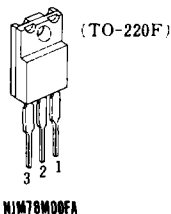


## NJM78M00

The NJM78M00 series of 3-Terminal Medium Current Positive Voltage Regulators is constructed using the New JRC Planar epitaxial process. These regulators employ internal current-limiting, thermal-shutdown and safe-area compensation making them essentially indestructible. If adequate heat sinking is provided, they can deliver in excess of 500mA output current. They are intended as fixed voltage regulation in a wide range of applications including local or on-card regulation for elimination of noise and distribution problems associated with single point regulation. In addition to use as fixed voltage regulators, these devices can be used with external components to obtain adjustable output voltages and currents.

### ■ Package Outline



The radiation fin is connected pin 2

### ■ Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Maximum Rating		Unit
Input Voltage	V <sub>IN</sub>	78M05 ~ 78M09	35	V
		78M12 ~ 78M15	35	
		78M18 ~ 78M24	40	
Storage Temperature Range	T <sub>stg</sub>	-40 ~ +150		°C
Operating Temperature Range	Operating Junction Temperature	T <sub>J</sub>	-30 ~ +150	°C
	Operating Ambient Temperature	T <sub>opr</sub>	-30 ~ +75	
Power Dissipation	P <sub>D</sub>	7.5 (T <sub>c</sub> ≤ 75°C)		W

### ■ Thermal Characteristics

Thermal Resistance	Junction-to-Ambient Temperature	θ <sub>ja</sub>	60	°C/W
	Junction-to-Case	θ <sub>jc</sub>	7	

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### ■ Electrical Characteristics (C<sub>IN</sub>=0.33μF, C<sub>O</sub>=0.1μF, T<sub>J</sub>=25°C)

Measurement is to be conducted in pulse testing.

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>NJM78M05FA</b>						
Output Voltage	V <sub>O</sub>	V <sub>IN</sub> =10V, I <sub>O</sub> =350mA	4.8	5.0	5.2	V
Line Regulation	ΔV <sub>O</sub> /V <sub>IN</sub>	V <sub>IN</sub> =7~25V, I <sub>O</sub> =200mA	—	3	50	mV
Load Regulation	ΔV <sub>O</sub> /I <sub>O</sub>	V <sub>IN</sub> =10V, I <sub>O</sub> =5~500mA	—	5	50	mV
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =10V, I <sub>O</sub> =0mA	—	4	6	mA
Average Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	V <sub>IN</sub> =10V, I <sub>O</sub> =5mA	—	-1	—	mV/°C
Ripple Rejection	RR	V <sub>IN</sub> =10V, I <sub>O</sub> =350mA, e <sub>in</sub> =1V <sub>P-P</sub> , f=120Hz	60	80	—	dB
Output Noise Voltage	V <sub>NO</sub>	V <sub>IN</sub> =10V, BW=10Hz~100kHz, I <sub>O</sub> =350mA	—	60	—	μV

# NJM78M00

## ■ Electrical Characteristics ( $C_{IN}=0.33\mu F$ , $C_O=0.1\mu F$ , $T_J=25^\circ C$ )

Measurement is to be conducted in pulse testing.

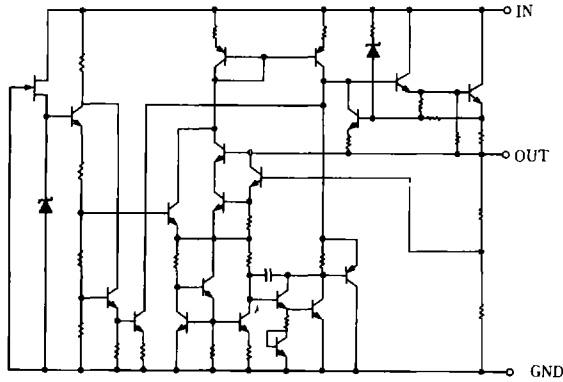
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>NJM78M06FA</b>						
Output Voltage	$V_O$	$V_{IN}=11V$ , $I_O=350mA$	5.75	6.0	6.25	V
Line Regulation	$\Delta V_O/V_{IN}$	$V_{IN}=8\sim 25V$ , $I_O=200mA$	—	5	60	mV
Load Regulation	$\Delta V_O/I_O$	$V_{IN}=11V$ , $I_O=5\sim 500mA$	—	5	60	mV
Quiescent Current	$I_Q$	$V_{IN}=11V$ , $I_O=0mA$	—	4	6	mA
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=11V$ , $I_O=5mA$	—	-1	—	mV/ $^\circ C$
Ripple Rejection	RR	$V_{IN}=11V$ , $I_O=350mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$	59	75	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=11V$ , $BW=10Hz\sim 100kHz$ , $I_O=350mA$	—	70	—	$\mu V$
<b>NJM78M08FA</b>						
Output Voltage	$V_O$	$V_{IN}=14V$ , $I_O=350mA$	7.7	8.0	8.3	V
Line Regulation	$\Delta V_O/V_{IN}$	$V_{IN}=10.5\sim 25V$ , $I_O=200mA$	—	6	60	mV
Load Regulation	$\Delta V_O/I_O$	$V_{IN}=14V$ , $I_O=5\sim 500mA$	—	8	80	mV
Quiescent Current	$I_Q$	$V_{IN}=14V$ , $I_O=0mA$	—	4	6	mA
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=14V$ , $I_O=5mA$	—	-1	—	mV/ $^\circ C$
Ripple Rejection	RR	$V_{IN}=14V$ , $I_O=350mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$	56	75	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=14V$ , $BW=10Hz\sim 100kHz$ , $I_O=350mA$	—	80	—	$\mu V$
<b>NJM78M09FA</b>						
Output Voltage	$V_O$	$V_{IN}=15V$ , $I_O=350mA$	8.65	9.0	9.35	V
Line Regulation	$\Delta V_O/V_{IN}$	$V_{IN}=11.5\sim 25V$ , $I_O=200mA$	—	6	60	mV
Load Regulation	$\Delta V_O/I_O$	$V_{IN}=15V$ , $I_O=5\sim 500mA$	—	8	90	mV
Quiescent Current	$I_Q$	$V_{IN}=15V$ , $I_O=0mA$	—	4.1	6	mA
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=15V$ , $I_O=5mA$	—	-1	—	mV/ $^\circ C$
Ripple Rejection	RR	$V_{IN}=15V$ , $I_O=350mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$	56	70	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=15V$ , $BW=10Hz\sim 100kHz$ , $I_O=350mA$	—	90	—	$\mu V$
<b>NJM78M12FA</b>						
Output Voltage	$V_O$	$V_{IN}=19V$ , $I_O=350mA$	11.5	12.0	12.5	V
Line Regulation	$\Delta V_O/V_{IN}$	$V_{IN}=14.5\sim 30V$ , $I_O=200mA$	—	8	60	mV
Load Regulation	$\Delta V_O/I_O$	$V_{IN}=19V$ , $I_O=5\sim 500mA$	—	8	120	mV
Quiescent Current	$I_Q$	$V_{IN}=19V$ , $I_O=0mA$	—	4.1	6	mA
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=19V$ , $I_O=5mA$	—	-1	—	mV/ $^\circ C$
Ripple Rejection	RR	$V_{IN}=19V$ , $I_O=350mA$ , $e_{in}=1V_{P-P}$ , $f=120Hz$	55	70	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=19V$ , $BW=10Hz\sim 100kHz$ , $I_O=350mA$	—	100	—	$\mu V$

■ **Electrical Characteristics** ( $C_{IN}=0.33\mu F$ ,  $C_O=0.1\mu F$ ,  $T_j=25^\circ C$ )

Measurement is to be conducted in pulse testing.

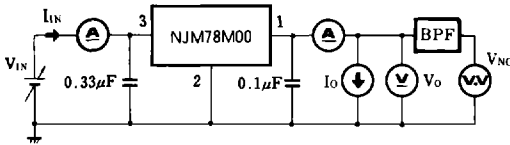
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
<b>NJM78M15FA</b>						
Output Voltage	$V_O$	$V_{IN}=23V, I_O=350mA$	14.4	15.0	15.6	V
Line Regulation	$\Delta V_O/V_{IN}$	$V_{IN}=17.5\sim 30V, I_O=200mA$	—	10	60	mV
Load Regulation	$\Delta V_O/I_O$	$V_{IN}=23V, I_O=5\sim 500mA$	—	10	150	mV
Quiescent Current	$I_Q$	$V_{IN}=23V, I_O=0mA$	—	4.1	6	mA
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=25V, I_O=5mA$	—	-1	—	mV/ $^\circ C$
Ripple Rejection	RR	$V_{IN}=23V, I_O=350mA, e_{in}=1V_{P-P}, f=120Hz$	54	70	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=23V, BW=10Hz\sim 100kHz, I_O=350mA$	—	120	—	$\mu V$
<b>NJM78M18FA</b>						
Output Voltage	$V_O$	$V_{IN}=27V, I_O=350mA$	17.3	18.0	18.7	V
Line Regulation	$\Delta V_O/V_{IN}$	$V_{IN}=21\sim 33V, I_O=200mA$	—	10	60	mV
Load Regulation	$\Delta V_O/I_O$	$V_{IN}=27V, I_O=5\sim 500mA$	—	15	180	mV
Quiescent Current	$I_Q$	$V_{IN}=27V, I_O=0mA$	—	4.2	6	mA
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=27V, I_O=5mA$	—	-1.1	—	mV/ $^\circ C$
Ripple Rejection	RR	$V_{IN}=27V, I_O=350mA, e_{in}=1V_{P-P}, f=120Hz$	53	65	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=27V, BW=10Hz\sim 100kHz, I_O=350mA$	—	140	—	$\mu V$
<b>NJM78M20FA</b>						
Output Voltage	$V_O$	$V_{IN}=29V, I_O=350mA$	19.2	20.0	20.8	V
Line Regulation	$\Delta V_O/V_{IN}$	$V_{IN}=23\sim 35V, I_O=200mA$	—	10	60	mV
Load Regulation	$\Delta V_O/I_O$	$V_{IN}=29V, I_O=5\sim 500mA$	—	20	200	mV
Quiescent Current	$I_Q$	$V_{IN}=29V, I_O=0mA$	—	4	6	mA
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=29V, I_O=5mA$	—	-1.1	—	mV/ $^\circ C$
Ripple Rejection	RR	$V_{IN}=29V, I_O=350mA, e_{in}=1V_{P-P}, f=120Hz$	53	65	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=29V, BW=10Hz\sim 100kHz, I_O=350mA$	—	150	—	$\mu V$
<b>NJM78M24FA</b>						
Output Voltage	$V_O$	$V_{IN}=33V, I_O=350mA$	23.0	24.0	25.0	V
Line Regulation	$\Delta V_O/V_{IN}$	$V_{IN}=27\sim 38V, I_O=200mA$	—	10	60	mV
Load Regulation	$\Delta V_O/I_O$	$V_{IN}=33V, I_O=5\sim 500mA$	—	20	240	mV
Quiescent Current	$I_Q$	$V_{IN}=33V, I_O=0mA$	—	4.2	6	mA
Average Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	$V_{IN}=33V, I_O=5mA$	—	-1.2	—	mV/ $^\circ C$
Ripple Rejection	RR	$V_{IN}=33V, I_O=350mA, e_{in}=1V_{P-P}, f=120Hz$	50	60	—	dB
Output Noise Voltage	$V_{NO}$	$V_{IN}=33V, BW=10Hz\sim 100kHz, I_O=350mA$	—	160	—	$\mu V$

## ■ Equivalent Circuit



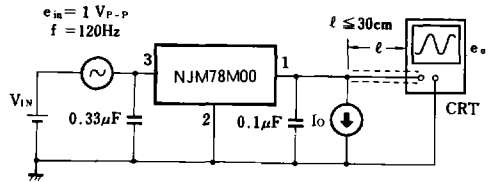
## ■ Test Circuit

1. Output Voltage, Line Regulation, Load Regulation, Quiescent Current, Average Temperature Coefficient of Output Voltage, Output Noise Voltage.



- Measurement is to be conducted
- $I_O = I_{IN} - I_0$  in pulse testing

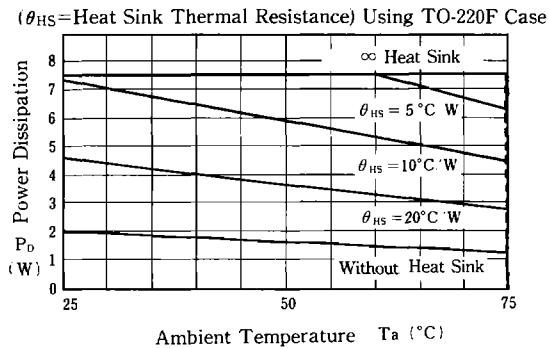
2. Ripple Rejection



$$RR = 20 \log_{10} \left( \frac{e_{in}}{e_o} \right) \text{ (dB)}$$

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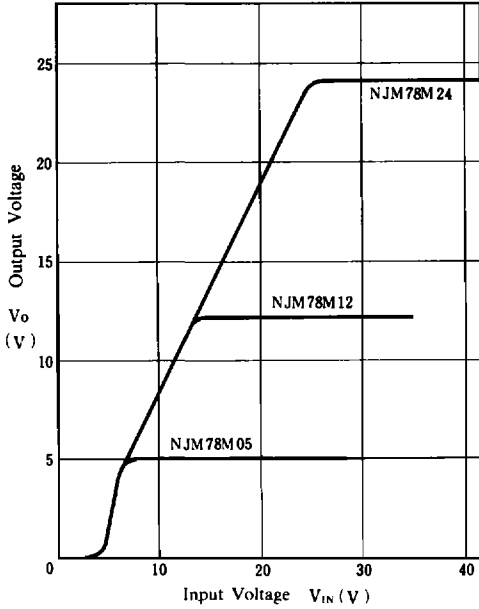
## ■ Power Dissipation vs. Ambient Temperature



## ■ Typical Characteristics

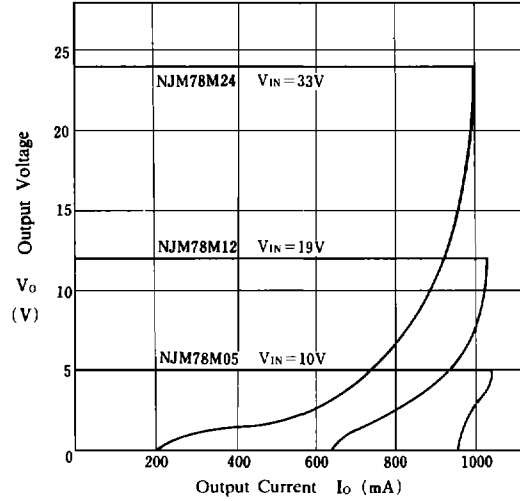
### NJM78M05/M12/M24 Output Characteristics

( $I_o = 350\text{mA}$ ,  $T_j = 25^\circ\text{C}$ )



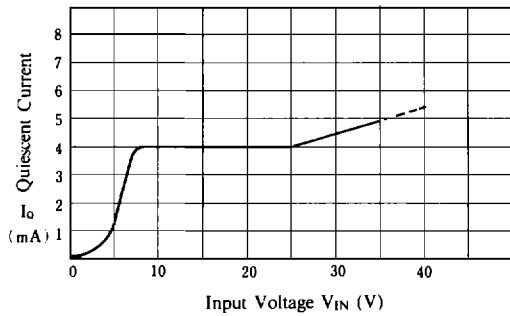
### NJM78M05/M12/M24 Load Characteristics

( $T_j = 25^\circ\text{C}$ )

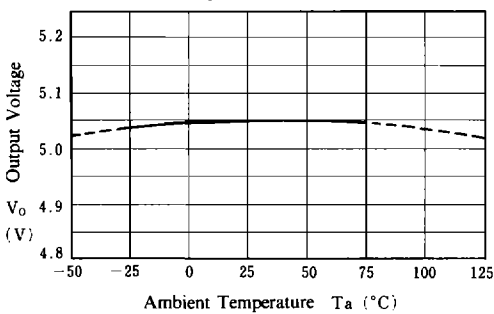


### NJM78M05 Quiescent Current vs. Input Voltage

( $I_o = 0\text{mA}$ ,  $T_j = 25^\circ\text{C}$ )

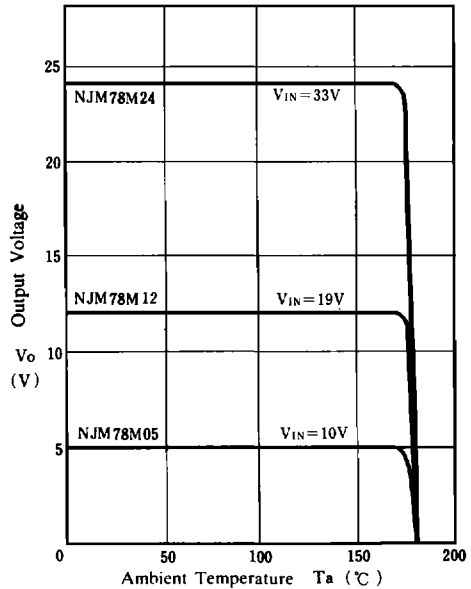


### NJM78M05 Output Voltage vs. Temperature



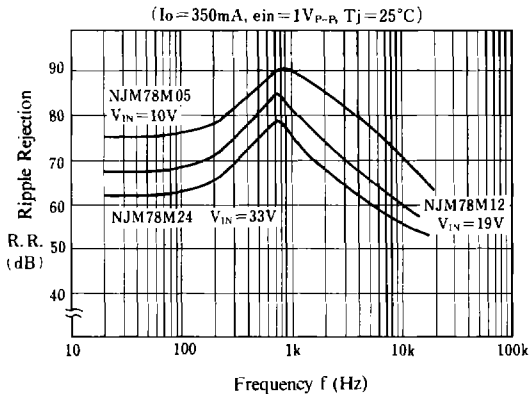
### NJM78M05/M12/M24 Thermal Shutdown Characteristics

( $I_o = 0\text{mA}$ )

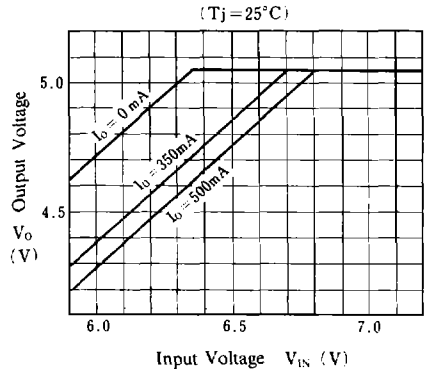


## ■ Typical Characteristics

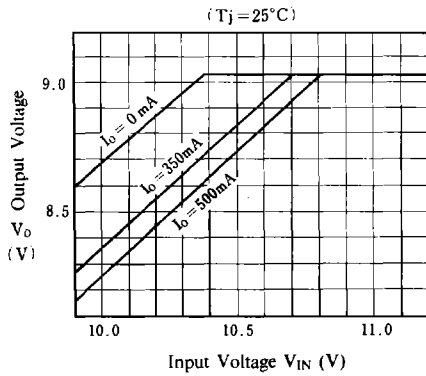
### NJM78M05/12/24 Ripple Rejection



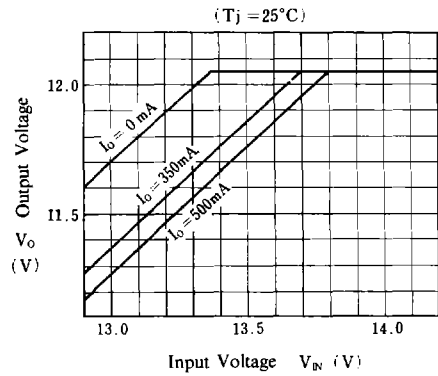
### NJM78M05 Dropout Characteristics



### NJM78M09 Dropout Characteristics



### NJM78M12 Dropout Characteristics



### NJM78M00 Series Short Circuit Output Current

