

Pb Free Plating Product

78M05 thru 78M24



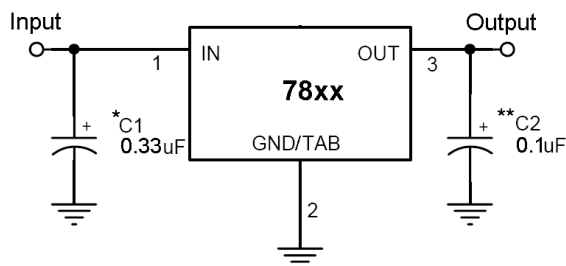
1 Ampere Surface Mount Positive Three Terminal Voltage Regulators

Features

- Output Voltage Range 5 to 24V
- Output current up to 1A
- No external components required
- Internal thermal overload protection
- Internal short-circuit current limiting
- Output transistor safe-area compensation
- Output voltage offered in 4% tolerance



DPAK/TO-252

Standard Application Circuit

A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0V above the output voltage even during the low point on the Input ripple voltage.

XX = these two digits of the type number indicate voltage.

* = Cin is required if regulator is located an appreciable distance from power supply filter.

** = Co is not needed for stability; however, it does improve transient response.

Absolute Maximum Rating ($T_a = 25^\circ\text{C}$ unless otherwise noted)

Parameter		Symbol	Limit	Unit
Input Voltage	$V_{OUT}=5\sim 18\text{V}$	V_{IN}	35	V
	$V_{OUT}=24\text{V}$		40	
Output Current		I_{OUT}	Internal Limited	
Power Dissipation		P_D	Internal Limited	
Operating Junction Temperature		T_J	$0\sim +125$	$^\circ\text{C}$
Storage Temperature Range		T_{STG}	$-65\sim +150$	$^\circ\text{C}$
Thermal Resistance - Junction to Case	TO-220	$R_{\theta_{JC}}$	5	$^\circ\text{C/W}$
	TO-252		5	
Thermal Resistance - Junction to Ambient	TO-220	$R_{\theta_{JA}}$	50	$^\circ\text{C/W}$
	TO-252		60	

Note: Absolute maximum ratings are those values beyond which damage to the device may occur.
Functional operation under these condition is not implied.

78M05 Electrical Characteristics

(Vin=10V, Iout=500mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output voltage	Vout	Tj=25°C	4.80	5	5.20	V
		7.5V≤Vin≤20V, 10mA≤Iout≤1A, PD≤15W	4.75	5	5.25	
Line Regulation	REGline	Tj=25°C	--	3	100	mV
		7.5V≤Vin≤25V	--	1	50	
Load Regulation	REGload	Tj=25°C	--	15	100	
		10mA≤Iout≤1A	--	5	50	
Quiescent Current	Iq	Iout=0, Tj=25°C	--	4.2	8	mA
Quiescent Current Change	ΔIq	7.5V≤Vin≤25V	--	--	1.3	
		10mA≤Iout≤1A	--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C	--	40	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 8V≤Vin≤18V	62	78	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	17	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C	--	750	--	mA
Peak Output Current	I _{o peak}	Tj=25°C	--	2.2	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C	--	-0.6	--	mV/ °C

78M06 Electrical Characteristics

(Vin=11V, Iout=500mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output Voltage	Vout	Tj=25°C	5.75	6	6.25	V
		8.5V≤Vin≤21V, 10mA≤Iout≤1A, PD≤15W	5.7	6	6.3	
Line Regulation	REGline	Tj=25°C	--	5	120	mV
		8.5V≤Vin≤25V	--	1.5	60	
Load Regulation	REGload	Tj=25°C	--	14	120	
		10mA≤Iout≤1A	--	4	60	
Quiescent Current	Iq	Iout=0, Tj=25°C	--	4.3	8	mA
Quiescent Current Change	ΔIq	8.5V≤Vin≤25V	--	--	1.3	
		10mA≤Iout≤1A	--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C	--	45	--	uV
Ripple Rejection Ratio	RR	f=120Hz, 9V≤Vin≤19V	59	75	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	19	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C	--	550	--	mA
Peak Output Current	I _{o peak}	Tj=25°C	--	2.2	--	A
Temperature Coefficient of Output Voltage	ΔVout/ΔTj	Iout=10mA, 0°C≤Tj≤125°C	--	-0.7	--	mV/ °C

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

78M08 Electrical Characteristics

(Vin=14V, Iout=500mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output voltage	Vout	Tj=25°C	7.69	8	8.32	V
		10.5V≤Vin≤23V, 10mA≤Iout≤1A, PD≤15W	7.61	8	8.40	
Line Regulation	REGline	Tj=25°C	--	6	160	mV
		10.5V≤Vin≤25V 11V≤Vin≤17V	--	2	80	
Load Regulation	REGload	Tj=25°C	--	12	160	
		10mA≤Iout≤1A 250mA≤Iout≤750mA	--	4	80	
Quiescent Current	Iq	Iout=0, Tj=25°C	--	4.3	8	mA
Quiescent Current Change	ΔIq	10.5V≤Vin≤25V	--	--	1	
		10mA≤Iout≤1A	--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C	--	52	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 11V≤Vin≤21V	56	72	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	16	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C	--	450	--	mA
Peak Output Current	I _{o peak}	Tj=25°C	--	2.2	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C	--	-0.8	--	mV/ °C

78M09 Electrical Characteristics

(Vin=15V, Iout=500mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output Voltage	Vout	Tj=25°C	8.65	9	9.36	V
		11.5V≤Vin≤23V, 10mA≤Iout≤1A, PD≤15W	8.57	9	9.45	
Line Regulation	REGline	Tj=25°C	--	6	180	mV
		11.5V≤Vin≤26V 12V≤Vin≤17V	--	2	90	
Load Regulation	REGload	Tj=25°C	--	12	180	
		10mA≤Iout≤1A 250mA≤Iout≤750mA	--	4	90	
Quiescent Current	Iq	Iout=0, Tj=25°C	--	4.3	8	mA
Quiescent Current Change	ΔIq	11.5V≤Vin≤26V	--	--	1	
		10mA≤Iout≤1A	--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C	--	52	--	uV
Ripple Rejection Ratio	RR	f=120Hz, 12V≤Vin≤22V	55	72	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	16	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C	--	450	--	mA
Peak Output Current	I _{o peak}	Tj=25°C	--	2.2	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C	--	-1	--	mV/ °C

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

78M10 Electrical Characteristics

Vin=16V, Iout=500mA, 0°C≤Tj≤125°C, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output voltage	Vout	Tj=25°C	9.6	10	10.4	V
		12.5V≤Vin≤25V, 10mA≤Iout≤1A, PD≤15W	9.5	10	10.5	
Line Regulation	REGline	Tj=25°C	12.5V≤Vin≤28V	--	7	mV
			13V≤Vin≤17V	--	2	
Load Regulation	REGload	Tj=25°C	10mA≤Iout≤1A	--	12	
			250mA≤Iout≤750mA	--	4	
Quiescent Current	Iq	Iout=0, Tj=25°C	--	4.3	8	mA
Quiescent Current Change	ΔIq	12.5V≤Vin≤28V	--	--	1	
		10mA≤Iout≤1A	--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C	--	70	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 13V≤Vin≤23V	55	71	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	18	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C	--	400	--	mA
Peak Output Current	I _{o peak}	Tj=25°C	--	2.2	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C	--	-1	--	mV/ °C

78M12 Electrical Characteristics

(Vin=19V, Iout=500mA, 0°C≤Tj≤125°C, Cin=0.33μF, Cout=0.1μF; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output Voltage	Vout	Tj=25°C	11.53	12	12.48	V
		14.5V≤Vin≤27V, 10mA≤Iout≤1A, PD ≤15W	11.42	12	12.60	
Line Regulation	REGline	Tj=25°C	14.5V≤Vin≤30V	--	10	mV
			15V≤Vin≤19V	--	3	
Load Regulation	REGload	Tj=25°C	10mA≤Iout≤1A	--	12	
			250mA≤Iout≤750mA	--	4	
Quiescent Current	Iq	Tj=25°C, Iout=0	--	4.3	8	mA
Quiescent Current Change	ΔIq	14.5V≤Vin≤30V	--	--	1	
		10mA≤Iout≤1A	--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C	--	75	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 15V≤Vin≤25V	55	71	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	18	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C	--	350	--	mA
Peak Output Current	I _{o peak}	Tj=25°C	--	2.2	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C	--	-1	--	mV/ °C

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- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

78M15 Electrical Characteristics

(Vin=23V, Iout=500mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output voltage	Vout	Tj=25°C	14.42	15	15.60	V
		17.5V≤Vin≤30V, 10mA≤Iout≤1A, PD ≤15W	14.28	15	15.75	
Line Regulation	REGline	Tj=25°C	17.5V≤Vin≤30V	--	12	mV
			18V≤Vin≤22V	--	3	
Load Regulation	REGload	Tj=25°C	10mA≤Iout≤1A	--	12	
			250mA≤Iout≤750mA	--	4	
Quiescent Current	Iq	Tj=25°C, Iout=0	--	4.3	8	mA
Quiescent Current Change	ΔIq	17.5V≤Vin≤30V	--	--	1	
		10mA≤Iout≤1A	--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C	--	90	--	μV
Ripple Rejection Ratio	RR	f=120Hz, 18V≤Vin≤28V	54	70	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	19	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C	--	230	--	mA
Peak Output Current	Io peak	Tj=25°C	--	2.2	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C	--	-1	--	mV/ °C

78M18 Electrical Characteristics

(Vin=24V, Iout=500mA, 0°C≤Tj≤125°C, Cin=0.33uF, Cout=0.1uF; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output Voltage	Vout	Tj=25°C	17.30	18	18.72	V
		21V≤Vin≤33V, 10mA≤Iout≤1A, PD ≤15W	17.14	18	18.90	
Line Regulation	REGline	Tj=25°C	21V≤Vin≤33V	--	15	mV
			22V≤Vin≤26V	--	5	
Load Regulation	REGload	Tj=25°C	10mA≤Iout≤1A	--	12	
			250mA≤Iout≤750mA	--	4	
Quiescent Current	Iq	Tj=25°C, Iout=0	--	4.5	8	mA
Quiescent Current Change	ΔIq	21V≤Vin≤33V	--	--	1	
		10mA≤Iout≤1A	--	--	0.5	
Output Noise Voltage	Vn	10Hz≤f≤100KHz, Tj=25°C	--	110	--	uV
Ripple Rejection Ratio	RR	f=120Hz, 21V≤Vin≤31V	54	70	--	dB
Voltage Drop	Vdrop	Iout=1.0A, Tj=25°C	--	2	--	V
Output Resistance	Rout	f=1KHz	--	22	--	mΩ
Output Short Circuit Current	Ios	Tj=25°C	--	200	--	mA
Peak Output Current	Io peak	Tj=25°C	--	2.2	--	A
Temperature Coefficient of Output Voltage	ΔVout/ ΔTj	Iout=10mA, 0°C≤Tj≤125°C	--	-1	--	mV/ °C

- Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible, and thermal effects must be taken into account separately.
- This specification applies only for DC power dissipation permitted by absolute maximum ratings.

78M24 Electrical Characteristics

$V_{in}=33V$, $I_{out}=500mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$, $C_{in}=0.33\mu F$, $C_{out}=0.1\mu F$; unless otherwise specified.)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Output voltage	V_{out}	$T_j=25^{\circ}C$	23.07	24	24.96	V
		$27V \leq V_{in} \leq 38V$, $10mA \leq I_{out} \leq 1A$, $PD \leq 15W$	22.85	24	25.20	
Line Regulation	REG _{line}	$T_j=25^{\circ}C$				mV
		$27V \leq V_{in} \leq 38V$	--	18	480	
		$28V \leq V_{in} \leq 32V$	--	6	240	
Load Regulation	REG _{load}	$T_j=25^{\circ}C$				
		$10mA \leq I_{out} \leq 1A$	--	12	480	
		$250mA \leq I_{out} \leq 750mA$	--	4	240	
Quiescent Current	I_q	$I_{out}=0$, $T_j=25^{\circ}C$	--	4.6	8	mA
Quiescent Current Change	ΔI_q	$27V \leq V_{in} \leq 38V$	--	--	1	
		$10mA \leq I_{out} \leq 1A$	--	--	0.5	
Output Noise Voltage	V_n	$10Hz \leq f \leq 100KHz$, $T_j=25^{\circ}C$	--	170	--	μV
Ripple Rejection Ratio	RR	$f=120Hz$, $27V \leq V_{in} \leq 37V$	54	70	--	dB
Voltage Drop	V_{drop}	$I_{out}=1.0A$, $T_j=25^{\circ}C$	--	2	--	V
Output Resistance	R_{out}	$f=1KHz$	--	28	--	$m\Omega$
Output Short Circuit Current	I_{os}	$T_j=25^{\circ}C$	--	150	--	mA
Peak Output Current	$I_{o peak}$	$T_j=25^{\circ}C$	--	2.2	--	A
Temperature Coefficient of Output Voltage	$\Delta V_{out} / \Delta T_j$	$I_{out}=10mA$, $0^{\circ}C \leq T_j \leq 125^{\circ}C$	--	-1.5	--	$mV / ^{\circ}C$

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Electrical Characteristics Curve

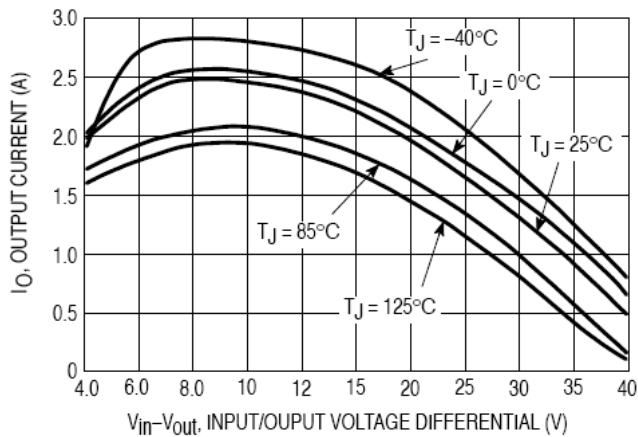


Figure 1. Peak Output Current as a Function of Input-Output Differential Voltage

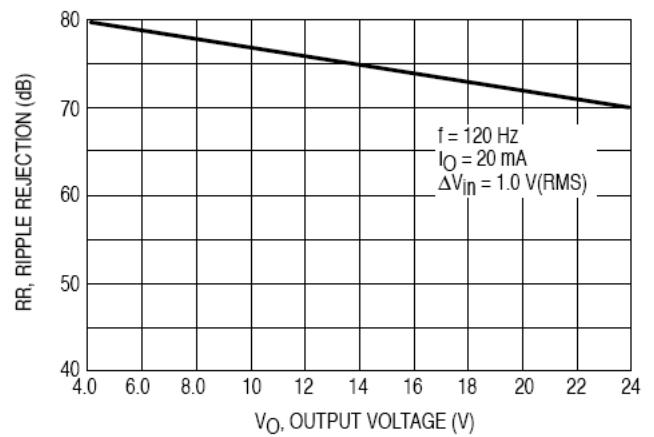


Figure 2. Ripple Rejection as a Function of Output Voltage

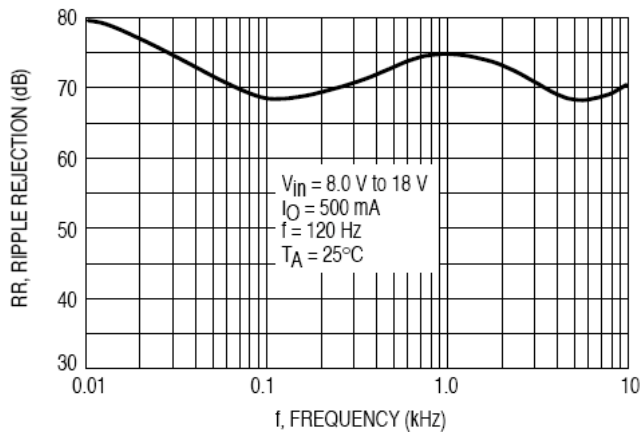


Figure 3. Ripple Rejection as a Function of Frequency

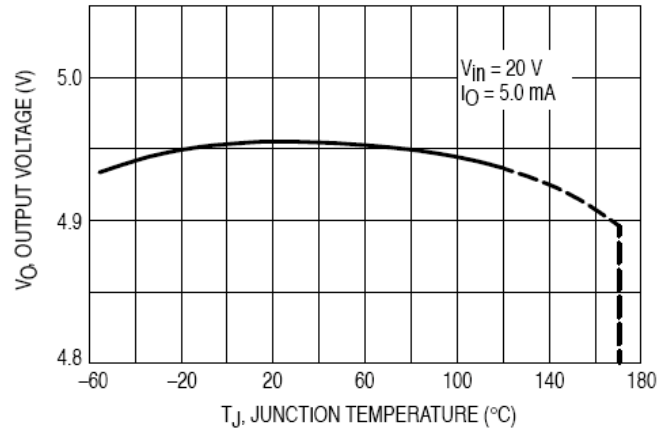


Figure 4. Output Voltage as a Function of Junction Temperature

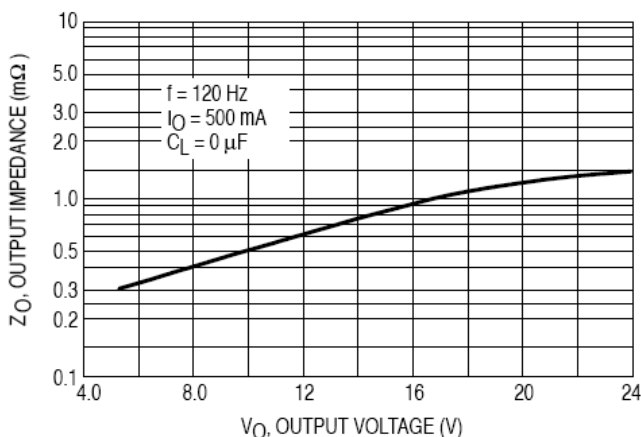


Figure 5. Output Impedance as a Function of Output Voltage

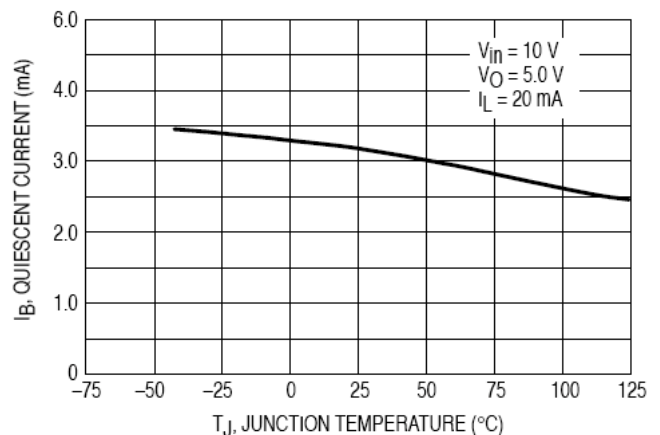


Figure 6. Quiescent Current as a Function of Temperature