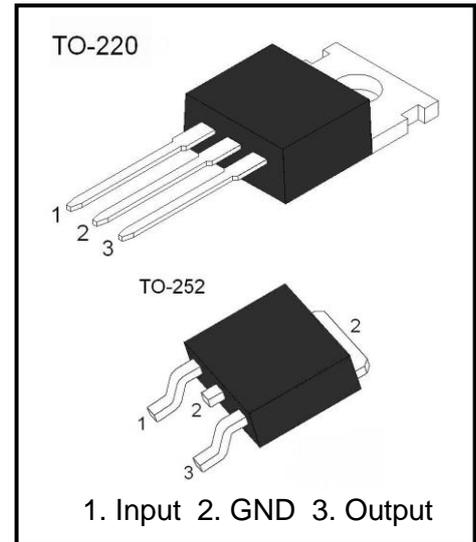


Description

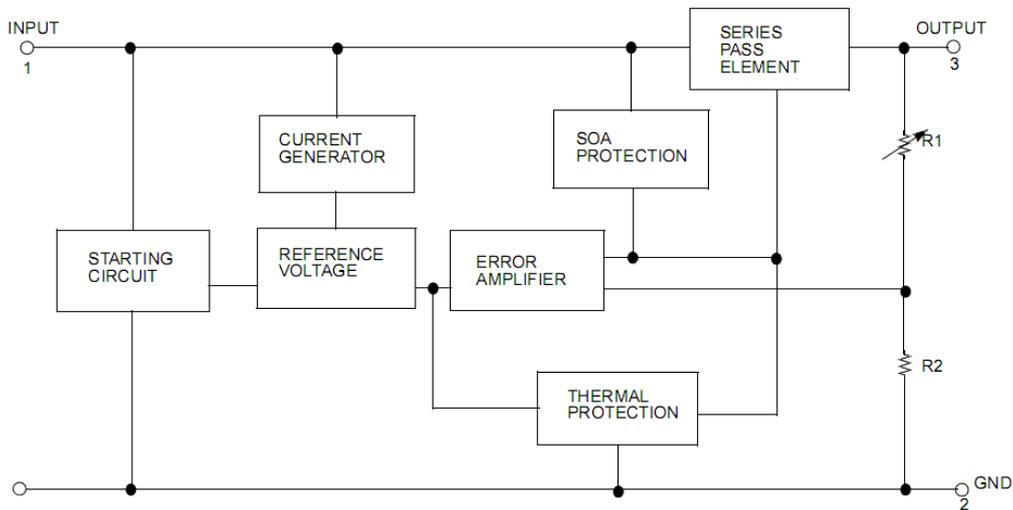
The 78MXX series of three-terminal positive regulators are available in the TO-220/TO-252 package with several fixed output voltages making it useful in a wide range of applications.

Features

- Output Current up to 1A
- Output Voltages of 5,6,8,10,12,15,18,20,24V
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Operating area (SOA)Protection



Internal Block Diagram



Absolute Maximum Ratings

Parameter		Symbol	Value	Unit
Input Voltage	$V_O = 5V \sim 18V$	V_{IN}	30	V
	$V_O = 24V$		40	
Thermal Resistance Junction-Cases (TO-220)		$R_{\theta JC}$	5	$^{\circ}C/W$
Thermal Resistance Junction-Air	TO-220	$R_{\theta JA}$	65	$^{\circ}C/W$
	TO-252		92	
Operating Temperature Range		T_{OPR}	0 ~ +125	$^{\circ}C$
Storage Temperature Range		T_{STG}	-55 ~ +150	$^{\circ}C$

Note1 .Absolute maximum ratings are those values beyond which damage to the device may occur. The datasheet specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside datasheet specifications.

Electrical Characteristics (78M05)(V_I = 10V, I_O = 0.5A, C_I = 0.33μF, C_O = 0.1μF, T_J = -40°C to 125°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V _O	T _J = 25°C, I _O = 5mA ~ 1A	4.80	5.0	5.20	V
		V _I = 7V ~ 20V, I _O = 5mA ~ 1A	4.75	5.0	5.25	V
Line Regulation ②	ΔV _O	T _J = 25°C	V _I = 7V ~ 25V		100	mV
			V _I = 8V ~ 12V		50	
Load Regulation ②	ΔV _O	T _J = 25°C	I _O = 5mA ~ 1A		100	mV
			I _O = 0.25A ~ 0.75A		50	
Quiescent Current	I _Q	T _J = 25°C			8.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA ~ 1A			0.5	mA
		V _I = 7V ~ 25V			1.3	
Output Voltage Drift ③	ΔV / ΔT	I _O = 5mA		-0.8		mV/°C
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100KHz		42		μV/V _O
Ripple Rejection ③	RR	f = 120Hz, V _I = 8V ~ 18V	62	73		dB
Output Resistance ③	R _O	f = 1kHz		15		mΩ
Short Circuit Current	I _{SC}	T _J = 25°C, V _I = 30V		230		mA
Peak Out Current ③	I _{PK}	T _J = 25°C		1.8		A
Dropout Voltage	V _d	T _J = 25°C, I _O = 1A		2.0		V

Note 2: Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Note 3: These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (78M06)(V_I = 11V, I_O = 0.5A, C_I = 0.33μF, C_O = 0.1μF, T_j = -40 to 125°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V _O	T _j = 25°C, I _O = 5mA ~ 1A	5.76	6.0	6.24	V
		V _I = 8V ~ 12V, I _O = 5mA ~ 1A	5.70	6.0	6.30	V
Line Regulation ④	ΔV _O	T _j = 25°C	V _I = 8V ~ 25V		120	mV
			V _I = 9V ~ 13V		60	
Load Regulation ④	ΔV _O	T _j = 25°C,	I _O = 5mA ~ 1A		120	mV
			I _O = 0.25A ~ 0.75A		60	
Quiescent Current	I _Q	T _j = 25°C			8.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA ~ 1A			0.5	mA
		V _I = 8V ~ 25V			1.3	
Output Voltage Drift ⑤	ΔV / ΔT	I _O = 5mA		-0.8		mV/°C
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100KHz		76		μV/V _O
Ripple Rejection ⑤	RR	f = 120Hz, V _I = 8V ~ 18V	55	71		dB
Output Resistance ⑤	R _O	f = 1kHz		19		mΩ
Short Circuit Current	I _{SC}	T _j = 25°C, V _I = 30V		230		mA
Peak Out Current ⑤	I _{PK}	T _j = 25°C		1.8		A
Dropout Voltage	V _d	T _j = 25°C, I _O = 500mA		2.0		V

Note 4: Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Note 5: These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (78M08)(V_I = 14V, I_O = 0.5A, C_I = 0.33μF, C_O = 0.1μF, T_j = -40 to 125°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V _O	T _j = 25°C, I _O = 5mA ~ 1A	7.68	8.0	8.32	V
		V _I = 10.5V ~ 23V, I _O = 5mA ~ 1A	7.60	8.0	8.40	V
Line Regulation ⑥	ΔV _O	T _j = 25°C	V _I = 10.5V ~ 25V		160	mV
			V _I = 11.5V ~ 17V		80	
Load Regulation ⑥	ΔV _O	T _j = 25°C,	I _O = 5mA ~ 1A		160	mV
			I _O = 0.25A ~ 0.75A		80	
Quiescent Current	I _Q	T _j = 25°C			8.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA ~ 1A			0.5	mA
		V _I = 10.5V ~ 25V			1.0	
Output Voltage Drift ⑦	ΔV / ΔT	I _O = 5mA		-0.8		mV/°C
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100KHz		52		μV/V _O
Ripple Rejection ⑦	RR	f = 120Hz, V _I = 11.5V ~ 21.5V	56	73		dB
Output Resistance ⑦	R _O	f = 1kHz		17		mΩ
Short Circuit Current	I _{SC}	T _j = 25°C, V _I = 30V		230		mA
Peak Out Current ⑦	I _{PK}	T _j = 25°C		1.8		A
Dropout Voltage	V _d	T _j = 25°C, I _O = 1A		2.0		V

Note 6: Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Note 7: These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (78M09)(V_I = 15V, I_O = 0.5A, C_I = 0.33μF, C_O = 0.1μF, T_J = -40 to 125°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V _O	T _J = 25°C, I _O = 5mA ~ 1A	8.64	9.0	9.36	V
		V _I = 11.5V ~ 24V, I _O = 5mA ~ 1A	8.55	9.0	9.45	V
Line Regulation ⑧	ΔV _O	T _J = 25°C	V _I = 11.5V ~ 25V		180	mV
			V _I = 12V ~ 17V		90	
Load Regulation ⑧	ΔV _O	T _J = 25°C,	I _O = 5mA ~ 1A		180	mV
			I _O = 0.25A ~ 0.75A		90	
Quiescent Current	I _Q	T _J = 25°C			8.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA ~ 1A			0.5	mA
		V _I = 11.5V ~ 26V			1.3	
Output Voltage Drift ⑨	ΔV / ΔT	I _O = 5mA		-1.0		mV/°C
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100KHz		52		μV/V _O
Ripple Rejection ⑨	RR	f = 120Hz, V _I = 13V ~ 23V	56	71		dB
Short Circuit Current	I _{SC}	T _J = 25°C, V _I = 30V		230		mA
Output Resistance ⑨	R _O	f = 1kHz		17		mΩ
Peak Out Current ⑨	I _{PK}	T _J = 25°C		1.8		A
Dropout Voltage	V _d	T _J = 25°C, I _O = 1A		2.0		V

Note 8: Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Note 9: These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (78M10)(V_I = 16V, I_O = 0.5A, C_I = 0.33μF, C_O = 0.1μF, T_J = -40 to 125°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V _O	T _J = 25°C, I _O = 5mA ~ 1A	9.60	10.0	10.40	V
		V _I = 12.5V ~ 25V, I _O = 5mA ~ 1A	9.50	10.0	10.50	V
Line Regulation ⑩	ΔV _O	T _J = 25°C	V _I = 12.5V ~ 25V		200	mV
			V _I = 13V ~ 25V		100	
Load Regulation ⑩	ΔV _O	T _J = 25°C,	I _O = 5mA ~ 1A		200	mV
			I _O = 0.25A ~ 0.75A		100	
Quiescent Current	I _Q	T _J = 25°C			8.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA ~ 1A			0.5	mA
		V _I = 12.5V ~ 29V			1.0	
Output Voltage Drift ⑪	ΔV / ΔT	I _O = 5mA		-1.0		mV/°C
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100KHz		58		μV/V _O
Ripple Rejection ⑪	RR	f = 120Hz, V _I = 13V ~ 23V	56	71		dB
Short Circuit Current	I _{SC}	T _J = 25°C, V _I = 30V		230		mA
Output Resistance ⑪	R _O	f = 1kHz		17		mΩ
Peak Out Current ⑪	I _{PK}	T _J = 25°C		1.8		A
Dropout Voltage	V _d	T _J = 25°C, I _O = 1A		2.0		V

Note 10: Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Note 11: These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (78M12)(V_I = 19V, I_O = 0.5A, C_I = 0.33μF, C_O = 0.1μF, T_J = -40 to 125°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V _O	T _J = 25°C, I _O = 5mA ~ 1A	11.52	12.0	12.48	V
		V _I = 14.5V ~ 27V, I _O = 5mA ~ 1A	11.40	12.0	12.60	V
Line Regulation ⑫	Δ V _O	T _J = 25°C I _O = 0.5A	V _I = 14.5V ~ 30V		240	mV
			V _I = 11.5V ~ 24V		120	
Load Regulation ⑫	Δ V _O	T _J = 25°C,	I _O = 5mA ~ 1A		240	mV
			I _O = 0.25A ~ 0.75A		120	
Quiescent Current	I _Q	T _J = 25°C			8.0	mA
Quiescent Current Change	Δ I _Q	I _O = 5mA ~ 1A			0.5	mA
		V _I = 14.5V ~ 30V			1.0	
Output Voltage Drift ⑬	Δ V / Δ T	I _O = 5mA		-1.0		mV/°C
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100KHz		76		μV/V _O
Ripple Rejection ⑬	RR	f = 120Hz, V _I = 15V ~ 25V	55	71		dB
Output Resistance ⑬	R _O	f = 1kHz		18		mΩ
Short Circuit Current	I _{SC}	T _J = 25°C, V _I = 30V		230		mA
Peak Out Current ⑬	I _{PK}	T _J = 25°C		1.8		A
Dropout Voltage	V _d	T _J = 25°C, I _O = 1A		2.0		V

Note 12: Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Note 13: These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (78M15)(V_I = 23V, I_O = 0.5A, C_I = 0.33μF, C_O = 0.1μF, T_J = -40 to 125°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V _O	T _J = 25°C, I _O = 5mA ~ 1A	14.40	15.0	15.60	V
		V _I = 17.5V ~ 30V, I _O = 5mA ~ 1A	14.25	15.0	15.75	V
Line Regulation ⑭	ΔV _O	T _J = 25°C I _O = 0.5A	V _I = 17.5V ~ 30V		300	mV
			V _I = 20V ~ 26V		150	
Load Regulation ⑭	ΔV _O	T _J = 25°C,	I _O = 5mA ~ 1A		300	mV
			I _O = 0.25A ~ 0.75A		150	
Quiescent Current	I _Q	T _J = 25°C			8.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA ~ 1A			0.5	mA
		V _I = 17.5V ~ 30V			1.0	
Output Voltage Drift ⑮	ΔV / ΔT	I _O = 5mA		-1.0		mV/°C
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100KHz		90		μV/V _O
Ripple Rejection ⑮	RR	f = 120Hz, V _I = 18.5V ~ 28.5V	54	70		dB
Output Resistance ⑮	R _O	f = 1kHz		19		mΩ
Short Circuit Current	I _{SC}	T _J = 25°C, V _I = 30V		230		mA
Peak Out Current ⑮	I _{PK}	T _J = 25°C		1.8		A
Dropout Voltage	V _d	T _J = 25°C, I _O = 1A		2.0		V

Note 14: Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Note 15: These parameters, although guaranteed, are not 100% tested in production.

Electrical Characteristics (78M18)(V_I = 27V, I_O = 0.5A, C_I = 0.33μF, C_O = 0.1μF, T_J = -40 to 125°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V _O	T _J = 25°C, I _O = 5mA ~ 1A	17.28	18.0	18.72	V
		V _I = 21V ~ 30V, I _O = 5mA ~ 1A	17.10	18.0	18.90	V
Line Regulation ⑯	ΔV _O	T _J = 25°C I _O = 0.5A	V _I = 21V ~ 30V		360	mV
			V _I = 24V ~ 26V		180	
Load Regulation ⑯	ΔV _O	T _J = 25°C,	I _O = 5mA ~ 1A		300	mV
			I _O = 0.25A ~ 0.75A		150	
Quiescent Current	I _Q	T _J = 25°C			8.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA ~ 1A			0.5	mA
		V _I = 21V ~ 30V			1.0	
Output Voltage Drift ⑰	ΔV / ΔT	I _O = 5mA		-1.0		mV/°C
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100KHz		110		μV/V _O
Ripple Rejection ⑰	RR	f = 120Hz, V _I = 22V ~ 30V	53	69		dB
Output Resistance ⑰	R _O	f = 1kHz		22		mΩ
Short Circuit Current	I _{SC}	T _J = 25°C, V _I = 30V		230		mA
Peak Out Current ⑰	I _{PK}	T _J = 25°C		1.8		A
Dropout Voltage	V _d	T _J = 25°C, I _O = 1A		2.0		V

Note 16: Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Note 17: These parameters, although guaranteed, are not 100% tested in production.

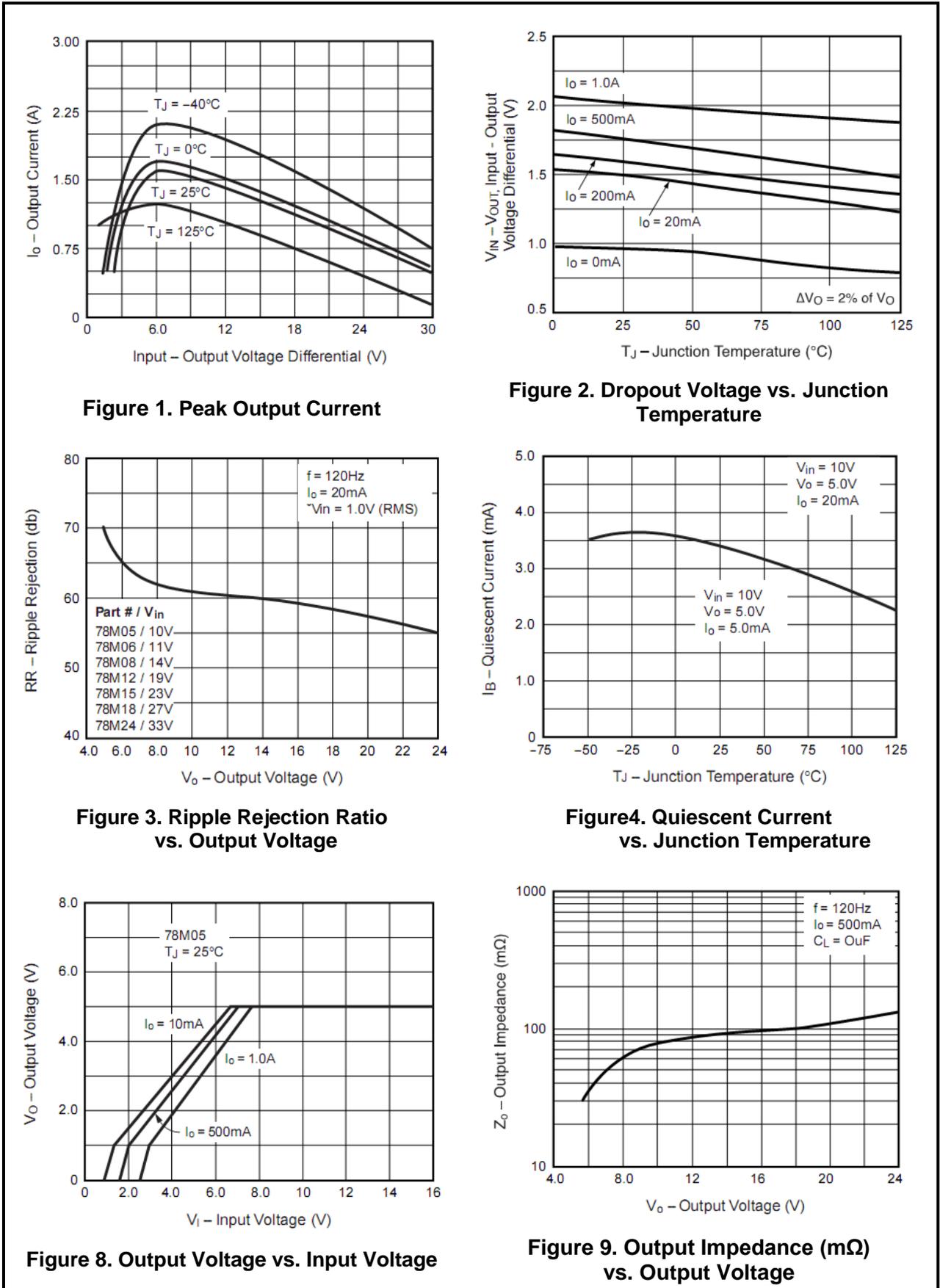
Electrical Characteristics (78M24)(V_I = 33V, I_O = 0.5A, C_I = 0.33μF, C_O = 0.1μF, T_J = -40 to 125°C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage	V _O	T _J = 25°C, I _O = 5mA ~ 1A	23.04	24.0	24.96	V
		V _I = 27V ~ 38V, I _O = 5mA ~ 1A	22.80	24.0	25.20	V
Line Regulation ⑱	ΔV _O	T _J = 25°C I _O = 0.5A	V _I = 27V ~ 38V		480	mV
			V _I = 30V ~ 36V		240	
Load Regulation ⑱	ΔV _O	T _J = 25°C,	I _O = 5mA ~ 1A		480	mV
			I _O = 0.25A ~ 0.75A		240	
Quiescent Current	I _Q	T _J = 25°C			8.0	mA
Quiescent Current Change	ΔI _Q	I _O = 5mA ~ 1A			0.5	mA
		V _I = 27V ~ 38V			1.0	
Output Voltage Drift ⑲	ΔV / ΔT	I _O = 5mA		-1.5		mV/°C
Output Noise Voltage	V _N	10Hz ≤ f ≤ 100KHz		60		μV/V _O
Ripple Rejection ⑲	RR	f = 120Hz, V _I = 28V ~ 38V	50	67		dB
Output Resistance ⑲	R _O	f = 1kHz		28		mΩ
Short Circuit Current	I _{SC}	T _J = 25°C, V _I = 35V		230		mA
Peak Out Current ⑲	I _{PK}	T _J = 25°C		1.8		A
Dropout Voltage	V _d	T _J = 25°C, I _O = 1A		2.0		V

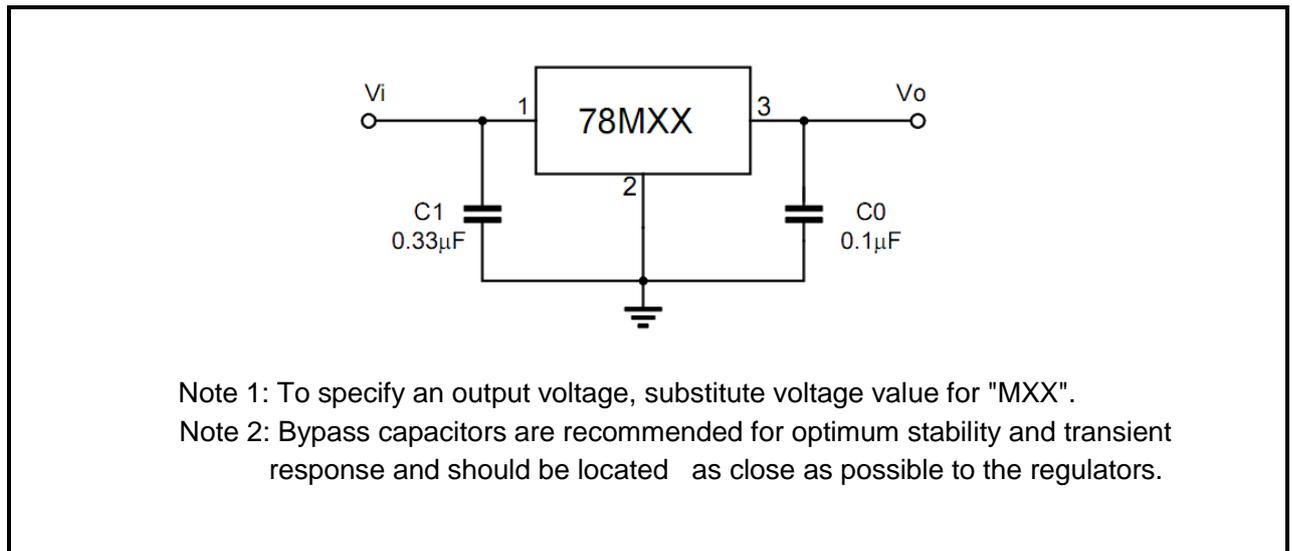
Note 18: Load and line regulation are specified at constant junction temperature. Changes in V_O due to heating effects must be taken into account separately. Pulse testing with low duty is used.

Note 19: These parameters, although guaranteed, are not 100% tested in production.

Typical Characteristics



Application circuit



Package Dimensions (TO-220)

Symbol	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.34	4.67	0.171	0.184
A1	2.52	2.82	0.099	0.111
b	0.71	0.91	0.028	0.036
b1	1.17	1.37	0.046	0.054
c	0.30	0.50	0.012	0.020
c1	1.17	1.37	0.046	0.054
D	9.90	10.20	0.390	0.402
E	8.50	8.90	0.335	0.350
E1	12.00	12.50	0.472	0.492
e	2.44	2.64	0.096	0.104
e1	4.88	5.28	0.192	0.208
F	2.60	2.80	0.102	0.110
L	13.20	13.80	0.520	0.543
L1	3.80	4.20	0.150	0.165
Φ	3.60	3.96	0.142	0.156

Package Dimensions (TO-252)

Symbol	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	2.20	2.50	0.087	0.098
A1	0.00	0.12	0.000	0.005
A2	2.20	2.40	0.087	0.094
B	1.20	1.60	0.047	0.063
b	0.50	0.70	0.020	0.028
b1	0.70	0.90	0.028	0.035
c	0.40	0.60	0.016	0.024
c1	0.40	0.60	0.016	0.024
D	6.35	6.65	0.250	0.262
D1	5.20	5.40	0.205	0.213
E	5.40	5.70	0.213	0.224
e	2.20	2.40	0.087	0.094
e1	4.40	4.80	0.173	0.189
L	9.60	10.20	0.378	0.402
L1	2.70	3.10	0.106	0.122
L2	1.40	1.80	0.055	0.071
L3	0.90	1.50	0.035	0.059