



# L78MR00 Series

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

### Overview

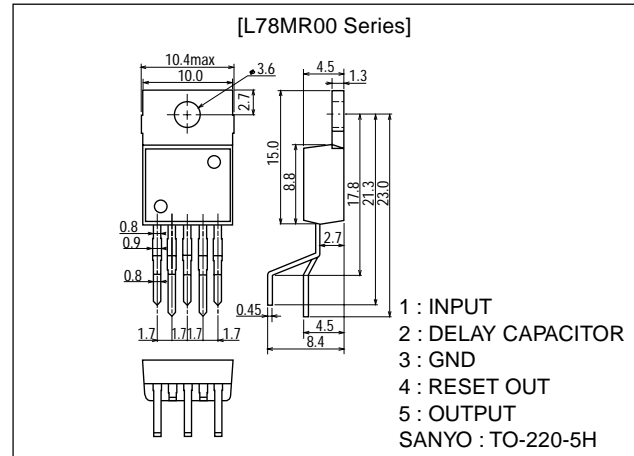
The L78MR00 series, 500mA general-purpose voltage regulator ICs provide reset output signal for microcomputers.

### Features

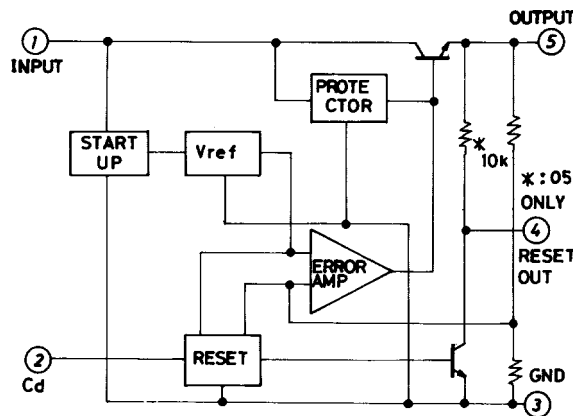
- Reset function (power supply voltage monitor : Generates a reset signal at a power-on and temporal power-down).
- Output voltage  
 L78MR05 : 5V (Reset output ..... On-chip pull-up resistor)  
 L78MR06 : 6V (Reset output ..... Open collector)  
 L78MR08 : 8V (Reset output ..... Open collector)  
 L78MR09 : 9V (Reset output ..... Open collector)  
 L78MR12 : 12V (Reset output ..... Open collector)
- Output current ..... 500mA
- On-chip ASO protector.
- On-chip thermal protector.
- On-chip overcurrent limiter.
- The use of package TO220-5H facilitates easy mounting and thermal design.
- Delay time ( $t_d$ ) may be set by an external capacitor.

### Package Dimensions

unit:mm  
3079



### Equivalent Circuit



Unit (resistance: Ω)

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# L78MR00 Series

## Specifications

[Common to L78MR00 Series]

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Input Voltage	$V_{IN\ max}$		35	V
Reset Pin Supply Voltage	$V_{reset}$		35	V
Allowable Power Dissipation	$P_d\ max$	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	$^\circ\text{C}$

[L78MR05]

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

Parameter	Symbol	Conditions	Ratings	Unit
Input Voltage	$V_{IN}$		7.5 to 20	V
Output Current	$I_{OUT}$		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	Ratings			Unit
			min	typ	max	
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	$\Delta V_O$	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	$\Delta V_O$	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)	$\Delta I_{CC}$	LN $8\text{V}\leq V_{IN}\leq 25\text{V}$ , $I_O=0.2\text{A}$			0.8	mA
Current Dissipation Variation (Load)	$\Delta I_{CC}$	LD $5\text{mA}\leq I_O\leq 0.35\text{A}$			0.5	mA
Output Noise Voltage	$V_{NO}$	$I_O=5\text{mA}$ , $10\text{Hz}\leq f\leq 100\text{kHz}$		60		$\mu\text{V}$
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 $125^\circ\text{C}$		-0.3		$\text{mV}/^\circ\text{C}$
'L' Reset Output Voltage	$V_{ORL}$	$V_O\leq 4.5\text{V}$ , $I_O=5\text{mA}$			0.2	V
Reset Threshold Voltage	$V_{RT}$	$I_O=5\text{mA}$	$V_O-0.3$	$V_O-0.2$		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	Conditions	Ratings	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 max	mA

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## L78MR00 Series

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### 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	Ratings			Unit
			min	typ	max	
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	$\Delta V_O$	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	$\Delta V_O$	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)	$\Delta I_{CC}$	LN $9\text{V}\leq V_{IN}\leq 25\text{V}$ , $I_O=0.2\text{A}$			0.8	mA
Current Dissipation Variation (Load)	$\Delta I_{CC}$	LD $5\text{mA}\leq I_O\leq 0.35\text{A}$			0.5	mA
Output Noise Voltage	$V_{NO}$	$I_O=5\text{mA}$ , $10\text{Hz}\leq f\leq 100\text{kHz}$		70		$\mu\text{V}$
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
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 $125^\circ\text{C}$		-0.4		$\text{mV}/^\circ\text{C}$
'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	$\mu\text{A}$
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 $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	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 max	mA

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

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
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	$\Delta V_O$	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	$\Delta V_O$	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)	$\Delta I_{CC}$	LN $10.5\text{V}\leq V_{IN}\leq 25\text{V}$ , $I_O=0.2\text{A}$			0.8	mA
Current Dissipation Variation (Load)	$\Delta I_{CC}$	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		$\mu\text{V}$
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	$\Delta V_O/\Delta T$	$I_O=5\text{mA}$ , $T_J=25$ to $125^\circ\text{C}$		-0.7		$\text{mV}/^\circ\text{C}$
'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	$\mu\text{A}$
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	Conditions	Ratings	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 max	mA

#### 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	Conditions	Ratings			Unit
			min	typ	max	
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	$\Delta V_O$	LN1	$T_J = 25^\circ\text{C}$ , $11.5\text{V} \leq V_{IN} \leq 25\text{V}$ , $I_O = 0.2\text{A}$			mV
		LN2	$T_J = 25^\circ\text{C}$ , $12\text{V} \leq V_{IN} \leq 25\text{V}$ , $I_O = 0.2\text{A}$			mV
Load Regulation	$\Delta V_O$	LD1	$T_J = 25^\circ\text{C}$ , $5\text{mA} \leq I_O \leq 0.5\text{A}$			mV
		LD2	$T_J = 25^\circ\text{C}$ , $5\text{mA} \leq I_O \leq 0.2\text{A}$			mV
Current Dissipation	$I_{CC}$	$T_J = 25^\circ\text{C}$		3.5	6.0	mA
Current Dissipation Variation (Line)	$\Delta I_{CC}$	LN	$11.5\text{V} \leq V_{IN} \leq 25\text{V}$ , $I_O = 0.2\text{A}$			mA
Current Dissipation Variation (Load)	$\Delta I_{CC}$	LD	$5\text{mA} \leq I_O \leq 0.35\text{A}$			mA
Output Noise Voltage	$V_{NO}$	$I_O = 5\text{mA}$ , $10\text{Hz} \leq f \leq 100\text{kHz}$		110		$\mu\text{V}$
Ripple Rejection	Rr1	$T_J = 25^\circ\text{C}$ , $f = 120\text{Hz}$ , $12\text{V} \leq V_{IN} \leq 22\text{V}$ , $I_O = 0.1\text{A}$	56	73		dB
	Rr2	$T_J = 25^\circ\text{C}$ , $f = 120\text{Hz}$ , $12\text{V} \leq V_{IN} \leq 22\text{V}$ , $I_O = 0.3\text{A}$	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 $125^\circ\text{C}$		-0.9		$\text{mV}/^\circ\text{C}$
'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	$\mu\text{A}$
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	Conditions	Ratings	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 max	mA

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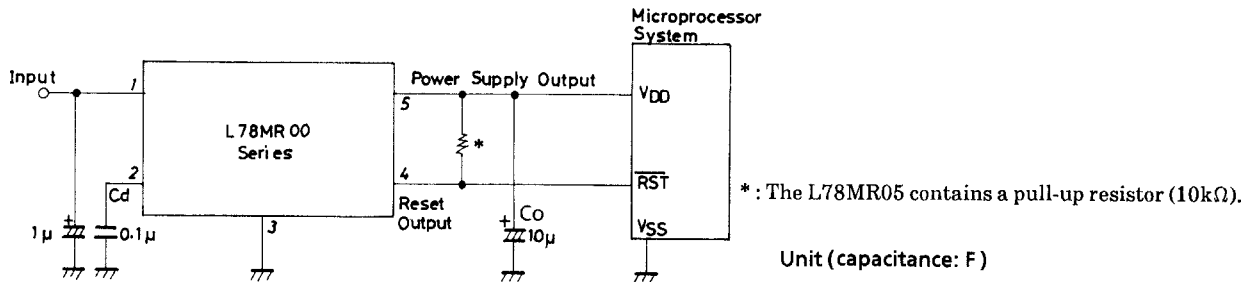
# L78MR00 Series

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

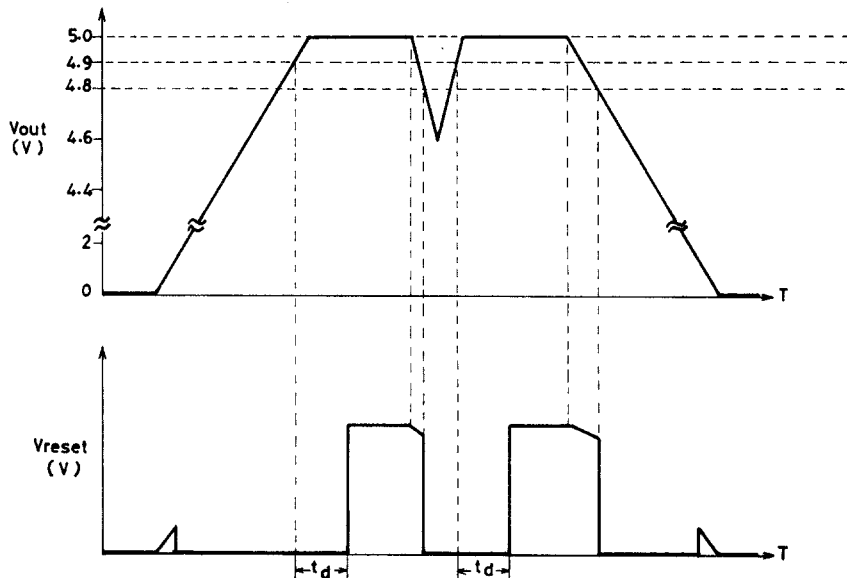
Parameter	Symbol	Conditions	Ratings			Unit	
			min	typ	max		
Output Voltage	$V_{O1}$	$T_J = 25^\circ\text{C}$	11.5	12.0	12.5	V	
	$V_{O2}$	$14.5\text{V} \leq V_{IN} \leq 27\text{V}$ , $5\text{mA} \leq I_O \leq 0.35\text{A}$	11.4		12.6	V	
Line Regulation	$\Delta V_O$	LN1	$T_J = 25^\circ\text{C}$ , $14.5\text{V} \leq V_{IN} \leq 30\text{V}$ , $I_O = 0.2\text{A}$		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	$\Delta V_O$	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	
Current Dissipation Variation (Line)	$\Delta I_{CC}$	LN	$14.5\text{V} \leq V_{IN} \leq 30\text{V}$ , $I_O = 0.2\text{A}$			0.8	mA
Current Dissipation Variation (Load)	$\Delta I_{CC}$	LD	$5\text{mA} \leq I_O \leq 0.35\text{A}$			0.5	mA
Output Noise Voltage	$V_{NO}$	$I_O = 5\text{mA}$ , $10\text{Hz} \leq f \leq 100\text{kHz}$		140		$\mu\text{V}$	
Ripple Rejection	$R_{r1}$	$T_J = 25^\circ\text{C}$ , $f = 120\text{Hz}$ , $15\text{V} \leq V_{IN} \leq 25\text{V}$ , $I_O = 0.1\text{A}$	55	68		dB	
	$R_{r2}$	$T_J = 25^\circ\text{C}$ , $f = 120\text{Hz}$ , $15\text{V} \leq V_{IN} \leq 25\text{V}$ , $I_O = 0.3\text{A}$	55	66		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 $125^\circ\text{C}$		-1.6		$\text{mV}/^\circ\text{C}$	
'L' Reset Output Voltage	$V_{ORL}$	$V_O \leq 10.8\text{V}$ , $I_{OR} = 20\text{mA}$ , $I_O = 5\text{mA}$			0.8	V	
Reset Output Leakage Current	$I_{RL}$	$V_R = 35\text{V}$			50	$\mu\text{A}$	
Reset Threshold Voltage	$V_{RT}$	$I_O = 5\text{mA}$	$V_O - 0.72$	$V_O - 0.48$		V	
Reset Hysteresis Voltage	$V_{RTH}$	$I_O = 5\text{mA}$		240		mV	
Reset Output Delay Time	$t_d$	$C_d = 0.1\mu\text{F}$ , $I_O = 5\text{mA}$		10		ms	

## Specified Application Circuit

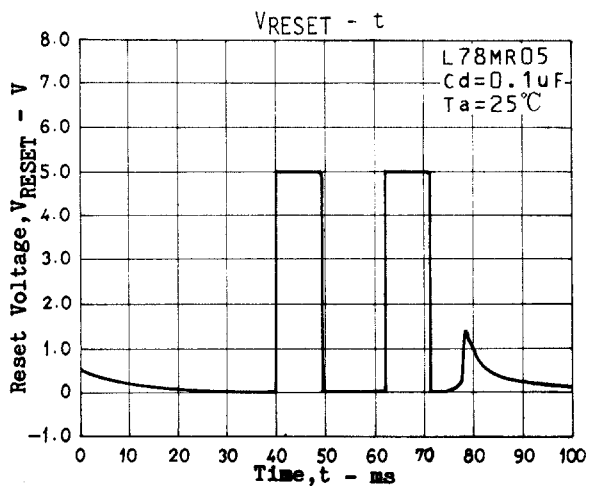
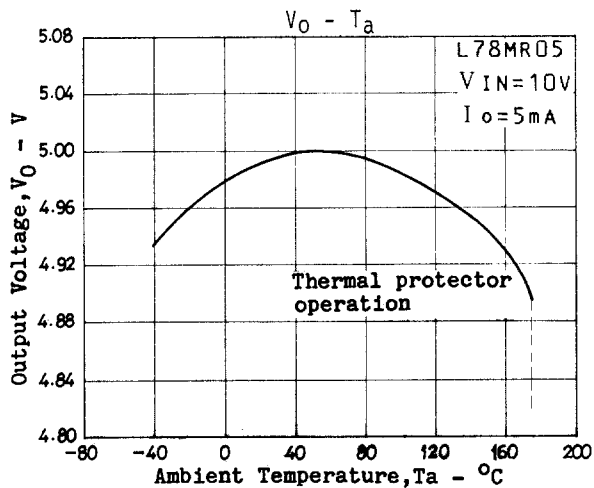
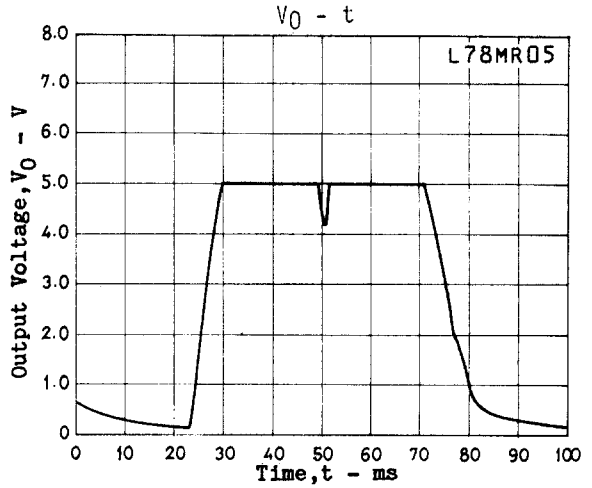
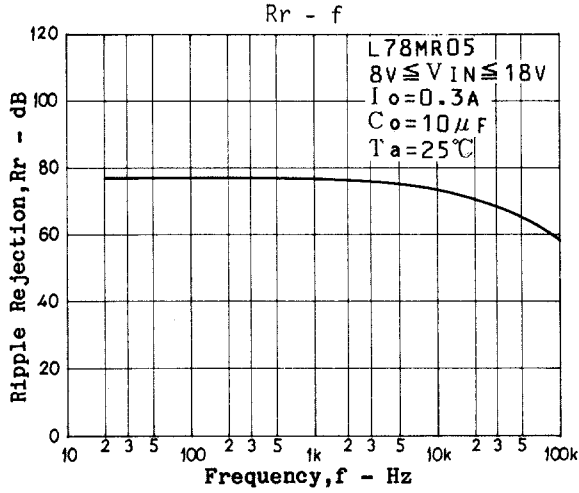
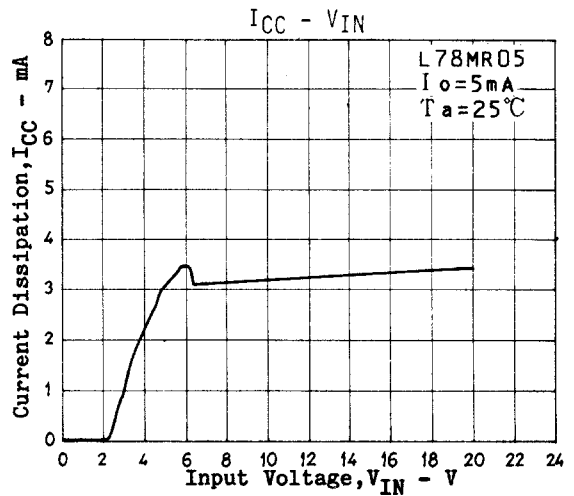
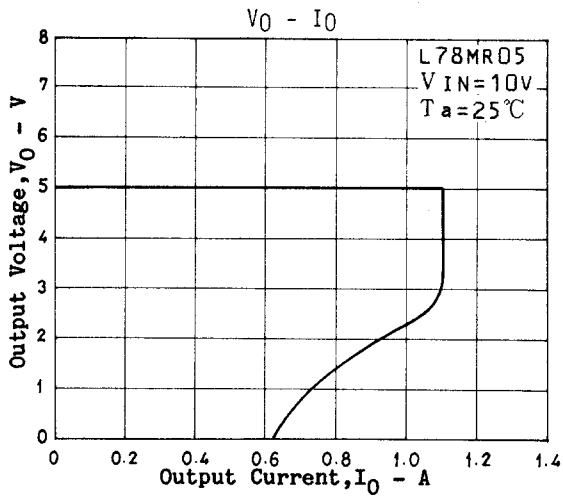
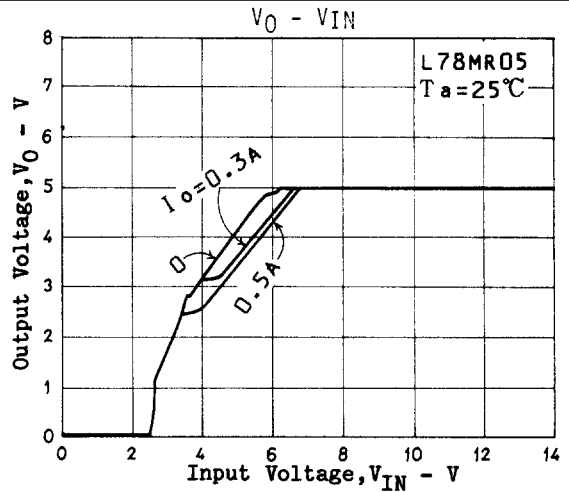
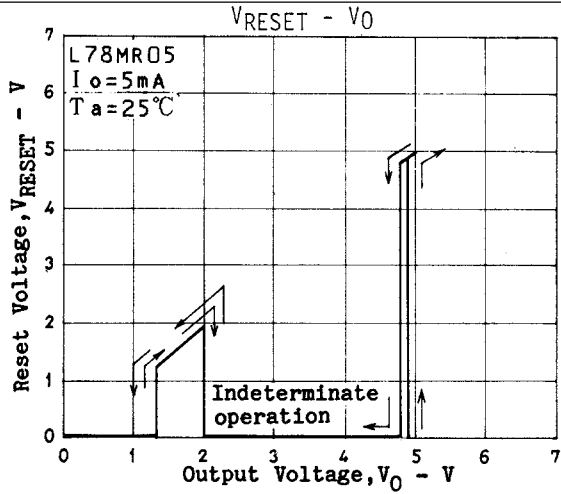


Note on use) If a load current (in particular, pulse-like load current) that is greater than a rated value is used, a reset signal may be generated due to the overload. Please keep it in mind.

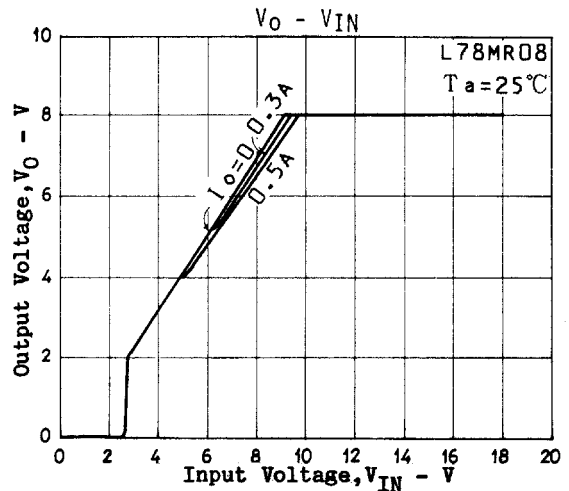
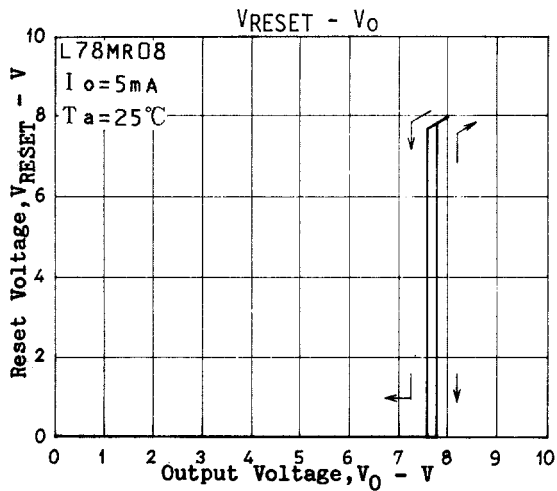
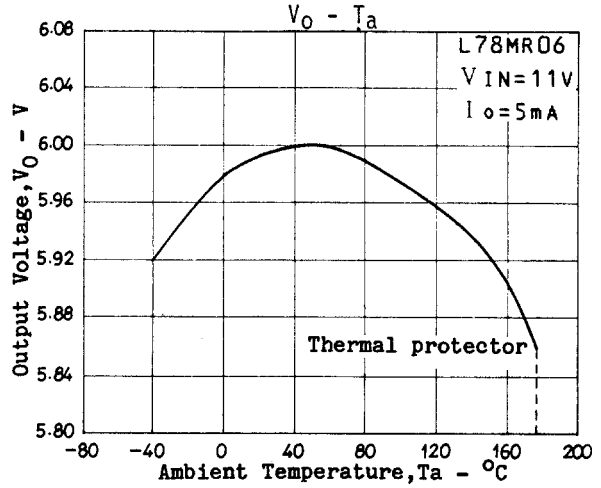
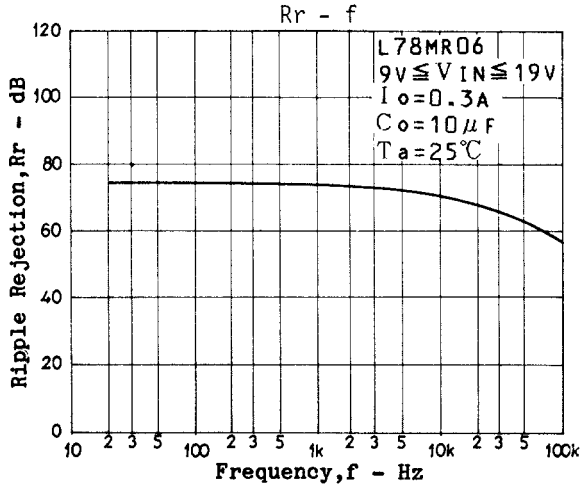
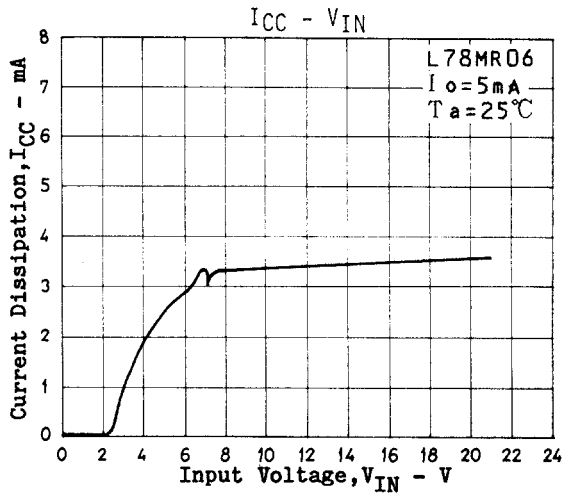
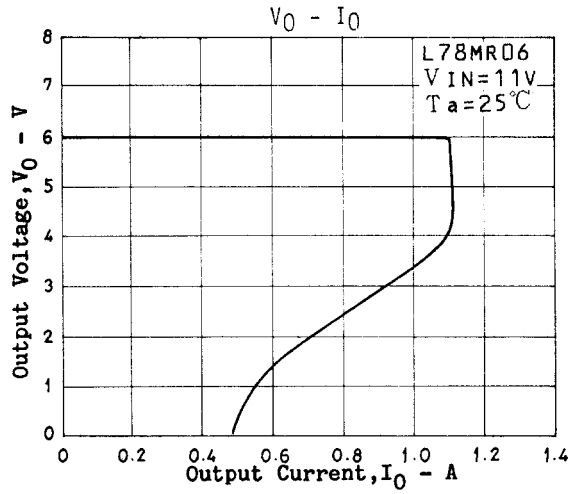
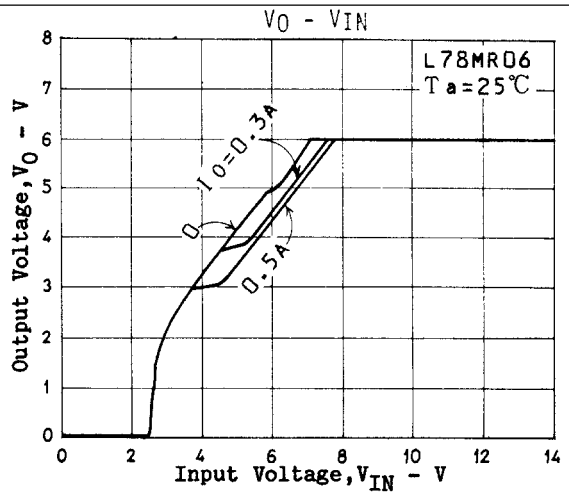
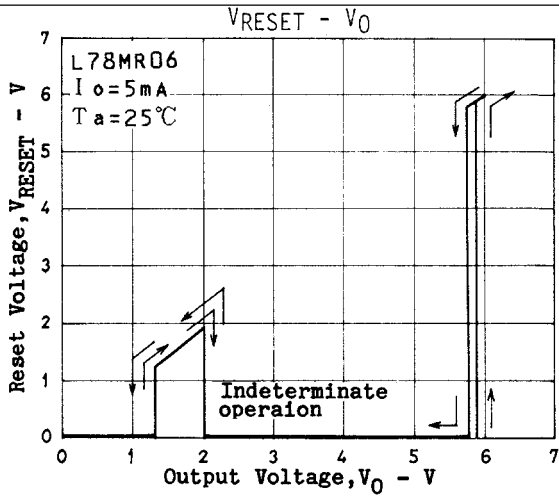
## L78MR05 Reset Operation



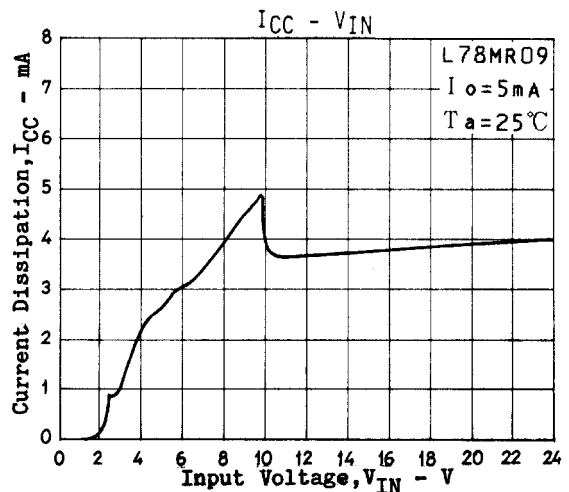
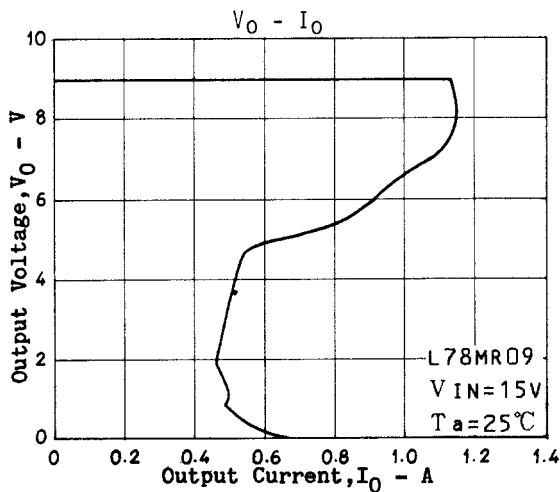
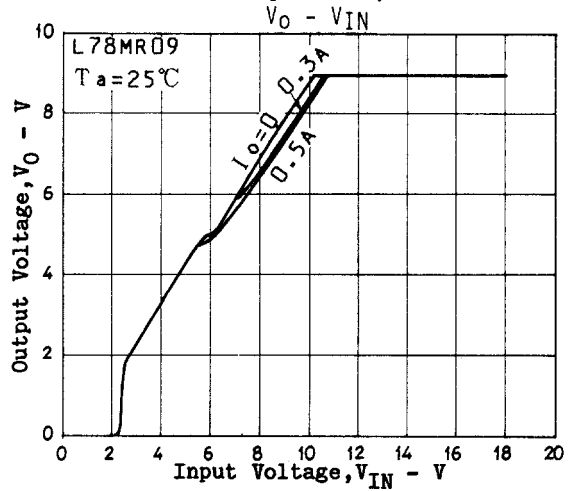
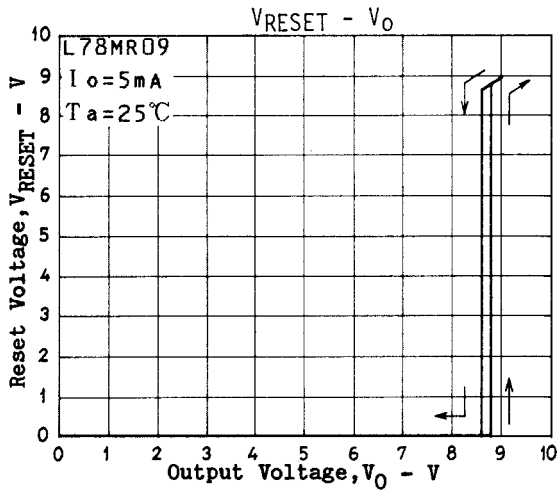
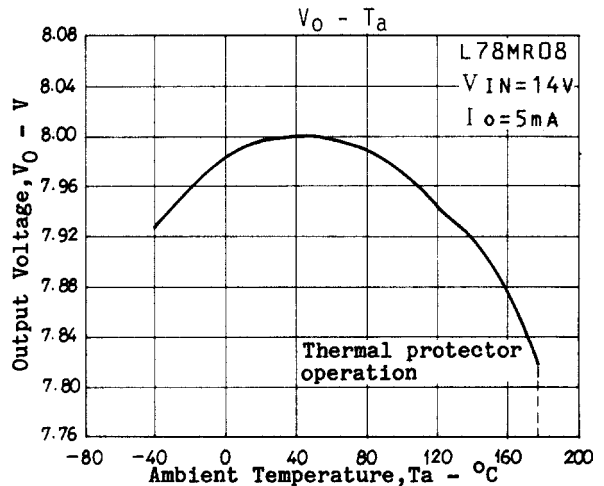
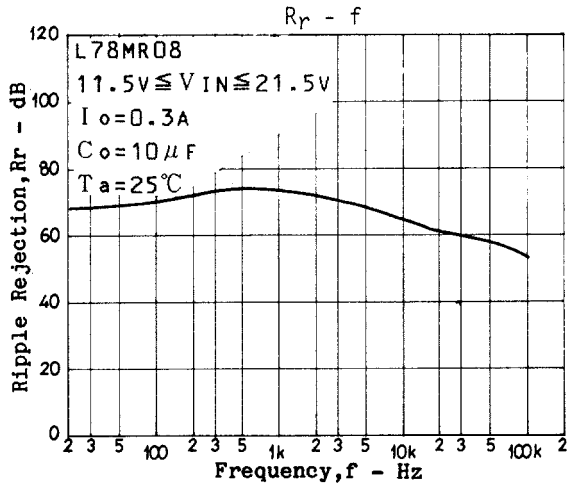
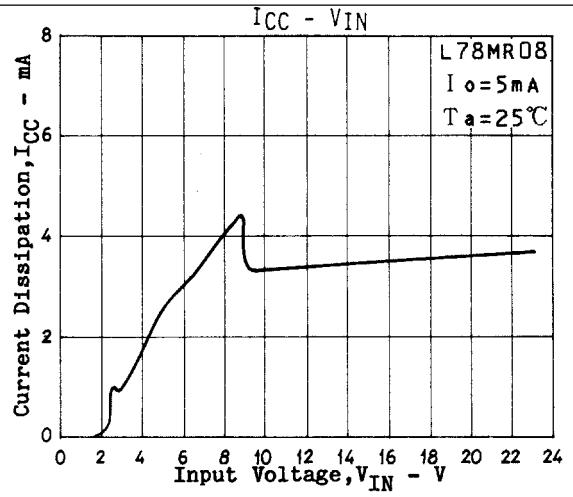
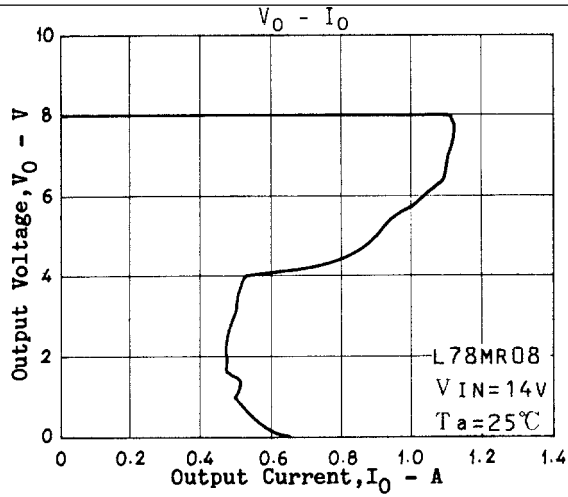
# L78MR00 Series



# L78MR00 Series

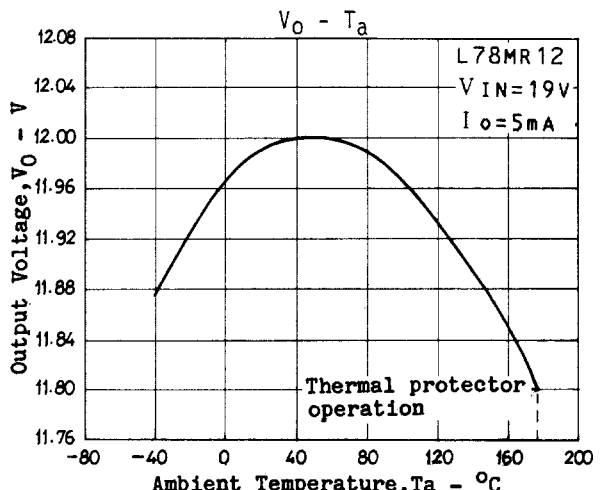
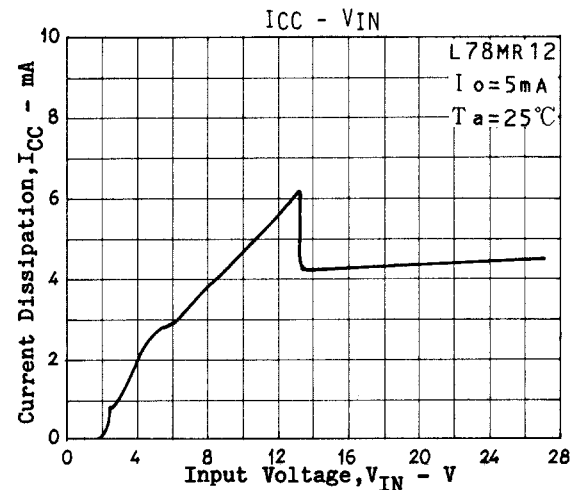
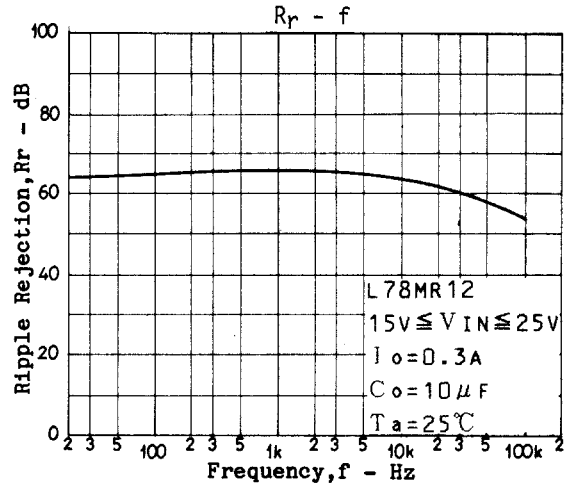
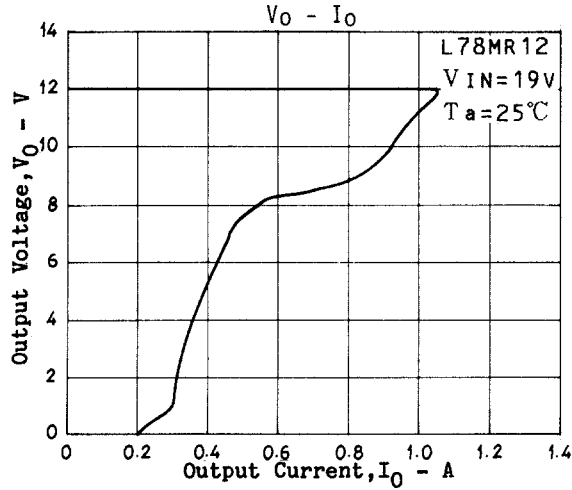
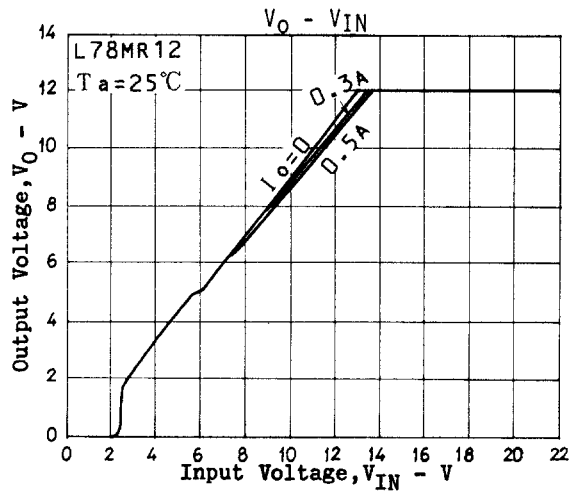
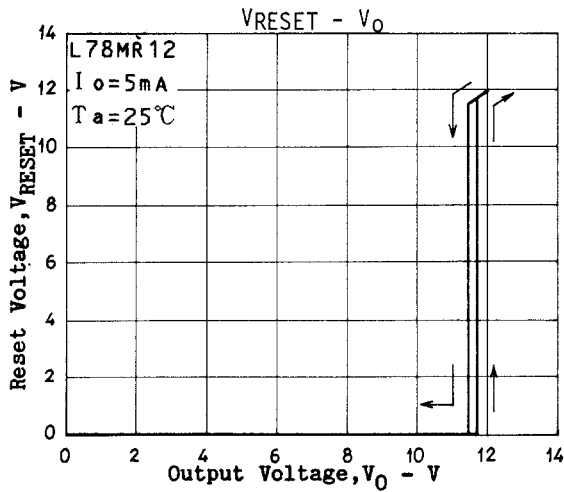
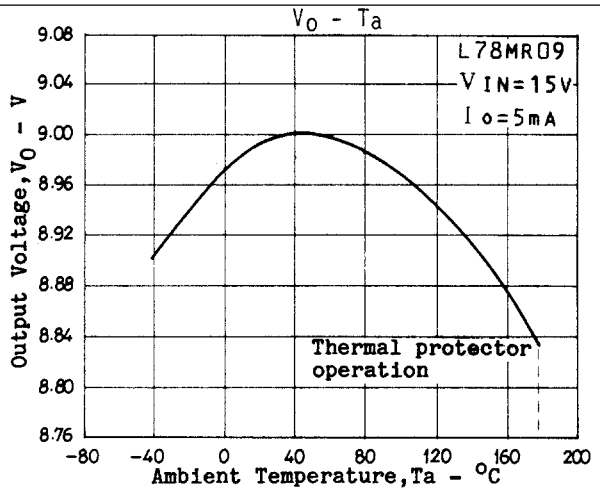
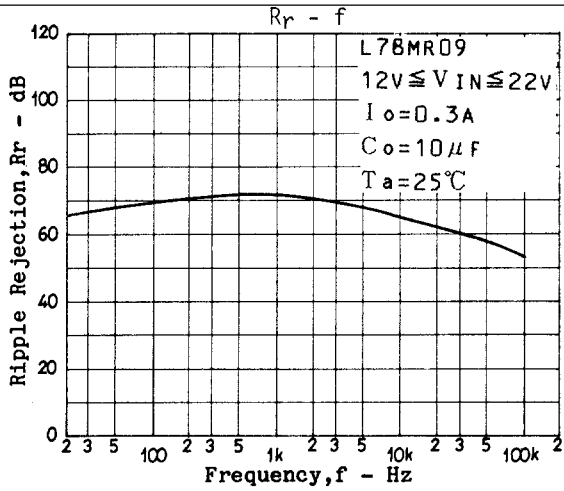


# L78MR00 Series

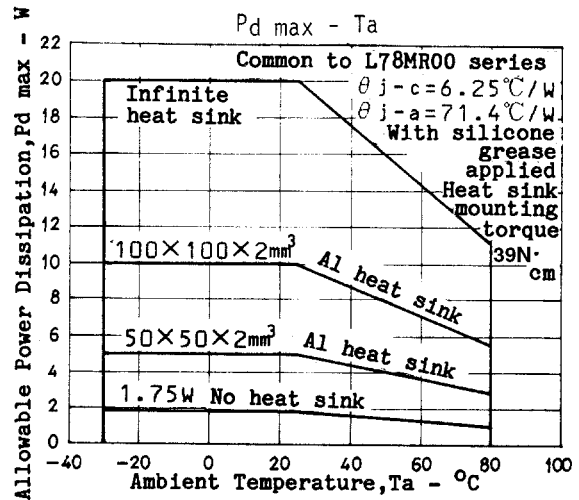
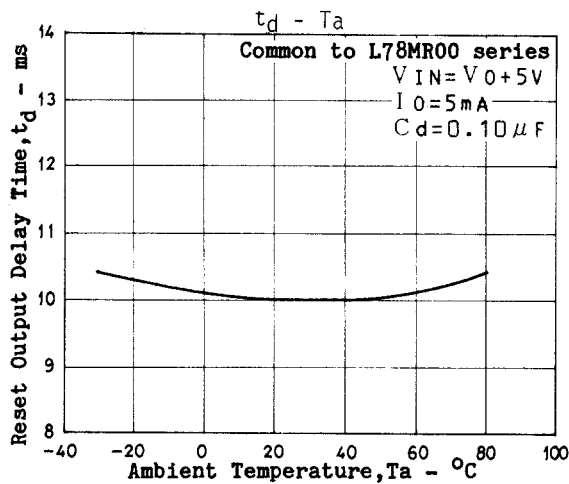
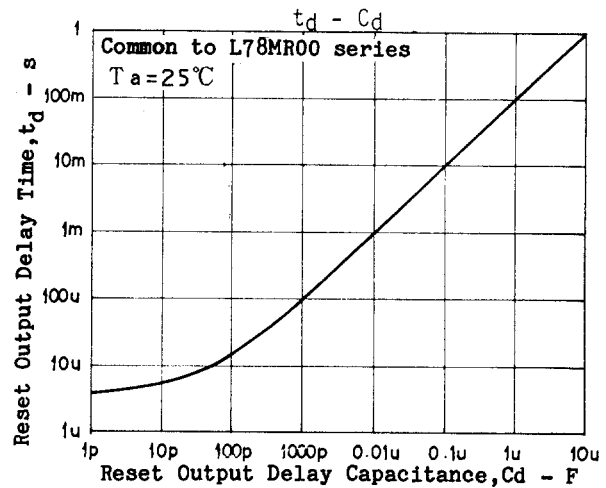
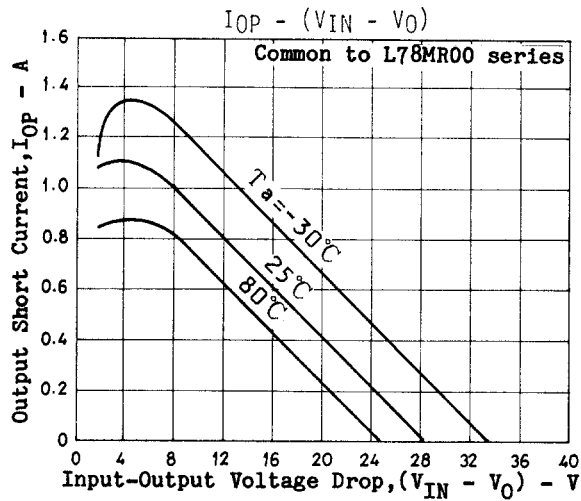




# L78MR00 Series



# L78MR00 Series



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