

SANYO

No.2168B

L78MR00 Series

5 to 12V 0.5A 5-Pin
Voltage Regulators with Reset Function

The L78MR00 series, 500mA general-purpose voltage regulator ICs provide reset output signal for micro computers.

Features

- Reset function (power supply voltage monitor : Generates a reset signal at a power-on and temporal power-down).
- Output voltage

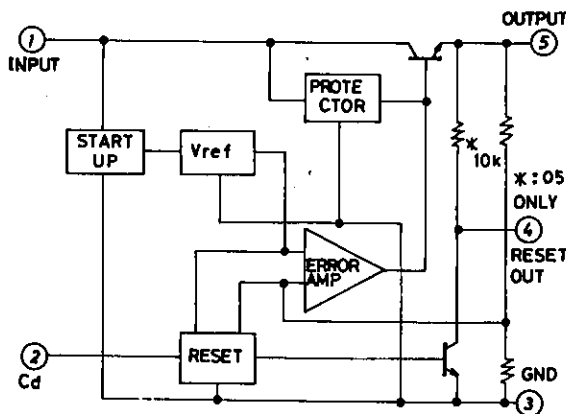
L78MR05 : 5V	(Reset output	.....	On-chip pull-up resistor)
L78MR06 : 6V	(Reset output	.....	Open collector)
L78MR08 : 8V	(Reset output	.....	Open collector)
L78MR09 : 9V	(Reset output	.....	Open collector)
L78MR12 : 12V	(Reset output	.....	Open collector)
- Output current 500mA
- On-chip ASO protector.
- On-chip thermal protector.
- On-chip over current limiter.
- The use of package TO220-5H facilitates easy mounting and thermal design.
- Delay time (t_d) may be set by an external capacitor.

[Common to L78MR00 Series]

Maximum Ratings at $T_a = 25^\circ\text{C}$

				unit
Maximum Input Voltage	$V_{IN \text{ max}}$		35	V
Reset Pin Supply Voltage	V_{reset}		35	V
Allowable Power Dissipation	$P_d \text{ max}$	No fin	1.75	W
		$T_C = 25^\circ\text{C}$	20	W
Operating Temperature	T_{opr}		-30 to +80	$^\circ\text{C}$
Storage Temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

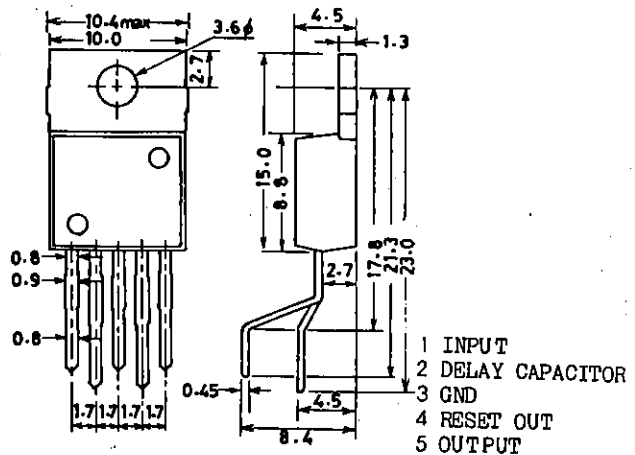
Equivalent Circuit Block Diagram



Unit (resistance: Ω)

Package Dimensions
(unit: mm)

3079



SANYO : TO-220 5H

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L78MR00 Series

[L78MR05]

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

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	7.5 to 20	V
Output Current	I_o	5 to 500	mA

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{IN} = 10\text{V}$, $I_o = 0.35\text{A}$, $C_o = 10\mu\text{F}$

Parameter	Symbol	Conditions	min	typ	max	unit
Output Voltage	V_{o1}	$T_j = 25^\circ\text{C}$	4.8	5.0	5.2	V
	V_{o2}	$7\text{V} \leq V_{IN} \leq 20\text{V}$, $5\text{mA} \leq I_o \leq 0.35\text{A}$	4.75		5.25	V
Line Regulation	ΔV_o	LN1 $T_j = 25^\circ\text{C}$, $7\text{V} \leq V_{IN} \leq 25\text{V}$, $I_o = 0.2\text{A}$		1.0	100	mV
		LN2 $T_j = 25^\circ\text{C}$, $8\text{V} \leq V_{IN} \leq 25\text{V}$, $I_o = 0.2\text{A}$		0.5	50	mV
Load Regulation	ΔV_o	LD1 $T_j = 25^\circ\text{C}$, $5\text{mA} \leq I_o \leq 0.5\text{A}$		3.0	100	mV
		LD2 $T_j = 25^\circ\text{C}$, $5\text{mA} \leq I_o \leq 0.2\text{A}$		1.5	50	mV
Current Dissipation	I_{CC}	$T_j = 25^\circ\text{C}$	3.4		6.0	mA
Current Dissipation Variation (Line)	ΔI_{CC}	LN $8\text{V} \leq V_{IN} \leq 25\text{V}$, $I_o \leq 0.2\text{A}$			0.8	mA
		LD $5\text{mA} \leq I_o \leq 0.35\text{A}$			0.5	mA
Output Noise Voltage	V_{NO}	$I_o = 5\text{mA}$, $10\text{Hz} \leq f \leq 100\text{kHz}$		60		μV
Ripple Rejection	Rr1	$T_j = 25^\circ\text{C}$, $f = 120\text{Hz}$, $8\text{V} \leq V_{IN} \leq 18\text{V}$, $I_o = 0.1\text{A}$	62	80		dB
	Rr2	$T_j = 25^\circ\text{C}$, $f = 120\text{Hz}$, $8\text{V} \leq V_{IN} \leq 18\text{V}$, $I_o = 0.3\text{A}$	62	77		dB
Dropout Voltage	V_{drop}			2.0	2.5	V
Peak Output Current	I_{OP}	$T_j = 25^\circ\text{C}$		1.1		A
Short Circuit Current	I_{OSC}	$T_j = 25^\circ\text{C}$, $V_{IN} = 35\text{V}$		0.02		A
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$I_o = 5\text{mA}$, $T_j = 25$ to 125°C	-0.3			mV/ $^\circ\text{C}$
'L' Reset Output Voltage	V_{ORL}	$V_o \leq 4.5\text{V}$, $I_o = 5\text{mA}$			0.2	V
Reset Threshold Voltage	V_{RT}	$I_o = 5\text{mA}$		$V_o - 0.3V_o - 0.2$		V
Reset Hysteresis Voltage	V_{RTH}	$I_o = 5\text{mA}$		100		mV
Reset Output Delay Time	t_d	$C_d = 0.1\mu\text{F}$, $I_o = 5\text{mA}$		10		ms

[L78MR06]

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

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	8.5 to 21	V
Output Current	I_o	5 to 500	mA
Reset Output Current	I_{oR}	$V_o \leq 5.64\text{V}$	20 mA max

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{IN} = 11\text{V}$, $I_o = 0.35\text{A}$, $C_o = 10\mu\text{F}$

Parameter	Symbol	Conditions	min	typ	max	unit
Output Voltage	V_{o1}	$T_j = 25^\circ\text{C}$	5.75	6.0	6.25	V
	V_{o2}	$8\text{V} \leq V_{IN} \leq 21\text{V}$, $5\text{mA} \leq I_o \leq 0.35\text{A}$	5.7		6.3	V
Line Regulation	ΔV_o	LN1 $T_j = 25^\circ\text{C}$, $8\text{V} \leq V_{IN} \leq 25\text{V}$, $I_o = 0.2\text{A}$		1.2	100	mV
		LN2 $T_j = 25^\circ\text{C}$, $9\text{V} \leq V_{IN} \leq 25\text{V}$, $I_o = 0.2\text{A}$		0.6	50	mV
Load Regulation	ΔV_o	LD1 $T_j = 25^\circ\text{C}$, $5\text{mA} \leq I_o \leq 0.5\text{A}$		4.0	120	mV
		LD2 $T_j = 25^\circ\text{C}$, $5\text{mA} \leq I_o \leq 0.2\text{A}$		2.0	60	mV
Current Dissipation	I_{CC}	$T_j = 25^\circ\text{C}$	3.4		6.0	mA
Current Dissipation Variation (Line)	ΔI_{CC}	LN $9\text{V} \leq V_{IN} \leq 25\text{V}$, $I_o \leq 0.2\text{A}$			0.8	mA
		LD $5\text{mA} \leq I_o \leq 0.35\text{A}$			0.5	mA
Output Noise Voltage	V_{NO}	$I_o = 5\text{mA}$, $10\text{Hz} \leq f \leq 100\text{kHz}$		70		μV
Ripple Rejection	Rr1	$T_j = 25^\circ\text{C}$, $f = 120\text{Hz}$, $9\text{V} \leq V_{IN} \leq 19\text{V}$, $I_o = 0.1\text{A}$	59	80		dB
	Rr2	$T_j = 25^\circ\text{C}$, $f = 120\text{Hz}$, $9\text{V} \leq V_{IN} \leq 19\text{V}$, $I_o = 0.3\text{A}$	59	75		dB

Continued on next page.

L78MR00 Series

Continued from preceding page.

			min	typ	max	unit
Dropout Voltage	V_{drop}			2.0	2.5	V
Peak Output Current	I_{OP}	$T_j = 25^\circ\text{C}$		1.1		A
Short Circuit Current	I_{OSC}	$T_j = 25^\circ\text{C}, V_{IN} = 35\text{V}$		0.02		A
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$I_o = 5\text{mA}, T_j = 25 \text{ to } 125^\circ\text{C}$		-0.4		mV/°C
'L' Reset Output Voltage	V_{ORL}	$V_o \leq 5.64\text{V}, I_{OR} = 20\text{mA}, I_o = 5\text{mA}$			0.8	V
Reset Output Leakage Current	I_{RL}	$V_R = 35\text{V}$			50	μA
Reset Threshold Voltage	V_{RT}	$I_o = 5\text{mA}$	$V_o - 0.36$	$V_o - 0.24$		V
Reset Hysteresis Voltage	V_{RTH}	$I_o = 5\text{mA}$		120		mV
Reset Output Delay Time	t_d	$C_d = 0.1\mu\text{F}, I_o = 5\text{mA}$		10		ms

[L78MR08]

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

				unit
Input Voltage	V_{IN}		10.5 to 23	V
Output Current	I_o		5 to 500	mA
Reset Output Current	I_{OR}	$V_o \leq 7.2\text{V}$	20	mA max

Operating Characteristics at $T_a = 25^\circ\text{C}, V_{IN} = 14\text{V}, I_o = 0.35\text{A}, C_o = 10\mu\text{F}$

			min	typ	max	unit
Output Voltage	V_{o1}	$T_j = 25^\circ\text{C}$	7.7	8.0	8.3	V
	V_{o2}	$10.5\text{V} \leq V_{IN} \leq 23\text{V},$ $5\text{mA} \leq I_o \leq 0.35\text{A}$	7.6		8.4	V
Line Regulation	ΔV_o	LN1 $T_j = 25^\circ\text{C}, 10.5\text{V} \leq V_{IN} \leq 25\text{V},$ $I_o = 0.2\text{A}$		1.6	100	mV
		LN2 $T_j = 25^\circ\text{C}, 11\text{V} \leq V_{IN} \leq 25\text{V},$ $I_o = 0.2\text{A}$		0.8	50	mV
Load Regulation	ΔV_o	LD1 $T_j = 25^\circ\text{C}, 5\text{mA} \leq I_o \leq 0.5\text{A}$		5.0	160	mV
		LD2 $T_j = 25^\circ\text{C}, 5\text{mA} \leq I_o \leq 0.2\text{A}$		2.0	80	mV
Current Dissipation	I_{CC}	$T_j = 25^\circ\text{C}$		3.5	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CC}	LN $10.5\text{V} \leq V_{IN} \leq 25\text{V}, I_o \leq 0.2\text{A}$			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD $5\text{mA} \leq I_o \leq 0.35\text{A}$			0.5	mA
Output Noise Voltage	V_{NO}	$I_o = 5\text{mA}, 10\text{Hz} \leq f \leq 100\text{kHz}$		100		μV
Ripple Rejection	Rr1	$T_j = 25^\circ\text{C}, f = 120\text{Hz},$ $11.5\text{V} \leq V_{IN} \leq 21.5\text{V}, I_o = 0.1\text{A}$	56	75		dB
	Rr2	$T_j = 25^\circ\text{C}, f = 120\text{Hz},$ $11.5\text{V} \leq V_{IN} \leq 21.5\text{V}, I_o = 0.3\text{A}$	56	71		dB
Dropout Voltage	V_{drop}			2.0	2.5	V
Peak Output Current	I_{OP}	$T_j = 25^\circ\text{C}$		1.1		A
Short Circuit Current	I_{OSC}	$T_j = 25^\circ\text{C}, V_{IN} = 35\text{V}$		0.02		A
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$I_o = 5\text{mA}, T_j = 25 \text{ to } 125^\circ\text{C}$		-0.7		mV/°C
'L' Reset Output Voltage	V_{ORL}	$V_o \leq 7.2\text{V}, I_{OR} = 20\text{mA}, I_o = 5\text{mA}$			0.8	V
Reset Output Leakage Current	I_{RL}	$V_R = 35\text{V}$			50	μA
Reset Threshold Voltage	V_{RT}	$I_o = 5\text{mA}$	$V_o - 0.48$	$V_o - 0.32$		V
Reset Hysteresis Voltage	V_{RTH}	$I_o = 5\text{mA}$		160		mV
Reset Output Delay Time	t_d	$C_d = 0.1\mu\text{F}, I_o = 5\text{mA}$		10		ms

L78MR00 Series

[L78MR09]

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

Parameter	Symbol	Condition	min	typ	max	unit
Input Voltage	V_{IN}			12 to 24		V
Output Current	I_o			5 to 500		mA
Reset Output Current	I_{OR}	$V_o \leq 8.1\text{V}$		20		mA max

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{IN} = 15\text{V}$, $I_o = 0.35\text{A}$, $C_o = 10\mu\text{F}$

Parameter	Symbol	Condition	min	typ	max	unit
Output Voltage	V_{o1}	$T_j = 25^\circ\text{C}$	8.6	9.0	9.4	V
	V_{o2}	$11.5\text{V} \leq V_{IN} \leq 24\text{V}$, $5\text{mA} \leq I_o \leq 0.35\text{A}$	8.5		9.5	V
Line Regulation	ΔV_o	LN1 $T_j = 25^\circ\text{C}$, $11.5\text{V} \leq V_{IN} \leq 25\text{V}$, $I_o = 0.2\text{A}$		1.6	100	mV
		LN2 $T_j = 25^\circ\text{C}$, $12\text{V} \leq V_{IN} \leq 25\text{V}$, $I_o = 0.2\text{A}$		0.8	50	mV
Load Regulation	ΔV_o	LD1 $T_j = 25^\circ\text{C}$, $5\text{mA} \leq I_o \leq 0.5\text{A}$		5.0	180	mV
		LD2 $T_j = 25^\circ\text{C}$, $5\text{mA} \leq I_o \leq 0.2\text{A}$		3.0	90	mV
Current Dissipation	I_{CC}	$T_j = 25^\circ\text{C}$		3.5	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CC}	LN $11.5\text{V} \leq V_{IN} \leq 25\text{V}$, $I_o \leq 0.2\text{A}$			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD $5\text{mA} \leq I_o \leq 0.35\text{A}$			0.5	mA
Output Noise Voltage	V_{NO}	$I_o = 5\text{mA}$, $10\text{Hz} \leq f \leq 100\text{kHz}$		110		μV
Ripple Rejection	R_{r1}	$T_j = 25^\circ\text{C}$, $f = 120\text{Hz}$, $12\text{V} \leq V_{IN} \leq 22\text{V}$, $I_o = 0.1\text{A}$	56	73		dB
		$T_j = 25^\circ\text{C}$, $f = 120\text{Hz}$, $12\text{V} \leq V_{IN} \leq 22\text{V}$, $I_o = 0.3\text{A}$	56	70		dB
Dropout Voltage	V_{drop}			2.0	2.5	V
Peak Output Current	I_{OP}	$T_j = 25^\circ\text{C}$		1.1		A
Short Circuit Current	I_{OSC}	$T_j = 25^\circ\text{C}$, $V_{IN} = 35\text{V}$		0.02		A
Temperature Coefficient of Output Voltage	$\Delta V_o/\Delta T$	$I_o = 5\text{mA}$, $T_j = 25$ to 125°C	-0.9			mV/°C
'L' Reset Output Voltage	V_{ORL}	$V_o \leq 8.1\text{V}$, $I_{OR} = 20\text{mA}$, $I_o = 5\text{mA}$			0.8	V
Reset Output Leakage Current	I_{RL}	$V_R = 35\text{V}$			50	μA
Reset Threshold Voltage	V_{RT}	$I_o = 5\text{mA}$		$V_o - 0.54 V_o - 0.36$		V
Reset Hysteresis Voltage	V_{RTH}	$I_o = 5\text{mA}$		180		mV
Reset Output Delay Time	t_d	$C_d = 0.1\mu\text{F}$, $I_o = 5\text{mA}$		10		ms

[L78MR12]

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

Parameter	Symbol	Condition	min	typ	max	unit
Input Voltage	V_{IN}			15 to 27		V
Output Current	I_o			5 to 500		mA
Reset Output Current	I_{OR}	$V_o \leq 10.8\text{V}$		20		mA max

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{IN} = 19\text{V}$, $I_o = 0.35\text{A}$, $C_o = 10\mu\text{F}$

Parameter	Symbol	Condition	min	typ	max	unit
Output Voltage	V_{o1}	$T_j = 25^\circ\text{C}$	11.5	12.0	12.5	V
	V_{o2}	$14.5\text{V} \leq V_{IN} \leq 27\text{V}$, $5\text{mA} \leq I_o \leq 0.35\text{A}$	11.4		12.6	V
Line Regulation	ΔV_o	LN1 $T_j = 25^\circ\text{C}$, $14.5\text{V} \leq V_{IN} \leq 30\text{V}$, $I_o = 0.2\text{A}$		2.4	100	mV
		LN2 $T_j = 25^\circ\text{C}$, $16\text{V} \leq V_{IN} \leq 30\text{V}$, $I_o = 0.2\text{A}$		1.2	50	mV
Load Regulation	ΔV_o	LD1 $T_j = 25^\circ\text{C}$, $5\text{mA} \leq I_o \leq 0.5\text{A}$		7.0	240	mV
		LD2 $T_j = 25^\circ\text{C}$, $5\text{mA} \leq I_o \leq 0.2\text{A}$		4.0	120	mV
Current Dissipation	I_{CC}	$T_j = 25^\circ\text{C}$		3.7	6.0	mA

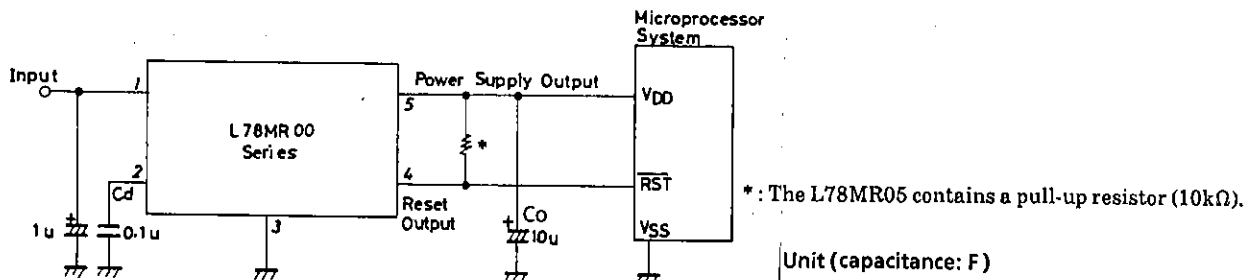
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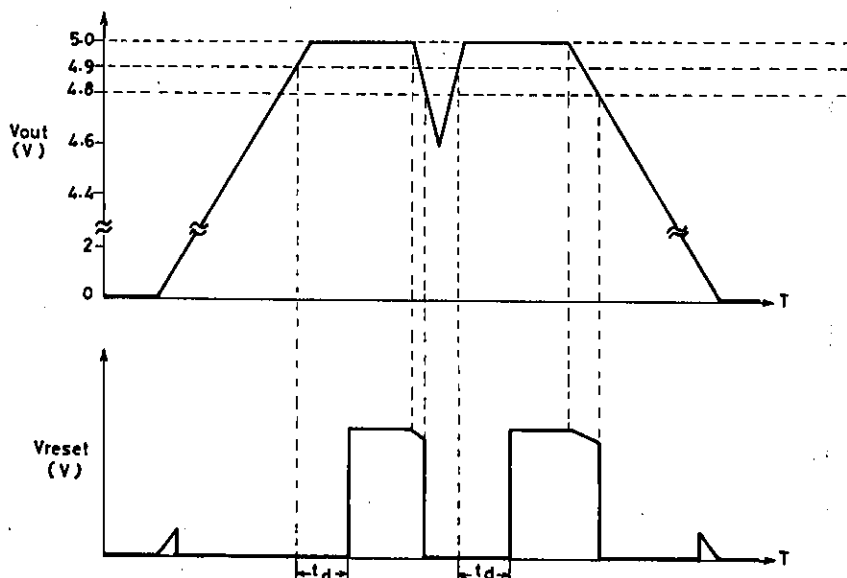
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Current Dissipation Variation (Line)	ΔI_{CC} LN	$14.5V \leq V_{IN} \leq 30V, I_o \leq 0.2A$				0.8	mA
	ΔI_{CC} LD	$5mA \leq I_o \leq 0.35A$				0.5	mA
Output Noise Voltage	V_{NO}	$I_o = 5mA, 10Hz \leq f \leq 100kHz$			140		μV
Ripple Rejection	Rr1	$T_j = 25^\circ C, f = 120Hz, 15V \leq V_{IN} \leq 25V, I_o = 0.1A$		55	68		dB
	Rr2	$T_j = 25^\circ C, f = 120Hz, 15V \leq V_{IN} \leq 25V, I_o = 0.3A$		55	66		dB
	V_{drop}				2.0	2.5	V
Peak Output Current	I_{OP}	$T_j = 25^\circ C$			1.1		A
Short Circuit Current	I_{OSC}	$T_j = 25^\circ C, V_{IN} = 35V$			0.02		A
Temperature Coefficient of Output Voltage	$\Delta V_o / \Delta T$	$I_o = 5mA, T_j = 25 \text{ to } 125^\circ C$			-1.6		mV/°C
'L' Reset Output Voltage	V_{ORL}	$V_o \leq 10.8V, I_{OR} = 20mA, I_o = 5mA$				0.8	V
Reset Output Leakage Current	I_{RL}	$V_R = 35V$				50	μA
Reset Threshold Voltage	V_{RT}	$I_o = 5mA$			$V_o - 0.72$	$V_o - 0.48$	V
Reset Hysteresis Voltage	V_{RTH}	$I_o = 5mA$			240		mV
Reset Output Delay Time	t_d	$C_d = 0.1\mu F, I_o = 5mA$			10		ms

Sample Application Circuit

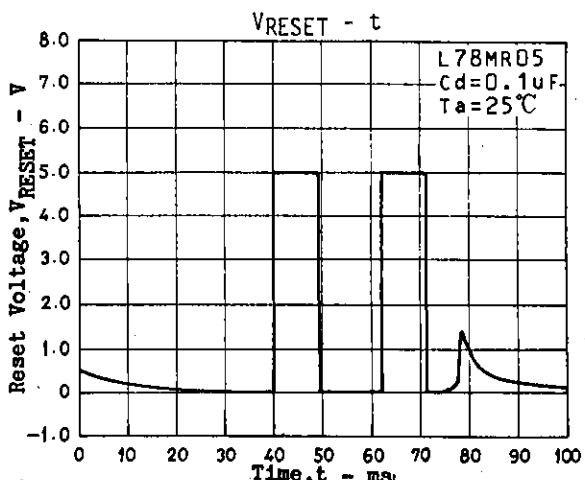
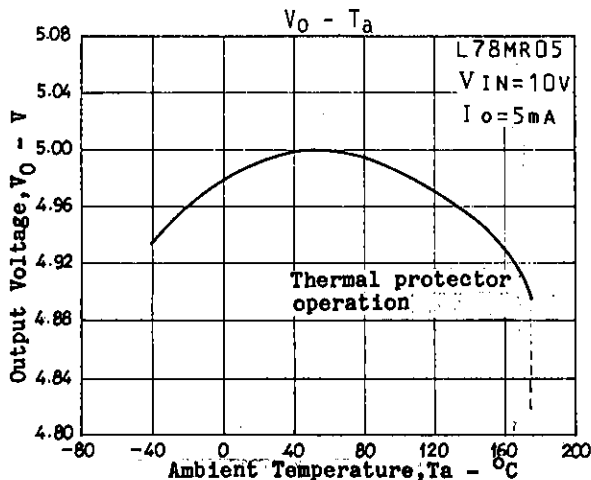
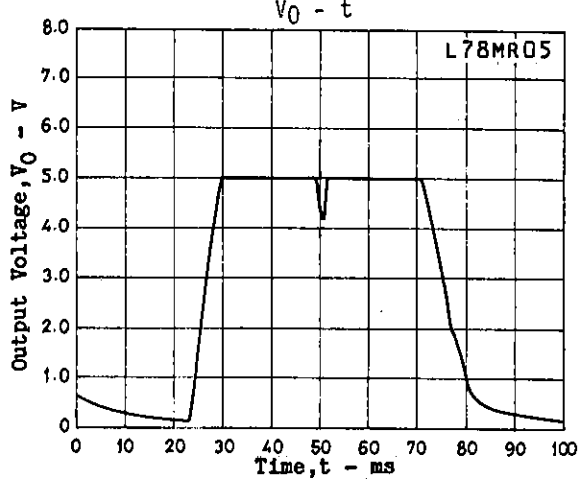
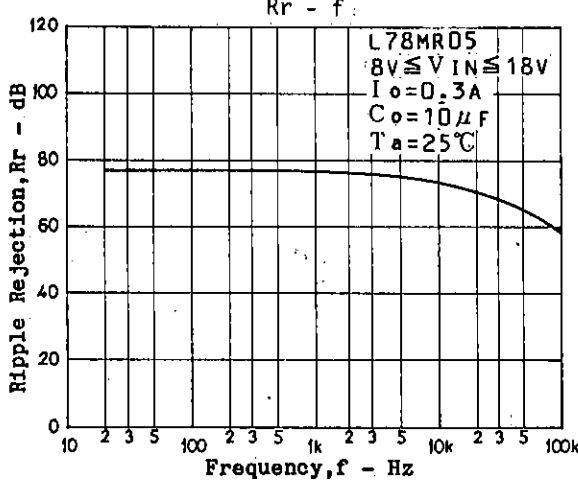
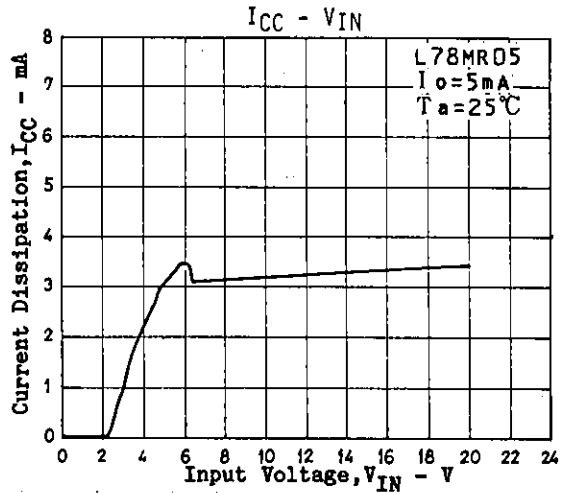
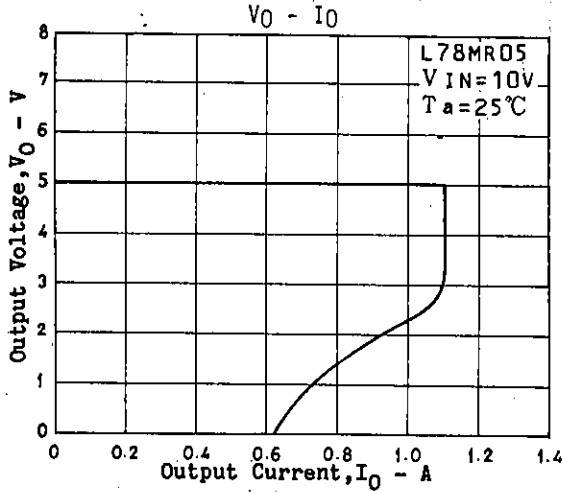
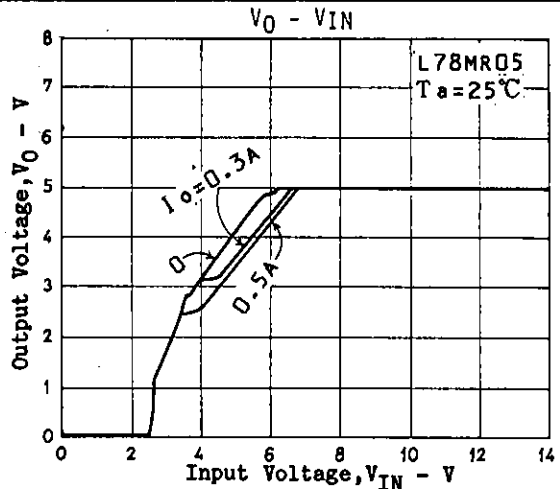
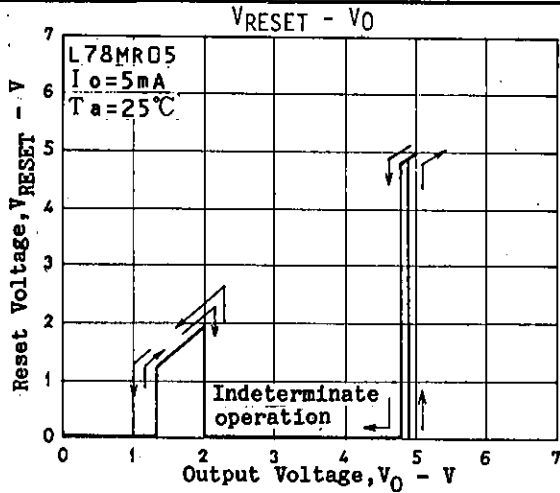


Note on use) If a load current (in particular, pulse-like load current) that is greater than a rated value is used, a reset signal may be generated due to the overload. Please keep it in mind.

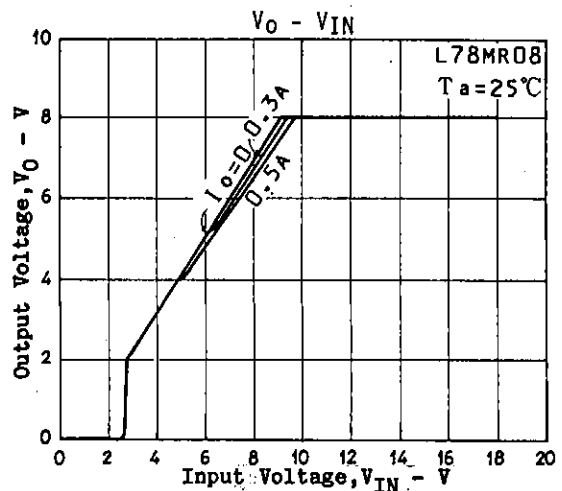
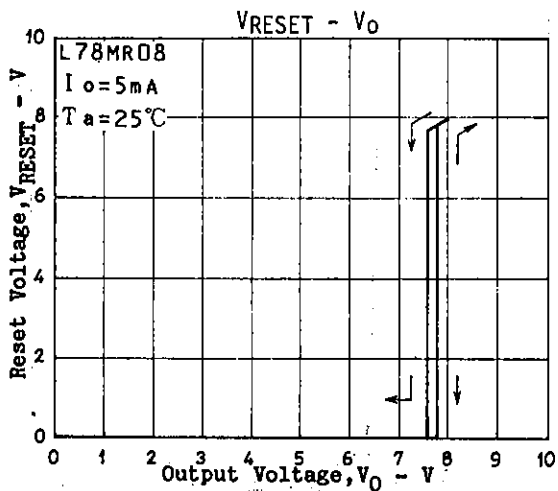
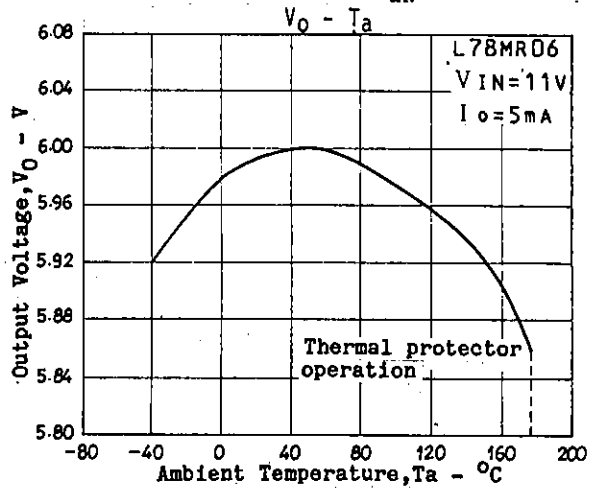
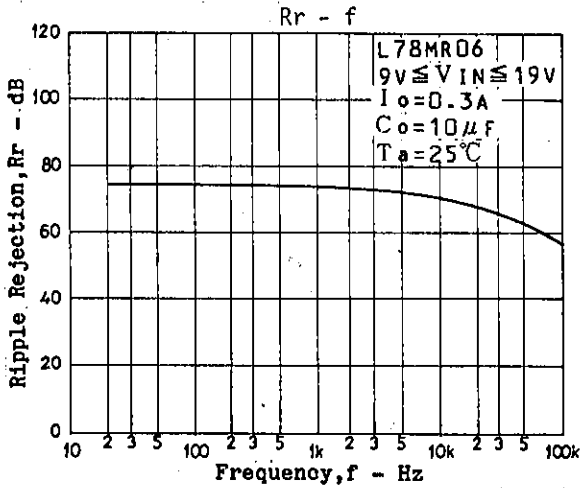
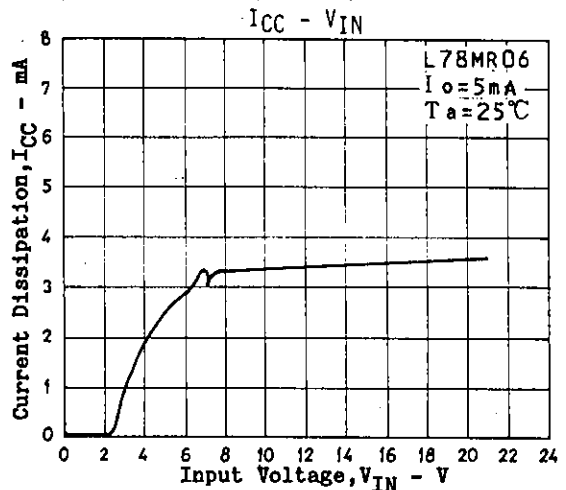
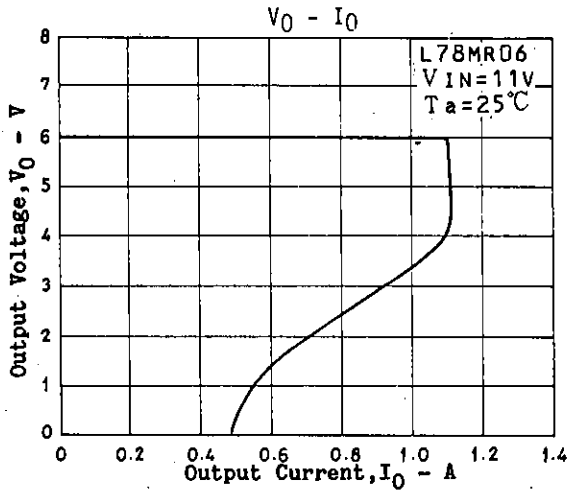
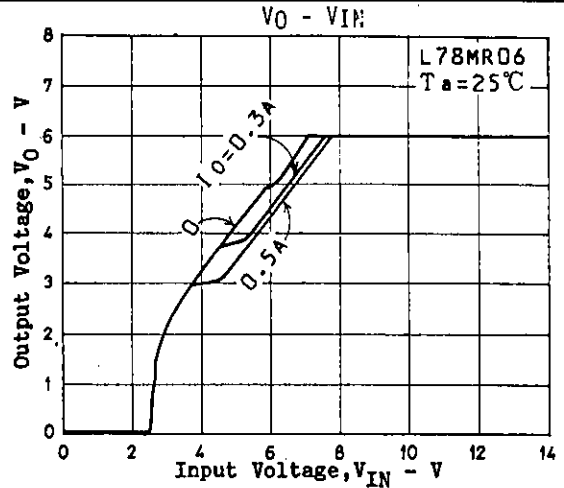
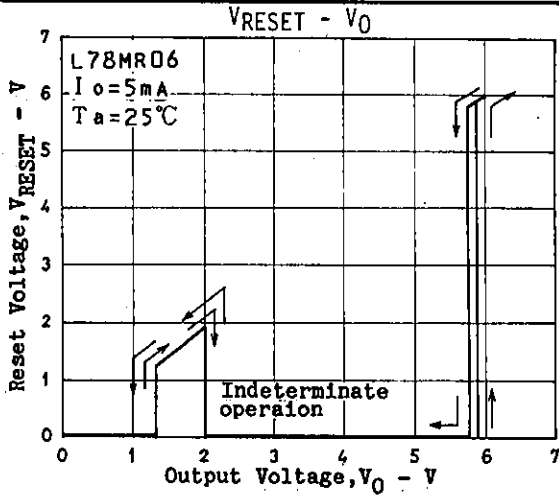
L78MR05 Reset Operation



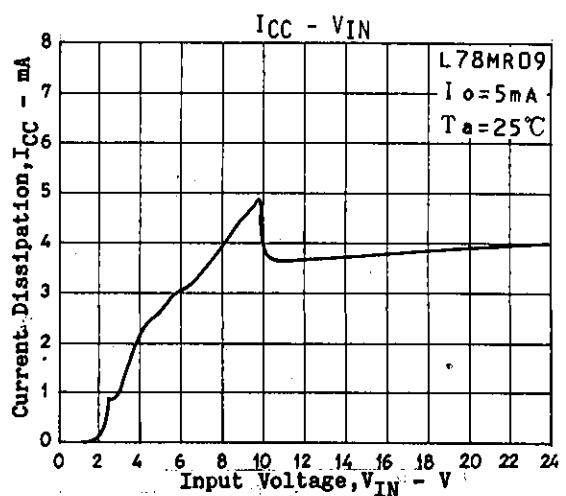
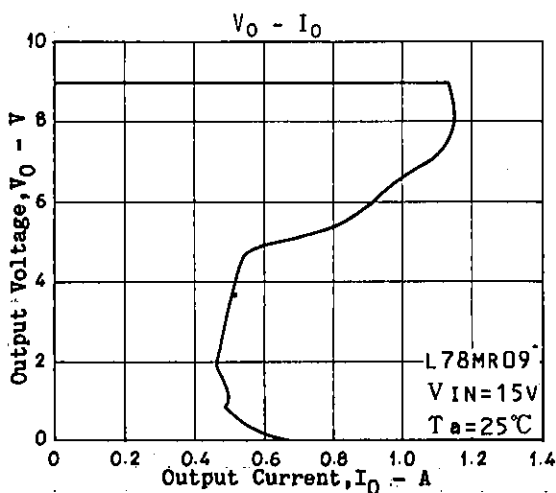
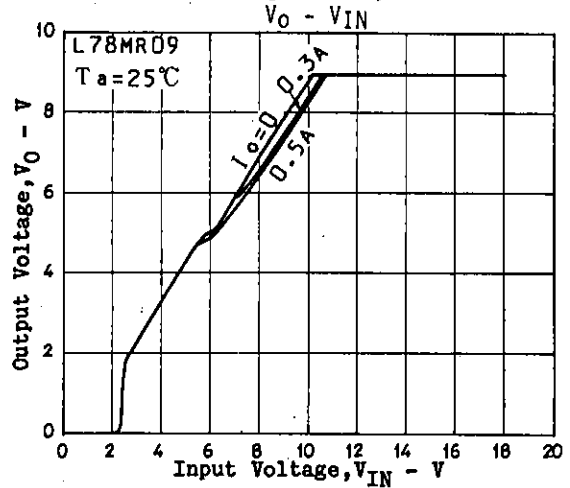
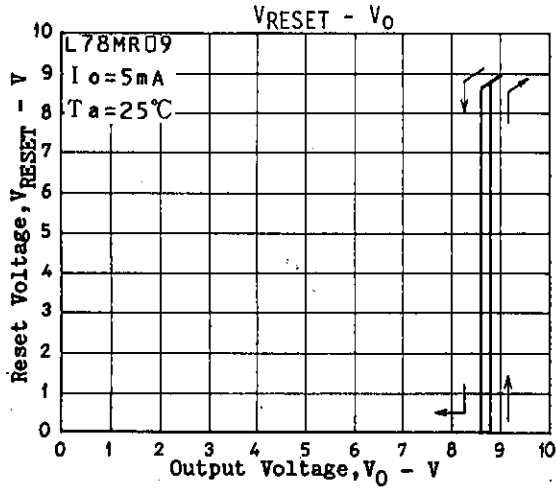
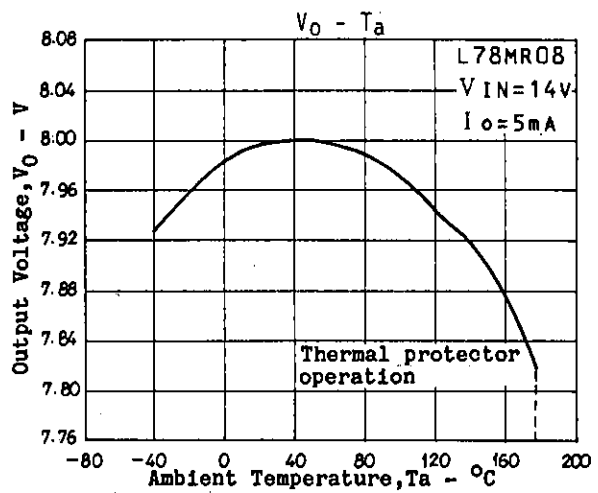
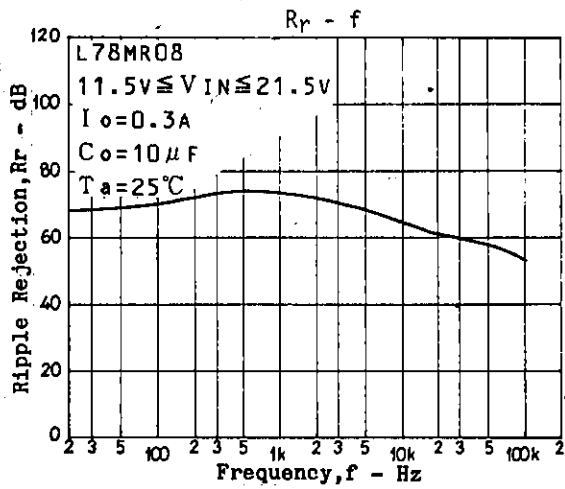
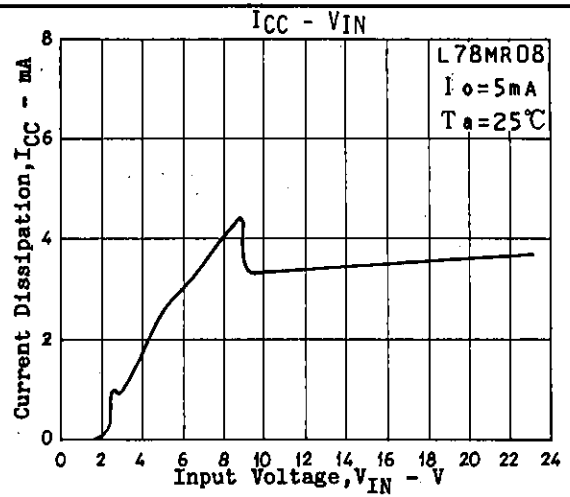
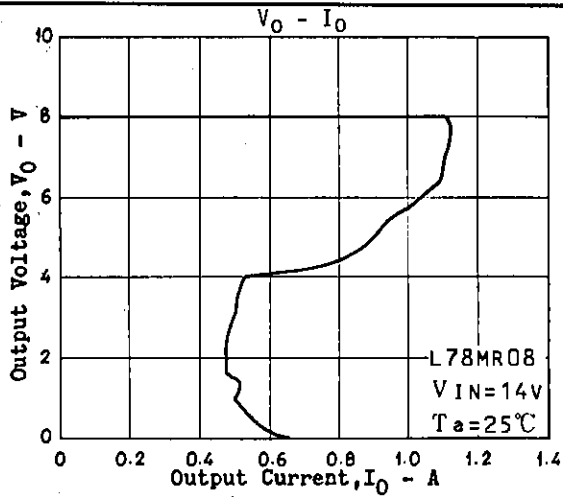
L78MR00 Series



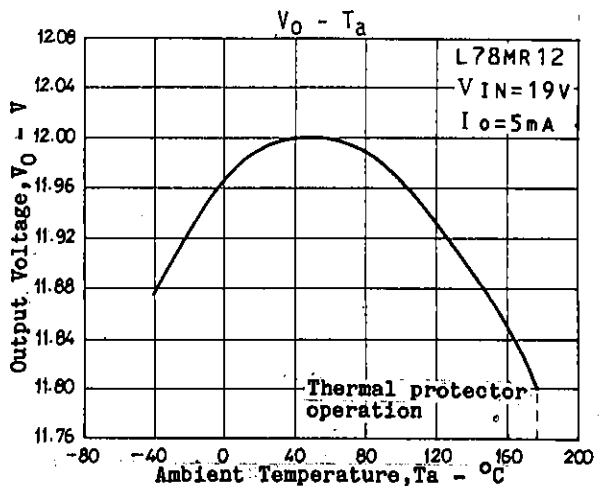
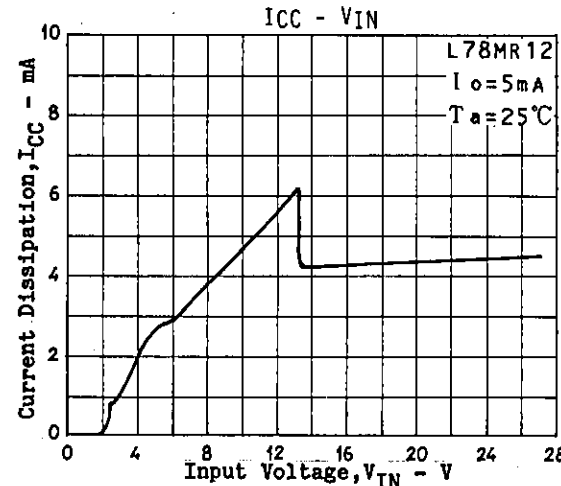
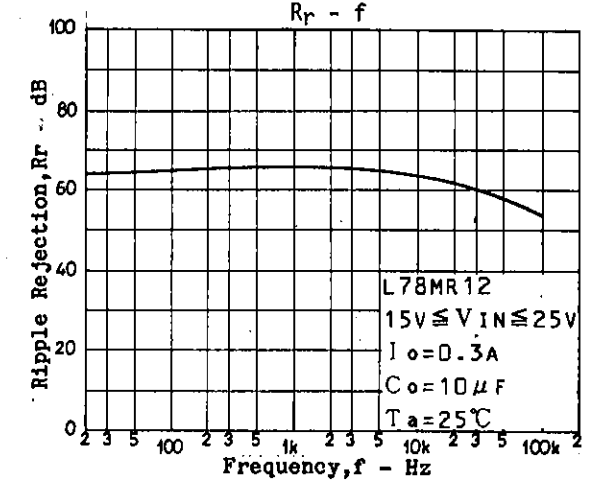
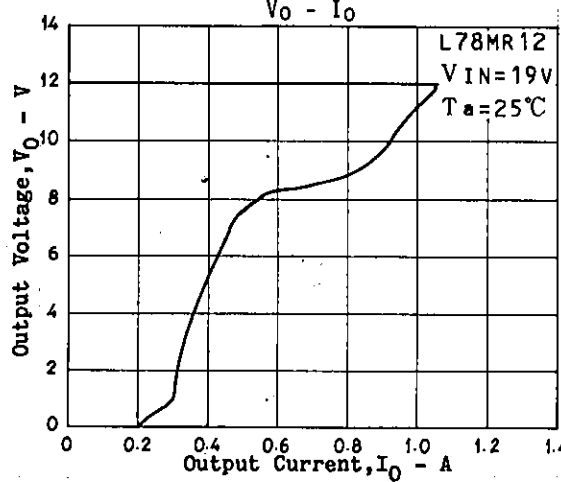
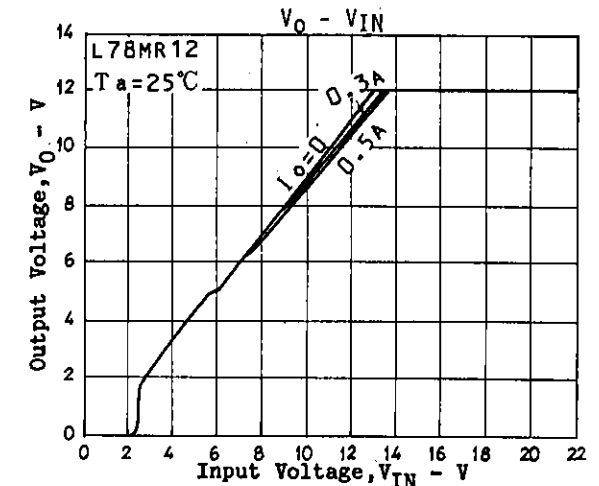
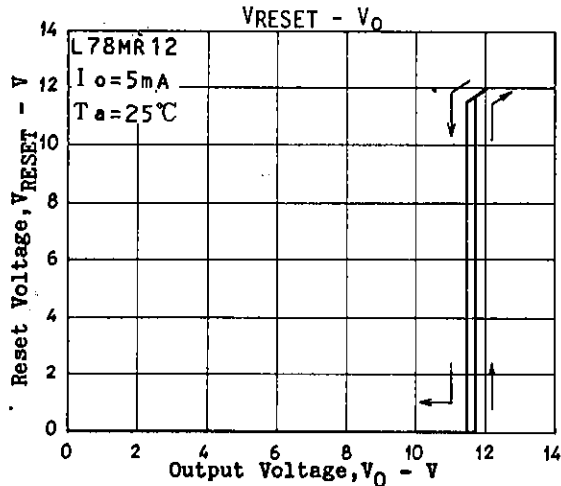
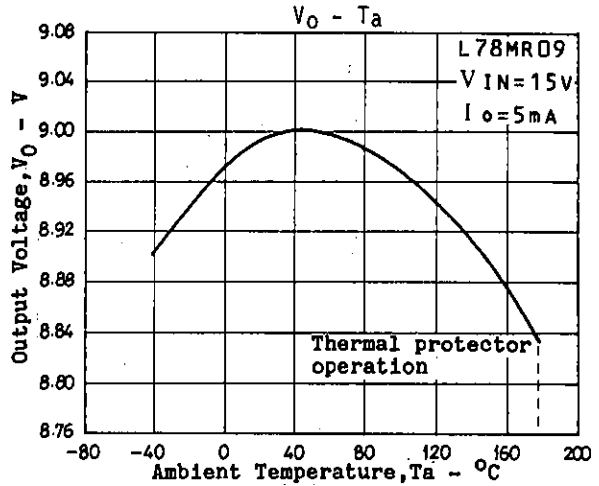
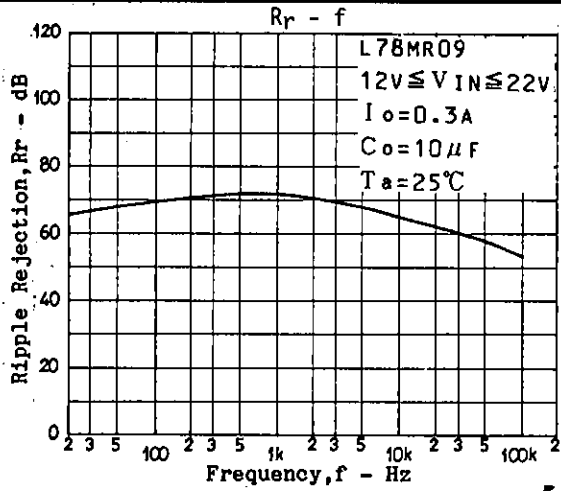
L78MR00 Series



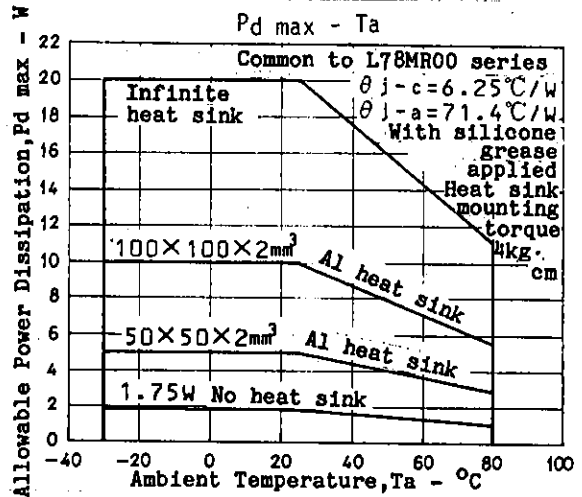
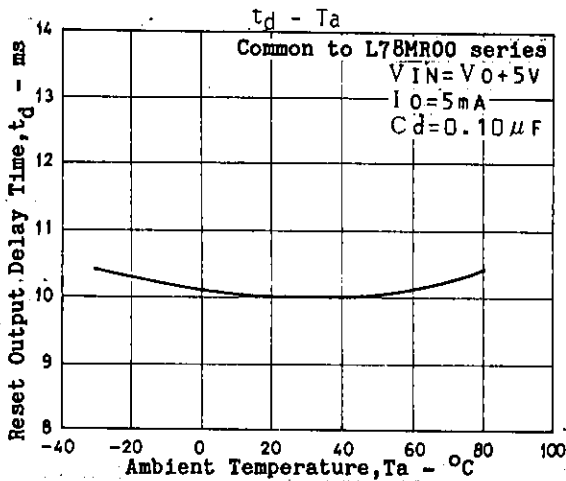
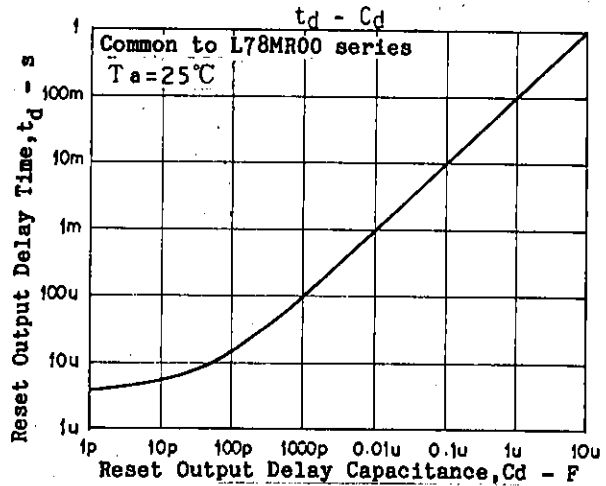
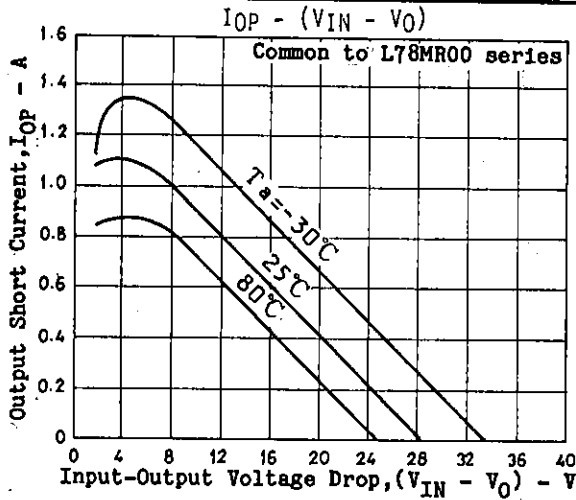
L78MR00 Series



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