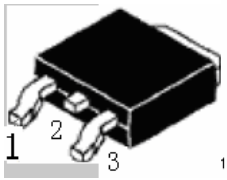
HS78MXX LINEAR INTEGRATED CIRCUIT

3 TERMINAL 0.5A POSITIVE VOLTAGE REGULATORS



1:INPUT; 2:GND; 3:OUTPUT

TO－252

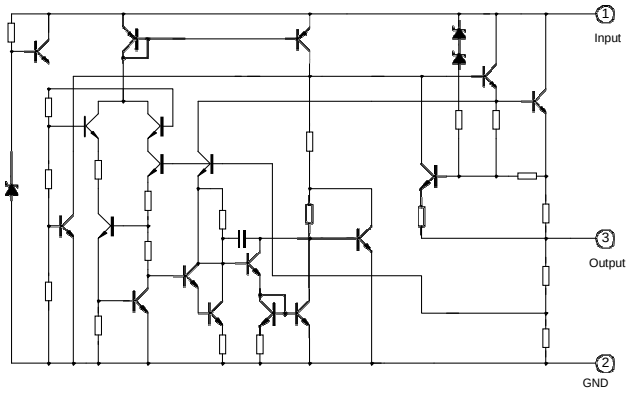
DESCRIPTION

The HS78MXX series o three-terminal positive regulators are available in TO－252 package and with several fixed output voltage, making them useful in a wide range of application. Each type employs internal current limiting, thermal shut-down and safe area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 0.5A output current, Although designed as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltage and currents.

FEATURES

*Output current up to 0.5A
*5V;6V;8V;9V;10V;12V;15V;output voltage available
*Thermal overload protection
*Short circuit protection
*Output transistor SOA protection

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS(Ta=25°C)

Characteristic	Symbol	Value	Unit
Input voltage (forVo=5Vto15V)	Vi	36	V
Thermal resistance junction-air	Rθ JA	65	°C/W
Thermal resistance junction-cases	R8JC	5	°C/W
OperatingTemperature	Topr	-10 ~ +105	°C
Storage Temperature	Tstg	-50 ~ +150	°C

78M05 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125°C,Io=500mA,Vi=10V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	4.8	5.0	5.2	V
		5.0mA<Io<0.5A,Po<15W Vi=8Vto20V	4.75	5.00	5.25	V
Line regulation	ΔVo	Tj=25°C,Vi=7V to 25V			100	mV
		Tj=25°C,Vi=8V to 12V			50	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mAto0.5A			100	mV
		Tj=25°C,Io=250mA to 750mA			50	mA
Quiescent current	IQ	Tj=25°C			8	mA
Quiescent current change	ΔIQ	Io=5mAto0.5A			0.5	mA
		Vi=8Vto25V			1.3	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		-0.8		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		42		μV
Ripple rejection	RR	f=120Hz, Vi=8V to 18V	62	73		dB
Dropout voltage	Vo	Io=0.5A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		15		mΩ
Short circuit current	Isc	Vi=30V,Ta=25°C		250		mA
peak current	Ipk	Tj=25°C		1.2		A

78M06 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125°C,Io=500mA,Vi=11V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	5.75	6.00	6.25	V
		5.0mA<Io<0.5A,Po<15W Vi=9Vto21V5.76.06.3V				
Line regulation	ΔVo	Tj=25°C,Vi=8V to 25V		5	120	mV
		Tj=25°C,Vi=9V to 13V		1.5	60	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mAto0.5A		9	130	mV
		Tj=25°C,Io=250mA to 750mA		3	60	mV
Quiescent current	IQ	Tj=25°C		5.0	8	mA
Quiescent current change	ΔIQ	Io=5mA to 0.5A			0.5	mA
		Vi=8V to 25V			1.3	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		-0.8		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		45		μV
Ripple rejection	RR	f=120Hz, Vi=9V to 19V	59	75		dB
Dropout voltage	Vo	Io=0.5A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		19		mΩ
Short circuit current	Isc	Vi=30V,Ta=25°C		250		mA
peak current	Ipk	Tj=25°C		1.2		A

78M08 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125°C,Io=500mA,Vi=14V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	7.7	8.0	8.3	V
		5.0mA<Io<0.5A,Po<15W Vi=10.5V to 23V	7.6	8.0	8.4	V
Line regulation	ΔVo	Tj=25°C,Vi=10.5V to 25V		5.0	160	mV
		Tj=25°C,Vi=11.5V to 17V		2.0	80	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mAto0.5A		10	160	mV
		Tj=25°C,Io=250mA to 750mA		5.0	80	mV
Quiescent current	IQ	Tj=25°C		5.0	8	mA
Quiescent current change	ΔIQ	Io=5mA to 0.5A		0.05	0.5	mA
		Vi=11.5V to 25V		0.5	1.0	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		-0.8		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		52		μV
Ripple rejection	RR	f=120Hz, Vi=11.5V to 21.5V	56	73		dB
Dropout voltage	Vo	Io=0.5A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		17		mΩ
Short circuit current	Isc	Vi=30V,Ta=25°C		230		mA
peak current	Ipk	Tj=25°C		1.2		A

78M09 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125°C,Io=500mA,Vi=15V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	8.65	9.00	9.35	V
		5.0mA<Io<0.5A,Po<15W Vi=11.5V to 24V	8.6	9.0	9.4	V
Line regulation	ΔVo	Tj=25°C,Vi=11.5V to 25V		6	180	mV
		Tj=25°C,Vi=12V to17V		2	90	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mAto0.5A		12	180	mV
		Tj=25°C,Io=250mA to 750mA		4	90	mV
Quiescent current	IQ	Tj=25°C		5.0	8	mA
Quiescent current change	ΔIQ	Io=5mA to 0.5A			0.5	mA
		Vi=11.5Vto25V1.3mA				
Output voltage drift	ΔVo/ΔT	Io=5mA		-1		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		58		μV
Ripple rejection	RR	f=120Hz, Vi=13V to 23V	56	71		dB
Dropout voltage	Vo	Io=0.5A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		15		mΩ
Short circuit current	Isc	Vi=30V,Ta=25°C		250		mA
peak current	Ipk	Tj=25°C		1.2		A

78M10 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125°C,Io=500mA,Vi=16V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	9.6	10	10.4	V
		5.0mA<Io<0.5A,Po<15W Vi=12.5V to 25V	9.5	10	10.5	V
Line regulation	ΔVo	Tj=25°C,Vi=12.5V to 25V		10	200	mV
		Tj=25°C,Vi=13V to 20V		3	100	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mAto0.5A		12	200	mV
		Tj=25°C,Io=250mA to 750mA		4	100	mV
Quiescent current	IQ	Tj=25°C		5.0	8	mA
Quiescent current change	ΔIQ	Io=5mA to 0.5A			0.5	mA
		Vi=12.5Vto25V1.0mA				
Output voltage drift	ΔVo/ΔT	Io=5mA		-1		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		58		μV
Ripple rejection	RR	f=120Hz, Vi=14V to 24V	56	71		dB
Dropout voltage	Vo	Io=0.5A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		17		mΩ
Short circuit current	Isc	Vi=30V,Ta=25°C		250		mA
peak current	Ipk	Tj=25°C		1.2		A

78M12 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125°C,Io=500mA,Vi=16V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	11.5	12.0	12.5	V
		5.0mA<Io<0.5A,Po<15W Vi=14.5Vto25V	11.4	12	12.6	V
Line regulation	ΔVo	Tj=25°C,Vi=14.5Vto25V		10	240	mV
		Tj=25°C,Vi=16V to 22V		3	120	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mAto0.5A		11	240	mV
		Tj=25°C,Io=250mA to 750mA		5.0	120	mV
Quiescent current	IQ	Tj=25°C		5.1	8	mA
Quiescent current change	ΔIQ	Io=5mA to 0.5A			0.5	mA
		Vi=14.5Vto25V1.0mA				
Output voltage drift	ΔVo/ΔT	Io=5mA		-1		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		76		μV
Ripple rejection	RR	f=120Hz, Vi=15V to 25V	55	71		dB
Dropout voltage	Vo	Io=0.5A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		18		mΩ
Short circuit current	Isc	Vi=30V,Ta=25°C		230		mA
peak current	Ipk	Tj=25°C		1.2		A

78M15 ELECTRICAL CHARACTERISTICS

(Refer to test circuits,0<Tj<125°C,Io=500mA,Vi=23V,Ci=0.33μF, Co=0.1μF, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Units
Output voltage	Vo	Tj=25°C	14.4	15.0	15.6	V
		5.0mA<Io<0.5A,Po<15W Vi=17.5Vto25V	14.25	15	15.75	V
Line regulation	ΔVo	Tj=25°C,Vi=17.5Vto28V		11	300	mV
		Tj=25°C,Vi=20Vto25V		3	150	mV
Load regulation	ΔVo	Tj=25°C,Io=5.0mAto0.5A		12	300	mV
		Tj=25°C,Io=250mA to 750mA		4	150	mV
Quiescent current	IQ	Tj=25°C		5.2	8	mA
Quiescent current change	ΔIQ	Io=5mA to 0.5A			0.5	mA
		Vi=17.5Vto25V			1.0	mA
Output voltage drift	ΔVo/ΔT	Io=5mA		-1		mV/°C
Output noise voltage	VN	f=10Hz to 100kHz,Ta=25°C		90		μV
Ripplerejection	RR	f=120Hz,Vi=18.5Vto25V	54	70		dB
Dropout voltage	Vo	Io=0.5A,Tj=25°C		2		V
Output resistance	Ro	f=1kHz		19		mΩ
Short circuit current	Isc	Vi=30V,Ta=25°C		250		mA
peak current	Ipk	Tj=25°C		1.2		A

TEST CIRCUITS

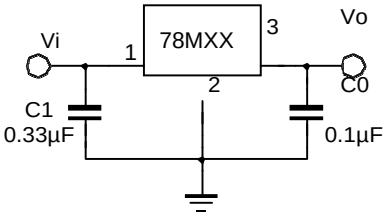


FIG.1 DC PARAMETERS

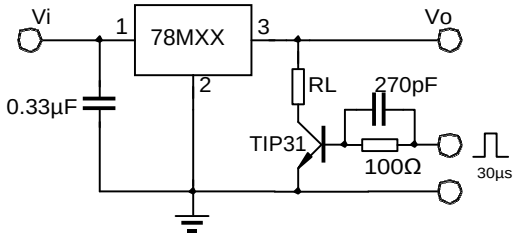


FIG.2 LOAD REGULATION

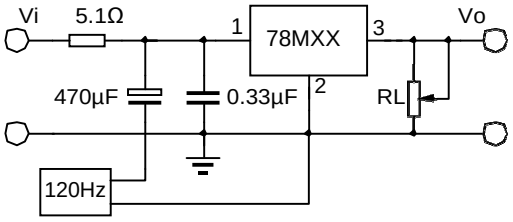


FIG.3 RIPPLE REJECTION

APPLICATION CIRCUITS

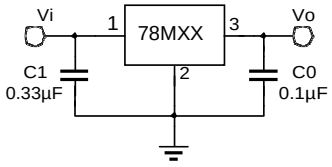


Fig.4 Fixed output regulator

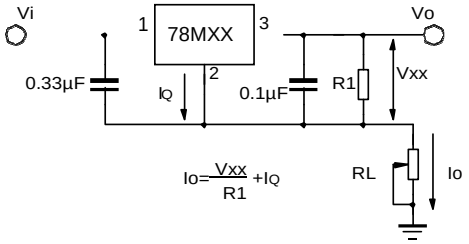


Fig.5 Constant current regulator

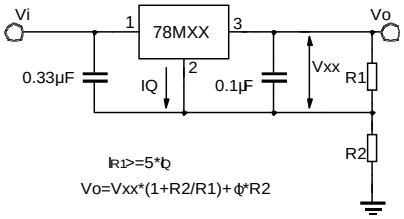


Fig.6 Circuit for increasing Regulator output voltage

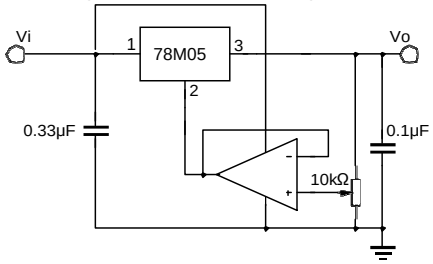


Fig.7 Adjustable output

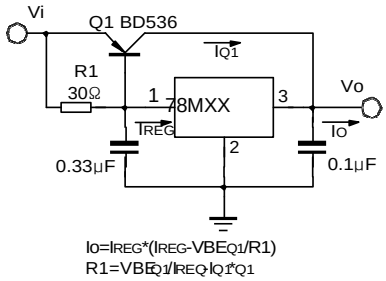


Fig.8 High currentwith voltage regulator

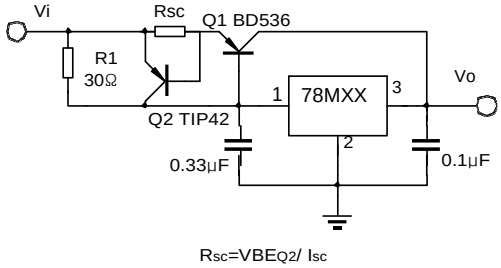


Fig.9 High output curent short circuit protection

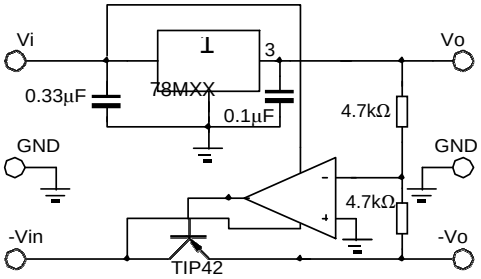


Fig.10 Tracking voltage regulator

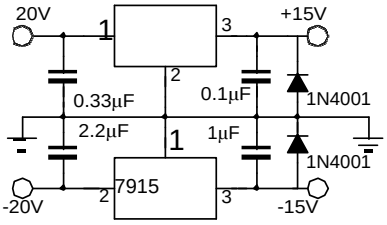


Fig.11 Split power supply(±15V,1A)

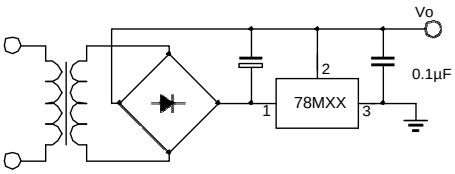


Fig.12 Negative output voltage ciruit

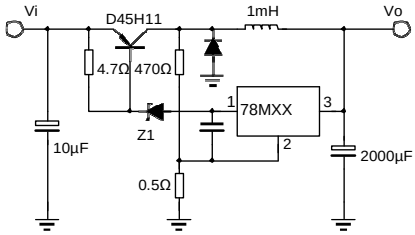


Fig.13 switching regulator

TYPICAL PERFORMANCE CHARACTERISTICS

Fig.14 Quiescent current

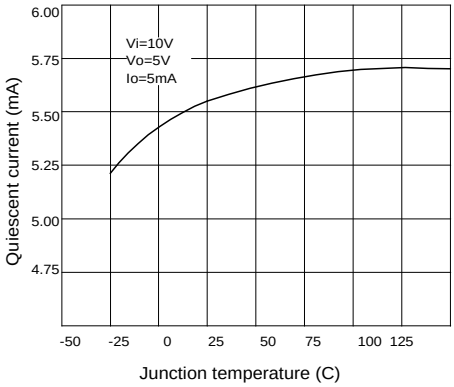


Fig.15 Output voltage

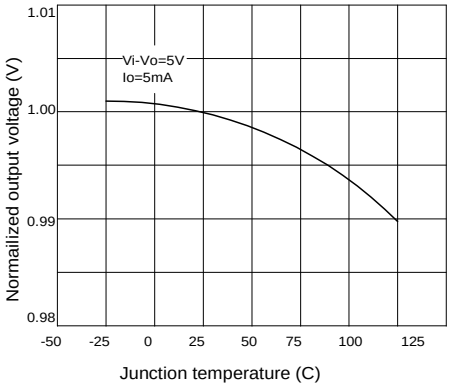


Fig.16 Peak output current

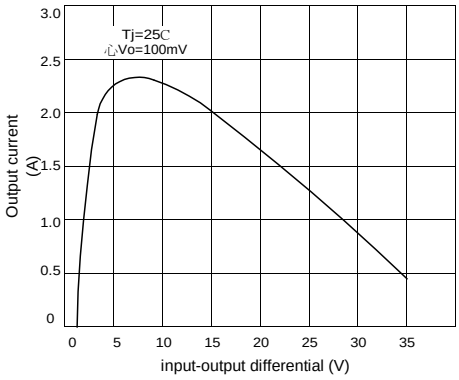


Fig.17 Quiescent current