

SANYO

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.

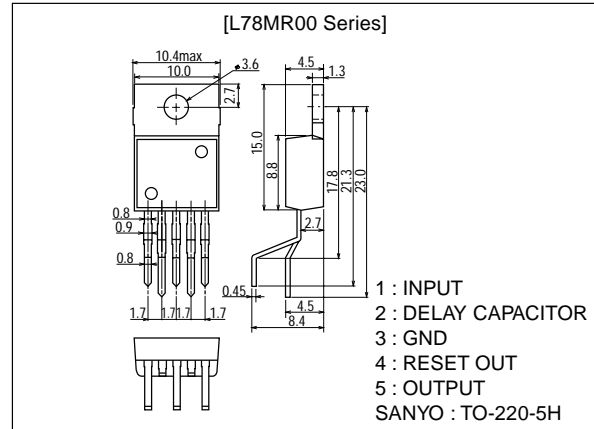
Features

- 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 current500mA
- 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.

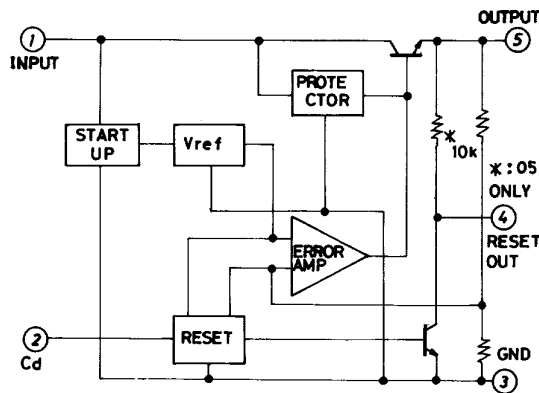
Package Dimensions

unit:mm

3079



Equivalent Circuit

Unit (resistance: Ω)

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11200TH (KT)/9101TS/8067TA/0076KI, TS No.2168-1/10

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 | 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 $8\text{V} \leq V_{IN} \leq 25\text{V}$, $I_O=0.2\text{A}$ | | | 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} | $I_O=5\text{mA}$, $10\text{Hz} \leq f \leq 100\text{kHz}$ | | 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 | | $\text{mV}/^\circ\text{C}$ |
| '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 | 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 $9\text{V} \leq V_{IN} \leq 25\text{V}$, $I_O=0.2\text{A}$ | | | 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} | $I_O=5\text{mA}$, $10\text{Hz} \leq f \leq 100\text{kHz}$ | | 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 |
| 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 | | -0.4 | | $\text{mV}/^\circ\text{C}$ |
| '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 | 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 $T_a = 25^\circ\text{C}$

| 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 | 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 $10.5\text{V} \leq V_{IN} \leq 25\text{V}$, $I_O=0.2\text{A}$ | | | 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 | $\Delta V_O/\Delta T$ | $I_O=5\text{mA}$, $T_J=25$ to 125°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 | 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 | 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 | 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 $11.5\text{V} \leq V_{IN} \leq 25\text{V}$, $I_O=0.2\text{A}$ | | | 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 | 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°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 | 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 | 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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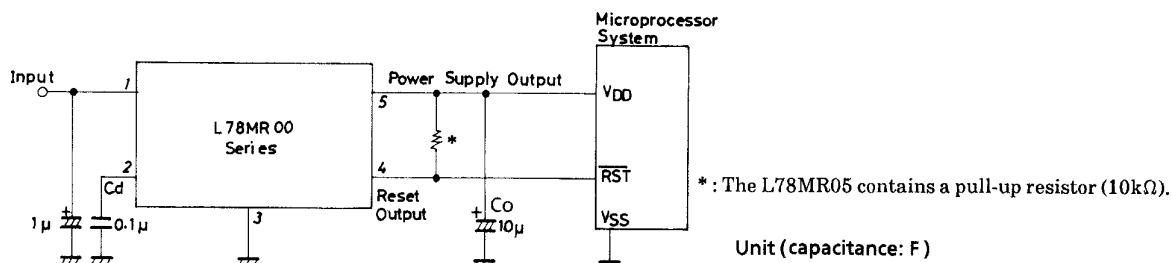
L78MR00 Series

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

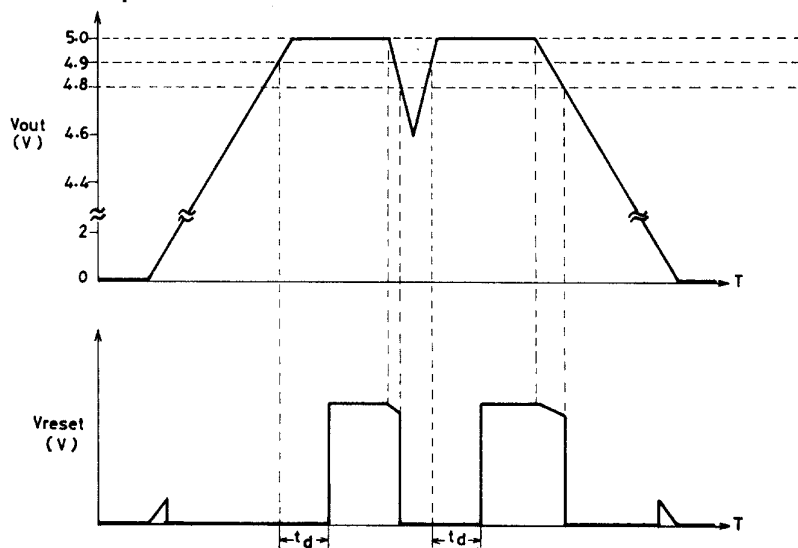
| Parameter | Symbol | Conditions | | Ratings | | | Unit |
|---|---------------------|------------|---|----------------------|----------------------|------|-------|
| | | | | min | typ | max | |
| Output Voltage | V _{O1} | | T _J =25°C | 11.5 | 12.0 | 12.5 | V |
| | V _{O2} | | 14.5V≤V _{IN} ≤27V, 5mA≤I _O ≤0.35A | 11.4 | | 12.6 | V |
| Line Regulation | ΔV _O | LN1 | T _J =25°C, 14.5V≤V _{IN} ≤30V, I _O =0.2A | | 2.4 | 100 | mV |
| | | LN2 | T _J =25°C, 16V≤V _{IN} ≤30V, I _O =0.2A | | 1.2 | 50 | mV |
| Load Regulation | ΔV _O | LD1 | T _J =25°C, 5mA≤I _O ≤0.5A | | 7.0 | 240 | mV |
| | | LD2 | T _J =25°C, 5mA≤I _O ≤0.2A | | 4.0 | 120 | mV |
| Current Dissipation | I _{CC} | | T _J =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 | | T _J =25°C, f=120Hz, 15V≤V _{IN} ≤25V, I _O =0.1A | 55 | 68 | | dB |
| | Rr2 | | T _J =25°C, f=120Hz, 15V≤V _{IN} ≤25V, I _O =0.3A | 55 | 66 | | dB |
| Dropout Voltage | V _{drop} | | | | 2.0 | 2.5 | V |
| Peak Output Current | I _{OP} | | T _J =25°C | | 1.1 | | A |
| Short Circuit Current | I _{OSC} | | T _J =25°C, V _{IN} =35V | | 0.02 | | A |
| Temperature Coefficient of Output Voltage | ΔV _O /ΔT | | I _O =5mA, T _J =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 | | C _d =0.1μF, I _O =5mA | | 10 | | ms |

Specified Application Circuit

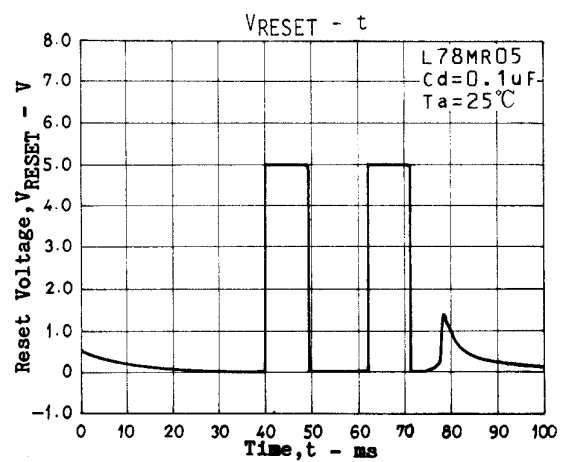
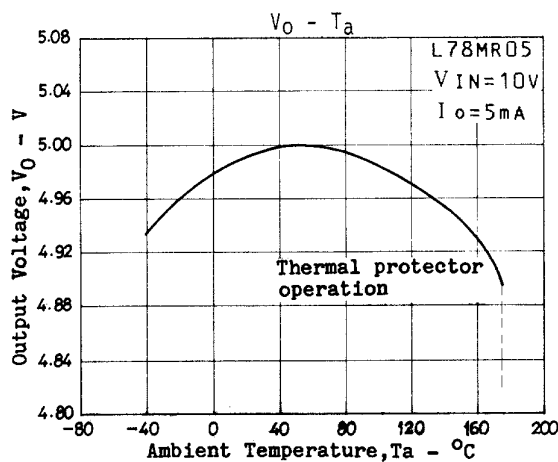
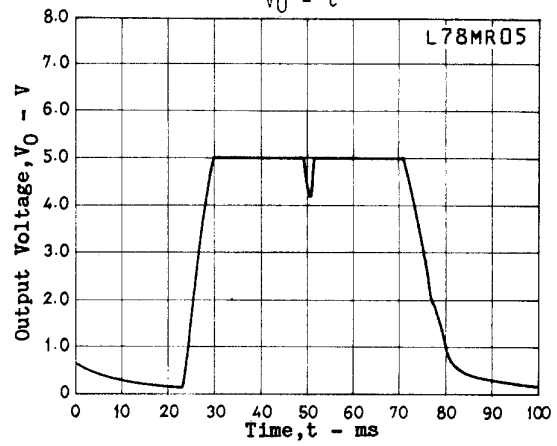
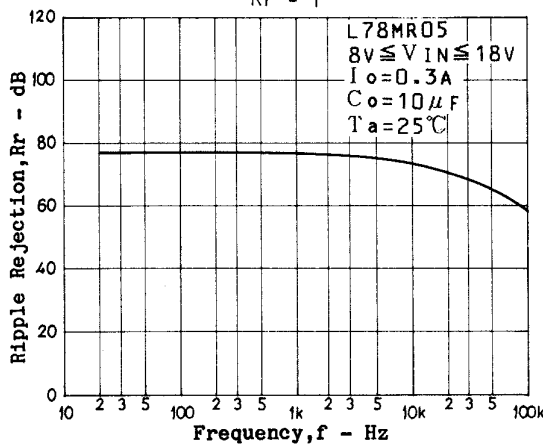
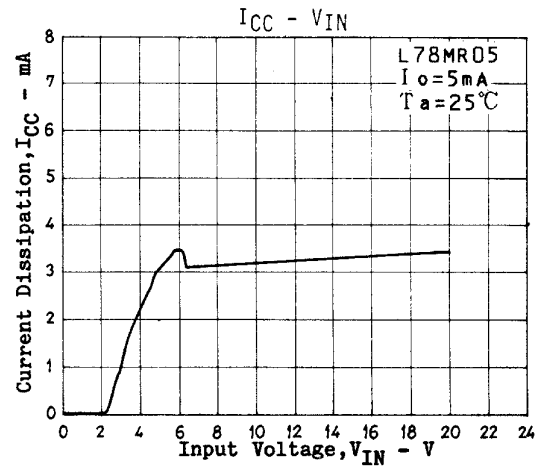
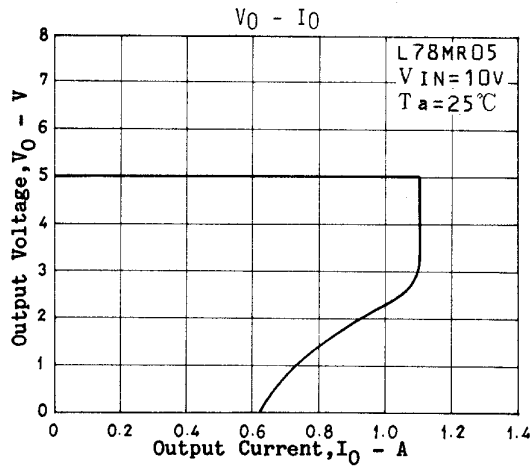
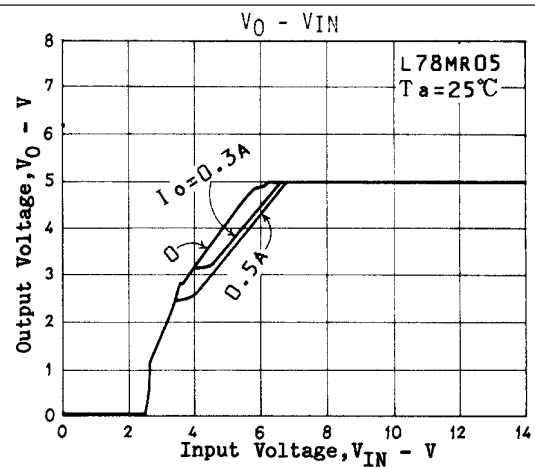
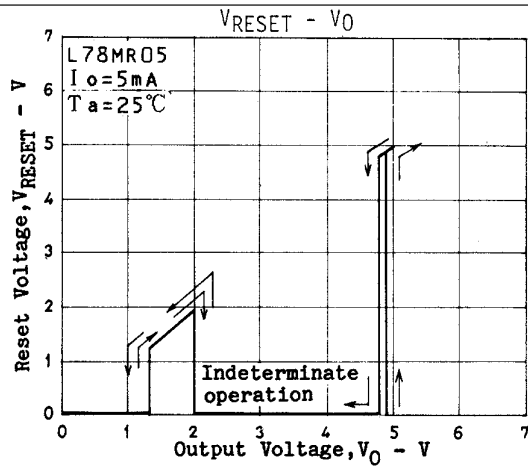


Note on use) If a load current (in particular, pulse-like load current) that is greater than a rated value is used, a reset signal may be generated due to the overload. Please keep it in mind.

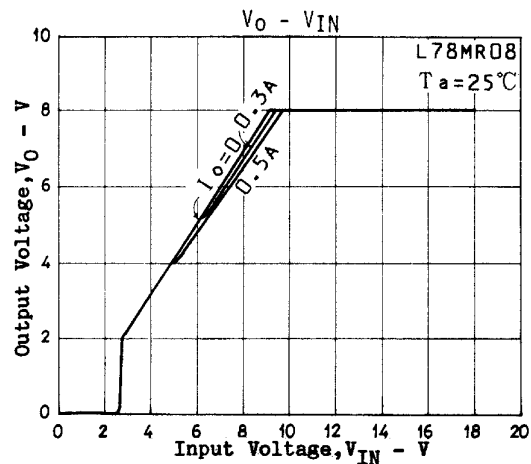
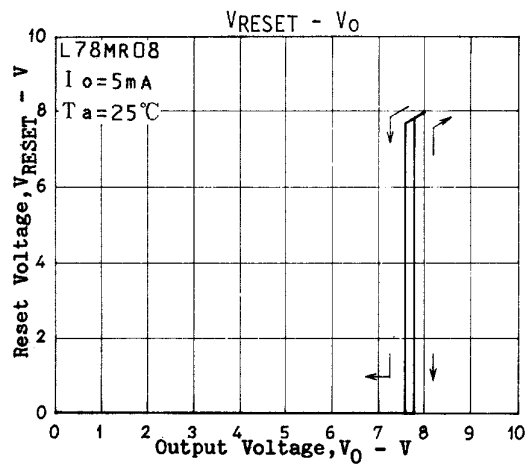
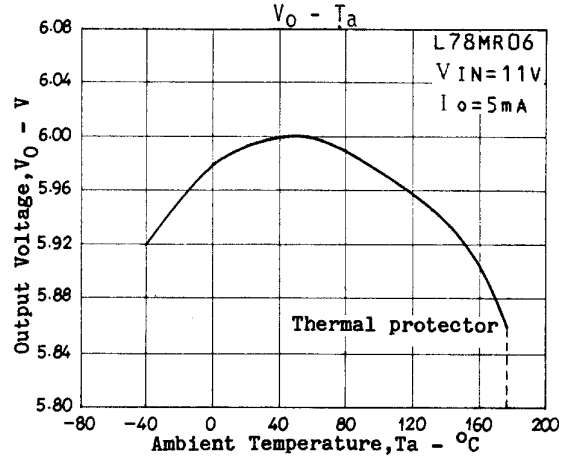
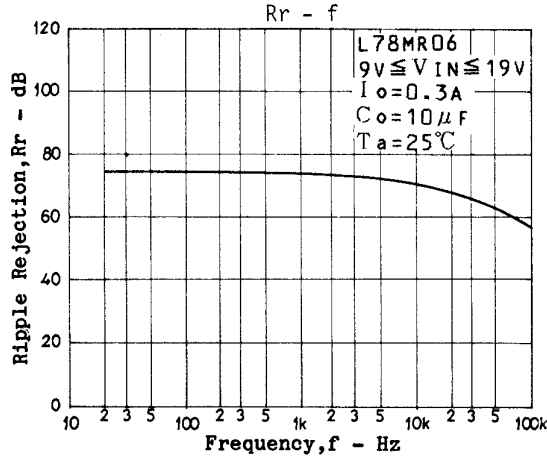
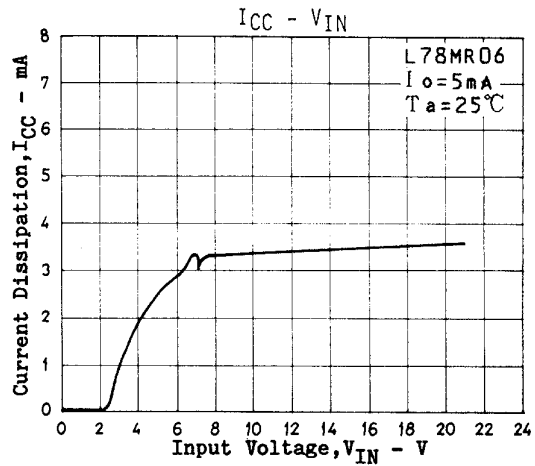
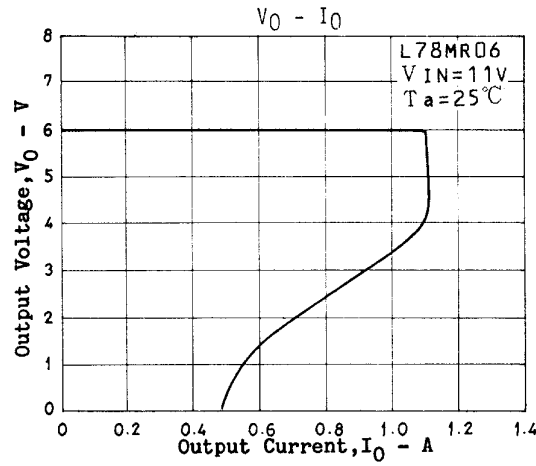
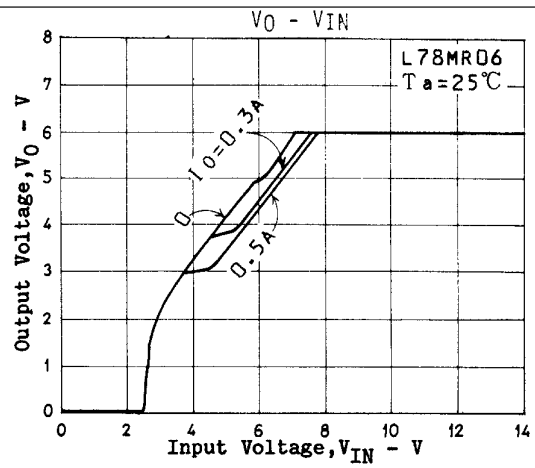
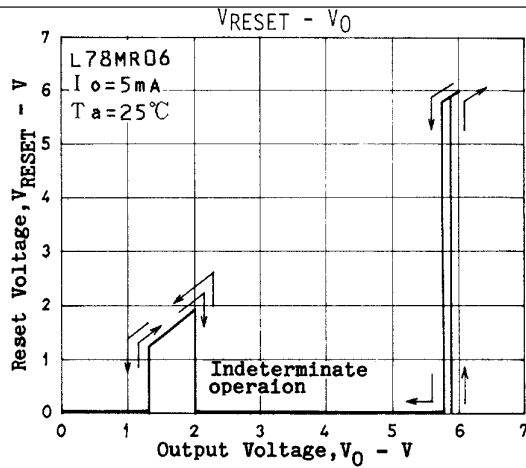
L78MR05 Reset Operation



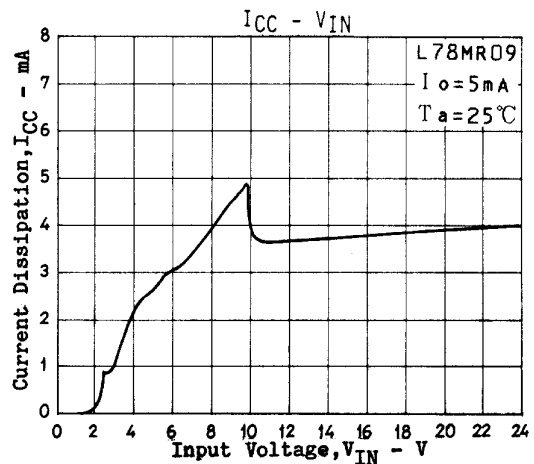
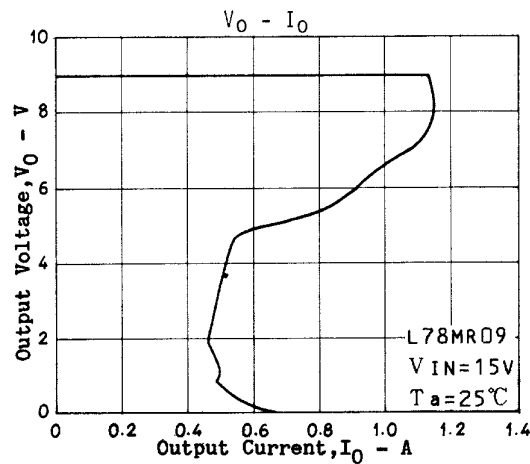
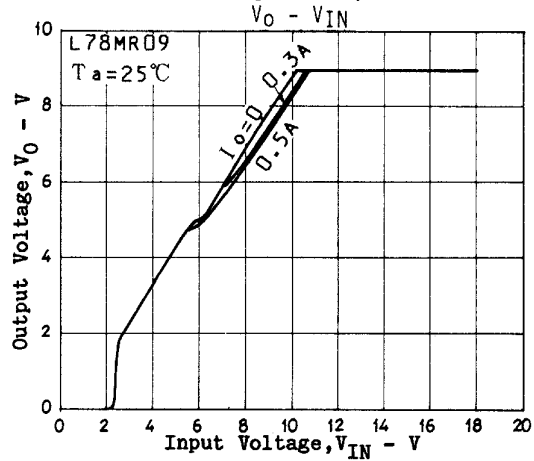
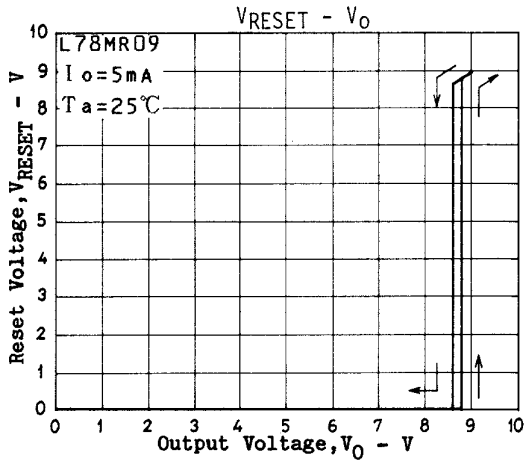
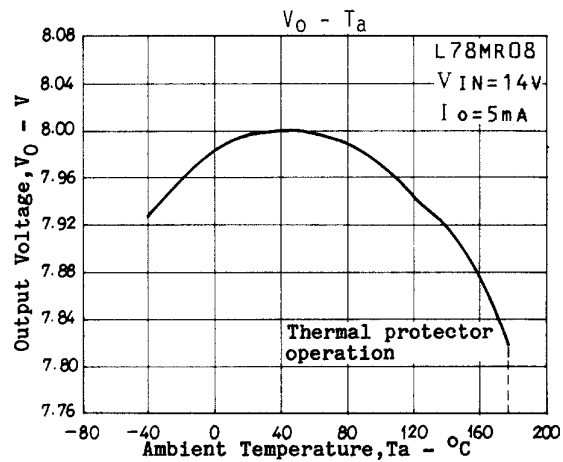
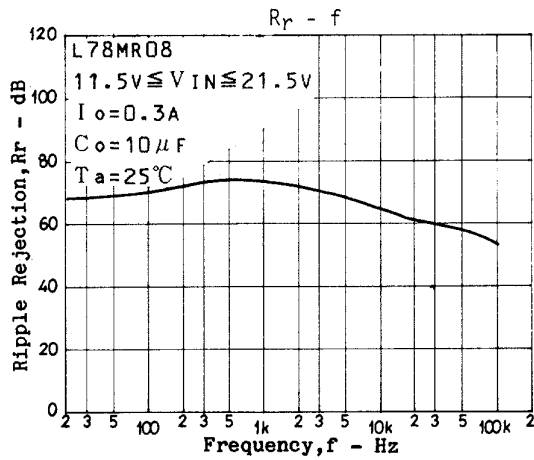
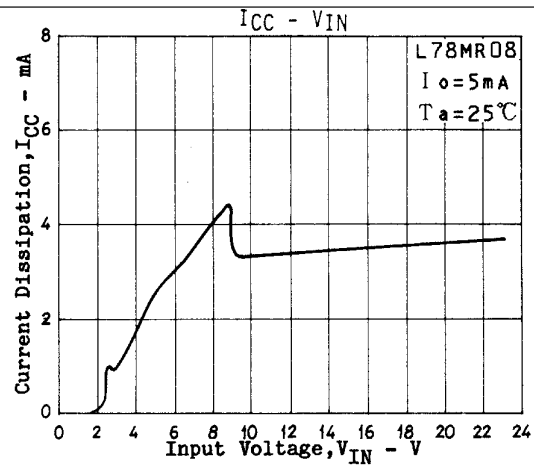
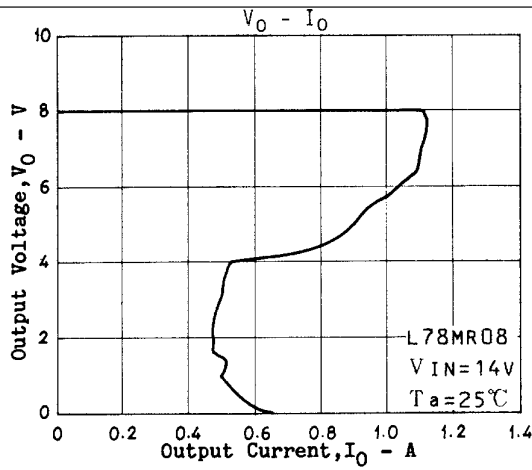
L78MR00 Series



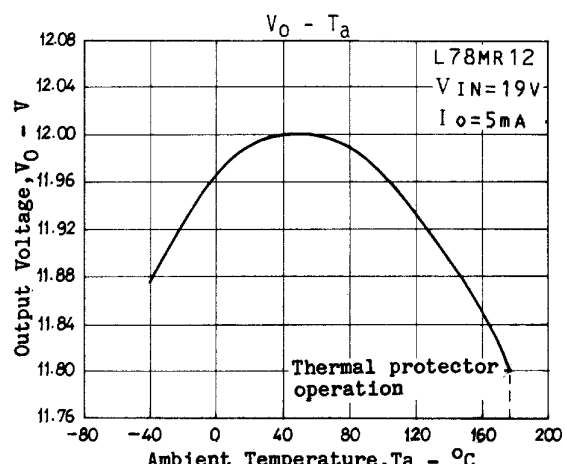
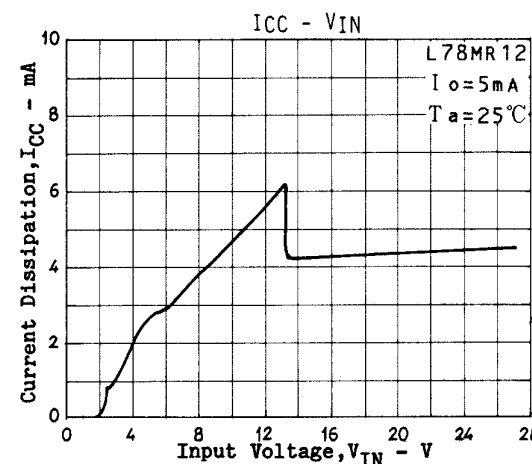
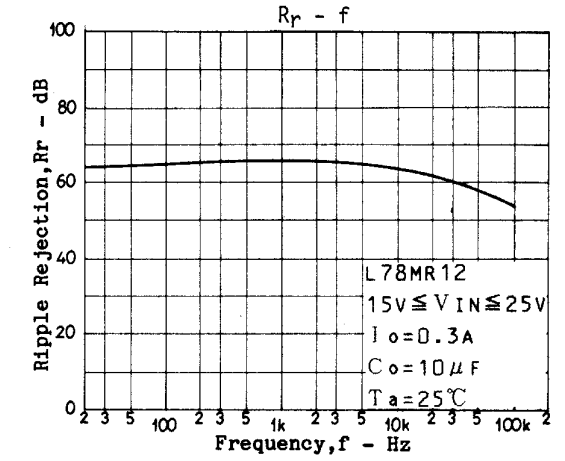
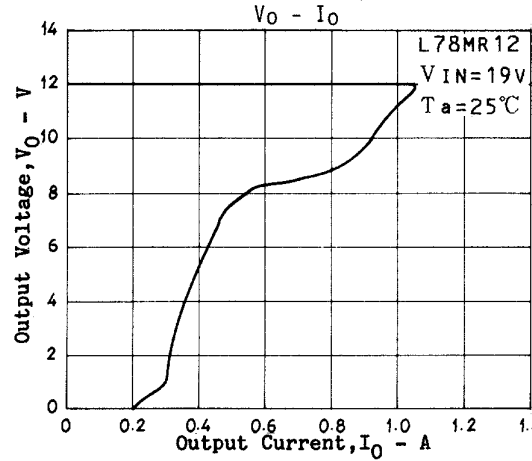
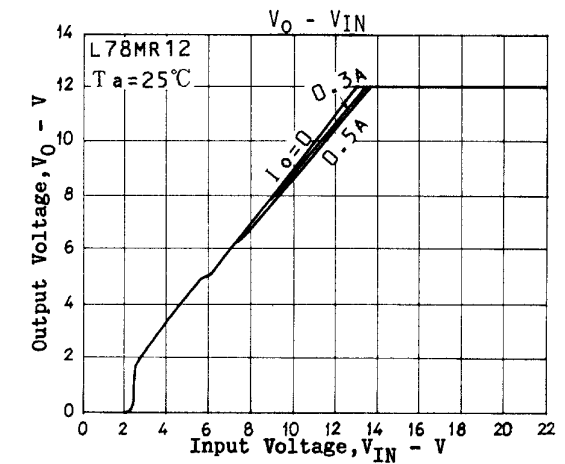
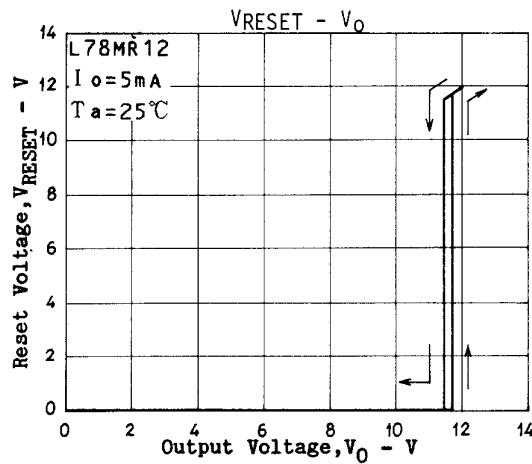
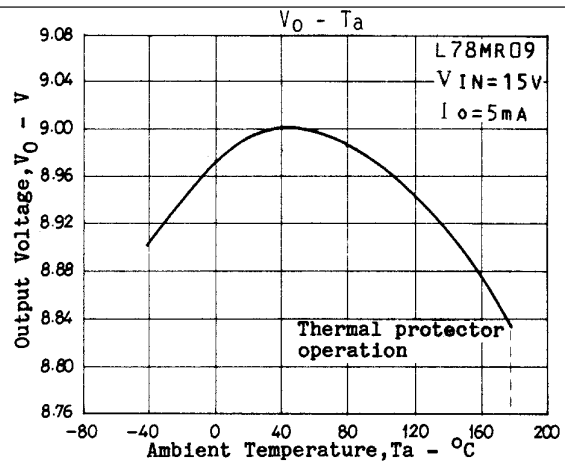
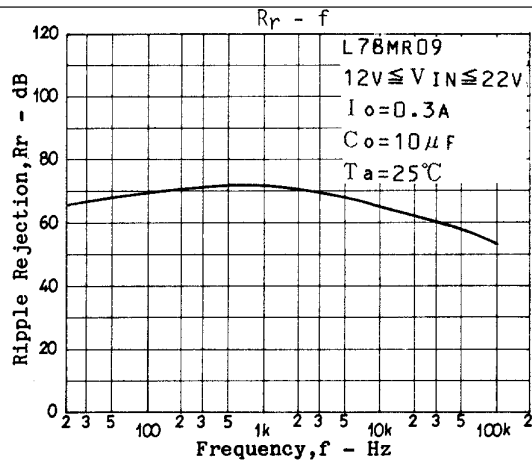
L78MR00 Series



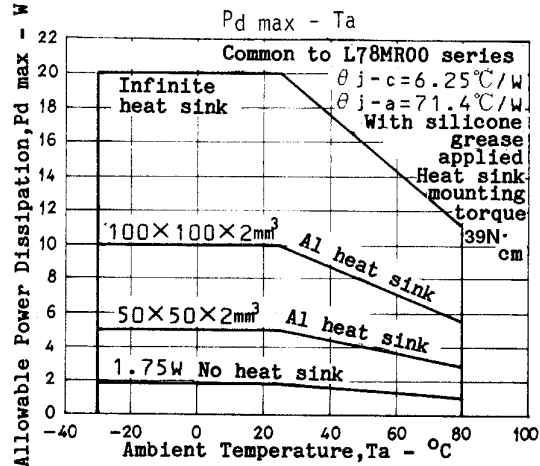
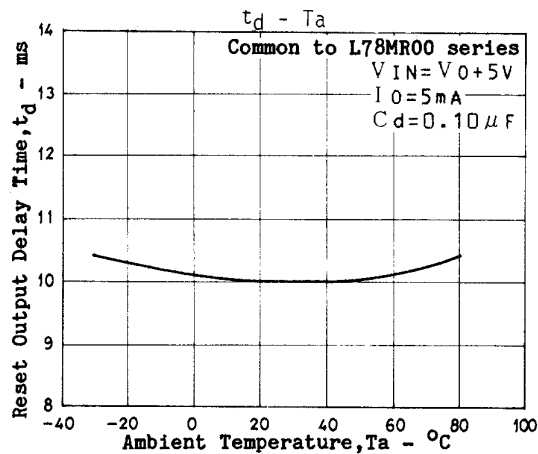
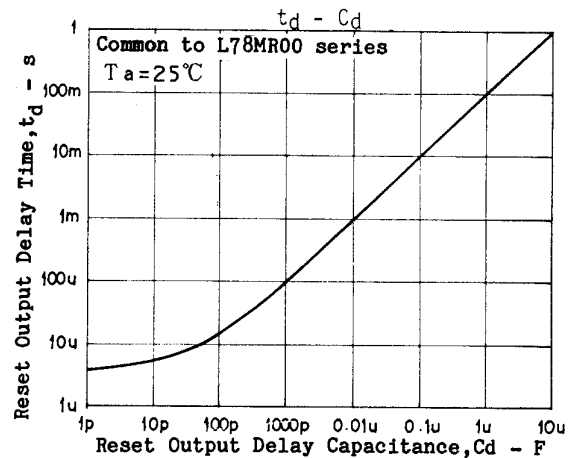
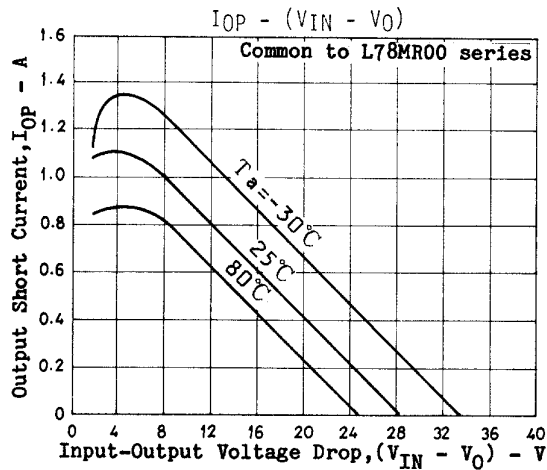
L78MR00 Series



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L78MR00 Series



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