TRISTAR SEMICONDUCTOR, INC.
A Samsung Company

MC79XXC
THREE TERMINAL 1.0A NEGATIVE VOLTAGE REGULATORS

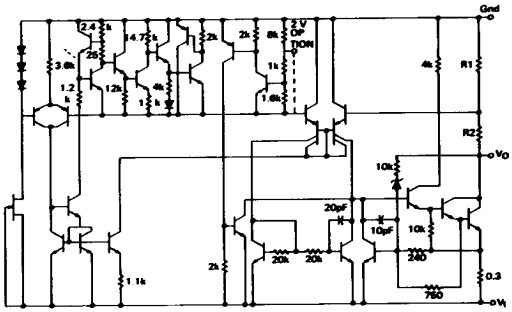
GENERAL DESCRIPTION

The MC79XXC series of three terminal negative fixed voltage regulators are designed for local or on-card regulation as well as many other applications. Internal current limiting, thermal shutdown circuitry and safe-area compensation for the internal pass transistor combine to make these devices nearly indestructible under most operating conditions.

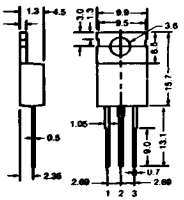
FEATURES

- Output current in excess of 1.0 A
- Output voltages of -2, -5, -5.2, -6, -8, -12, -15, -18, -24V.
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation
- Available in plastic TO-220 package

EQUIVALENT CIRCUIT



PLASTIC TO-220 PACKAGE



PIN	FUNCTION
1	GND
2	Input
3	Output
Tab	Input

Unit : mm

ORDERING INFORMATION

PART NO.*	OUTPUT
MC7902C	-2V
MC7905C	-5V
MC7905.2C	-5.2V
MC7906C	-6V
MC7908C	-8V
MC7912C	-12V
MC7915C	-15V
MC7918C	-18V
MC7924C	-24V

*for TO-220 package

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ABSOLUTE MAXIMUM RATING (T_A = 25°C unless otherwise noted. For TO-220 Plastic package.)

Rating	Symbol	Value	Unit
Input Voltage (-2.0 to -18V) (-24V)	V_I	-35 -40	Vdc
Power Dissipation T_A = 25°C Derate above T_A = 25°C T_C = 25°C Derated above T_C = 95°C	P_D $1/\theta_{JA}$ P_D $1/\theta_{JC}$	Internally limited 15.4 Internally limited 200	Watts mW/°C Watts mW/°C
Storage Temperature Range	Tstg	-65°C to +150	°C
Junction Temperature Range	T_J	0°C to +150	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max	Unit
Thermal Resistance, Junction to Ambient	$1/\theta_{JA}$	65	°C/W
Thermal Resistance, Junction to Case	$1/\theta_{JC}$	5.0	°C/W

MC7902C ELECTRICAL CHARACTERISTICS (V_I = -10V, I_O =500mA, 0°C < T_J < + 125°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	-1.92	-2.00	-2.08	Vdc
Line Regulation (T_J = +25°C, I_O = 100mA) -7.0 Vdc ≥ V_I ≥ -25 Vdc -8.0 Vdc ≥ V_I ≥ -12 Vdc) (T_J = +25°C, I_O = 500 mA) -7.0 Vdc ≥ V_I ≥ -25 Vdc -8.0 Vdc ≥ V_I ≥ -12 Vdc	Reg_{line}	 — — — —	 8.0 4.0 18 8.0	 20 10 40 20	mV
Load Regulation T_J = +25°C, 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 70 20	 120 60	mV
Output Voltage -7.0 Vdc ≥ V_I ≥ -20 Vdc, 5.0 mA ≤ I_O ≤ 1.0A, P ≤ 15 W	V_O	-1.90	—	-2.10	Vdc
Input Bias Current (T_J =25°C)	I_{IB}	—	4.3	8.0	mA
Input Bias Current Change -7.0 Vdc ≥ V_I ≥ -25 Vdc 5.0 mA ≤ I_O ≤ 1.5 A)	ΔI_{IB}	 — —	 — —	 1.3 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	40	—	μV
Long-Term Stability	$\Delta V_O/\Delta t$	—	—	20	mV/1.0 k Hrs.
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	—	65	—	dB
Input-Output Voltage Differential I_O = 1.0A, T_J = +25°C	$\lvert V_I - V_O \rvert$	—	3.5	—	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_A ≤ +125°C	$\Delta V_O/\Delta T$	—	-1.0	—	mV/°C

MC7905C ELECTRICAL CHARACTERISTICS (V_I = -10 V, I_O =500mA, 0°C < T_J < +125°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	-4.8	-5.0	-5.2	Vdc
Line Regulation (T_J = +25°C, I_O = 100mA) -7.0 Vdc ≥ V_I ≥ -25 Vdc -8.0 Vdc ≥ V_I ≥ -12 Vdc (T_J = +25°C, I_O = 500 mA) -7.0 Vdc ≥ V_I ≥ -25 Vdc -8.0 Vdc ≥ V_I ≥ -12 Vdc	Reg_{line}	 — — — —	 7.0 2.0 35 8.0	 50 25 100 50	mV
Load Regulation (T_J = +25°C, 5.0mA ≤ I_O ≤ 1.5A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 11 4.0	 100 50	mV
Output Voltage -7.0 Vdc ≥ V_I ≥ -20 Vdc, 5.0 mA ≤ I_O ≤ 1.0A, P ≤ 15 W	V_O	-4.75	—	-5.25	Vdc
Input Bias Current (T_J =25°C)	I_{IB}	—	4.3	8.0	mA
Input Bias Current Change -7.0 Vdc ≥ V_I ≥ -25 Vdc 5.0 mA ≤ I_O ≤ 1.5 A	ΔI_{IB}	 — —	 — —	 1.3 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	40	—	μV
Long-Term Stability	$\Delta V_O/\Delta t$	—	—	20	mV/1.0 k Hrs.
Ripple Rejection (I_O = 20 mA, f = 120 Hz	RR	—	70	—	dB
Input-Output Voltage Differential I_O = 1.0A, T_J = +25°C	$\lvert V_I - V_O \rvert$	—	2.0	—	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_A ≤ +125°C	$\Delta V_O/\Delta T$	—	-1.0	—	mV/°C

MC7905.2C ELECTRICAL CHARACTERISTICS (V_I = -10 V, I_O =500mA, 0°C < T_J < +125°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	-5.0	-5.2	-5.4	Vdc
Line Regulation (T_J = +25°C, I_O = 100mA) -7.2 Vdc ≥ V_I ≥ -25 Vdc -8.0 Vdc ≥ V_I ≥ -12 Vdc (T_J = +25°C, I_O = 500 mA) -7.2 Vdc ≥ V_I ≥ -25 Vdc -8.0 Vdc ≥ V_I ≥ -12 Vdc	Reg_{line}	 — — — —	 8.0 2.2 37 8.5	 52 27 105 52	mV
Load Regulation T_J = +25°C, 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 12 4.5	 105 52	mV
Output Voltage -7.2 Vdc ≥ V_I ≥ -20 Vdc, 5.0 mA ≤ I_O ≤ 1.0A, P ≤ 15 W	V_O	-4.94	—	-5.46	Vdc
Input Bias Current (T_J =25°C)	I_{IB}	—	4.3	8.0	mA
Input Bias Current Change -7.2 Vdc ≥ V_I ≥ -25 Vdc 5.0 mA ≤ I_O ≤ 1.5 A	ΔI_{IB}	 — —	 — —	 1.3 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	42	—	μV
Long-Term Stability	$\Delta V_O/\Delta t$	—	—	20	mV/1.0 k Hrs.
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	—	68	—	dB
Input-Output Voltage Differential I_O = 1.0A, T_J = +25°C	$\lvert V_I - V_O \rvert$	—	2.0	—	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_A ≤ +125°C	$\Delta V_O/\Delta T$	—	-1.0	—	mV/°C

MC7906C ELECTRICAL CHARACTERISTICS (V_I = -11 V, I_O =500mA, 0°C < T_J < + 125°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	-5.75	-6.0	-6.25	Vdc
Line Regulation (T_J = +25°C, I_O = 100mA) -8.0 Vdc ≥ V_I ≥ -25 Vdc -9.0 Vdc ≥ V_I ≥ -13 Vdc (T_J = +25°C, I_O = 500 mA) -8.0 Vdc ≥ V_I ≥ -25 Vdc -9.0 Vdc ≥ V_I ≥ -13 Vdc	Reg_{line}	 — — — —	 9.0 3.0 43 10	 60 30 120 60	mV
Load Regulation (T_J = +25°C, 5.0mA ≤ I_O ≤ 1.5A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 13 5.0	 120 60	mV
Output Voltage -8.0 Vdc ≥ V_I ≥ -21 Vdc, 5.0 mA ≤ I_O ≤ 1.0A, P ≤ 15 W	V_O	-5.7	—	-6.3	Vdc
Input Bias Current (T_J =25°C)	I_{IB}	—	4.3	8.0	mA
Input Bias Current Change -8.0 Vdc ≥ V_I ≥ -25 Vdc 5.0 mA ≤ I_O ≤ 1.5 A	ΔI_{IB}	 — —	 — —	 1.3 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	45	—	μV
Long-Term Stability	$\Delta V_O/\Delta t$	—	—	24	mV/1.0 k Hrs.
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	—	65	—	dB
Input-Output Voltage Differential I_O = 1.0A, T_J = +25°C	$\lvert V_I - V_O \rvert$	—	2.0	—	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_A ≤ +125°C	$\Delta V_O/\Delta T$	—	-1.0	—	mV/°C

MC7908C ELECTRICAL CHARACTERISTICS (V_I = -14 V, I_O =500mA, 0°C < T_J < + 125°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	-7.7	-8.0	-8.3	Vdc
Line Regulation (T_J = +25°C, I_O = 100mA) -10.5 Vdc ≥ V_I ≥ -25 Vdc -11 Vdc ≥ V_I ≥ -17 Vdc (T_J = +25°C, I_O = 500 mA) -10.5 Vdc ≥ V_I ≥ -25 Vdc -11 Vdc ≥ V_I ≥ -17 Vdc	Reg_{line}	 — — — —	 12 5.0 50 22	 80 40 160 80	mV
Load Regulation T_J = +25°C, 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 26 9.0	 160 80	mV
Output Voltage -10.5 Vdc ≥ V_I ≥ -23 Vdc, 5.0 mA ≤ I_O ≤ 1.0A, P ≤ 15 W	V_O	-7.6	—	-8.4	Vdc
Input Bias Current (T_J =25°C)	I_{IB}	—	4.3	8.0	mA
Input Bias Current Change -10.5 Vdc ≥ V_I ≥ -25 Vdc 5.0 mA ≤ I_O ≤ 1.5 A	ΔI_{IB}	 — —	 — —	 1.0 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	52	—	μV
Long-Term Stability	$\Delta V_O/\Delta t$	—	—	32	mV/1.0 k Hrs.
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	—	62	—	dB
Input-Output Voltage Differential I_O = 1.0A, T_J = +25°C	$\lvert V_I - V_O \rvert$	—	2.0	—	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_A ≤ +125°C	$\Delta V_O/\Delta T$	—	-1.0	—	mV/°C

MC7912C ELECTRICAL CHARACTERISTICS (V_I = -19 V, I_O =500mA, 0°C < T_J < + 125°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	-11.5	-12	-12.5	Vdc
Line Regulation (T_J = +25°C, I_O = 100mA) -14.5 Vdc ≥ V_I ≥ -30 Vdc -16 Vdc ≥ V_I ≥ -22 Vdc (T_J = +25°C, I_O = 500 mA) -14.5 Vdc ≥ V_I ≥ -30 Vdc -16 Vdc ≥ V_I ≥ -22 Vdc	Reg_{line}	 — — — —	 13 6.0 55 24	 120 60 240 120	mV
Load Regulation (T_J = +25°C, 5.0mA ≤ I_O ≤ 1.0A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 46 17	 240 120	mV
Output Voltage -14.5 Vdc ≥ V_I ≥ -27 Vdc, 5.0 mA ≤ I_O ≤ 1.0A, P ≤ 15 W	V_O	-11.4	—	-12.6	Vdc
Input Bias Current (T_J =25°C)	I_{IB}	—	4.4	8.0	mA
Input Bias Current Change -14.5 Vdc ≥ V_I ≥ -30 Vdc 5.0 mA ≤ I_O ≤ 1.5 A)	ΔI_{IB}	 — —	 — —	 1.0 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	75	—	μV
Long-Term Stability	$\Delta V_O/\Delta t$	—	—	48	mV/1.0 k Hrs.
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	—	61	—	dB
Input-Output Voltage Differential I_O = 1.0A, T_J = +25°C	$\lvert V_I - V_O \rvert$	—	2.0	—	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_A ≤ +125°C	$\Delta V_O/\Delta T$	—	-1.0	—	mV/°C

MC7915C ELECTRICAL CHARACTERISTICS (V_I = -23 V, I_O =500mA, 0°C < T_J < + 125°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	-14.4	-15	-15.6	Vdc
Line Regulation (T_J = +25°C, I_O = 100mA) -17.5 Vdc ≥ V_I ≥ -30 Vdc -20 Vdc ≥ V_I ≥ -26 Vdc (T_J = +25°C, I_O = 500 mA) -17.5 Vdc ≥ V_I ≥ -30 Vdc -20 Vdc ≥ V_I ≥ -26 Vdc	Reg_{line}	 — — — —	 14 6.0 57 27	 150 75 300 150	mV
Load Regulation T_J = +25°C, 5.0 mA ≤ I_O ≤ 1.5 A 250 mA ≤ I_O ≤ 750 mA	Reg_{load}	 — —	 68 25	 300 150	mV
Output Voltage -17.5 Vdc ≥ V_I ≥ -30 Vdc, 5.0 mA ≤ I_O ≤ 1.0A, P ≤ 15 W	V_O	-14.25	—	-15.75	Vdc
Input Bias Current (T_J =25°C)	I_{IB}	—	4.4	8.0	mA
Input Bias Current Change -17.5 Vdc ≥ V_I ≥ -30 Vdc 5.0 mA ≤ I_O ≤ 1.5 A)	ΔI_{IB}	 — —	 — —	 1.0 0.5	mA
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	90	—	μV
Long-Term Stability	$\Delta V_O/\Delta t$	—	—	60	mV/1.0 k Hrs.
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	—	60	—	dB
Input-Output Voltage Differential I_O = 1.0A, T_J = +25°C	$\lvert V_I - V_O \rvert$	—	2.0	—	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_A ≤ +125°C	$\Delta V_O/\Delta T$	—	-1.0	—	mV/°C

MC7918C ELECTRICAL CHARACTERISTICS (V_I = -27 V, I_O =500mA, 0°C < T_J < + 125°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	-17.3	-18	-18.7	Vdc
Line Regulation	Reg_{line}				mV
(T_J = +25°C, I_O = 100mA)					
-21 Vdc ≥ V_I ≥ -33 Vdc		—	25	180	
-24 Vdc ≥ V_I ≥ -30 Vdc		—	10	90	
(T_J = +25°C, I_O = 500 mA)					
-21 Vdc ≥ V_I ≥ -33 Vdc		—	90	360	
-24 Vdc ≥ V_I ≥ -30 Vdc		—	50	180	
Load Regulation	Reg_{load}				mV
(T_J = +25°C, 5.0mA ≤ I_O ≤ 1.0A		—	110	360	
250 mA ≤ I_O ≤ 750 mA		—	55	180	
Output Voltage -21 Vdc ≥ V_I ≥ -33 Vdc, 5.0 mA ≤ I_O ≤ 1.0A, P ≤ 15 W	V_O	-17.1	—	-18.9	Vdc
Input Bias Current (T_J =25°C)	I_{IB}	—	4.5	8.0	mA
Input Bias Current Change	ΔI_{IB}				mA
-21 Vdc ≥ V_I ≥ -33 Vdc		—	—	1.0	
5.0 mA ≤ I_O ≤ 1.0 A		—	—	0.5	
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	110	—	μV
Long-Term Stability	$\Delta V_O/\Delta t$	—	—	72	mV/1.0 k Hrs.
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	—	59	—	dB
Input-Output Voltage Differential I_O = 1.0A, T_J = +25°C	$\|V_I-V_O\|$	—	2.0	—	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_A ≤ +125°C	$\Delta V_O/\Delta T$	—	-1.0	—	mV/°C

MC7924C ELECTRICAL CHARACTERISTICS (V_I = -33 V, I_O =500mA, 0°C < T_J < + 125°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
Output Voltage (T_J = +25°C)	V_O	-23	-24	-25	Vdc
Line Regulation	Reg_{line}				mV
(T_J = +25°C, I_O = 100mA)					
-27 Vdc ≥ V_I ≥ -38 Vdc		—	31	240	
-30 Vdc ≥ V_I ≥ -36 Vdc		—	14	120	
(T_J = +25°C, I_O = 500 mA)					
-27 Vdc ≥ V_I ≥ -38 Vdc		—	118	480	
-30 Vdc ≥ V_I ≥ -36 Vdc		—	70	240	
Load Regulation	Reg_{load}				mV
T_J = +25°C, 5.0 mA ≤ I_O ≤ 1.0 A		—	150	480	
250 mA ≤ I_O ≤ 750 mA		—	85	240	
Output Voltage -27 Vdc ≥ V_I ≥ -38 Vdc, 5.0 mA ≤ I_O ≤ 1.0A, P ≤ 15 W	V_O	-22.8	—	-25.2	Vdc
Input Bias Current (T_J =25°C)	I_{IB}	—	4.6	8.0	mA
Input Bias Current Change	ΔI_{IB}				mA
-27 Vdc ≥ V_I ≥ -38 Vdc		—	—	1.0	
5.0 mA ≤ I_O ≤ 1.0 A)		—	—	0.5	
Output Noise Voltage (T_A = +25°C, 10 Hz ≤ f ≤ 100 kHz)	V_n	—	170	—	μV
Long-Term Stability	$\Delta V_O/\Delta t$	—	—	96	mV/1.0 k Hrs.
Ripple Rejection (I_O = 20 mA, f = 120 Hz)	RR	—	56	—	dB
Input-Output Voltage Differential I_O = 1.0A, T_J = +25°C	$\|V_I-V_O\|$	—	2.0	—	Vdc
Average Temperature Coefficient of Output Voltage I_O = 5.0 mA, 0°C ≤ T_A ≤ +125°C	$\Delta V_O/\Delta T$	—	-1.0	—	mV/°C

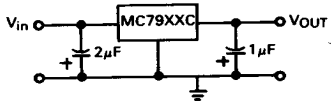
APPLICATIONS INFORMATION

DESIGN CONSIDERATIONS

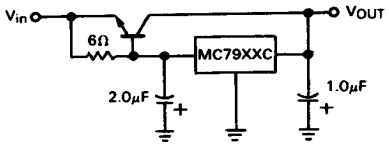
The MC79XXC fixed voltage regulators are designed with the following built in safety features: thermal overload protection that shuts down the circuit under excess power conditions; internal short-circuit protection that limits the maximum output current; and output transistor safe-area compensation that reduces the output short-circuit current as the voltage across the pass transistor is increased. These features make the MC79XXC virtually indestructible under most operating conditions.

In many MC79XXC applications, compensation capacitors are not required. However, for stable operation of the regulator over all input voltage and output current ranges, bypassing of the input and output is recommended. Input bypassing is necessary if the regulator is located far from the power supply filter capacitor. Bypassing the output will improve the transient response of the regulator. The input bypass capacitor should be 2.0μF or larger and the output bypass capacitor should be 1.0μF.

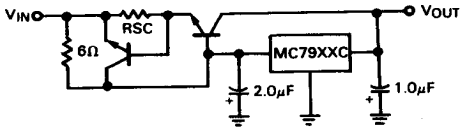
FIXED OUTPUT REGULATOR



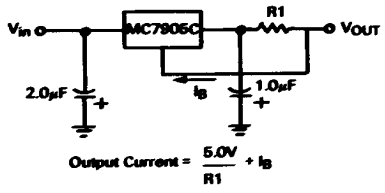
HIGH CURRENT VOLTAGE REGULATOR



HIGH OUTPUT CURRENT, SHORT CIRCUIT PROTECTED

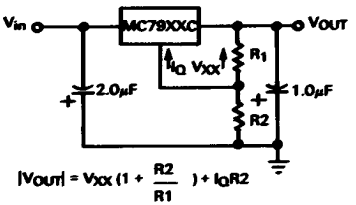


CURRENT REGULATOR



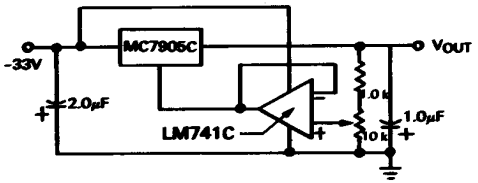
$$\text{Output Current} = \frac{5.0V}{R1} + I_B$$

VARIABLE OUTPUT VOLTAGE REGULATOR



$$|V_{OUT}| = V_{XX}\left(1 + \frac{R2}{R1}\right) + I_Q R2$$

VARIABLE OUTPUT VOLTAGE, -30 V TO -7V



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