Ordering number:ENN2168B

Monolithic Linear IC

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

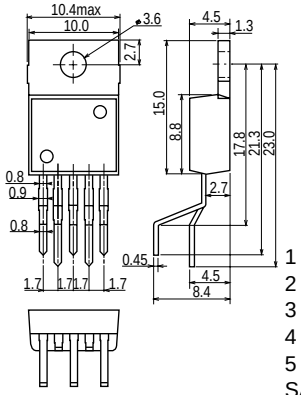
- Reset function (power supply voltage monitor : Generates a reset signal at a power-on and temporal power-down).
- Output voltage
  - L78MR05 : 5V (Reset output ..... On-chip pull-up resistor)
  - L78MR06 : 6V (Reset output ..... Open collector)
  - L78MR08 : 8V (Reset output ..... Open collector)
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

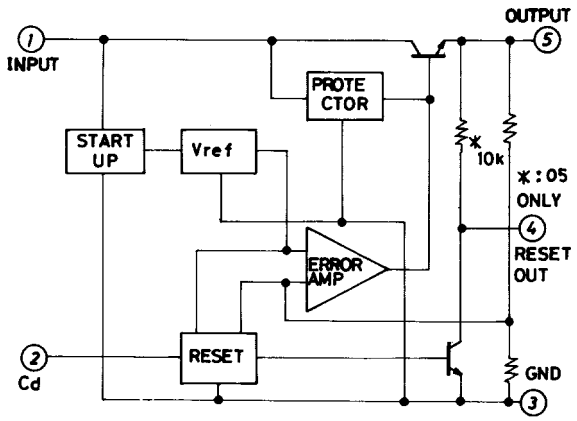
3079

[L78MR00 Series]



1 : INPUT
2 : DELAY CAPACITOR
3 : GND
4 : RESET OUT
5 : OUTPUT
SANYO : TO-220-5H

Equivalent Circuit



Unit (resistance: Ω)

SANYO Electric Co.,Ltd. Semiconductor Company
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Specifications

[Common to L78MR00 Series]

Maximum Ratings at Ta = 25˚C

Parameter	Symbol	Conditions	Ratings	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
		Tc=25°C	20	W
Operating Temperature	Topr		–30 to +80	˚C
Storage Temperature	Tstg		–55 to +150	˚C

[L78MR05]

Recommended Operating Conditions at Ta = 25˚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 Ta = 25˚C, V_{IN}=10V, I_O=0.35A, C_O=10μF

Parameter	Symbol	Conditions		Ratings			Unit
				min	typ	max	
Output Voltage	V_O1		Tj=25°C	4.8	5.0	5.2	V
	V_O2		7V≤V_{IN}≤20V, 5mA≤I_O≤0.35A	4.75		5.25	V
Line Regulation	ΔV_O	LN1	Tj=25°C, 7V≤V_{IN}≤25V, I_O=0.2A		1.0	100	mV
		LN2	Tj=25°C, 8V≤V_{IN}≤25V, I_O=0.2A		0.5	50	mV
Load Regulation	ΔV_O	LD1	Tj=25°C, 5mA≤I_O≤0.5A		3.0	100	mV
		LD2	Tj=25°C, 5mA≤I_O≤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, I_O=0.2A			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	5mA≤I_O≤0.35A			0.5	mA
Output Noise Voltage	V_{NO}		I_O=5mA, 10Hz≤f≤100kHz		60		μV
Ripple Rejection	Rr1		Tj=25°C, f=120Hz, 8V≤V_{IN}≤18V, I_O=0.1A	62	80		dB
	Rr2		Tj=25°C, f=120Hz, 8V≤V_{IN}≤18V, I_O=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	$\Delta V_O/\Delta T$		I_O=5mA, Tj=25 to 125°C		–0.3		mV/˚C
'L' Reset Output Voltage	V_{ORL}		V_O≤4.5V, I_O=5mA			0.2	V
Reset Threshold Voltage	V_{RT}		I_O=5mA	V_O–0.3	V_O–0.2		V
Reset Hysteresis Voltage	V_{RTH}		I_O=5mA		100		mV
Reset Output Delay Time	t_d		Cd=0.1μF, I_O=5mA		10		ms

[L78MR06]

Recommended Operating Conditions at Ta = 25˚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≤5.64V	20 max	mA

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Operating Characteristics at Ta = 25˚C, V_{IN}=11V, I_O=0.35A, C_O=10µF

Parameter	Symbol		Conditions	Ratings min	Ratings typ	Ratings max	Unit
Output Voltage	V_O1		Tj=25°C	5.75	6.0	6.25	V
	V_O2		8V≤V_{IN}≤21V, 5mA≤I_O≤0.35A	5.7		6.3	V
Line Regulation	ΔV_O	LN1	Tj=25°C, 8V≤V_{IN}≤25V, I_O=0.2A		1.2	100	mV
		LN2	Tj=25°C, 9V≤V_{IN}≤25V, I_O=0.2A		0.6	50	mV
Load Regulation	ΔV_O	LD1	Tj=25°C, 5mA≤I_O≤0.5A		4.0	120	mV
		LD2	Tj=25°C, 5mA≤I_O≤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, I_O=0.2A			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	5mA≤I_O≤0.35A			0.5	mA
Output Noise Voltage	V_{NO}		I_O=5mA, 10Hz≤f≤100kHz		70		µV
Ripple Rejection	Rr1		Tj=25°C, f=120Hz, 9V≤V_{IN}≤19V, I_O=0.1A	59	80		dB
	Rr2		Tj=25°C, f=120Hz, 9V≤V_{IN}≤19V, I_O=0.3A	59	75		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	$\Delta V_O/\Delta T$		I_O=5mA, Tj=25 to 125°C		–0.4		mV/˚C
'L' Reset Output Voltage	V_{ORL}		V_O≤5.64V, 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–0.36	V_O–0.24		V
Reset Hysteresis Voltage	V_{RTH}		I_O=5mA		120		mV
Reset Output Delay Time	t_d		Cd=0.1µF, I_O=5mA		10		ms

[L78MR08]

Recommended Operating Conditions at Ta = 25˚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≤7.2V	20 max	mA

Operating Characteristics at Ta = 25˚C, V_{IN}=14V, I_O=0.35A, C_O=10µF

Parameter	Symbol		Conditions	Ratings min	Ratings typ	Ratings max	Unit
Output Voltage	V_O1		Tj=25°C	7.7	8.0	8.3	V
	V_O2		10.5V≤V_{IN}≤23V, 5mA≤I_O≤0.35A	7.6		8.4	V
Line Regulation	ΔV_O	LN1	Tj=25°C, 10.5V≤V_{IN}≤25V, I_O=0.2A		1.6	100	mV
		LN2	Tj=25°C, 11V≤V_{IN}≤25V, I_O=0.2A		0.8	50	mV
Load Regulation	ΔV_O	LD1	Tj=25°C, 5mA≤I_O≤0.5A		5.0	160	mV
		LD2	Tj=25°C, 5mA≤I_O≤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, I_O=0.2A			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	5mA≤I_O≤0.35A			0.5	mA
Output Noise Voltage	V_{NO}		I_O=5mA, 10Hz≤f≤100kHz		100		µV
Ripple Rejection	Rr1		Tj=25°C, f=120Hz, 11.5V≤V_{IN}≤21.5V, I_O=0.1A	56	75		dB
	Rr2		Tj=25°C, f=120Hz, 11.5V≤V_{IN}≤21.5V, I_O=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	$\Delta V_O/\Delta T$		I_O=5mA, Tj=25 to 125°C		–0.7		mV/˚C
'L' Reset Output Voltage	V_{ORL}		V_O≤7.2V, 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–0.48	V_O–0.32		V
Reset Hysteresis Voltage	V_{RTH}		I_O=5mA		160		mV
Reset Output Delay Time	t_d		Cd=0.1µF, I_O=5mA		10		ms

[L78MR09]

Recommended Operating Conditions at Ta = 25˚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≤8.1V	20 max	mA

Operating Characteristics at Ta = 25˚C, V_{IN}=15V, I_O=0.35A, C_O=10μF

Parameter	Symbol	Conditions		Ratings			Unit
				min	typ	max	
Output Voltage	V_O1		Tj=25°C	8.6	9.0	9.4	V
	V_O2		11.5V≤V_{IN}≤24V, 5mA≤I_O≤0.35A	8.5		9.5	V
Line Regulation	ΔV_O	LN1	Tj=25°C, 11.5V≤V_{IN}≤25V, I_O=0.2A		1.6	100	mV
		LN2	Tj=25°C, 12V≤V_{IN}≤25V, I_O=0.2A		0.8	50	mV
Load Regulation	ΔV_O	LD1	Tj=25°C, 5mA≤I_O≤0.5A		5.0	180	mV
		LD2	Tj=25°C, 5mA≤I_O≤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, I_O=0.2A			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	5mA≤I_O≤0.35A			0.5	mA
Output Noise Voltage	V_{NO}		I_O=5mA, 10Hz≤f≤100kHz		110		μV
Ripple Rejection	Rr1		Tj=25°C, f=120Hz, 12V≤V_{IN}≤22V, I_O=0.1A	56	73		dB
	Rr2		Tj=25°C, f=120Hz, 12V≤V_{IN}≤22V, I_O=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	$\Delta V_O/\Delta T$		I_O=5mA, Tj=25 to 125°C		–0.9		mV/˚C
'L' Reset Output Voltage	V_{ORL}		V_O≤8.1V, 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–0.54	V_O–0.36		V
Reset Hysteresis Voltage	V_{RTH}		I_O=5mA		180		mV
Reset Output Delay Time	t_d		Cd=0.1μF, I_O=5mA		10		ms

[L78MR12]

Recommended Operating Conditions at Ta = 25˚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≤10.8V	20 max	mA

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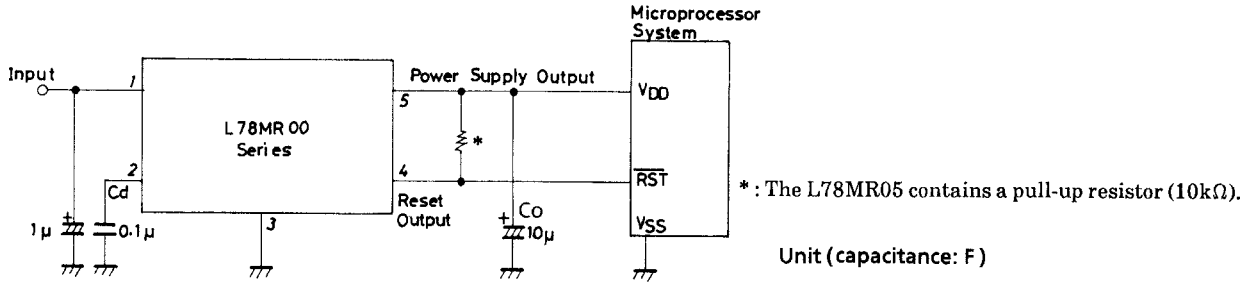
Operating Characteristics at Ta = 25˚C, V_{IN}=19V, I_O=0.35A, C_O=10µF

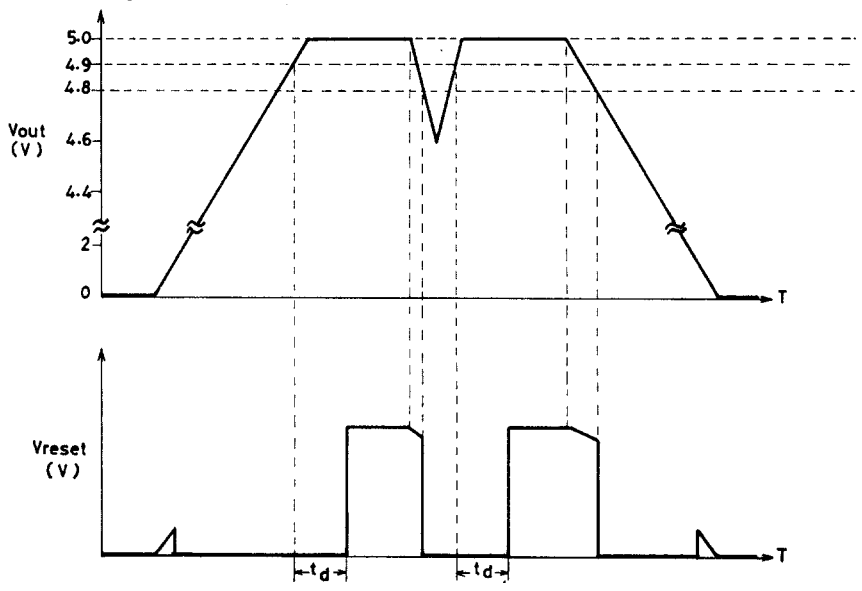
Parameter	Symbol	Conditions		Ratings min	Ratings typ	Ratings max	Unit
Output Voltage	V_O1		Tj=25°C	11.5	12.0	12.5	V
	V_O2		14.5V≤V_{IN}≤27V, 5mA≤I_O≤0.35A	11.4		12.6	V
Line Regulation	ΔV_O	LN1	Tj=25°C, 14.5V≤V_{IN}≤30V, I_O=0.2A		2.4	100	mV
		LN2	Tj=25°C, 16V≤V_{IN}≤30V, I_O=0.2A		1.2	50	mV
Load Regulation	ΔV_O	LD1	Tj=25°C, 5mA≤I_O≤0.5A		7.0	240	mV
		LD2	Tj=25°C, 5mA≤I_O≤0.2A		4.0	120	mV
Current Dissipation	I_{CC}		Tj=25°C		3.7	6.0	mA
Current Dissipation Variation (Line)	ΔI_{CC}	LN	14.5V≤V_{IN}≤30V, I_O=0.2A			0.8	mA
Current Dissipation Variation (Load)	ΔI_{CC}	LD	5mA≤I_O≤0.35A			0.5	mA
Output Noise Voltage	V_{NO}		I_O=5mA, 10Hz≤f≤100kHz		140		µV
Ripple Rejection	Rr1		Tj=25°C, f=120Hz, 15V≤V_{IN}≤25V, I_O=0.1A	55	68		dB
	Rr2		Tj=25°C, f=120Hz, 15V≤V_{IN}≤25V, I_O=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	$\Delta V_O/\Delta T$		I_O=5mA, Tj=25 to 125°C		–1.6		mV/˚C
'L' Reset Output Voltage	V_{ORL}		V_O≤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		Cd=0.1µF, I_O=5mA		10		ms

Specified Application Circuit

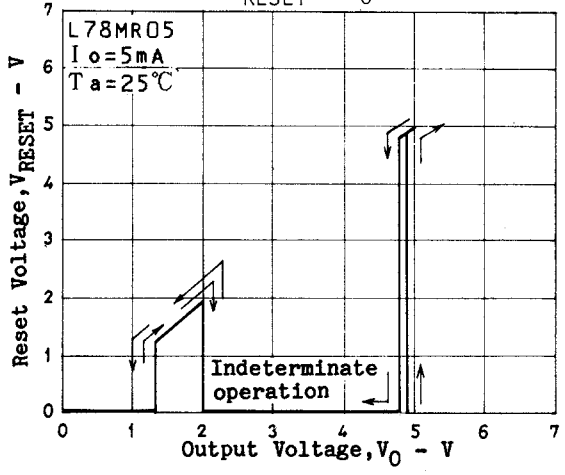


Note on use) If a load current (in particular, pulse-like load current) that is greater than a rated value is used, a reset signal may be generated due to the overload. Please keep it in mind.

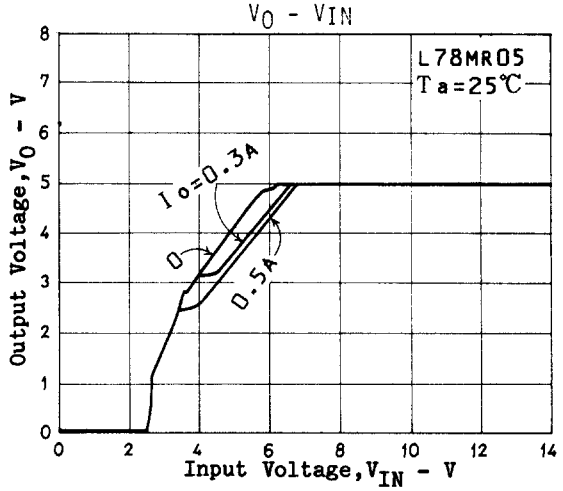
L78MR05 Reset Operation



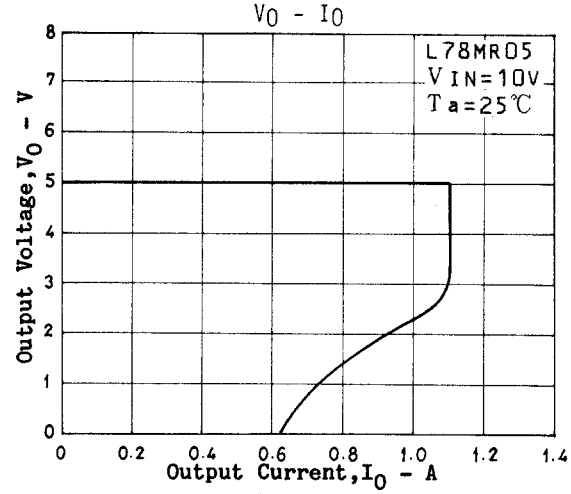
V_{RESET} - V_O



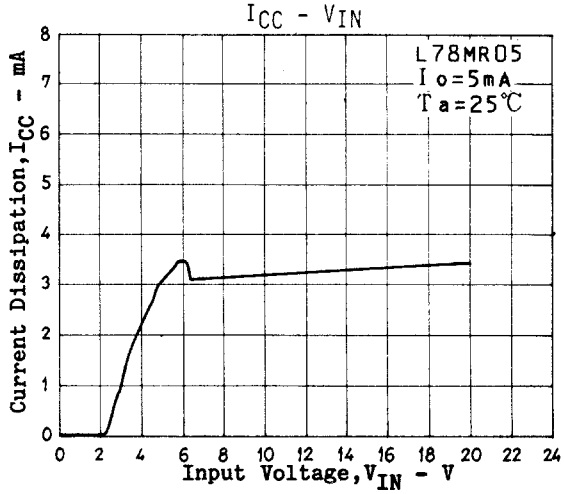
V_O - V_{IN}



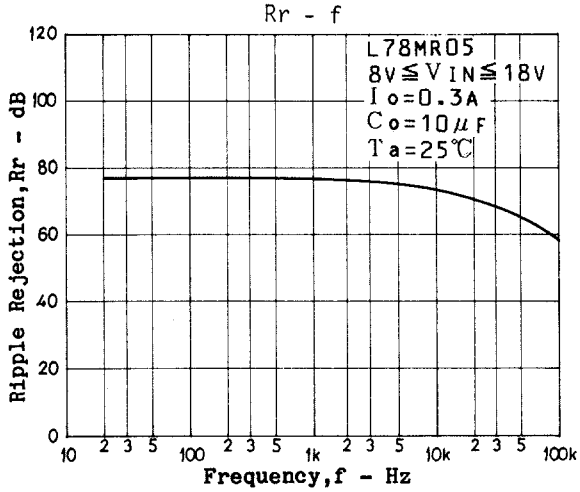
V_O - I_O



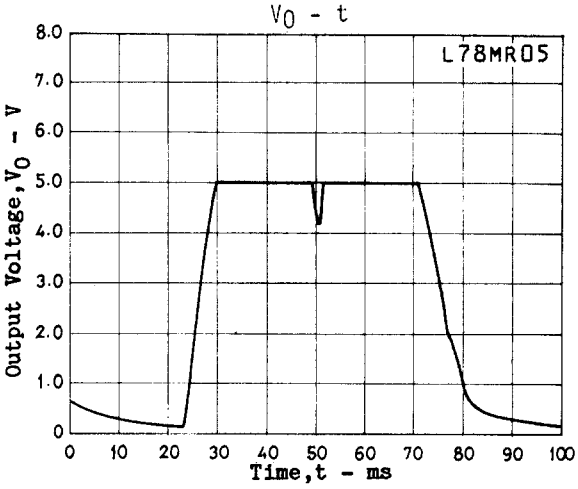
I_{CC} - V_{IN}



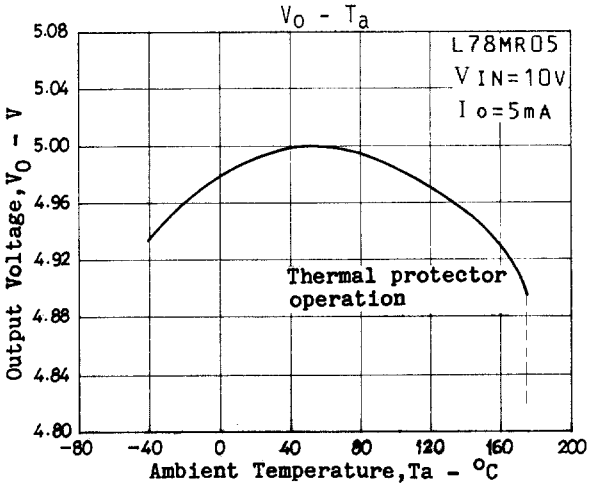
Rr - f



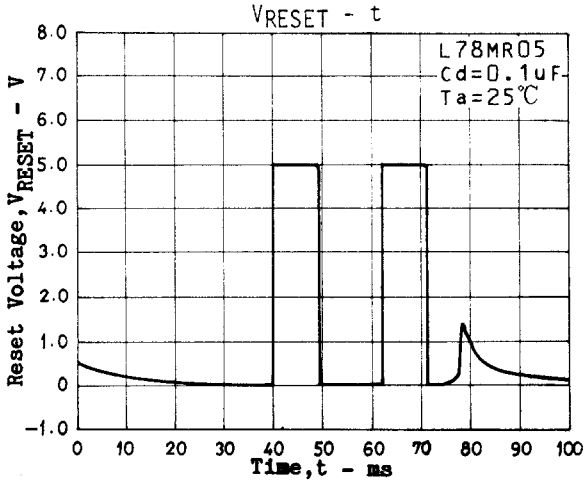
V_O - t



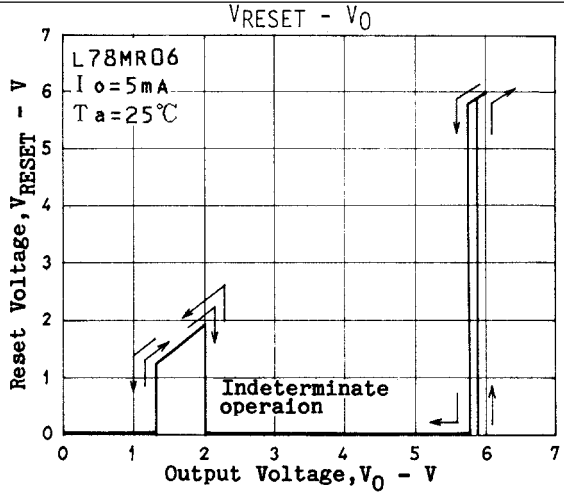
V_O - T_a



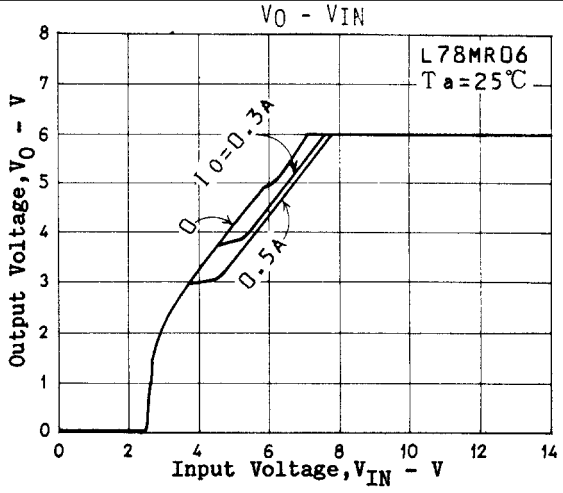
V_{RESET} - t



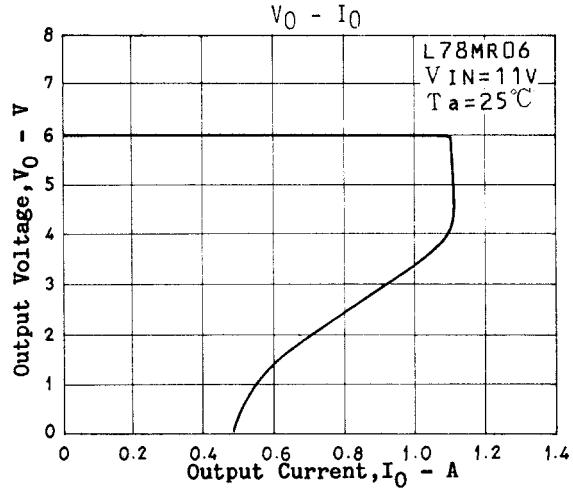
V_{RESET} - V_O



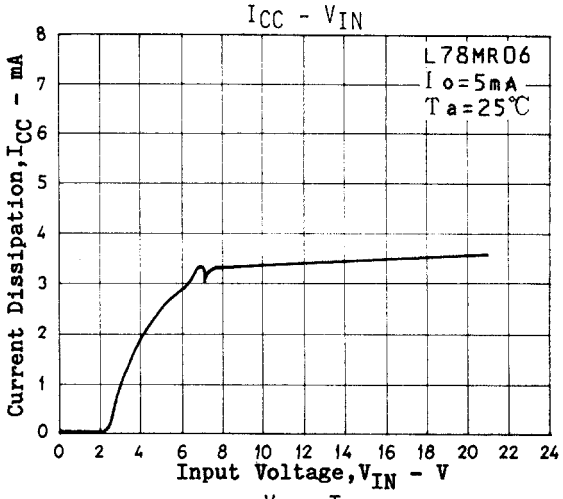
V_O - V_{IN}



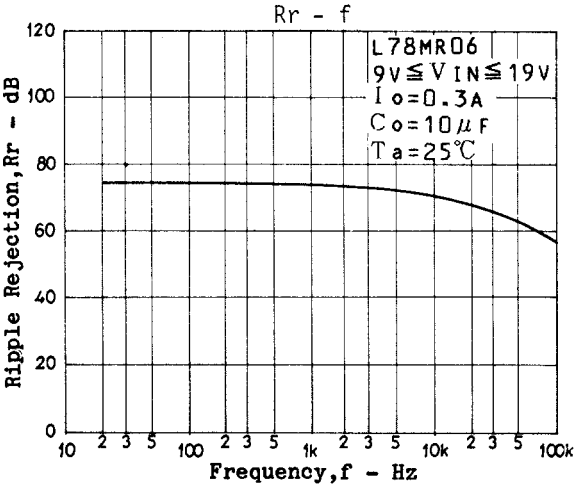
V_O - I_O



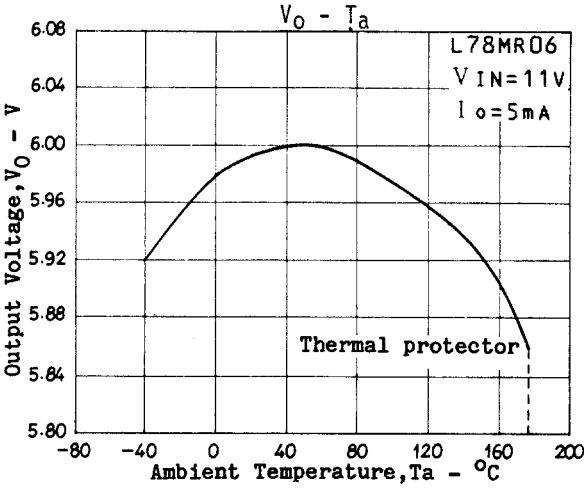
I_{CC} - V_{IN}



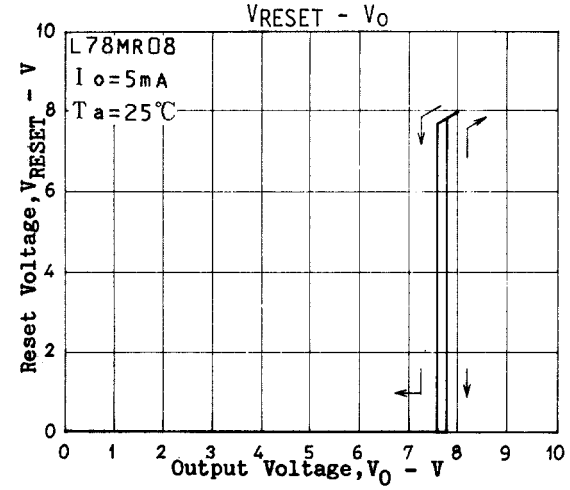
Rr - f



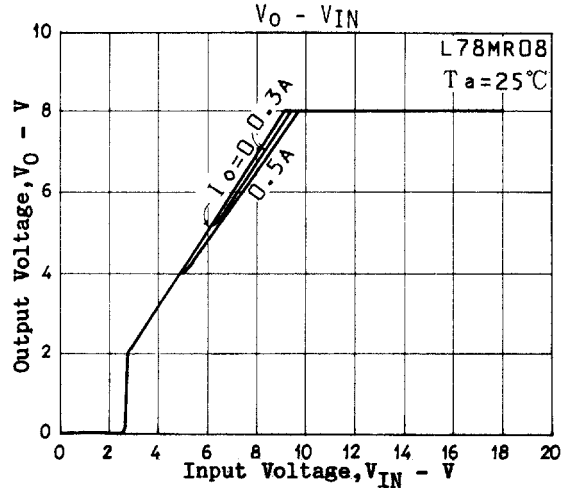
V_O - T_a

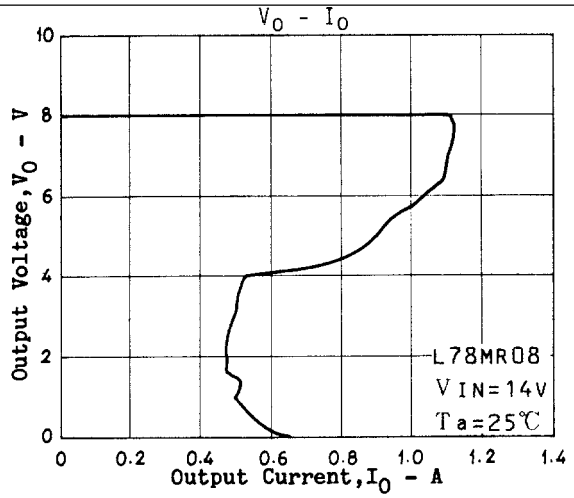


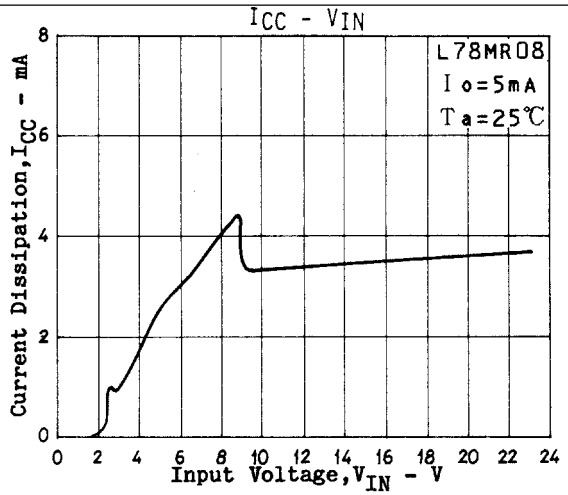
V_{RESET} - V_O

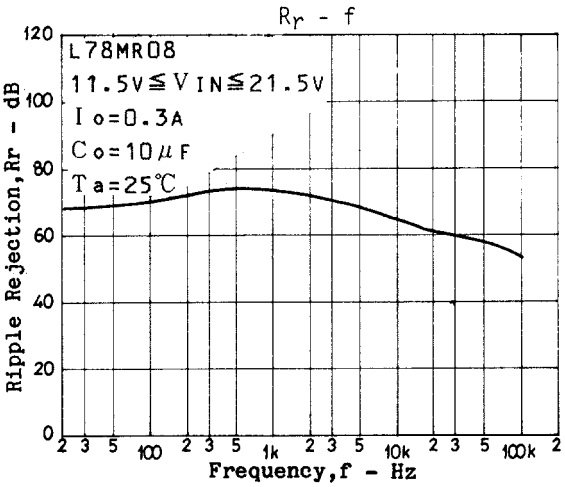


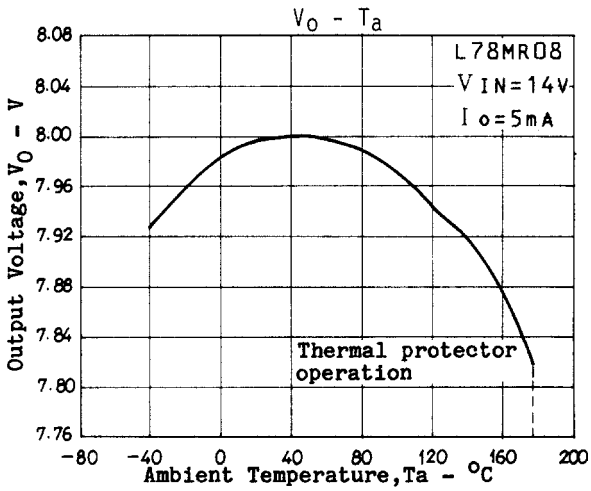
V_O - V_{IN}

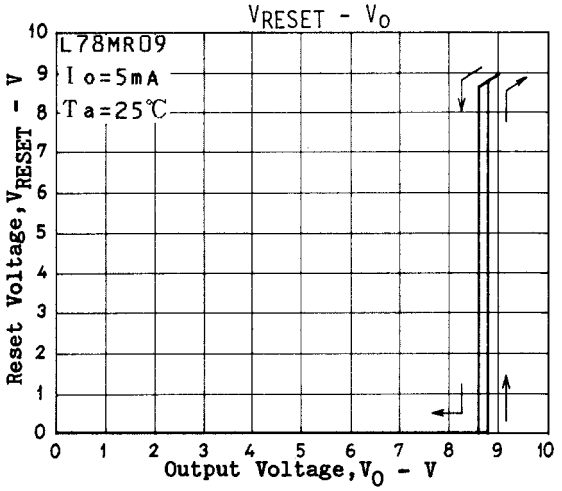


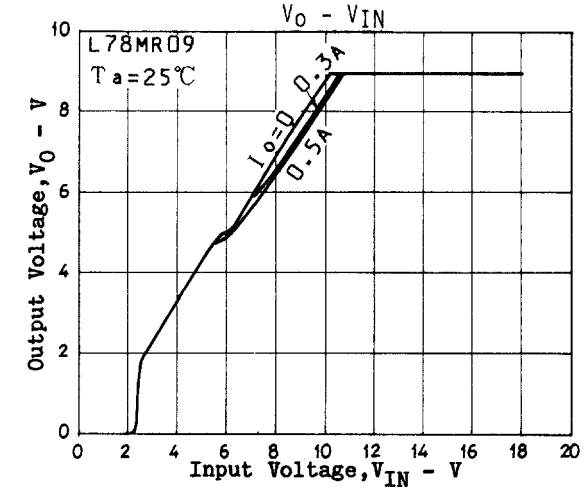

V_O - I_O
Output Voltage, V_O - V
Output Current, I_O - A
L78MR08
VIN=14V
Ta=25℃

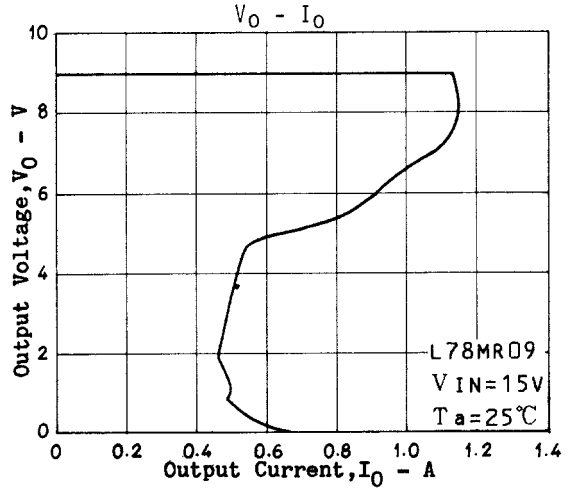

I_{CC} - V_{IN}
Current Dissipation, I_{CC} - mA
Input Voltage, V_{IN} - V
L78MR08
Io=5mA
Ta=25℃

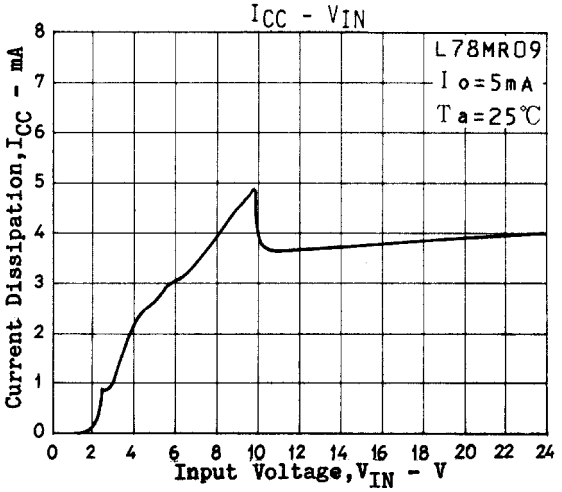

R_r - f
Ripple Rejection, Rr - dB
Frequency, f - Hz
L78MR08
11.5V≦VIN≦21.5V
Io=0.3A
Co=10μF
Ta=25℃

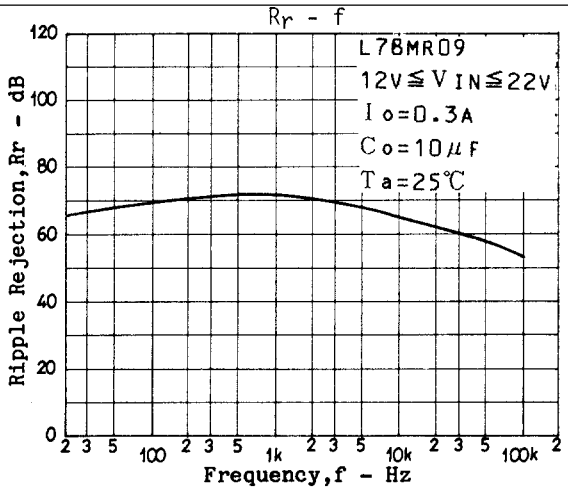

V_O - Ta
Output Voltage, V_O - V
Ambient Temperature, Ta - °C
L78MR08
VIN=14V
Io=5mA
Thermal protector operation

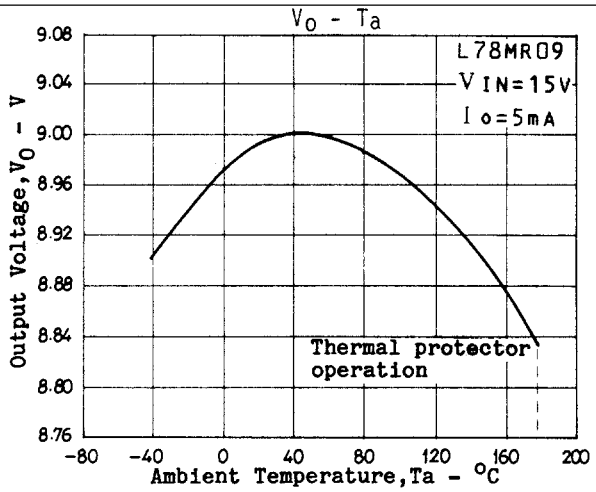

V_{RESET} - V_O
Reset Voltage, V_{RESET} - V
Output Voltage, V_O - V
L78MR09
Io=5mA
Ta=25℃

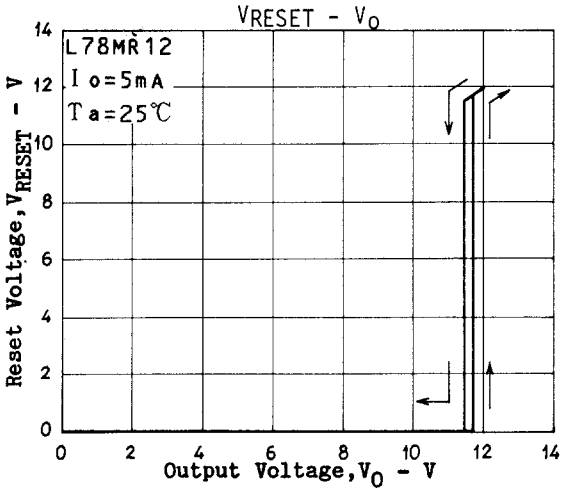

V_O - V_{IN}
Output Voltage, V_O - V
Input Voltage, V_{IN} - V
L78MR09
Ta=25℃
Io=0
0.3A
0.5A

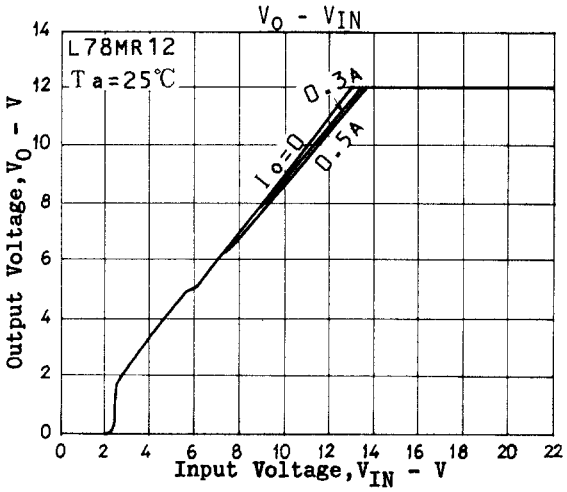

V_O - I_O
Output Voltage, V_O - V
Output Current, I_O - A
L78MR09
VIN=15V
Ta=25℃

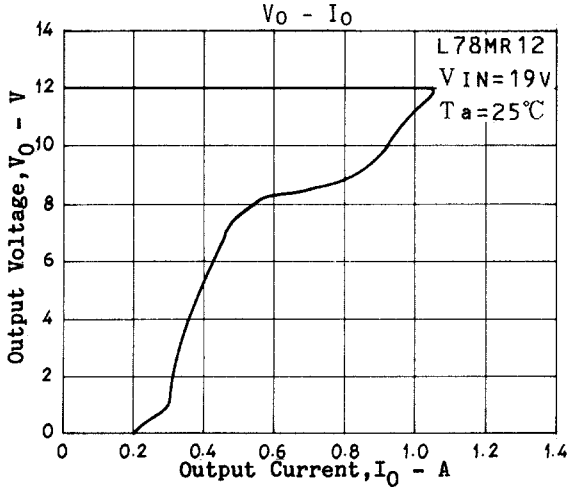

I_{CC} - V_{IN}
Current Dissipation, I_{CC} - mA
Input Voltage, V_{IN} - V
L78MR09
Io=5mA
Ta=25℃

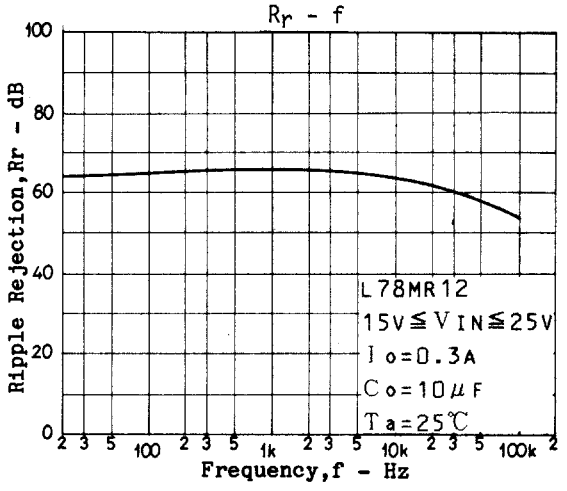

Rr - f
L78MR09
12V≦VIN≦22V
Io=0.3A
Co=10μF
Ta=25℃
Ripple Rejection,Rr - dB
Frequency,f - Hz

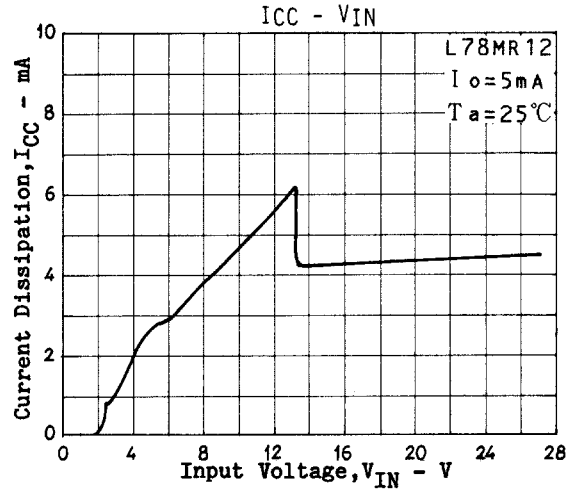

VO - Ta
L78MR09
VIN=15V
Io=5mA
Thermal protector operation
Output Voltage,VO - V
Ambient Temperature,Ta - °C

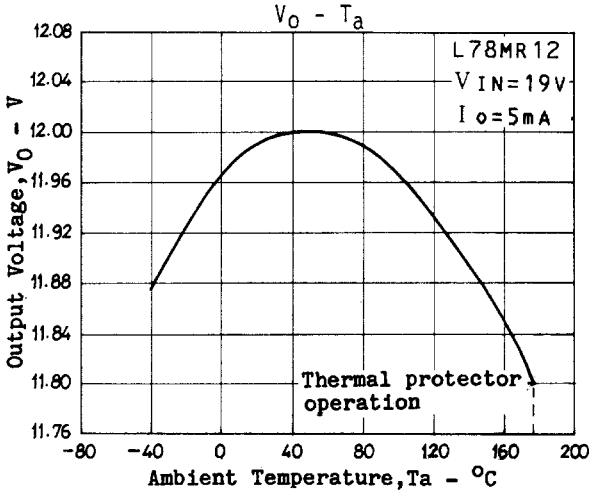

VRESET - VO
L78MR12
Io=5mA
Ta=25℃
Reset Voltage,VRESET - V
Output Voltage,VO - V


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