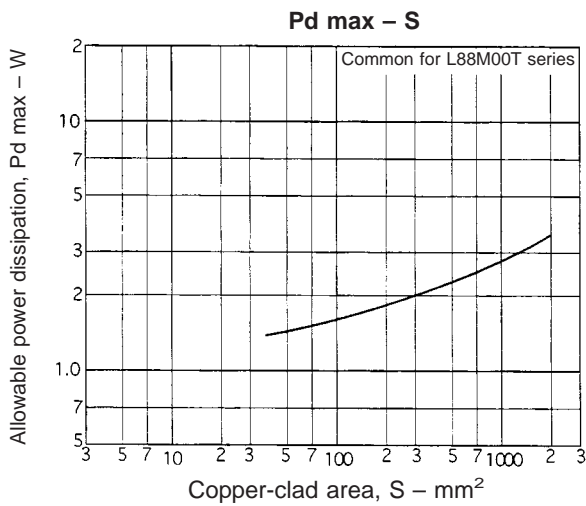
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- Notes:
1. To ensure operational stability,  $C_{IN}$  and  $C_{OUT}$  should be placed as close to the IC as possible.
  2. Because the output capacitor  $C_{OUT}$  is set at over 100  $\mu F$  to prevent oscillation at low temperatures, a capacitor that exhibits little change in capacity with temperature variations should be used (such as a tantalum capacitor).
  3. When  $V_{IN}$  is minus (-) and GND is plus (+) (reversed connection), excessive current flow will occur.

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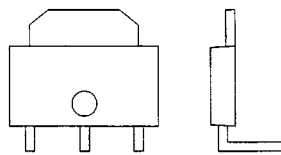


- The allowable power dissipation is 1.0 W ( $T_a = 25^\circ\text{C}$ ) with no fin attached, but when mounted on a hybrid IC board or printed circuit board, high allowable power dissipation is achieved, despite the compact package. The graph below depicts the relationship between the copper-clad area and allowable power dissipation when mounted on a glass epoxy board ( $50 \times 50 \times 0.8 \text{ mm}^3$ ) with a copper thickness of 18  $\mu\text{m}$ .



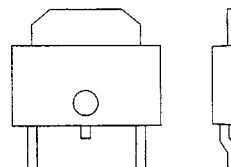
- Pd is the value for when the solder on the surface of the IC heat sink has melted completely and the surface mount is horizontal.
- Please be advised that the flow solder application system (full-heat method) cannot be recommended.

## Lead Formings



LR forming

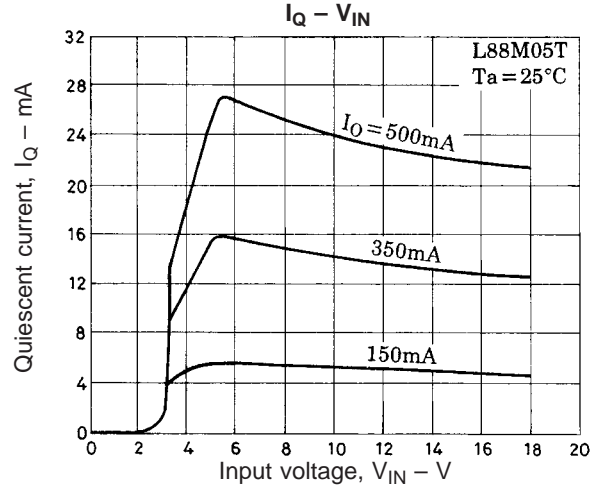
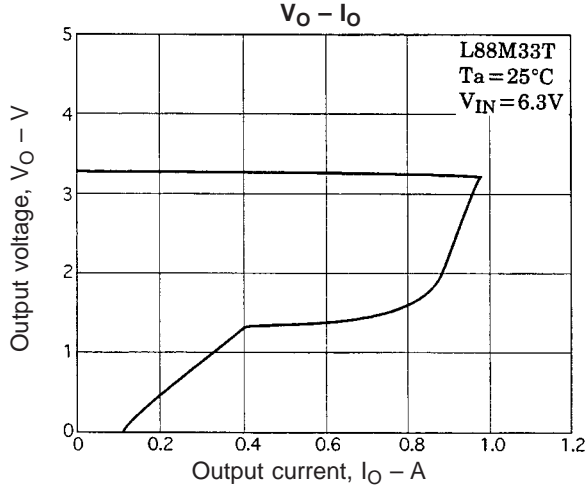
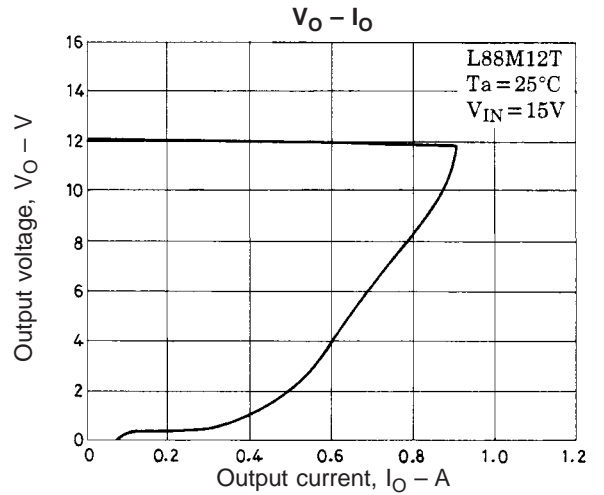
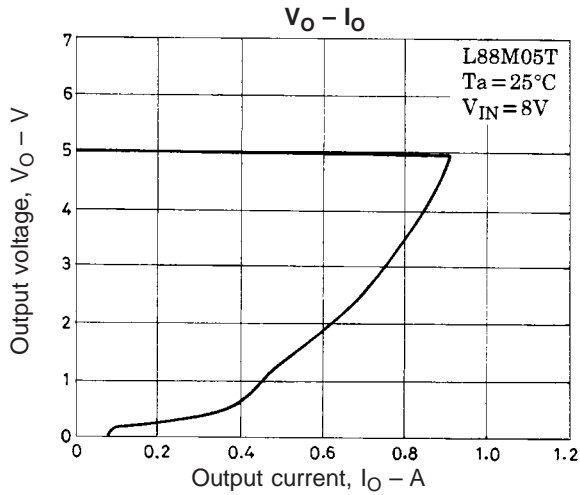
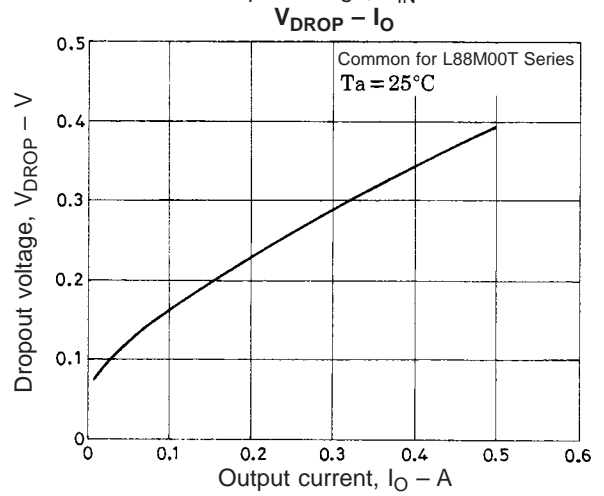
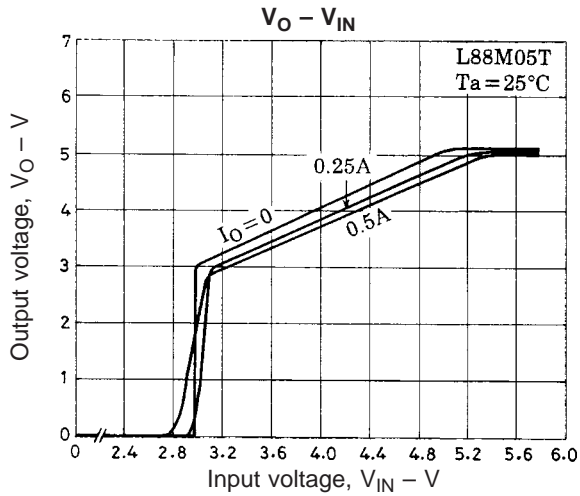
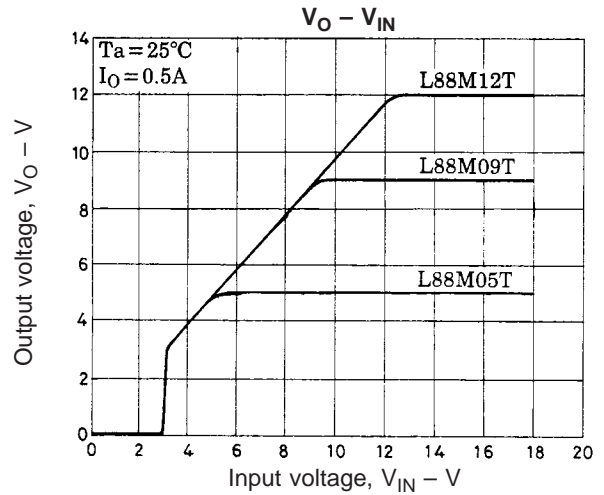
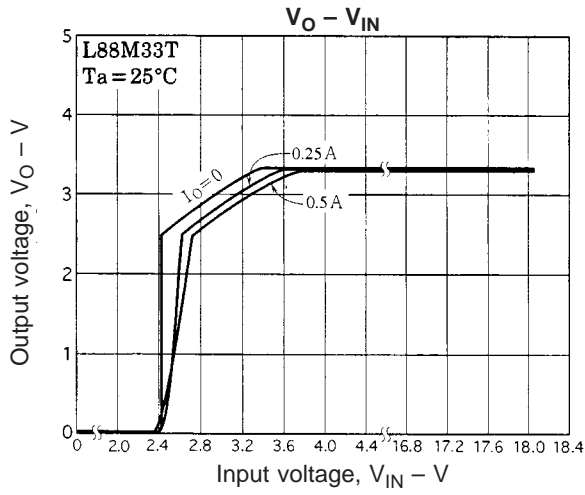
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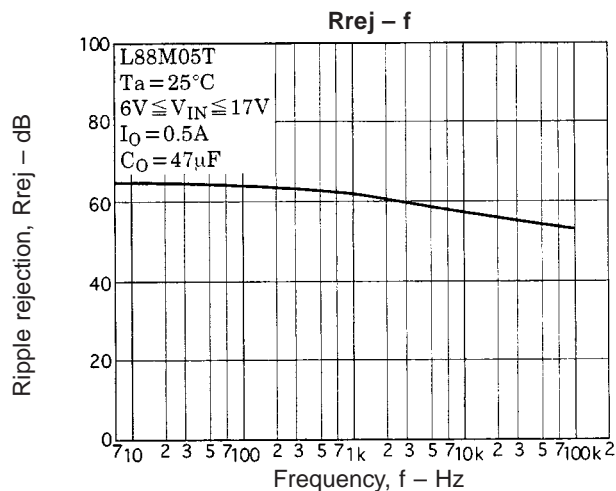
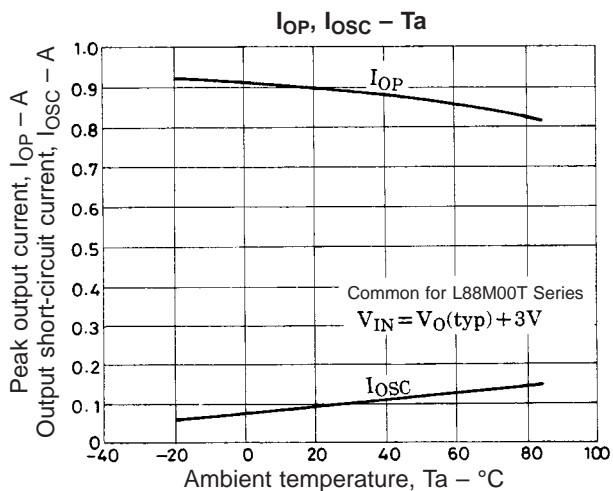
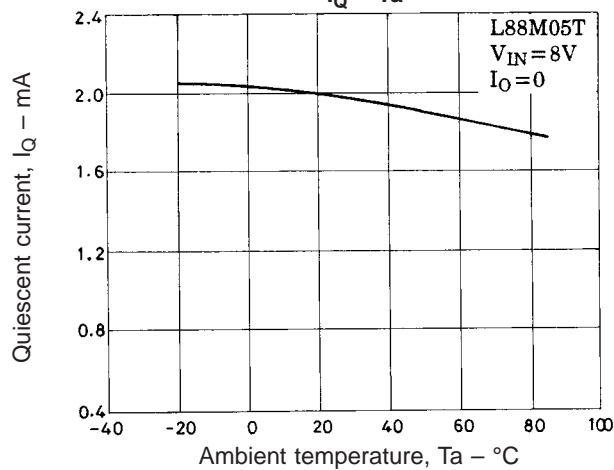
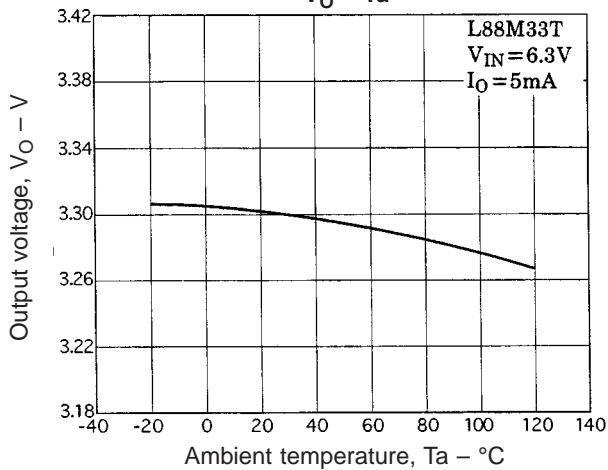
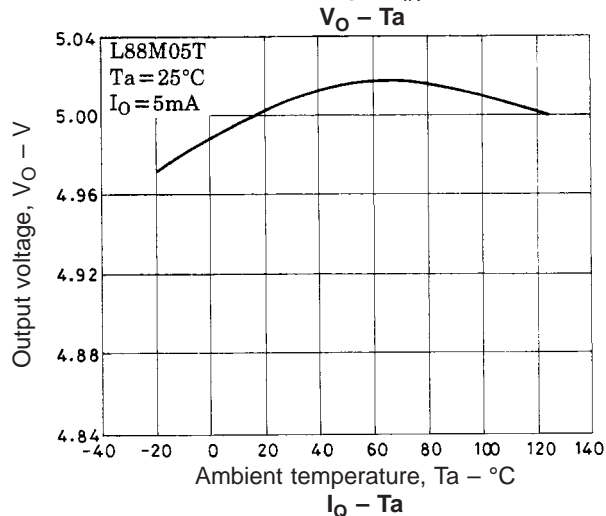
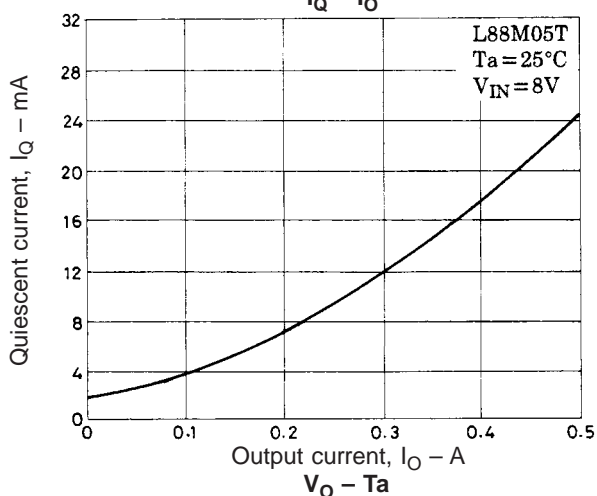
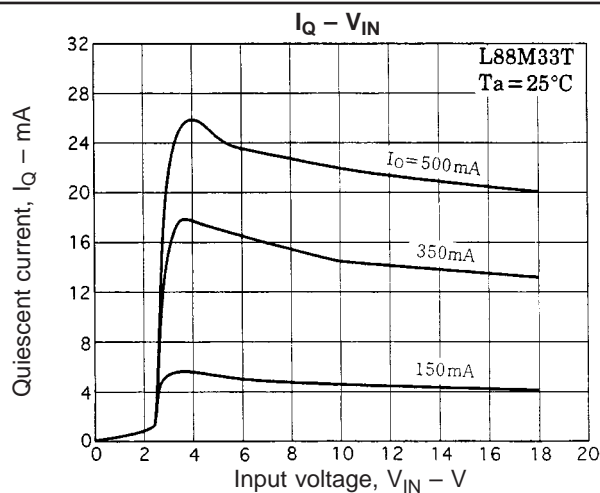
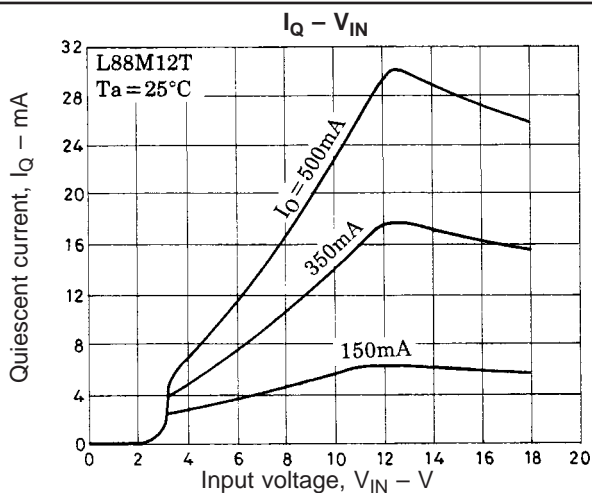
FA forming

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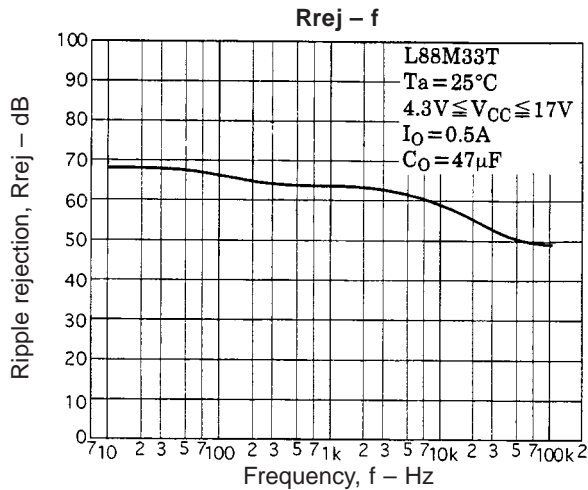
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