µA79M00 SERIES

3-TERMINAL NEGATIVE VOLTAGE REGULATORS

FAIRCHILD LINEAR INTEGRATED CIRCUITS

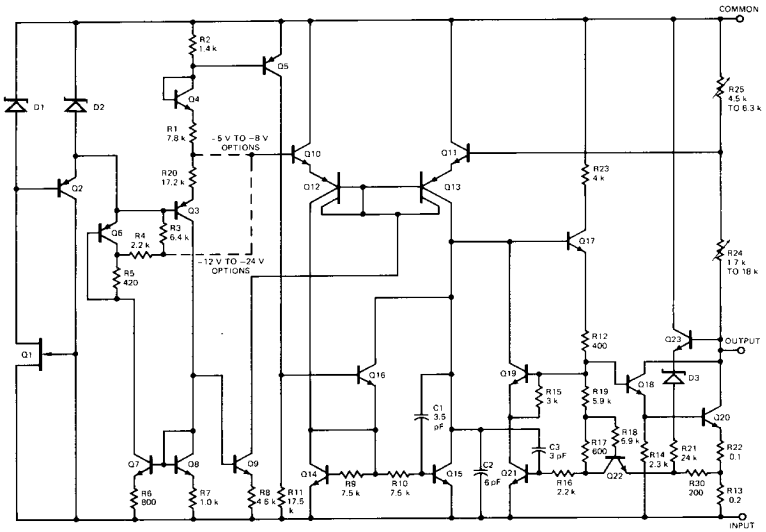
GENERAL DESCRIPTION – The µA79M00 series of 3-Terminal Medium Current Negative Voltage Regulators are constructed using the Fairchild Planar* epitaxial process. These regulators employ internal current limiting, thermal shutdown and safe area compensation making them essentially indestructible. If adequate heat sinking is provided, they can deliver up to 500 mA output current. They are intended as fixed voltage regulators in a wide range of applications including local (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.

- **OUTPUT CURRENT IN EXCESS OF 0.5 A**
- **INTERNAL THERMAL OVERLOAD PROTECTION**
- **INTERNAL SHORT CIRCUIT CURRENT LIMITING**
- **OUTPUT TRANSISTOR SAFE AREA COMPENSATION**
- **AVAILABLE IN JEDEC TO-220 AND TO-39 PACKAGES**
- **OUTPUT VOLTAGES OF –5 V, –6 V, –8 V, –12 V, –15 V, –20 V AND –24 V**

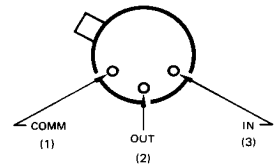
ABSOLUTE MAXIMUM RATINGS

Input Voltage	
(–5 V through –15 V)	–35 V
(–20 V, –24 V)	–40 V
Internal Power Dissipation	Internally Limited
Storage Temperature Range	
TO-39	–65°C to +150°C
TO-220	–55°C to +125°C
Operating Junction Temperature Range	
TO-39 Military (µA79M00)	–55°C to +150°C
Commercial (µA79M00C)	0°C to +150°C
TO-220 Commercial (µA79M00C)	0°C to +150°C
Lead Temperature (Soldering, 60 s) TO-39	300°C
(Soldering, 10 s) T)-220	230°C

EQUIVALENT CIRCUIT



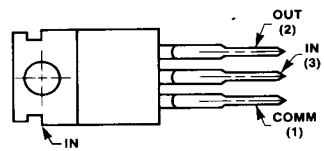
CONNECTION DIAGRAMS
TO-39 PACKAGE
(TOP VIEW)



ORDER INFORMATION

OUTPUT VOLTAGE	PART NO.	PART NO.
–5 V	µA 79M05HM	µA 79M05AHC
–6 V	µA 79M06HM	µA 79M06AHC
–8 V	µA 79M08HM	µA 79M08AHC
–12 V	µA 79M12HM	µA 79M12AHC
–15 V	µA 79M15HM	µA 79M15AHC
–20 V	µA 79M20HM	µA 79M20AHC
–24 V	µA 79M24HM	µA 79M24AHC

TO-220 PACKAGE
(SIDE VIEW)



ORDER INFORMATION

OUTPUT VOLTAGE	PART NO.
–5 V	µA 79M05AUC
–6 V	µA 79M06AUC
–8 V	µA 79M08AUC
–12 V	µA 79M12AUC
–15 V	µA 79M15AUC
–20 V	µA 79M20AUC
–24 V	µA 79M24AUC

*Planar is a patented Fairchild process.

μA79M05HM

ELECTRICAL CHARACTERISTICS: $V_{IN} = -10$ V, $I_{OUT} = 350$ mA, $-55°C \leq T_J \leq 150°C$, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, unless otherwise specified. Notes 1 and 2

CHARACTERISTICS		CONDITIONS (Note 3)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−5.2	−5.0	−4.8	V
Line Regulation		$T_J = 25°C$	$-25\ V \leq V_{IN} \leq -7\ V$		7.0	50	mV
			$-18\ V \leq V_{IN} \leq -8\ V$		3.0	30	mV
Load Regulation		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 500\ mA$			75	100	mV
		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 350\ mA$			50		mV
Output Voltage		$-25\ V \leq V_{IN} \leq -7\ V$, $5\ mA \leq I_{OUT} \leq 350\ mA$*		−5.25		−4.75	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-25\ V \leq V_{IN} \leq -8\ V$				0.4	mA
	with load	$5\ mA \leq I_{OUT} \leq 350\ mA$				0.4	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			25	80	$\mu V/V_{OUT}$
Ripple Rejection		$-18\ V \leq V_{IN} \leq -8\ V$, $f = 120\ Hz$	$I_{OUT} = 100\ mA$	50			dB
			$I_{OUT} = 300\ mA$, $T_J = 25°C$	54	60		dB
Dropout Voltage		$T_J = 25°C$			1.1	2.3	V
Short Circuit Current		$T_J = 25°C$, $V_{IN} = -35\ V$				0.6	A
Peak Output Current				0.4	0.65	1.4	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$ $-55°C \leq T_J \leq +150°C$				0.3	$mV/°C/V_{OUT}$

μA79M05AHC AND μA79M05AUC

ELECTRICAL CHARACTERISTICS: $V_{IN} = -10$ V, $I_{OUT} = 350$ mA, $0°C \leq T_J \leq 125°C$, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 3)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−5.2	−5.0	−4.8	V
Line Regulation		$T_J = 25°C$	$-25\ V \leq V_{IN} \leq -7\ V$		7.0	50	mV
			$-18\ V \leq V_{IN} \leq -8\ V$		3.0	30	mV
Load Regulation		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 500\ mA$			75	100	mV
		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 350\ mA$			50		mV
Output Voltage		$-25\ V \leq V_{IN} \leq -7\ V$, $5\ mA \leq I_{OUT} \leq 350\ mA$*		−5.25	5%	−4.75	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-25\ V \leq V_{IN} \leq -8\ V$				0.4	mA
	with load	$5\ mA \leq I_{OUT} \leq 350\ mA$				0.4	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			125		μV
Ripple Rejection		$-18\ V \leq V_{IN} \leq -8\ V$, $f = 120\ Hz$	$I_{OUT} = 100\ mA$	50			dB
			$I_{OUT} = 300\ mA$, $T_J = 25°C$	54	60		dB
Dropout Voltage		$T_J = 25°C$			1.1		V
Short Circuit Current		$T_J = 25°C$, $V_{IN} = -30\ V$			140		mA
Peak Output Current					650		mA
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$			−0.4		mV/°C

*$P_D \leq 4$ W

NOTES:
1. See Test Circuit.
2. The convention for negative regulators is the algebraic valves, thus −15 V is less than −10 V.
3. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle ≤ 5%). Output voltage changes due to changes due to changes in internal temperature must be taken into account separately.

μA79M06HM

ELECTRICAL CHARACTERISTICS: $V_{IN} = -11$ V, $I_{OUT} = 350$ mA, $-55°C \leq T_J \leq 150°C$, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−6.25	−6.0	−5.75	V
Line Regulation		$T_J = 25°C$	$-25\ V \leq V_{IN} \leq -8\ V$		7.0	60	mV
			$-19\ V \leq V_{IN} \leq -9\ V$		3.0	40	mV
Load Regulation		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 500\ mA$			80	120	mV
		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 350\ mA$*			55		mV
Output Voltage		$-25\ V \leq V_{IN} \leq -8\ V$, $5\ mA \leq I_{OUT} \leq 350\ mA$*		−6.3		−5.7	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-25\ V \leq V_{IN} \leq -9\ V$				0.4	mA
	with load	$5\ mA \leq I_{OUT} \leq 350\ mA$				0.4	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			25	80	$\mu V/V_{OUT}$
Ripple Rejection		$-19\ V \leq V_{IN} \leq -9\ V$,	$I_{OUT} = 100\ mA$	50			dB
		$f = 120\ Hz$	$I_{OUT} = 300\ mA$, $T_J = 25°C$	54	60		dB
Dropout Voltage		$T_J = 25°C$			1.1	2.3	V
Short Circuit Current		$T_J = 25°C$, $V_{IN} = -35\ V$				0.6	A
Peak Output Current				0.4	0.65	1.4	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$, $-55°C \leq T_J \leq +150°C$				0.3	$mV/°C/V_{OUT}$

AHC

μA79M06AHC AND μA79M06AUC

ELECTRICAL CHARACTERISTICS: $V_{IN} = -11$ V, $I_{OUT} = 350$ mA, $0°C \leq T_J \leq 125°C$, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−6.25	−6.0	−5.75	V
Line Regulation		$T_J = 25°C$	$-25\ V \leq V_{IN} \leq -8\ V$		7.0	60	mV
			$-19\ V \leq V_{IN} \leq -9\ V$		3.0	40	mV
Load Regulation		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 500\ mA$			80	120	mV
		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 350\ mA$			55		mV
Output Voltage		$-25\ V \leq V_{IN} \leq -8\ V$, $5\ mA \leq I_{OUT} \leq 350\ mA$		−6.3		−5.7	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-25\ V \leq V_{IN} \leq -9\ V$				0.4	mA
	with load	$5\ mA \leq I_{OUT} \leq 350\ mA$				0.4	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			150		μV
Ripple Rejection		$-19\ V \leq V_{IN} \leq -9\ V$,	$I_{OUT} = 100\ mA$	50			dB
		$f = 120\ Hz$	$I_{OUT} = 300\ mA$, $T_J = 25°C$	54	60		dB
Dropout Voltage		$T_J = 25°C$			1.1		V
Short Circuit Current		$T_J = 25°C$, $V_{IN} = -30\ V$			140		mA
Peak Output Current					650		mA
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$			−0.4		mV/°C

*$P_D \leq 4$ W

NOTE:

1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

μA79M08HM

ELECTRICAL CHARACTERISTICS: $V_{IN} = -14$ V, $I_{OUT} = 350$ mA, $-55°C \leq T_J \leq 150°C$, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−8.3	−8.0	−7.7	V
Line Regulation		$T_J = 25°C$	$-25\ V \leq V_{IN} \leq -10.5\ V$		8.0	80	mV
			$-21\ V \leq V_{IN} \leq -11\ V$		4.0	50	mV
Load Regulation		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 500\ mA$			90	160	mV
		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 350\ mA$			60		mV
Output Voltage		$-25\ V \leq V_{IN} \leq -10.5\ V$, $5\ mA \leq I_{OUT} \leq 350\ mA$*		−8.4	5%	−7.6	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-25\ V \leq V_{IN} \leq -10.5\ V$				0.4	mA
	with load	$5\ mA \leq I_{OUT} \leq 350\ mA$				0.4	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			25	80	$\mu V/V_{OUT}$
Ripple Rejection		$-21.5\ V \leq V_{IN} \leq -11.5\ V$,	$I_{OUT} = 100\ mA$	50			dB
		$f = 120\ Hz$	$I_{OUT} = 300\ mA$, $T_J = 25°C$	54	59		dB
Dropout Voltage		$T_J = 25°C$			1.1	2.3	V
Short Circuit Current		$T_J = 25°C$, $V_{IN} = -35\ V$				0.6	A
Peak Output Current				0.4	0.65	1.4	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$, $-55°C \leq T_J \leq +150°C$				0.3	$mV/°C/V_{OUT}$

μA79M08AHC AND μA79M08AUC

ELECTRICAL CHARACTERISTICS: $V_{IN} = -14$ V, $I_{OUT} = 350$ mA, $0°C \leq T_J \leq 125°C$, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−8.3	−8.0	−7.7	V
Line Regulation		$T_J = 25°C$	$-25\ V \leq V_{IN} \leq -10.5\ V$		8.0	80	mV
			$-21\ V \leq V_{IN} \leq -11\ V$		4.0	50	mV
Load Regulation		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 500\ mA$			90	160	mV
		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 350\ mA$			60		mV
Output Voltage		$-25\ V \leq V_{IN} \leq -10.5\ V$, $5\ mA \leq I_{OUT} \leq 350\ mA$		−8.4		−7.6	V
Quiescent Current		$T_J = 25°C$			1.0	2.0	mA
Quiescent Current Change	with line	$-25\ V \leq V_{IN} \leq -10.5\ V$				0.4	mA
	with load	$5\ mA \leq I_{OUT} \leq 350\ mA$				0.4	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			200		μV
Ripple Rejection		$-21.5\ V \leq V_{IN} \leq -11.5\ V$,	$I_{OUT} = 100\ mA$	50			dB
		$f = 120\ Hz$	$I_{OUT} = 300\ mA$, $T_J = 25°C$	54	59		dB
Dropout Voltage		$T_J = 25°C$			1.1		V
Short Circuit Current		$T_J = 25°C$, $V_{IN} = -30\ V$			140		mA
Peak Output Current					650		mA
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$			−0.6		$mV/°C$

*$P_D \leq 4$ W

NOTE:
1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

7

μA79M12HM

ELECTRICAL CHARACTERISTICS: $V_{IN} = -11$ V, $I_{OUT} = 350$ mA, $-55°C \leq T_J \leq 150°C$, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−12.5	−12	−11.5	V
Line Regulation		$T_J = 25°C$	$-30\ V \leq V_{IN} \leq -14.5\ V$		9.0	80	mV
			$-25\ V \leq V_{IN} \leq -15\ V$		5.0	50	mV
Load Regulation		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 500\ mA$			65	240	mV
		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 350\ mA$			45		mV
Output Voltage		$-30\ V \leq V_{IN} \leq -14.5\ V$, $5\ mA \leq I_{OUT} \leq 350\ mA$*		−12.6		−11.4	V
Quiescent Current		$T_J = 25°C$			1.5	3.0	mA
Quiescent Current Change	with line	$-30\ V \leq V_{IN} \leq -14.5\ V$				0.4	mA
	with load	$5\ mA \leq I_{OUT} \leq 350\ mA$				0.4	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			25	80	$\mu V/V_{OUT}$
Ripple Rejection		$-25\ V \leq V_{IN} \leq -15\ V$,	$I_{OUT} = 100\ mA$	50			dB
		$f = 120\ Hz$	$I_{OUT} = 300\ mA$, $T_J = 25°C$	54	60		dB
Dropout Voltage		$T_J = 25°C$			1.1	2.3	V
Short Circuit Current		$T_J = 25°C$, $V_{IN} = -35\ V$				0.6	A
Peak Output Current				0.4	0.65	1.4	A
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$, $-55°C \leq T_J \leq +150°C$				0.3	$mV/°C/V_{OUT}$

μA79M12AHC AND μA79M12AUC

ELECTRICAL CHARACTERISTICS: $V_{IN} = -19$ V, $I_{OUT} = 350$ mA, $0°C \leq T_J \leq 125°C$, $C_{IN} = 2\ \mu F$, $C_{OUT} = 1\ \mu F$, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		$T_J = 25°C$		−12.5	−12	−11.5	V
Line Regulation		$T_J = 25°C$	$-30\ V \leq V_{IN} \leq -14.5\ V$		9.0	80	mV
			$-25\ V \leq V_{IN} \leq -15\ V$		5.0	50	mV
Load Regulation		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 500\ mA$			65	240	mV
		$T_J = 25°C$, $5\ mA \leq I_{OUT} \leq 350\ mA$			45		mV
Output Voltage		$-30\ V \leq V_{IN} \leq -14.5\ V$, $5\ mA \leq I_{OUT} \leq 350\ mA$		−12.6		−11.4	V
Quiescent Current		$T_J = 25°C$			1.5	3.0	mA
Quiescent Current Change	with line	$-30\ V \leq V_{IN} \leq -14.5\ V$				0.4	mA
	with load	$5\ mA \leq I_{OUT} \leq 350\ mA$				0.4	mA
Output Noise Voltage		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			300		μV
Ripple Rejection		$-25\ V \leq V_{IN} \leq -15\ V$,	$I_{OUT} = 100\ mA$	50			dB
		$f = 120\ Hz$	$I_{OUT} = 300\ mA$, $T_J = 25°C$	54	60		dB
Dropout Voltage		$T_J = 25°C$			1.1		V
Short Circuit Current		$T_J = 25°C$, $V_{IN} = -30\ V$			140		mA
Peak Output Current					650		mA
Average Temperature Coefficient of Output Voltage		$I_{OUT} = 5\ mA$			−0.8		mV/°C

*$P_D \leq 4$ W

NOTE:

1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_w \leq 10$ ms, duty cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

μA79M15HM

ELECTRICAL CHARACTERISTICS: V_{IN} = −23 V, I_{OUT} = 350 mA, 0°C ≤ T_J ≤ +125°C, C_{IN} = 2 μF, C_{OUT} = 1 μF, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		T_J = 25°C		−15.6	−15	−14.4	V
Line Regulation		T_J = 25°C	−30 V ≤ V_{IN} ≤ −17.5 V		9.0	80	mV
			−28 V ≤ V_{IN} ≤ −18 V		7.0	50	mV
Load Regulation		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 500 mA			65	240	mV
		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 350 mA			45		mV
Output Voltage		−30 V ≤ V_{IN} ≤ −17.5 V, 5 mA ≤ I_{OUT} ≤ 350 mA*		−15.75		−14.25	V
Quiescent Current		T_J = 25°C			1.5	3.0	mA
Quiescent Current Change	with line	−30 V ≤ V_{IN} ≤ −17.5 V				0.4	mA
	with load	5 mA ≤ I_{OUT} ≤ 350 mA				0.4	mA
Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			25	80	μV/V_{OUT}
Ripple Rejection		−28.5 V ≤ V_{IN} ≤ −18.5 V,	I_{OUT} = 100 mA	50			dB
		f = 120 Hz	I_{OUT} = 300 mA, T_J = 25°C	54	59		dB
Dropout Voltage		T_J = 25°C			1.1	2.3	V
Short Circuit Current		T_J = 25°C, V_{IN} = −35 V				0.6	A
Peak Output Current				0.4	0.65	1.4	A
Average Temperature Coefficient of Output Voltage		I_{OUT} = 5 mA, −55°C ≤ T_J ≤ +150°C				0.3	mV/°C/V_{OUT}

μA79M15AHC AND μA79M15AUC

ELECTRICAL CHARACTERISTICS: V_{IN} = −23 V, I_{OUT} = 350 mA, 0°C ≤ T_J ≤ +150°C, C_{IN} = 2 μF, C_{OUT} = 1 μF, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		T_J = 25°C		−15.6	−15	−14.4	V
Line Regulation		T_J = 25°C	−30 V ≤ V_{IN} ≤ −17.5 V		9.0	80	mV
			−28 V ≤ V_{IN} ≤ −18 V		7.0	50	mV
Load Regulation		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 500 mA			65	240	mV
		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 350 mA			45		mV
Output Voltage		−30 V ≤ V_{IN} ≤ −17.5 V, 5 mA ≤ I_{OUT} ≤ 350 mA		−15.75		−14.25	V
Quiescent Current		T_J = 25°C			1.5	3.0	mA
Quiescent Current Change	with line	−30 V ≤ V_{IN} ≤ −17.5 V				0.4	mA
	with load	5 mA ≤ I_{OUT} ≤ 350 mA				0.4	mA
Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			375		μV
Ripple Rejection		−28.5 V ≤ V_{IN} ≤ −18.5 V,	I_{OUT} = 100 mA	50			dB
		f = 120 Hz	I_{OUT} = 300 mA, T_J = 25°C	54	59		dB
Dropout Voltage		T_J = 25°C			1.1		V
Short Circuit Current		T_J = 25°C, V_{IN} = −30 V			140		mA
Peak Output Current					650		mA
Average Temperature Coefficient of Output Voltage		I_{OUT} = 5 mA			−1.0		mV/°C

*P_D ≤ 4 W

NOTE:
1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques (t_w ≤ 10 ms, duty cycle ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

7

μA79M20HM

ELECTRICAL CHARACTERISTICS: V_{IN} = −29 V, I_{OUT} = 350 mA, −55°C ≤ T_J ≤ 150°C, C_{IN} = 2 μF, C_{OUT} = 1 μF unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		T_J = 25°C		−20.8	−20	−19.2	V
Line Regulation		T_J = 25°C	−35 V ≤ V_{IN} ≤ −23 V		12	80	mV
			−34 V ≤ V_{IN} ≤ −24 V		10	70	mV
Load Regulation		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 500 mA			75	300	mV
		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 350 mA			50		mV
Output Voltage		−35 V ≤ V_{IN} ≤ −23 V, 5 mA ≤ I_{OUT} ≤ 350 mA*		−21		−19	V
Quiescent Current		T_J = 25°C			1.5	3.5	mA
Quiescent Current Change	with line	−35 V ≤ V_{IN} ≤ −23 V				0.4	mA
	with load	5 mA ≤ I_{OUT} ≤ 350 mA				0.4	mA
Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			25	80	μV/V_{OUT}
Ripple Rejection		−34 V ≤ V_{IN} ≤ −24 V, f = 120 Hz	I_{OUT} = 100 mA	50			dB
			I_{OUT} = 300 mA, T_J = 25°C	54	58		dB
Dropout Voltage		T_J = 25°C			1.1	2.3	V
Short Circuit Current		T_J = 25°C, V_{IN} = −35 V				0.6	A
Peak Output Current				0.4	0.65	1.4	A
Average Temperature Coefficient of Output Voltage		I_{OUT} = 5 mA, −55°C ≤ T_J ≤ +150°C				0.3	mV/°C /V_{OUT}

μA79M20AHC AND μA79M20AUC

ELECTRICAL CHARACTERISTICS: V_{IN} = −29 V, I_{OUT} = 350 mA, 0°C ≤ T_J ≤ 125°C, C_{IN} = 2 μF, C_{OUT} = 1 μF, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)		MIN	TYP	MAX	UNITS
Output Voltage		T_J = 25°C		−20.8	−20	−19.2	V
Line Regulation		T_J = 25°C	−35 V ≤ V_{IN} ≤ −23 V		12	80	mV
			−34 V ≤ V_{IN} ≤ −24 V		10	70	mV
Load Regulation		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 500 mA			75	300	mV
		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 350 mA			50		mV
Output Voltage		−35 V ≤ V_{IN} ≤ −23 V, 5 mA ≤ I_{OUT} ≤ 350 mA		−21		−19	V
Quiescent Current		T_J = 25°C			1.5	3.5	mA
Quiescent Current Change	with line	−35 V ≤ V_{IN} ≤ −23 V				0.4	mA
	with load	5 mA ≤ I_{OUT} ≤ 350 mA				0.4	mA
Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz			500		μV
Ripple Rejection		−34 V ≤ V_{IN} ≤ −24 V, f = 120 Hz	I_{OUT} = 100 mA	50			dB
			I_{OUT} = 300 mA, T_J = 25°C	54	58		dB
Dropout Voltage		T_J = 25°C			1.1		V
Short Circuit Current		T_J = 25°C, V_{IN} = −30			140		mA
Peak Output Current					650		mA
Average Temperature Coefficient of Output Voltage		I_{OUT} = 5 mA			−1.0		mV/°C

*P_D ≤ 4 W

NOTE:

1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques (t_w ≤ 10 ms, duty cycle ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

μA79M24HM

ELECTRICAL CHARACTERISTICS: V_{IN} = −33 V, I_{OUT} = 350 mA, −55°C ≤ T_J ≤ 150°C, C_{IN} = 2 μF, C_{OUT} = 1 μF, unless otherwise specified.

CHARACTERISTICS		CONDITIONS (Note 1)	MIN	TYP	MAX	UNITS
Output Voltage		T_J = 25°C	−25	−24	−23	V
Line Regulation		T_J = 25°C, −38 V ≤ V_{IN} ≤ −27 V		12	80	mV
		T_J = 25°C, −38 V ≤ V_{IN} ≤ −28 V		12	70	mV
Load Regulation		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 500 mA		75	300	mV
		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 350 mA		50		mV
Output Voltage		−38 V ≤ V_{IN} ≤ −27 V, 5 mA ≤ I_{OUT} ≤ 350 mA*	−25.2		−22.8	V
Quiescent Current		T_J = 25°C		1.5	3.5	mA
Quiescent Current Change	with line	−38 V ≤ V_{IN} ≤ −27 V			0.4	mA
	with load	5 mA ≤ I_{OUT} ≤ 350 mA			0.4	mA
Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz		25	80	μV/V_{OUT}
Ripple Rejection		−38 V ≤ V_{IN} ≤ −28 V, f = 120 Hz, I_{OUT} = 100 mA	50			dB
		f = 120 Hz, I_{OUT} = 300 mA, T_J = 25°C	54	58		dB
Dropout Voltage		T_J = 25°C		1.1	2.3	V
Short Circuit Current		T_J = 25°C, V_{IN} = −35 V			0.6	A
Peak Output Current			0.4	0.65	1.4	A
Average Temperature Coefficient of Output Voltage		I_{OUT} = 5 mA, −55°C ≤ T_J ≤ +150°C			0.3	mV/°C /V_{OUT}

μA79M24AHC AND μA79M24AUC

ELECTRICAL CHARACTERISTICS: V_{IN} = −33 V, I_{OUT} = 350 mA, 0°C ≤ T_J ≤ 125°C, C_{IN} = 2 μF, C_{OUT} = 1 μF, unless otherwise specified.

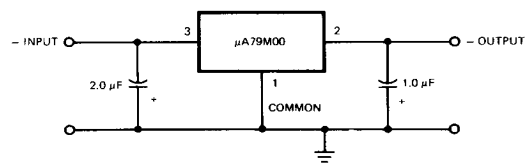
CHARACTERISTICS		CONDITIONS (Note 1)	MIN	TYP	MAX	UNITS
Output Voltage		T_J = 25°C	−25	−24	−23	V
Line Regulation		T_J = 25°C, −38 V ≤ V_{IN} ≤ −27 V		12	80	mV
		T_J = 25°C, −38 V ≤ V_{IN} ≤ −28 V		12	70	mV
Load Regulation		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 500 mA		75	300	mV
		T_J = 25°C, 5 mA ≤ I_{OUT} ≤ 350 mA		50		mV
Output Voltage		−38 V ≤ V_{IN} ≤ −27 V, 5 mA ≤ I_{OUT} ≤ 350 mA	−25.2		−22.8	V
Quiescent Current		T_J = 25°C		1.5	3.5	mA
Quiescent Current Change	with line	−38 V ≤ V_{IN} ≤ −27 V			0.4	mA
	with load	5 mA ≤ I_{OUT} ≤ 350 mA			0.4	mA
Output Noise Voltage		T_A = 25°C, 10 Hz ≤ f ≤ 100 kHz		600		μV
Ripple Rejection		−38 V ≤ V_{IN} ≤ −28 V, f = 120 Hz, I_{OUT} = 100 mA	50			dB
		f = 120 Hz, I_{OUT} = 300 mA, T_J = 25°C	54	58		dB
Dropout Voltage		T_J = 25°C		1.1		V
Short Circuit Current		T_J = 25°C, V_{IN} = −30 V		140		mA
Peak Output Current				650		mA
Average Temperature Coefficient of Output Voltage		I_{OUT} = 5 mA		−1.0		mV/°C

*P_D ≤ 4 W

NOTE:

1. All characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques (t_w ≤ 10 ms, duty cycle ≤ 5%). Output voltage changes due to changes in internal temperature must be taken into account separately.

DC PARAMETER TEST CIRCUIT



DESIGN CONSIDERATIONS

The μA79M00 fixed voltage regulator series has thermal overload protection from excessive power, internal short circuit protection which limits the circuit's maximum current, and output transistor safe area compensation for reducing the output current as the voltage across the pass transistor is increased.

The safe area protection network may cause the device to latch-up if the output is shorted and the regulator is operating with high input voltages. This mode of operation will not damage the device. However, power (input voltage or the load) must be interrupted momentarily for the device to recover from the latched condition.

Although the internal power dissipation is limited, the junction temperature must be kept below the maximum specified temperature (150°C for 79M00, 125°C for 79M00AC and 79M00C) in order to meet data sheet specifications. To calculate the maximum junction temperature or heat sink required, the following thermal resistance values should be used:

	TYP	MAX	TYP	MAX
PACKAGE	θ_{JC}	θ_{JC}	θ_{JA}	θ_{JA}
TO-39	18.0	25	120	185
TO-220	3.0	5.0	62	70

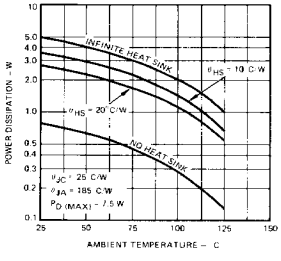
$$P_{D\,(MAX)} = \frac{T_{J\,(MAX)} - T_A}{\theta_{JC} + \theta_{CA}} \text{ or } \frac{T_{J\,(MAX)} - T_A}{\theta_{JA}} \text{ (Without a heat sink)}$$

$$\theta_{CA} = \theta_{CS} + \theta_{SA}$$

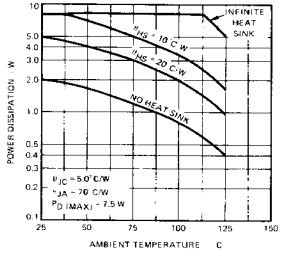
Solving for T_J: $T_J = T_A + P_D(\theta_{JC}+\theta_{CA})$ or $T_A + P_D\,\theta\,JA$ (Without a heat sink)

Where T_J = Junction Temperature
T_A = Ambient Temperature
P_D = Power Dissipation
θ_{JC} = Junction to case thermal resistance
θ_{CA} = Case to ambient thermal resistance
θ_{CS} = Case to heat sink thermal resistance
θ_{SA} = Heat sink to ambient thermal resistance
θ_{JA} = Junction to ambient thermal resistance

WORST CASE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE TO-39

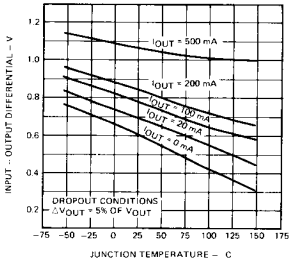


WORST CASE POWER DISSIPATION VERSUS AMBIENT TEMPERATURE TO-220

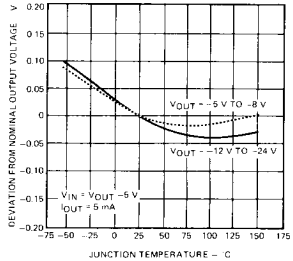


TYPICAL PERFORMANCE CURVES

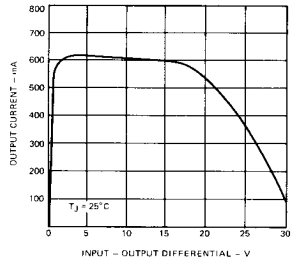
DROPOUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE



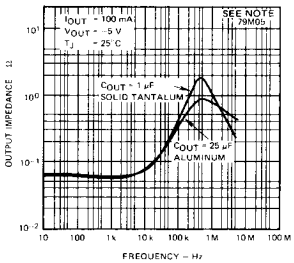
OUTPUT VOLTAGE AS A FUNCTION OF JUNCTION TEMPERATURE



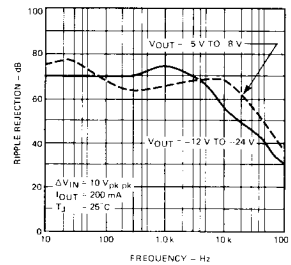
PEAK OUTPUT CURRENT AS A FUNCTION OF INPUT-OUTPUT DIFFERENTIAL VOLTAGE



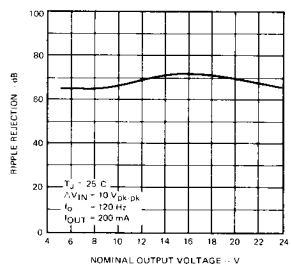
OUTPUT IMPEDANCE AS A FUNCTION OF FREQUENCY



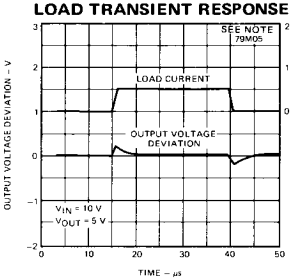
RIPPLE REJECTION AS A FUNCTION OF FREQUENCY



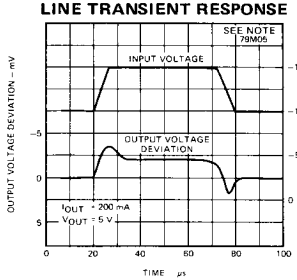
RIPPLE REJECTION AS A FUNCTION OF OUTPUT VOLTAGES



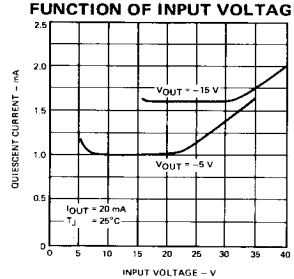
LOAD TRANSIENT RESPONSE



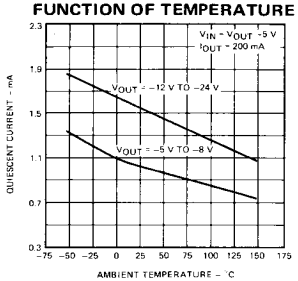
LINE TRANSIENT RESPONSE



QUIESCENT CURRENT AS A FUNCTION OF INPUT VOLTAGE



QUIESCENT CURRENT AS A FUNCTION OF TEMPERATURE



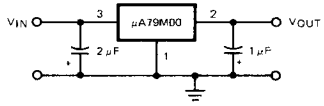
NOTE : The other μA79M00 voltage series devices have similar performance curves.

7

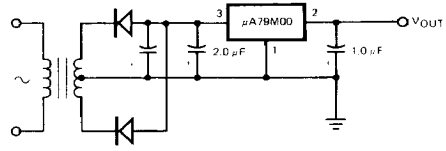
TYPICAL APPLICATIONS

Bypass capacitors are recommended for stable operation of the 79M00 series of regulators over the input voltage and output current ranges. Output bypass capacitors will improve the transient response of the regulator.

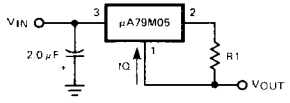
The bypass capacitors, (2 μF on the input, 1 μF on the output) should be ceramic or solid tantalum which have good high frequency characteristics. If aluminum electrolytics are used, their values should be 10 μF or larger. The bypass capacitors should be mounted with the shortest leads, and if possible, directly across the regulator terminals.



FIXED OUTPUT REGULATOR

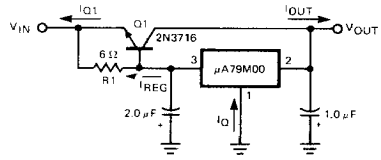


NEGATIVE OUTPUT VOLTAGE CIRCUIT



$$\text{OUTPUT CURRENT} = \frac{5.0\ \text{V}}{R1} + I_Q$$

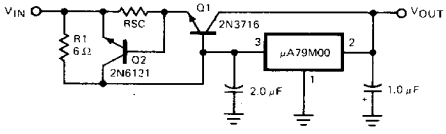
BASIC CURRENT REGULATOR



$$R1 = \frac{V_{BE(Q1)}}{I_{REG}} = \frac{\beta V_{BE(Q1)}}{I_{REQ(MAX)}\,(\beta + 1) - I_{OUT(MAX)}}$$

$$I_{Q1} = \beta(Q1) I_{REG}$$

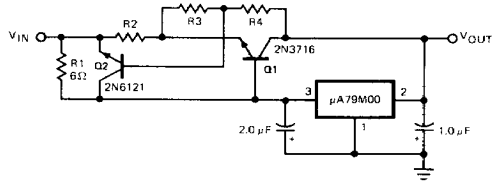
HIGH CURRENT VOLTAGE REGULATOR



$$R1 = \frac{\beta V_{BE(Q1)}}{I_{REQ(MAX)}\,(\beta + 1) - I_{OUT(MAX)}}$$

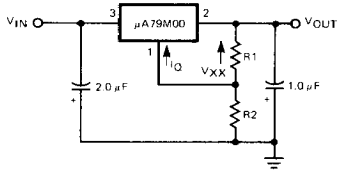
$$R_{SC} = \frac{V_{BE(Q2)}}{I_{SC}}$$

HIGH OUTPUT CURRENT, SHORT CIRCUIT PROTECTED



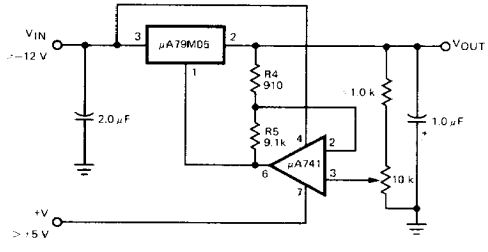
$$R1 = \frac{\beta V_{BE(Q1)}}{I_{REQ(MAX)}\,(\beta + 1) - I_{OUT(MAX)}}$$

HIGH OUTPUT CURRENT, FOLDBACK CURRENT LIMITED



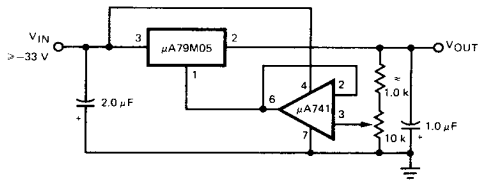
$$\left|V_{OUT}\right| = V_{XX}\left(1 + \frac{R2}{R1}\right) + I_Q R2$$

VARIABLE OUTPUT VOLTAGE REGULATOR

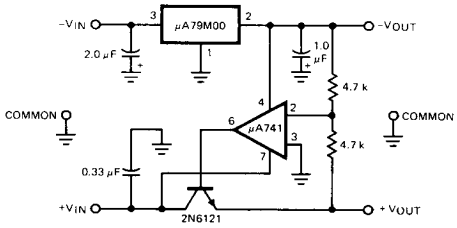


VARIABLE OUTPUT VOLTAGE, −0.5 V TO −10 V

TYPICAL APPLICATIONS (Cont'd)



VARIABLE OUTPUT VOLTAGE, −30 V TO −7 V



POSITIVE AND NEGATIVE TRACKING VOLTAGE REGULATOR

7