Ordering number: EN2168B

Monolithic Linear IC

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

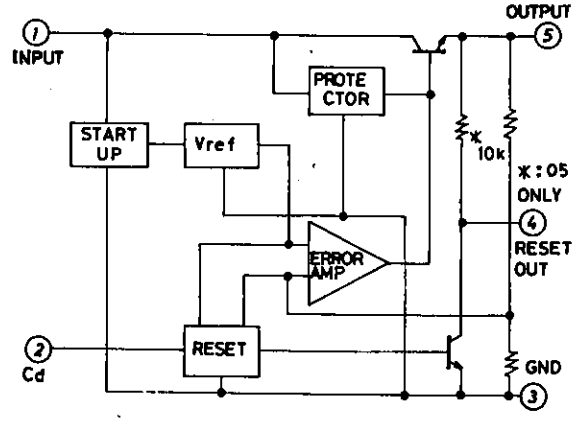
- Reset function (power supply voltage monitor : Generates a reset signal at a power-on and temporal power-down).
- Output voltage
  - L78MR05 : 5V (Reset output ..... On-chip pull-up resistor)
  - L78MR06 : 6V (Reset output ..... Open collector)
  - L78MR08 : 8V (Reset output ..... Open collector)
  - 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 Ta = 25°C

				unit
Maximum Input Voltage	V_{IN} max		35	V
Reset Pin Supply Voltage	Vreset		35	V
Allowable Power Dissipation	Pd max	No fin	1.75	W
		T_C = 25°C	20	W
Operating Temperature	Topr		−30 to +80	°C
Storage Temperature	Tstg		−55 to +150	°C

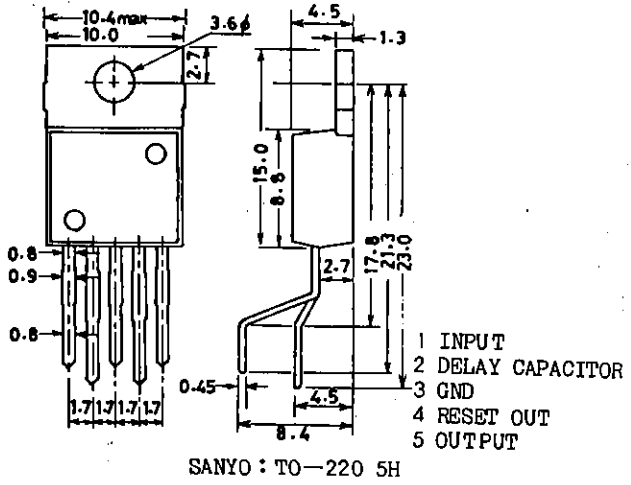
Equivalent Circuit Block Diagram



Unit (resistance: Ω)

Package Dimensions (unit: mm)

3079



SANYO : TO−220 5H

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[L78MR05]

Recommended Operating Conditions at Ta=25°C				unit
Input Voltage	V_{IN}		7.5 to 20	V
Output Current	Io		5 to 500	mA

Operating Characteristics at Ta=25°C, V_{IN}=10V, Io=0.35A, Co=10μF				min	typ	max	unit
Output Voltage	Vo1		Tj=25°C	4.8	5.0	5.2	V
	Vo2		7V≦V_{IN}≦20V, 5mA≦Io≦0.35A	4.75		5.25	V
Line Regulation	ΔVo	LN1	Tj=25°C, 7V≦V_{IN}≦25V, Io=0.2A		1.0	100	mV
		LN2	Tj=25°C, 8V≦V_{IN}≦25V, Io=0.2A		0.5	50	mV
Load Regulation	ΔVo	LD1	Tj=25°C, 5mA≦Io≦0.5A		3.0	100	mV
		LD2	Tj=25°C, 5mA≦Io≦0.2A		1.5	50	mV
Current Dissipation	I_{CC}		Tj=25°C		3.4	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CC}	LN	8V≦V_{IN}≦25V, Io≦0.2A			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	5mA≦Io≦0.35A			0.5	mA
Output Noise Voltage	V_{NO}		Io=5mA, 10Hz≦f≦100kHz		60		μV
Ripple Rejection	Rr1		Tj=25°C, f=120Hz, 8V≦V_{IN}≦18V, Io=0.1A	62	80		dB
	Rr2		Tj=25°C, f=120Hz, 8V≦V_{IN}≦18V, Io=0.3A	62	77		dB
Dropout Voltage	Vdrop				2.0	2.5	V
Peak Output Current	I_{OP}		Tj=25°C		1.1		A
Short Circuit Current	I_{OSC}		Tj=25°C, V_{IN}=35V		0.02		A
Temperature Coefficient of Output Voltage	ΔVo/ΔT		Io=5mA, Tj=25 to 125°C		−0.3		mV/°C
'L' Reset Output Voltage	V_{ORL}		Vo≦4.5V, Io=5mA			0.2	V
Reset Threshold Voltage	V_{RT}		Io=5mA	Vo−0.3	Vo−0.2		V
Reset Hysteresis Voltage	V_{RTH}		Io=5mA		100		mV
Reset Output Delay Time	t_d		Cd=0.1μF, Io=5mA		10		ms

[L78MR06]

Recommended Operating Conditions at Ta=25°C				unit
Input Voltage	V_{IN}		8.5 to 21	V
Output Current	Io		5 to 500	mA
Reset Output Current	I_{OR}	Vo≦5.64V	20	mA max

Operating Characteristics at Ta=25°C, V_{IN}=11V, Io=0.35A, Co=10μF				min	typ	max	unit
Output Voltage	Vo1		Tj=25°C	5.75	6.0	6.25	V
	Vo2		8V≦V_{IN}≦21V, 5mA≦Io≦0.35A	5.7		6.3	V
Line Regulation	ΔVo	LN1	Tj=25°C, 8V≦V_{IN}≦25V, Io=0.2A		1.2	100	mV
		LN2	Tj=25°C, 9V≦V_{IN}≦25V, Io=0.2A		0.6	50	mV
Load Regulation	ΔVo	LD1	Tj=25°C, 5mA≦Io≦0.5A		4.0	120	mV
		LD2	Tj=25°C, 5mA≦Io≦0.2A		2.0	60	mV
Current Dissipation	I_{CC}		Tj=25°C		3.4	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CC}	LN	9V≦V_{IN}≦25V, Io≦0.2A			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	5mA≦Io≦0.35A			0.5	mA
Output Noise Voltage	V_{NO}		Io=5mA, 10Hz≦f≦100kHz		70		μV
Ripple Rejection	Rr1		Tj=25°C, f=120Hz, 9V≦V_{IN}≦19V, Io=0.1A	59	80		dB
	Rr2		Tj=25°C, f=120Hz, 9V≦V_{IN}≦19V, Io=0.3A	59	75		dB

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			min	typ	max	unit
Dropout Voltage	Vdrop			2.0	2.5	V
Peak Output Current	I_{OP}	Tj=25°C		1.1		A
Short Circuit Current	I_{OSC}	Tj=25°C, V_{IN}=35V		0.02		A
Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta T$	Io=5mA, Tj=25 to 125°C		−0.4		mV/°C
'L' Reset Output Voltage	V_{ORL}	Vo≦5.64V, I_{OR}=20mA, Io=5mA			0.8	V
Reset Output Leakage Current	I_{RL}	V_R=35V			50	μA
Reset Threshold Voltage	V_{RT}	Io=5mA	Vo−0.36	Vo−0.24		V
Reset Hysteresis Voltage	V_{RTH}	Io=5mA		120		mV
Reset Output Delay Time	t_d	Cd=0.1μF, Io=5mA		10		ms

[L78MR08]

Recommended Operating Conditions at Ta=25°C

			unit
Input Voltage	V_{IN}	10.5 to 23	V
Output Current	Io	5 to 500	mA
Reset Output Current	I_{OR}	Vo≦7.2V 20	mA max

Operating Characteristics at Ta=25°C, V_{IN}=14V, Io=0.35A, Co=10μF

				min	typ	max	unit
Output Voltage	Vo1		Tj=25°C	7.7	8.0	8.3	V
	Vo2		10.5V≦V_{IN}≦23V, 5mA≦Io≦0.35A	7.6		8.4	V
Line Regulation	ΔVo	LN1	Tj=25°C, 10.5V≦V_{IN}≦25V, Io=0.2A		1.6	100	mV
		LN2	Tj=25°C, 11V≦V_{IN}≦25V, Io=0.2A		0.8	50	mV
Load Regulation	ΔVo	LD1	Tj=25°C, 5mA≦Io≦0.5A		5.0	160	mV
		LD2	Tj=25°C, 5mA≦Io≦0.2A		2.0	80	mV
Current Dissipation	I_{CC}		Tj=25°C		3.5	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CC}	LN	10.5V≦V_{IN}≦25V, Io≦0.2A			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	5mA≦Io≦0.35A			0.5	mA
Output Noise Voltage	V_{NO}		Io=5mA, 10Hz≦f≦100kHz		100		μV
Ripple Rejection	Rr1		Tj=25°C, f=120Hz, 11.5V≦V_{IN}≦21.5V, Io=0.1A	56	75		dB
	Rr2		Tj=25°C, f=120Hz, 11.5V≦V_{IN}≦21.5V, Io=0.3A	56	71		dB
Dropout Voltage	Vdrop				2.0	2.5	V
Peak Output Current	I_{OP}		Tj=25°C		1.1		A
Short Circuit Current	I_{OSC}		Tj=25°C, V_{IN}=35V		0.02		A
Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta T$		Io=5mA, Tj=25 to 125°C		−0.7		mV/°C
'L' Reset Output Voltage	V_{ORL}		Vo≦7.2V, I_{OR}=20mA, Io=5mA			0.8	V
Reset Output Leakage Current	I_{RL}		V_R=35V			50	μA
Reset Threshold Voltage	V_{RT}		Io=5mA	Vo−0.48	Vo−0.32		V
Reset Hysteresis Voltage	V_{RTH}		Io=5mA		160		mV
Reset Output Delay Time	t_d		Cd=0.1μF, Io=5mA		10		ms

[L78MR09]

Recommended Operating Conditions at Ta = 25°C

			unit
Input Voltage	V_{IN}	12 to 24	V
Output Current	Io	5 to 500	mA
Reset Output Current	Io_R	Vo≦8.1V 20	mA max

Operating Characteristics at Ta = 25°C, V_{IN} = 15V, Io = 0.35A, Co = 10μF

				min	typ	max	unit
Output Voltage	Vo1		Tj = 25°C	8.6	9.0	9.4	V
	Vo2		11.5V≦V_{IN}≦24V, 5mA≦Io≦0.35A	8.5		9.5	V
Line Regulation	ΔVo	LN1	Tj = 25°C, 11.5V≦V_{IN}≦25V, Io = 0.2A		1.6	100	mV
		LN2	Tj = 25°C, 12V≦V_{IN}≦25V, Io = 0.2A		0.8	50	mV
Load Regulation	ΔVo	LD1	Tj = 25°C, 5mA≦Io≦0.5A		5.0	180	mV
		LD2	Tj = 25°C, 5mA≦Io≦0.2A		3.0	90	mV
Current Dissipation	I_{CC}		Tj = 25°C		3.5	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CC}	LN	11.5V≦V_{IN}≦25V, Io≦0.2A			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	5mA≦Io≦0.35A			0.5	mA
Output Noise Voltage	V_{NO}		Io = 5mA, 10Hz≦f≦100kHz		110		μV
Ripple Rejection	Rr1		Tj = 25°C, f = 120Hz, 12V≦V_{IN}≦22V, Io = 0.1A	56	73		dB
	Rr2		Tj = 25°C, f = 120Hz, 12V≦V_{IN}≦22V, Io = 0.3A	56	70		dB
Dropout Voltage	Vdrop				2.0	2.5	V
Peak Output Current	I_{OP}		Tj = 25°C		1.1		A
Short Circuit Current	I_{OSC}		Tj = 25°C, V_{IN} = 35V		0.02		A
Temperature Coefficient of Output Voltage	ΔVo/ΔT		Io = 5mA, Tj = 25 to 125°C		−0.9		mV/°C
'L' Reset Output Voltage	V_{ORL}		Vo≦8.1V, Io_R = 20mA, Io = 5mA			0.8	V
Reset Output Leakage Current	I_{RL}		V_R = 35V			50	μA
Reset Threshold Voltage	V_{RT}		Io = 5mA	Vo−0.54	Vo−0.36		V
Reset Hysteresis Voltage	V_{RTH}		Io = 5mA		180		mV
Reset Output Delay Time	t_d		Cd = 0.1μF, Io = 5mA		10		ms

[L78MR12]

Recommended Operating Conditions at Ta = 25°C

			unit
Input Voltage	V_{IN}	15 to 27	V
Output Current	Io	5 to 500	mA
Reset Output Current	Io_R	Vo≦10.8V 20	mA max

Operating Characteristics at Ta = 25°C, V_{IN} = 19V, Io = 0.35A, Co = 10μF

				min	typ	max	unit
Output Voltage	Vo1		Tj = 25°C	11.5	12.0	12.5	V
	Vo2		14.5V≦V_{IN}≦27V, 5mA≦Io≦0.35A	11.4		12.6	V
Line Regulation	ΔVo	LN1	Tj = 25°C, 14.5V≦V_{IN}≦30V, Io = 0.2A		2.4	100	mV
		LN2	Tj = 25°C, 16V≦V_{IN}≦30V, Io = 0.2A		1.2	50	mV
Load Regulation	ΔVo	LD1	Tj = 25°C, 5mA≦Io≦0.5A		7.0	240	mV
		LD2	Tj = 25°C, 5mA≦Io≦0.2A		4.0	120	mV
Current Dissipation	I_{CC}		Tj = 25°C		3.7	6.0	mA

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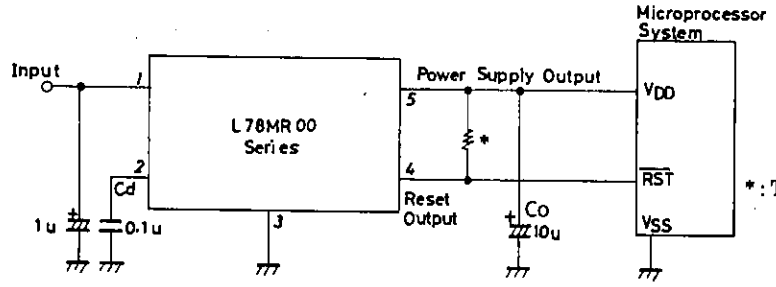
				min	typ	max	unit
Current Dissipation Variation (Line)	ΔI_{CC}	LN	$14.5V \leqq V_{IN} \leqq 30V$, $Io \leqq 0.2A$			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	$5mA \leqq Io \leqq 0.35A$			0.5	mA
Output Noise Voltage	V_{NO}		$Io=5mA$, $10Hz \leqq f \leqq 100kHz$		140		μV
Ripple Rejection	Rr1		$Tj=25°C$, $f=120Hz$, $15V \leqq V_{IN} \leqq 25V$, $Io=0.1A$	55	68		dB
	Rr2		$Tj=25°C$, $f=120Hz$, $15V \leqq V_{IN} \leqq 25V$, $Io=0.3A$	55	66		dB
Dropout Voltage	Vdrop				2.0	2.5	V
Peak Output Current	I_{OP}		$Tj=25°C$		1.1		A
Short Circuit Current	I_{OSC}		$Tj=25°C$, $V_{IN}=35V$		0.02		A
Temperature Coefficient of Output Voltage	$\Delta Vo/\Delta T$		$Io=5mA$, $Tj=25$ to $125°C$		−1.6		mV/°C
'L' Reset Output Voltage	V_{ORL}		$Vo \leqq 10.8V$, $Io_R=20mA$, $Io=5mA$			0.8	V
Reset Output Leakage Current	I_{RL}		$V_R=35V$			50	μA
Reset Threshold Voltage	V_{RT}		$Io=5mA$	Vo−0.72	Vo−0.48		V
Reset Hysteresis Voltage	V_{RTH}		$Io=5mA$		240		mV
Reset Output Delay Time	t_d		$Cd=0.1\mu F$, $Io=5mA$		10		ms

Sample Application Circuit

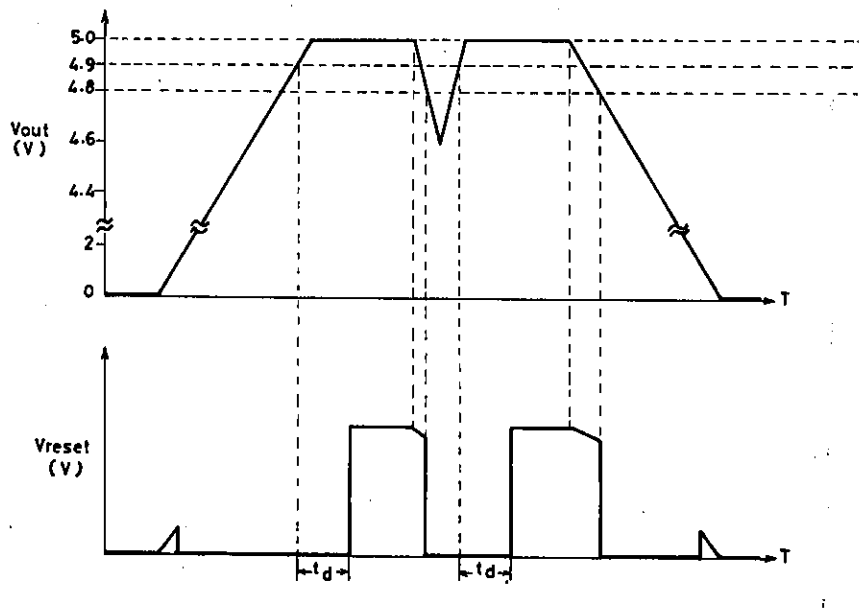


*: The L78MR05 contains a pull-up resistor (10kΩ).

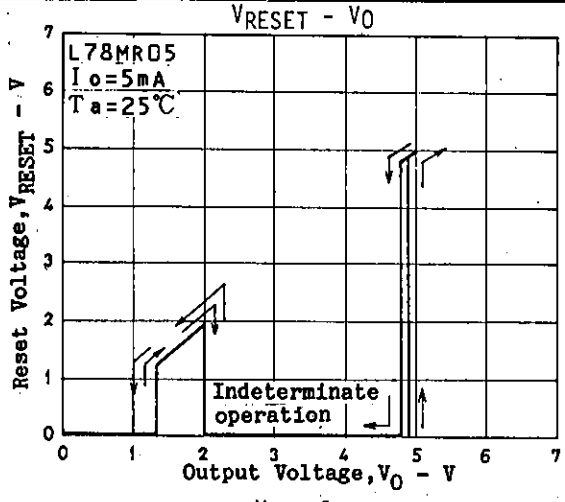
Unit (capacitance: F)

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.

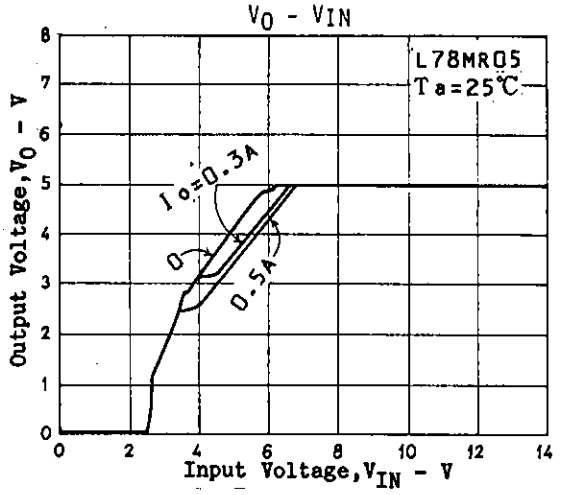
L78MR05 Reset Operation



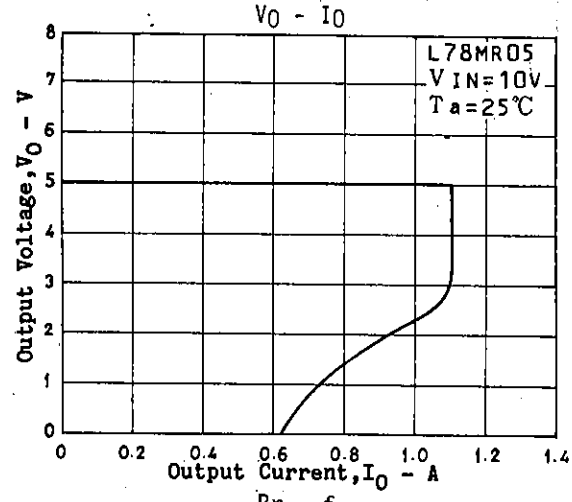
V_{RESET} - V_O



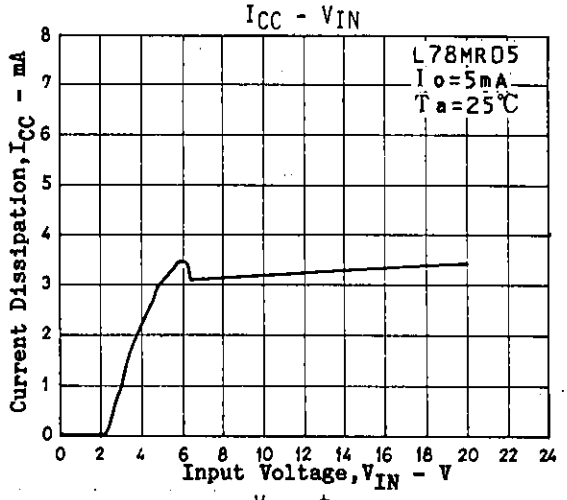
V_O - V_{IN}



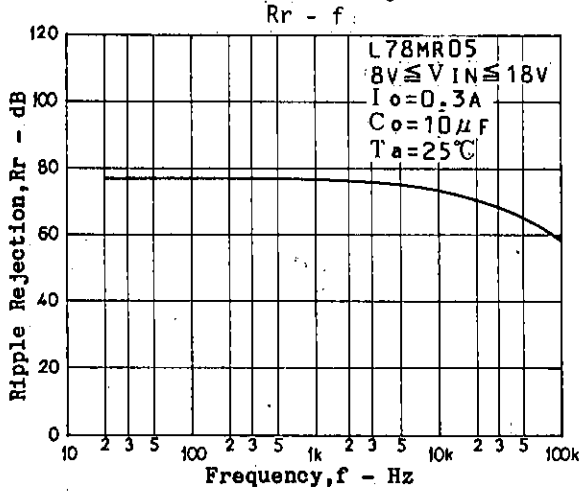
V_O - I_O



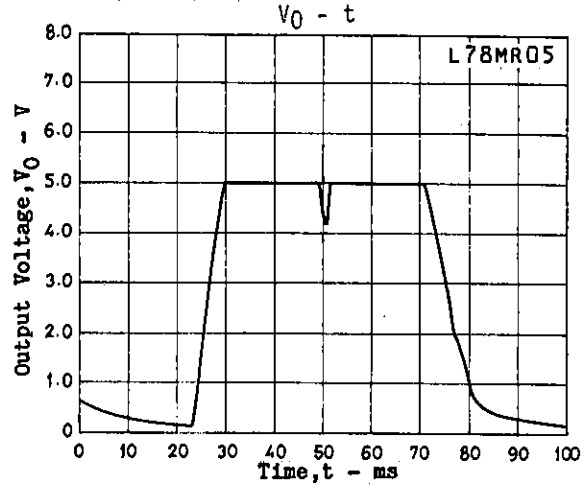
I_{CC} - V_{IN}



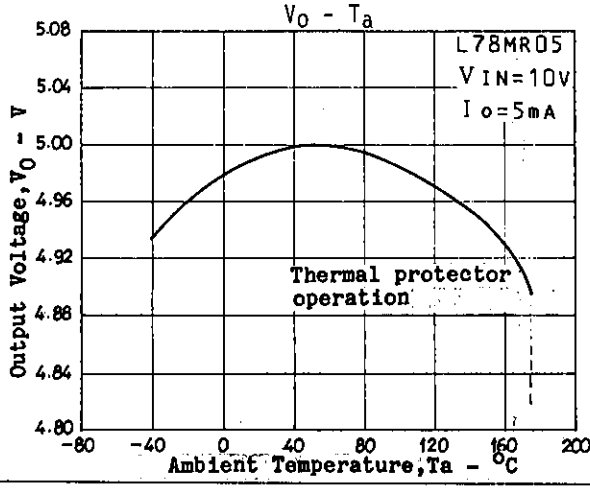
Rr - f



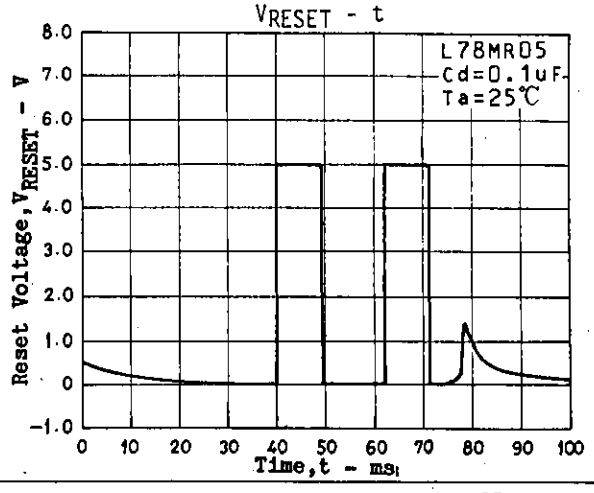
V_O - t



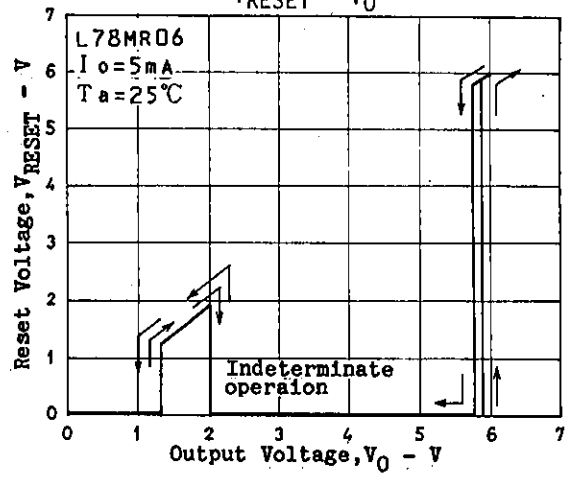
V_O - T_a



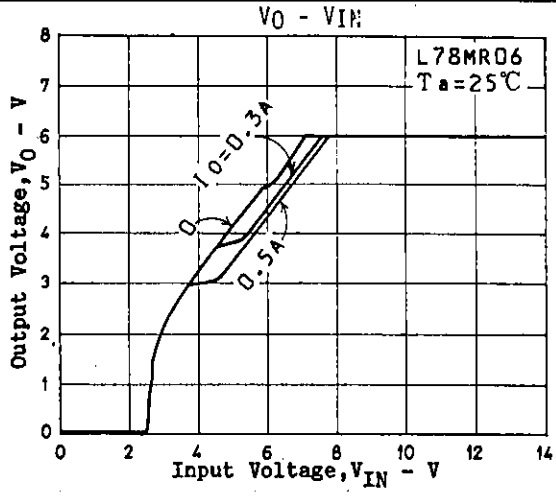
V_{RESET} - t



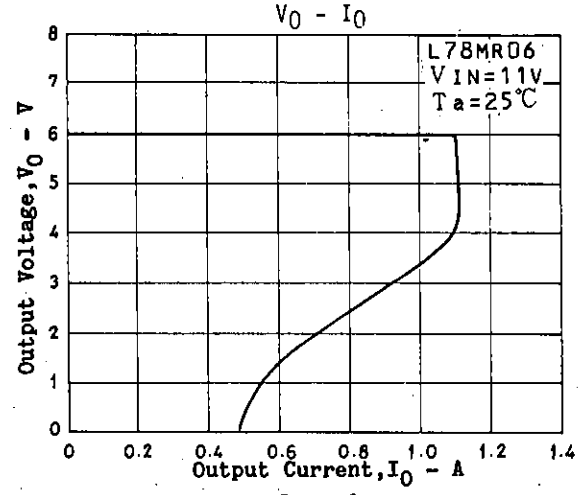
V_{RESET} - V_O



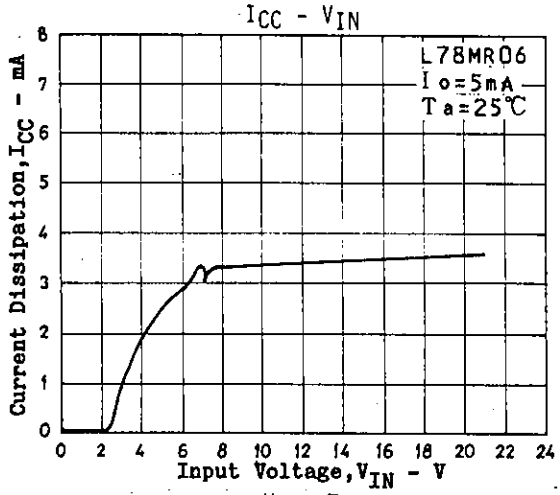
V_O - V_{IN}



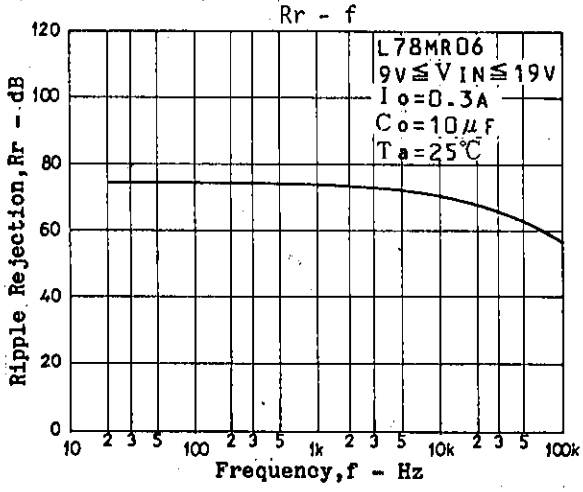
V_O - I_O



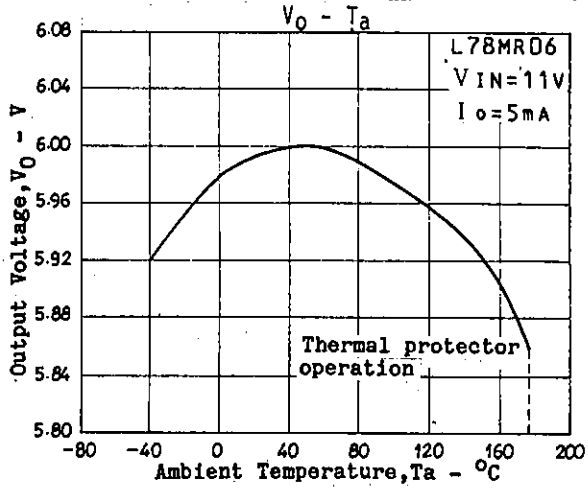
I_{CC} - V_{IN}



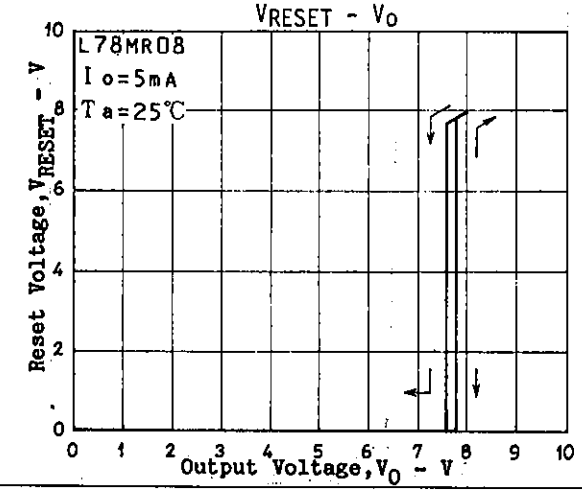
Rr - f



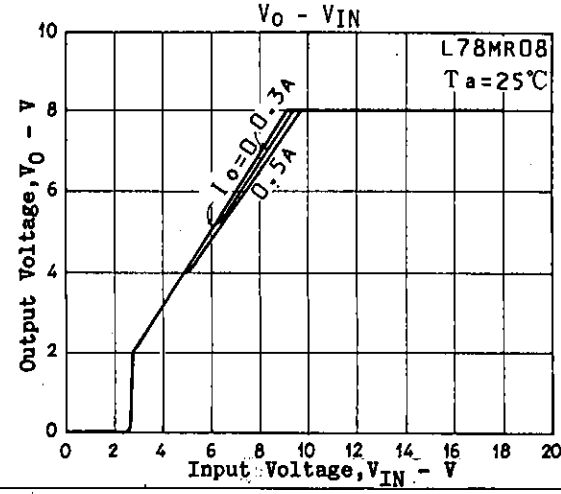
V_O - Ta



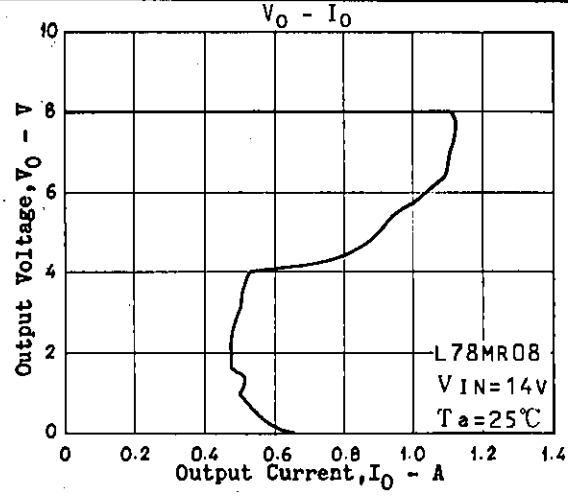
V_{RESET} - V_O



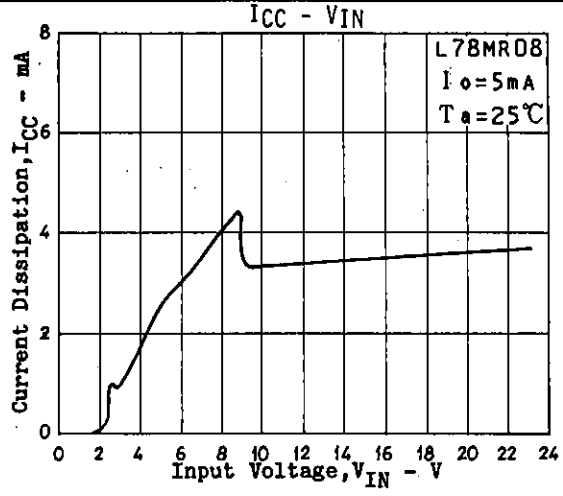
V_O - V_{IN}



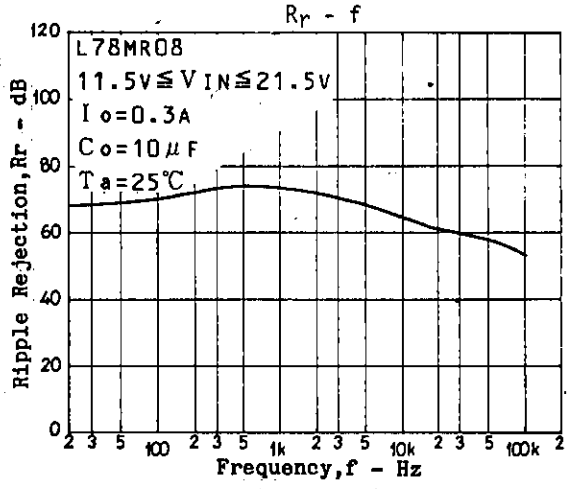
$V_O - I_O$



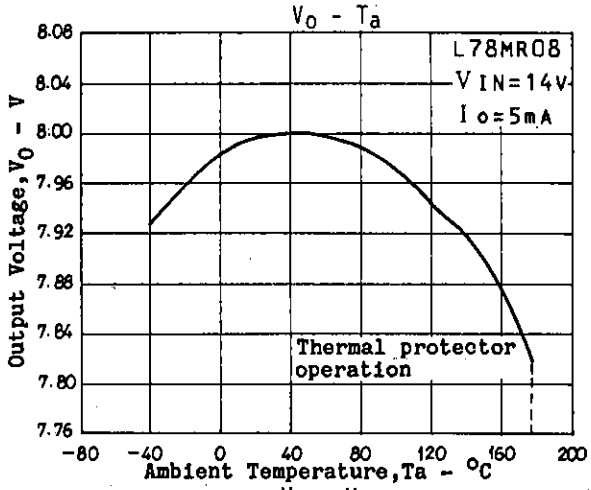
$I_{CC} - V_{IN}$



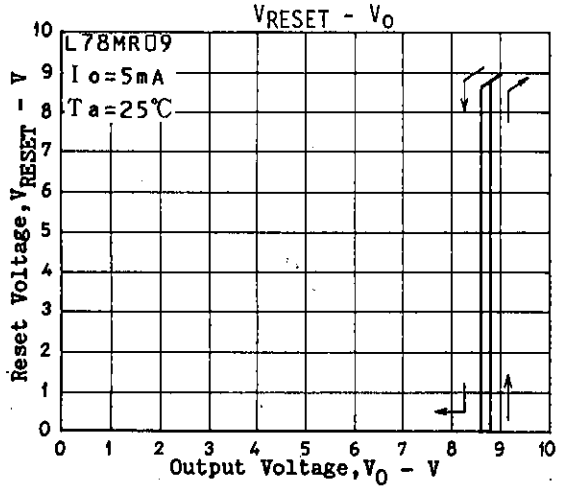
$R_r - f$



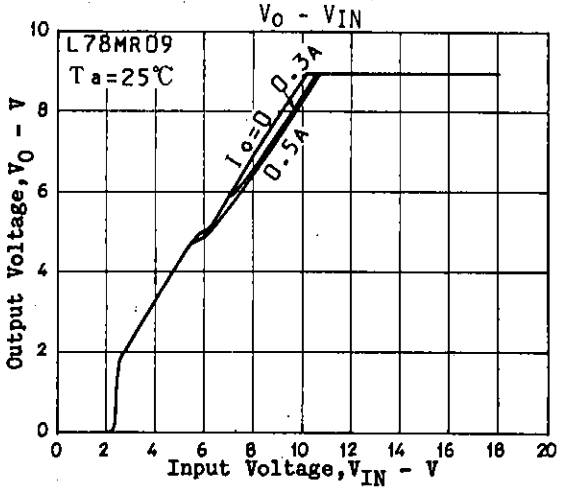
$V_O - T_a$



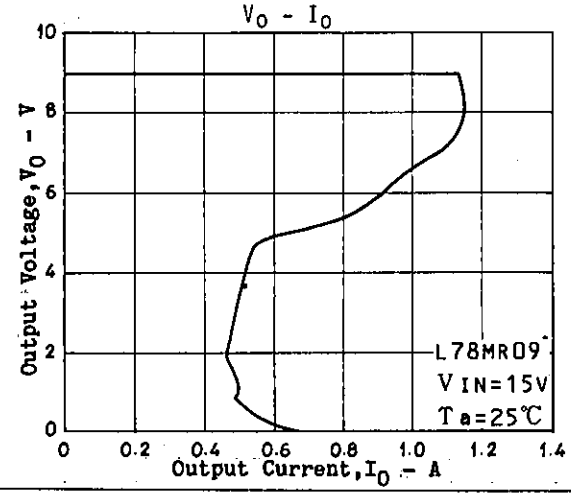
$V_{RESET} - V_O$



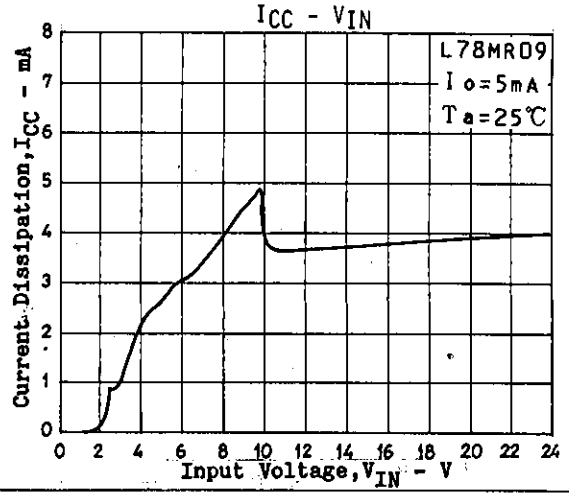
$V_O - V_{IN}$

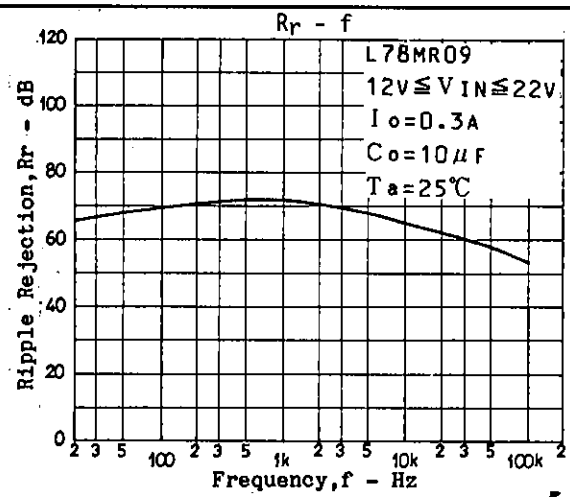


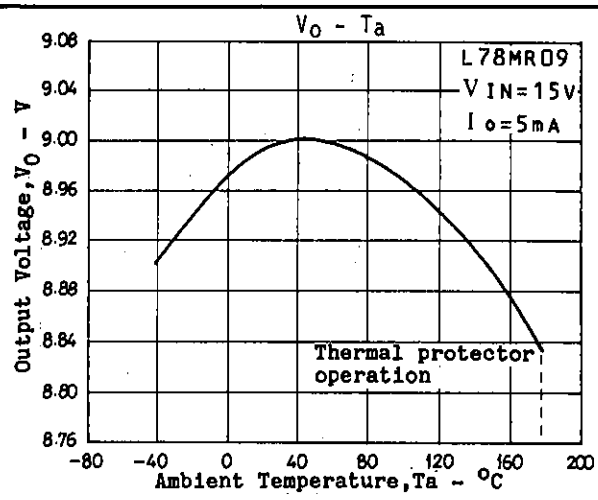
$V_O - I_O$

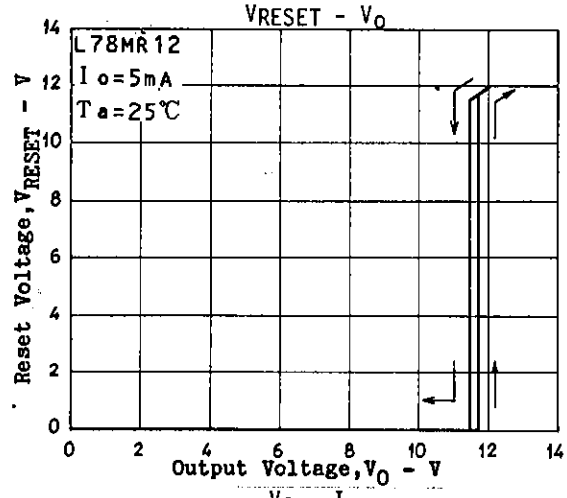


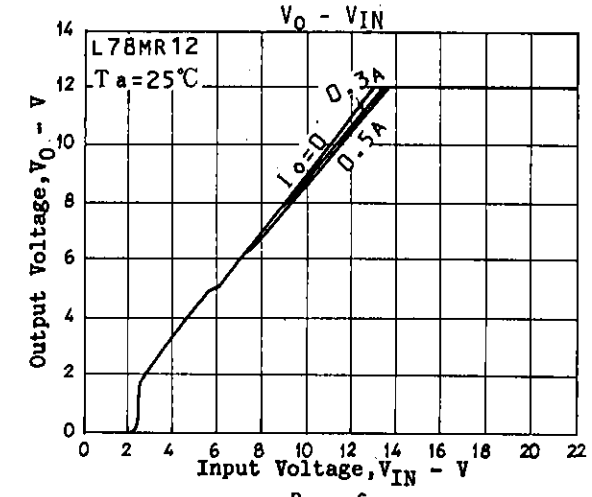
$I_{CC} - V_{IN}$

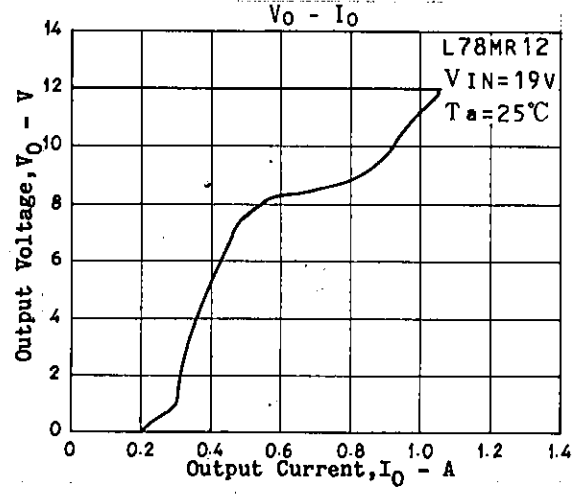


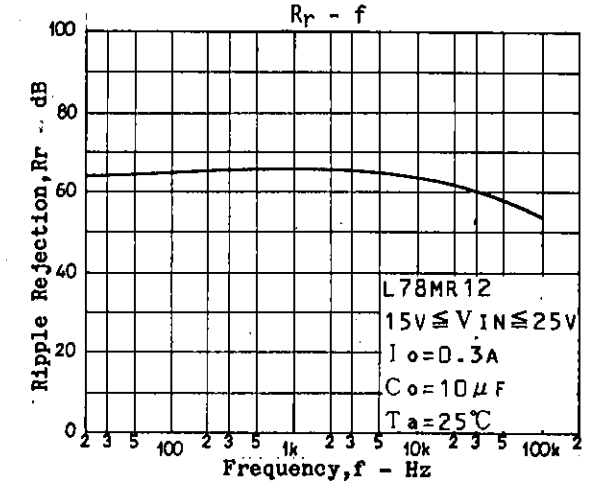

Rr - f
L78MR09
12V≦VIN≦22V
Io=0.3A
Co=10μF
Ta=25℃
Ripple Rejection,Rr - dB
Frequency,f - Hz

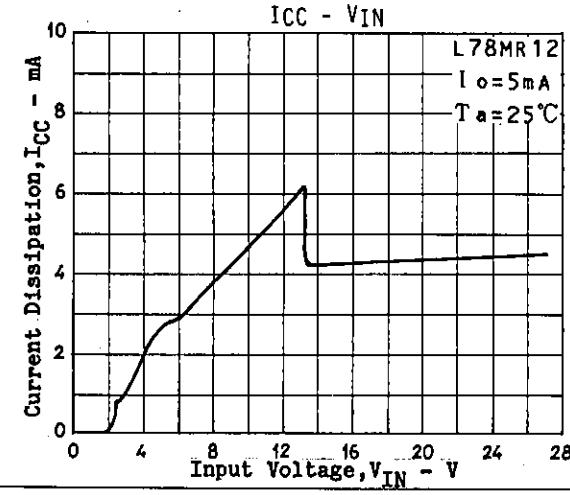

Vo - Ta
L78MR09
VIN=15V
Io=5mA
Thermal protector operation
Output Voltage,Vo - V
Ambient Temperature,Ta - °C

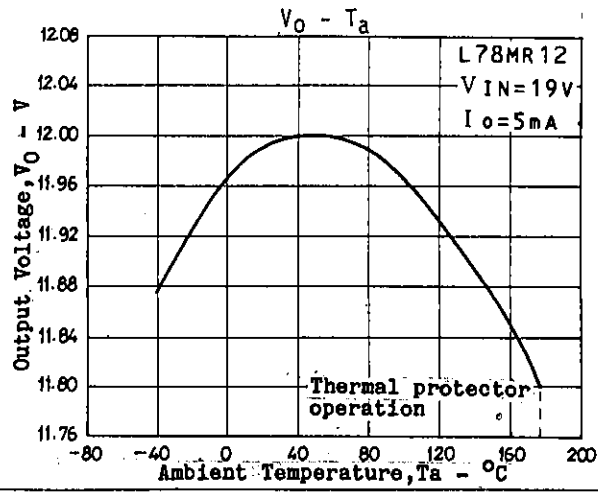

VRESET - Vo
L78MR12
Io=5mA
Ta=25℃
Reset Voltage,VRESET - V
Output Voltage,Vo - V


Vo - VIN
L78MR12
Ta=25℃
Io=0
0.3A
0.5A
Output Voltage,Vo - V
Input Voltage,VIN - V


Vo - Io
L78MR12
VIN=19V
Ta=25℃
Output Voltage,Vo - V
Output Current,Io - A


Rr - f
L78MR12
15V≦VIN≦25V
Io=0.3A
Co=10μF
Ta=25℃
Ripple Rejection,Rr - dB
Frequency,f - Hz


ICC - VIN
L78MR12
Io=5mA
Ta=25℃
Current Dissipation,ICC - mA
Input Voltage,VIN - V


Vo - Ta
L78MR12
VIN=19V
Io=5mA
Thermal protector operation
Output Voltage,Vo - V
Ambient Temperature,Ta - °C