FAIRCHILD
A Schlumberger Company

μA7800 Series 3-Terminal Positive Voltage Regulators

Linear Division Voltage Regulators

Description

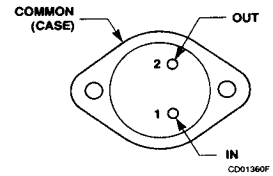
The μA7800 series of monolithic 3-terminal positive voltage regulators is constructed using the Fairchild Planar Epitaxial process. These regulators employ internal current-limiting, thermal shutdown and safe-area compensation, making them essentially indestructible. If adequate heat sinking is provided, they can deliver over 1.0 A 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 1.0 A**
- **No External Components**
- **Internal Thermal Overload Protection**
- **Internal Short Circuit Current-Limiting**
- **Output Transistor Safe-Area Compensation**
- **Available In JEDEC TO-220 And TO-3 Packages**
- **Output Voltages Of 5 V, 6 V, 8 V, 8.5 V, 12 V, 15 V, 18 V, And 24 V**
- **Available In Extended Temperature Range**

Absolute Maximum Ratings

Storage Temperature Range	
TO-3 Metal Can	−65°C to +175°C
TO-220 Package	−65°C to +150°C
Operating Junction Temperature Range	
Extended (μA7800M)	−55°C to +150°C
Commercial (μA7800C)	0°C to +150°C
Lead Temperature	
TO-3 Metal Can (soldering, 60 s)	300°C
TO-220 Package (soldering, 10 s)	265°C
Power Dissipation	Internally Limited
Input Voltage	
5.0 V to 18 V	35 V
24 V	40 V

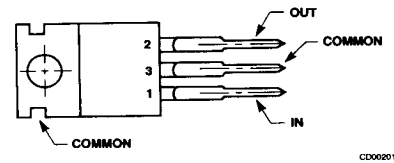
Connection Diagram
TO-3 Package (Top View)



Order Information

Device Code	Package Code	Package Description
μA7805KM	HJ	Metal
μA7806KM	HJ	Metal
μA7808KM	HJ	Metal
μA7812KM	HJ	Metal
μA7815KM	HJ	Metal
μA7818KM	HJ	Metal
μA7824KM	HJ	Metal
μA7805KC	HJ	Metal
μA7806KC	HJ	Metal
μA7808KC	HJ	Metal
μA7812KC	HJ	Metal
μA7815KC	HJ	Metal
μA7818KC	HJ	Metal
μA7824KC	HJ	Metal

Connection Diagram
TO-220 Package (Top View)

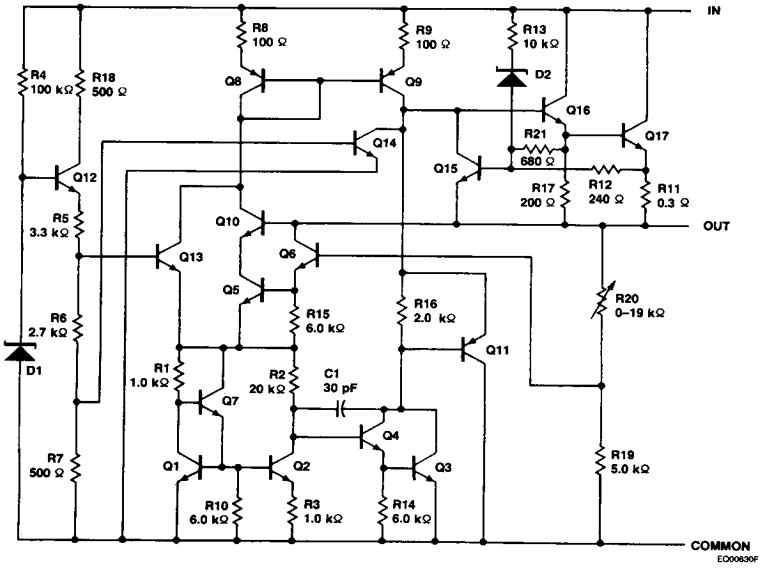


Lead 3 connected to case.

Order Information

Device Code	Package Code	Package Description
μA7805UC	GH	Molded Power Pack
μA7806UC	GH	Molded Power Pack
μA7808UC	GH	Molded Power Pack
μA7812UC	GH	Molded Power Pack
μA7815UC	GH	Molded Power Pack
μA7818UC	GH	Molded Power Pack
μA7824UC	GH	Molded Power Pack
μA7885UC	GH	Molded Power Pack
μA7805UC2	GH	Molded Power Pack
μA7812UC2	GH	Molded Power Pack

Equivalent Circuit



μA7805

Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 10$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		4.8	5.0	5.2	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	7.0 V $\leq V_I \leq$ 25 V		3.0	50	mV
				8.0 V $\leq V_I \leq$ 12 V		1.0	25	
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	5.0 mA $\leq I_O \leq$ 1.5 A		15	100	mV
				250 mA $\leq I_O \leq$ 750 mA		5.0	25	
V_O	Output Voltage		8.0 V $\leq V_I \leq$ 20 V 5.0 mA $\leq I_O \leq$ 1.0 A P $\leq$ 15 W		4.65		5.35	V
I_Q	Quiescent Current		$T_J = 25°C$			4.2	6.0	mA
ΔI_Q	Quiescent Current Change	with line	8.0 V $\leq V_I \leq$ 25 V				0.8	mA
		with load	5.0 mA $\leq I_O \leq$ 1.0 A				0.5	
N_O	Noise		$T_A = 25°C$, 10 Hz $\leq f \leq$ 100 kHz			8.0	40	μV/V_O
$\Delta V_I/\Delta V_O$	Ripple Rejection		f = 2400 Hz, I_O = 350 mA, $T_J = 25°C$		68	78		dB
V_{DO}	Dropout Voltage		I_O = 1.0 A, $T_J = 25°C$			2.0	2.5	V
R_O	Output Resistance		f = 1.0 kHz			17		mΩ

μA7805 (Cont.)
Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 10$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic	Condition[1]		Min	Typ	Max	Unit
I_{OS}	Output Short Circuit Current	$T_J = 25°C$, $V_I = 35$ V			0.75	1.2	A
I_{pk}	Peak Output Current	$T_J = 25°C$		1.3	2.2	3.3	A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage	$I_O = 5.0$ mA	$-55°C \leq T_A \leq +25°C$			0.4	mV/°C/ V_O
			$+25°C \leq T_A \leq +125°C$			0.3	

μA7805C
Electrical Characteristics $0°C \leq T_A \leq 125°C$, $V_I = 10$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		4.8	5.0	5.2	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	$7.0\ V \leq V_I \leq 25$ V		3.0	100	mV
				$8.0\ V \leq V_I \leq 12$ V		1.0	50	
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	$5.0\ mA \leq I_O \leq 1.5$ A		15	100	mV
				$250\ mA \leq I_O \leq 750$ mA		5.0	50	
V_O	Output Voltage		$7.0\ V \leq V_I \leq 20$ V $5.0\ mA \leq I_O \leq 1.0$ A $P \leq 15$ W		4.75		5.25	V
I_Q	Quiescent Current		$T_J = 25°C$			4.2	8.0	mA
ΔI_Q	Quiescent Current Change	with line	$7.0\ V \leq V_I \leq 25$ V				1.3	mA
		with load	$5.0\ mA \leq I_O \leq 1.0$ A				0.5	
N_O	Noise		$T_A = 25°C$, $10\ Hz \leq f \leq 100$ kHz			40		μV
$\Delta V_I/\Delta V_O$	Ripple Rejection		$f = 2400$ Hz, $I_O = 350$ mA, $T_J = 25°C$		62	78		dB
V_{DO}	Dropout Voltage		$I_O = 1.0$ A, $T_J = 25°C$			2.0		V
R_O	Output Resistance		$f = 1.0$ kHz			17		mΩ
I_{OS}	Output Short Circuit Current		$T_J = 25°C$, $V_I = 35$ V			750		mA
I_{pk}	Peak Output Current		$T_J = 25°C$			2.2		A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage		$I_O = 5.0$ mA, $0°C \leq T_A \leq 125°C$			1.1		mV/°C

μA7806C

Electrical Characteristics $0°C \leq T_A \leq 125°C$, $V_I = 11$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		5.75	6.0	6.25	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	8.0 V $\leq V_I \leq$ 25 V		5.0	120	mV
				9.0 V $\leq V_I \leq$ 13 V		1.5	60	
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	5.0 mA $\leq I_O \leq$ 1.5 A		14	120	mV
				250 mA $\leq I_O \leq$ 750 mA		4.0	60	
V_O	Output Voltage		8.0 V $\leq V_I \leq$ 21 V 5.0 mA $\leq I_O \leq$ 1.0 A P $\leq$ 15 W		5.7		6.3	V
I_Q	Quiescent Current		$T_J = 25°C$			4.3	8.0	mA
ΔI_Q	Quiescent Current Change	with line	8.0 V $\leq V_I \leq$ 25 V				1.3	mA
		with load	5.0 mA $\leq I_O \leq$ 1.0 A				0.5	
N_O	Noise		$T_A = 25°C$, 10 Hz $\leq f \leq$ 100 kHz			45		μV
$\Delta V_I/\Delta V_O$	Ripple Rejection		f = 2400 Hz, I_O = 350 mA, $T_J = 25°C$		59	75		dB
V_{DO}	Dropout Voltage		I_O = 1.0 A, $T_J = 25°C$			2.0		V
R_O	Output Resistance		f = 1.0 kHz			19		mΩ
I_{OS}	Output Short Circuit Current		$T_J = 25°C$, V_I = 35 V			550		mA
I_{pk}	Peak Output Current		$T_J = 25°C$			2.2		A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage		I_O = 5.0 mA, $0°C \leq T_A \leq +125°C$			0.8		mV/°C

μA7808

Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 14$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		7.7	8.0	8.3	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	10.5 V $\leq V_I \leq$ 25 V		6.0	80	mV
				11 V $\leq V_I \leq$ 17 V		2.0	40	
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	5.0 mA $\leq I_O \leq$ 1.5 A		12	100	mV
				250 mA $\leq I_O \leq$ 750 mA		4.0	40	
V_O	Output Voltage		11.5 V $\leq V_I \leq$ 23 V 5.0 mA $\leq I_O \leq$ 1.0 A P $\leq$ 15 W		7.6		8.4	V
I_Q	Quiescent Current		$T_J = 25°C$			4.3	6.0	mA
ΔI_Q	Quiescent Current Change	with line	11.5 V $\leq V_I \leq$ 25 V				0.8	mA
		with load	5.0 mA $\leq I_O \leq$ 1.0 A				0.5	

μA7808 (Cont.)
Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 14$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic	Condition[1]		Min	Typ	Max	Unit
N_O	Noise	$T_A = 25°C$, 10 Hz ≤ f ≤ 100 kHz			8.0	40	μV/V_O
$\Delta V_I/\Delta V_O$	Ripple Rejection	f = 2400 Hz, I_O = 350 mA, $T_J = 25°C$		62	72		dB
V_{DO}	Dropout Voltage	I_O = 1.0 A, $T_J = 25°C$			2.0	2.5	V
R_O	Output Resistance	f = 1.0 kHz			16		mΩ
I_{OS}	Output Short Circuit Current	$T_J = 25°C$, V_I = 35 V			0.75	1.2	A
I_{pk}	Peak Output Current	$T_J = 25°C$		1.3	2.2	3.3	A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage	I_O = 5.0 mA	$-55°C \leq T_A \leq +25°C$			0.4	mV/°C/ V_O
			$+25°C \leq T_A \leq +125°C$			0.3	

μA7808C
Electrical Characteristics $0°C \leq T_A \leq 125°C$, $V_I = 14$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		7.7	8.0	8.3	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	10.5 V ≤ V_I ≤ 25 V		6.0	160	mV
				11 V ≤ V_I ≤ 17 V		2.0	80	
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	5.0 mA ≤ I_O ≤ 1.5 A		12	160	mV
				250 mA ≤ I_O ≤ 750 mA		4.0	80	
V_O	Output Voltage		10.5 V ≤ V_I ≤ 23 V 5.0 mA ≤ I_O ≤ 1.0 A P ≤ 15 W		7.6		8.4	V
I_Q	Quiescent Current		$T_J = 25°C$			4.3	8.0	mA
ΔI_Q	Quiescent Current Change	with line	10.5 V ≤ V_I ≤ 25 V				1.0	mA
		with load	5.0 mA ≤ I_O ≤ 1.0 A				0.5	
N_O	Noise		$T_A = 25°C$, 10 Hz ≤ f ≤ 100 kHz			52		μV
$\Delta V_I/\Delta V_O$	Ripple Rejection		f = 2400 Hz, I_O = 350 mA, $T_J = 25°C$		56	72		dB
V_{DO}	Dropout Voltage		I_O = 1.0 A, $T_J = 25°C$			2.0		V
R_O	Output Resistance		f = 1.0 kHz			16		mΩ
I_{OS}	Output Short Circuit Current		$T_J = 25°C$, V_I = 35 V			450		mA
I_{pk}	Peak Output Current		$T_J = 25°C$			2.2		A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage		I_O = 5.0 mA			0.8		mV/°C

μA7885C

Electrical Characteristics $0°C \leq T_A \leq 125°C$, $V_I = 15$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		8.15	8.5	8.85	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	$10.5\ V \leq V_I \leq 25\ V$		6.0	170	mV
				$11\ V \leq V_I \leq 17\ V$		2.0	85	mV
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	$5.0\ mA \leq I_O \leq 1.5\ A$		12	170	mV
				$250\ mA \leq I_O \leq 750\ mA$		4.0	85	mV
V_O	Output Voltage		$11\ V \leq V_I \leq 23.5\ V$ $5.0\ mA \leq I_O \leq 1.0\ A$ $P \leq 15\ W$		8.1		8.9	V
I_Q	Quiescent Current		$T_J = 25°C$			4.3	8.0	mA
ΔI_Q	Quiescent Current Change	with line	$10.5\ V \leq V_I \leq 25\ V$				1.0	mA
		with load	$5.0\ mA \leq I_O \leq 1.0\ A$				0.5	mA
N_O	Noise		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			55		μV
$\Delta V_I/\Delta V_O$	Ripple Rejection		$f = 2400\ Hz$, $I_O = 350\ mA$, $T_J = 25°C$		56	70		dB
V_{DO}	Dropout Voltage		$I_O = 1.0\ A$, $T_J = 25°C$			2.0		V
R_O	Output Resistance		$f = 1.0\ kHz$			16		mΩ
I_{OS}	Output Short Circuit Current		$T_J = 25°C$, $V_I = 35\ V$			450		mA
I_{pk}	Peak Output Current		$T_J = 25°C$			2.2		A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage		$I_O = 5.0\ mA$			0.8		mV/°C

μA7812

Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 19$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		11.5	12.0	12.5	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	$14.5\ V \leq V_I \leq 30\ V$		10	120	mV
				$16\ V \leq V_I \leq 22\ V$		3.0	60	
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	$5.0\ mA \leq I_O \leq 1.5\ A$		12	120	mV
				$250\ mA \leq I_O \leq 750\ mA$		4.0	60	
V_O	Output Voltage		$15.5\ V \leq V_I \leq 27\ V$ $5.0\ mA \leq I_O \leq 1.0\ A$ $P \leq 15\ W$		11.4		12.6	V
I_Q	Quiescent Current		$T_J = 25°C$			4.3	6.0	mA
ΔI_Q	Quiescent Current Change	with line	$15\ V \leq V_I \leq 30\ V$				0.8	mA
		with load	$5.0\ mA \leq I_O \leq 1.0\ A$				0.5	

μA7812 (Cont.)
Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 19$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic	Condition[1]		Min	Typ	Max	Unit
N_O	Noise	$T_A = 25°C$, 10 Hz ≤ f ≤ 100 kHz			8.0	40	μV/V_O
$\Delta V_I/\Delta V_O$	Ripple Rejection	f = 2400 Hz, I_O = 350 mA, $T_J = 25°C$		61	71		dB
V_{DO}	Dropout Voltage	I_O = 1.0 A, $T_J = 25°C$			2.0	2.5	V
R_O	Output Resistance	f = 1.0 kHz			18		mΩ
I_{OS}	Output Short Circuit Current	$T_J = 25°C$, V_I = 35 V			0.75	1.2	A
I_{pk}	Peak Output Current	$T_J = 25°C$		1.3	2.2	3.3	A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage	I_O = 5.0 mA	$-55°C \leq T_A \leq +25°C$			0.4	mV/°C/ V_O
			$+25°C \leq T_A \leq +125°C$			0.3	

μA7812C
Electrical Characteristics $0°C \leq T_A \leq 125°C$, $V_I = 19$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		11.5	12.0	12.5	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	14.5 V ≤ V_I ≤ 30 V		10	240	mV
				16 V ≤ V_I ≤ 22 V		3.0	120	mV
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	5.0 mA ≤ I_O ≤ 1.5 A		12	240	mV
				250 mA ≤ I_O ≤ 750 mA		4.0	120	mV
V_O	Output Voltage		14.5 V ≤ V_I ≤ 27 V 5.0 mA ≤ I_O ≤ 1.0 A P ≤ 15 W		11.4		12.6	V
I_Q	Quiescent Current		$T_J = 25°C$			4.3	8.0	mA
ΔI_Q	Quiescent Current Change	with line	14.5 V ≤ V_I ≤ 30 V				1.0	mA
		with load	5.0 mA ≤ I_O ≤ 1.0 A				0.5	mA
N_O	Noise		$T_A = 25°C$, 10 Hz ≤ f ≤ 100 kHz			75		μV
$\Delta V_I/\Delta V_O$	Ripple Rejection		f = 2400 Hz, I_O = 350 mA, $T_J = 25°C$		55	71		dB
V_{DO}	Dropout Voltage		I_O = 1.0 A, $T_J = 25°C$			2.0		V
R_O	Output Resistance		f = 1.0 kHz			18		mΩ
I_{OS}	Output Short Circuit Current		$T_J = 25°C$, V_I = 35 V			350		mA
I_{pk}	Peak Output Current		$T_J = 25°C$			2.2		A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage		I_O = 5.0 mA			1.0		mV/°C

μA7815

Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 23$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		14.4	15.0	15.6	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	$17.5\ V \leq V_I \leq 30\ V$		11	150	mV
				$20\ V \leq V_I \leq 26\ V$		3.0	75	mV
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	$5.0\ mA \leq I_O \leq 1.5\ A$		12	150	mV
				$250\ mA \leq I_O \leq 750\ mA$		4.0	75	mV
V_O	Output Voltage		$18.5\ V \leq V_I \leq 30\ V$ $5.0\ mA \leq I_O \leq 1.0\ A$ $P \leq 15\ W$		14.25		15.75	V
I_Q	Quiescent Current		$T_J = 25°C$			4.4	6.0	mA
ΔI_Q	Quiescent Current Change	with line	$18.5\ V \leq V_I \leq 30\ V$				0.8	mA
		with load	$5.0\ mA \leq I_O \leq 1.0\ A$				0.5	mA
N_O	Noise		$T_A = 25°C$, $10\ Hz \leq f \leq 100\ kHz$			8.0	40	$\mu V/V_O$
$\Delta V_I/\Delta V_O$	Ripple Rejection		$f = 2400\ Hz$, $I_O = 350\ mA$, $T_J = 25°C$		60	70		dB
V_{DO}	Dropout Voltage		$I_O = 1.0\ A$, $T_J = 25°C$			2.0	2.5	V
R_O	Output Resistance		$f = 1.0\ kHz$			19		mΩ
I_{OS}	Output Short Circuit Current		$T_J = 25°C$, $V_I = 35\ V$			0.75		A
I_{pk}	Peak Output Current		$T_J = 25°C$		1.3	2.2	3.3	A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage		$I_O = 5.0\ mA$	$-55°C \leq T_A \leq +25°C$			0.4	mV/°C/V_O
				$+25°C \leq T_A \leq +125°C$			0.3	

μA7815C

Electrical Characteristics $0°C \leq T_A \leq 125°C$, $V_I = 23$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		14.4	15.0	15.6	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	$17.5\ V \leq V_I \leq 30\ V$		11	300	mV
				$20\ V \leq V_I \leq 26\ V$		3.0	150	mV
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	$5.0\ mA \leq I_O \leq 1.5\ A$		12	300	mV
				$250\ mA \leq I_O \leq 750\ mA$		4.0	150	mV
V_O	Output Voltage		$17.5\ V \leq V_I \leq 30\ V$ $5.0\ mA \leq I_O \leq 1.0\ A$ $P \leq 15\ W$		14.25		15.75	V
I_Q	Quiescent Current		$T_J = 25°C$			4.4	8.0	mA
ΔI_Q	Quiescent Current Change	with line	$17.5\ V \leq V_I \leq 30\ V$				1.0	mA
		with load	$5.0\ mA \leq I_O \leq 1.0\ A$				0.5	mA

μA7815C (Cont.)
Electrical Characteristics $0°C \leq T_A \leq 125°C$, $V_I = 23$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic	Condition[1]	Min	Typ	Max	Unit
N_O	Noise	$T_A = 25°C$, 10 Hz ≤ f ≤ 100 kHz		90		μV
$\Delta V_I/\Delta V_O$	Ripple Rejection	f = 2400 Hz, $I_O = 350$ mA, $T_J = 25°C$	54	70		dB
V_{DO}	Dropout Voltage	$I_O = 1.0$ A, $T_J = 25°C$		2.0		V
R_O	Output Resistance	f = 1.0 kHz		19		mΩ
I_{OS}	Output Short Circuit Current	$T_J = 25°C$, $V_I = 35$ V		230		A
I_{pk}	Peak Output Current	$T_J = 25°C$		2.1		A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage	$I_O = 5.0$ mA		1.0		mV/°C

μA7818
Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 27$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		17.3	18.0	18.7	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	21 V ≤ V_I ≤ 33 V		15	180	mV
				24 V ≤ V_I ≤ 30 V		5.0	90	mV
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	5.0 mA ≤ I_O ≤ 1.5 A		12	180	mV
				250 mA ≤ I_O ≤ 750 mA		4.0	90	mV
V_O	Output Voltage		22 V ≤ V_I ≤ 33 V 5.0 mA ≤ I_O ≤ 1.0 A P ≤ 15 W		17.1		18.9	V
I_Q	Quiescent Current		$T_J = 25°C$			4.5	6.0	mA
ΔI_Q	Quiescent Current Change	with line	22 V ≤ V_I ≤ 33 V				0.8	mA
		with load	5.0 mA ≤ I_O ≤ 1.0 A				0.5	mA
N_O	Noise		$T_A = 25°C$, 10 Hz ≤ f ≤ 100 kHz			8.0	40	μV/V_O
$\Delta V_I/\Delta V_O$	Ripple Rejection		f = 2400 Hz, $I_O = 350$ mA, $T_J = 25°C$		59	69		dB
V_{DO}	Dropout Voltage		$I_O = 1.0$ A, $T_J = 25°C$			2.0		V
R_O	Output Resistance		f = 1.0 kHz			22		mΩ
I_{OS}	Output Short Circuit Current		$T_J = 25°C$, $V_I = 35$ V			0.75		A
I_{pk}	Peak Output Current		$T_J = 25°C$		1.3	2.2	3.3	A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage		$I_O = 5.0$ mA	−55°C ≤ T_A ≤ +25°C			0.4	mV/°C/V_O
				+25°C ≤ T_A ≤ +125°C			0.3	

μA7818C

Electrical Characteristics $0°C \leq T_A \leq 125°C$, $V_I = 27$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		17.3	18.0	18.7	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	21 V $\leq V_I \leq$ 33 V		15	360	mV
				24 V $\leq V_I \leq$ 30 V		5.0	180	mV
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	5.0 mA $\leq I_O \leq$ 1.5 A		12	360	mV
				250 mA $\leq I_O \leq$ 750 mA		4.0	180	mV
V_O	Output Voltage		21 V $\leq V_I \leq$ 33 V 5.0 mA $\leq I_O \leq$ 1.0 A P $\leq$ 15 W		17.1		18.9	V
I_Q	Quiescent Current		$T_J = 25°C$			4.5	8.0	mA
ΔI_Q	Quiescent Current Change	with line	21 V $\leq V_I \leq$ 33 V				1.0	mA
		with load	5.0 mA $\leq I_O \leq$ 1.0 A				0.5	mA
N_O	Noise		$T_A = 25°C$, 10 Hz $\leq f \leq$ 100 kHz			110		μV
$\Delta V_I/\Delta V_O$	Ripple Rejection		f = 2400 Hz, I_O = 350 mA, $T_J = 25°C$		53	69		dB
V_{DO}	Dropout Voltage		I_O = 1.0 A, $T_J = 25°C$			2.0		V
R_O	Output Resistance		f = 1.0 kHz			22		mΩ
I_{OS}	Output Short Circuit Current		$T_J = 25°C$, V_I = 35 V			200		mA
I_{pk}	Peak Output Current		$T_J = 25°C$			2.1		A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage		I_O = 5.0 mA			1.0		mV/°C

μA7824

Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 33$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		23.0	24.0	25.0	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	27 V $\leq V_I \leq$ 38 V		18	240	mV
				30 V $\leq V_I \leq$ 36 V		6.0	120	mV
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	5.0 mA $\leq I_O \leq$ 1.5 A		12	240	mV
				250 mA $\leq I_O \leq$ 750 mA		4.0	120	mV
V_O	Output Voltage		28 V $\leq V_I \leq$ 38 V 5.0 mA $\leq I_O \leq$ 1.0 A P $\leq$ 15 W		22.8		25.2	V
I_Q	Quiescent Current		$T_J = 25°C$			4.6	6.0	mA
ΔI_Q	Quiescent Current Change	with line	28 V $\leq V_I \leq$ 38 V				0.8	mA
		with load	5.0 mA $\leq I_O \leq$ 1.0 A				0.5	mA

μA7824 (Cont.)
Electrical Characteristics $-55°C \leq T_A \leq 125°C$, $V_I = 33$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic	Condition[1]		Min	Typ	Max	Unit
N_O	Noise	$T_A = 25°C$, 10 Hz $\leq f \leq$ 100 kHz			8.0	40	μV/V_O
$\Delta V_I/\Delta V_O$	Ripple Rejection	f = 2400 Hz, I_O = 350 mA, $T_J = 25°C$		56	66		dB
V_{DO}	Dropout Voltage	I_O = 1.0 A, $T_J = 25°C$			2.0	2.5	V
R_O	Output Resistance	f = 1.0 kHz			28		mΩ
I_{OS}	Output Short Circuit Current	$T_J = 25°C$, V_I = 35 V			0.75	1.2	A
I_{pk}	Peak Output Current	$T_J = 25°C$		1.3	2.2	3.3	A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage	I_O = 5.0 mA	$-55°C \leq T_A \leq +25°C$			0.4	mV/°C/ V_O
			$+25°C \leq T_A \leq +125°C$			0.3	

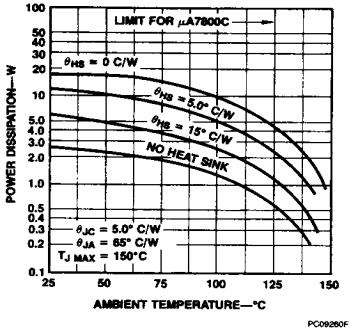
μA7824C
Electrical Characteristics $0°C \leq T_A \leq 125°C$, $V_I = 33$ V, $I_O = 500$ mA, $C_I = 0.33$ μF, $C_O = 0.1$ μF, unless otherwise specified.

Symbol	Characteristic		Condition[1]		Min	Typ	Max	Unit
V_O	Output Voltage		$T_J = 25°C$		23.0	24.0	25.0	V
$V_{R\ LINE}$	Line Regulation		$T_J = 25°C$	27 V $\leq V_I \leq$ 38 V		18	480	mV
				30 V $\leq V_I \leq$ 36 V		6.0	240	mV
$V_{R\ LOAD}$	Load Regulation		$T_J = 25°C$	5.0 mA $\leq I_O \leq$ 1.5 A		12	480	mV
				250 mA $\leq I_O \leq$ 750 mA		4.0	240	mV
V_O	Output Voltage		27 V $\leq V_I \leq$ 38 V, 5.0 mA $\leq I_O \leq$ 1.0 A, P $\leq$ 15 W		22.8		25.2	V
I_Q	Quiescent Current		$T_J = 25°C$			4.6	8.0	mA
ΔI_Q	Quiescent Current Change	with line	27 V $\leq V_I \leq$ 38 V				1.0	mA
		with load	5.0 mA $\leq I_O \leq$ 1.0 A				0.5	mA
N_O	Noise		$T_A = 25°C$, 10 Hz $\leq f \leq$ 100 kHz			170		μV
$\Delta V_I/\Delta V_O$	Ripple Rejection		f = 2400 Hz, I_O = 350 mA, $T_J = 25°C$		50	66		dB
V_{DO}	Dropout Voltage		I_O = 1.0 A, $T_J = 25°C$			2.0		V
R_O	Output Resistance		f = 1.0 kHz			28		mΩ
I_{OS}	Output Short Circuit Current		$T_J = 25°C$, V_I = 35 V			150		mA
I_{pk}	Peak Output Current		$T_J = 25°C$			2.1		A
$\Delta V_O/\Delta T$	Average Temperature Coefficient of Output Voltage		I_O = 5.0 mA			1.5		mV/°C

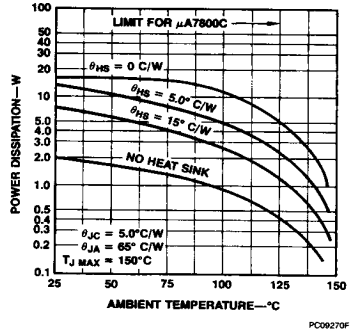
Note
1. For all tables, all characteristics except noise voltage and ripple rejection ratio are measured using pulse techniques ($t_W \leq 10$ ms, duty cycle $\leq 5\%$). Output voltage changes due to changes in internal temperature must be taken into account separately.

Typical Performance Curves

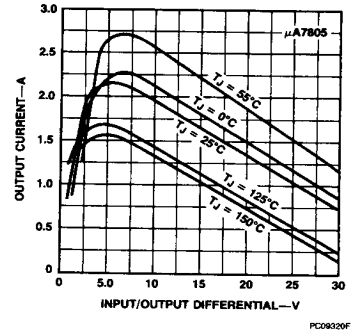
Worst Case Power Dissipation vs Ambient Temperature (TO-3)



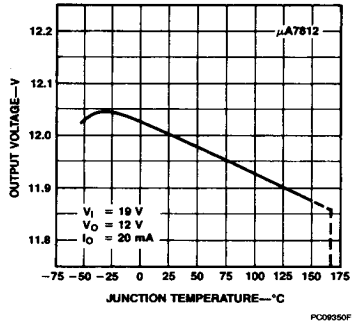
Worst Case Power Dissipation vs Ambient Temperature (TO-220)



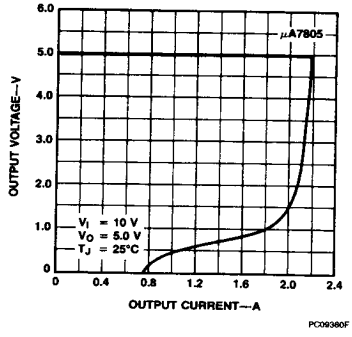
Peak Output Current vs Input/Output Voltage Differential



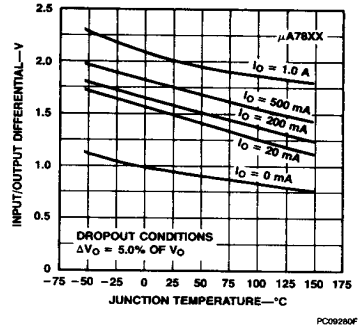
Output Voltage vs Junction Temperature



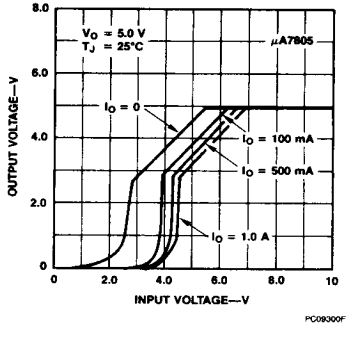
Current-Limiting Characteristics



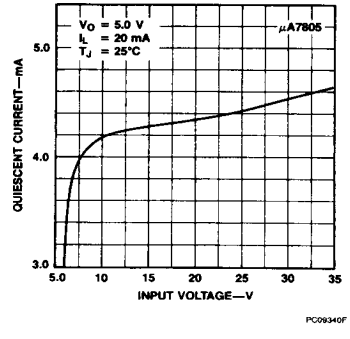
Dropout Voltage vs Junction Temperature



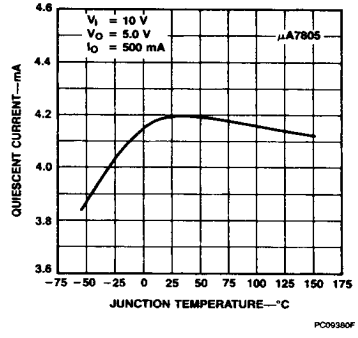
Dropout Characteristics



Quiescent Current vs Input Voltage

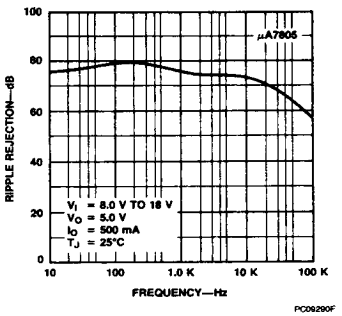


Quiescent Current vs Junction Temperature

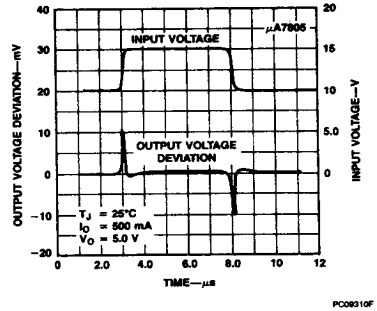


Typical Performance Curves (Cont.)

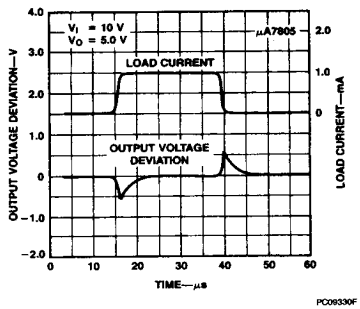
Ripple Rejection vs Frequency



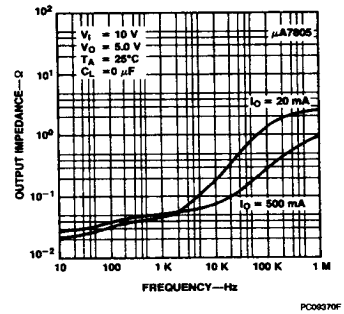
Line Transient Response



Load Transient Response

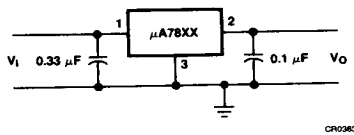


Output Impedance vs Frequency



Note
The other μA7800 series devices have similar curves.

DC Parameter Test Circuit



Design Considerations

The μA7800 fixed voltage regulator series has thermal overload protection from excessive power dissipation, internal short circuit protection which limits the regulator's maximum current, and output transistor safe-area compensation for reducing the output current as the voltage across the pass transistor is increased.

Although the internal power dissipation is limited, the junction temperature must be kept below the maximum specified temperature (150°C for μA7800, 125°C for μA7800C) 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:

Package	Typ θ_{JC} °C/W	Max θ_{JC} °C/W	Typ θ_{JA} °C/W	Max θ_{JA} °C/W
TO-3	3.5	5.5	35	40
TO-220	3.0	5.0	40	60

$$P_{D\ Max} = \frac{T_{J\ Max} - T_A}{\theta_{JC} + \theta_{CA}} \text{ or}$$

$$= \frac{T_{J\ Max} T_A}{\theta_{JA}} \text{ (Without heat sink)}$$

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

Solving for T_J:

$T_J = T_A + P_D(\theta_{JC} + \theta_{CA})$ or

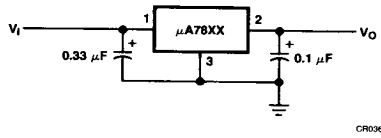
$= T_A + P_D\theta_{JA}$ (Without heat sink)

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 to thermal resistance
θ_{SA} = Heat sink-to-ambient thermal resistance
θ_{JA} = Junction-to-ambient thermal resistance

Typical Applications

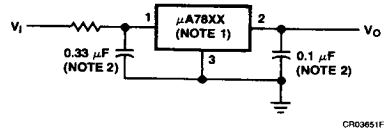
Fixed Output Regulator

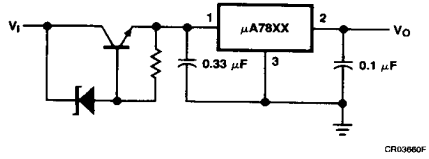


Notes

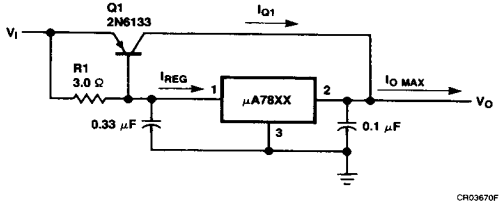
1. To specify an output voltage, substitute voltage value for "XX."
2. Bypass capacitors are recommended for optimum stability and transient response, and should be located as close as possible to the regulator.

High Input Voltage Circuits





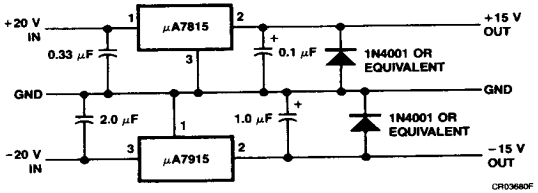
High Current Voltage Regulator



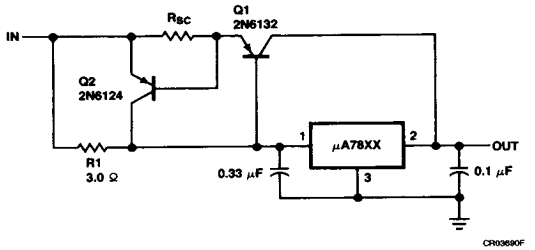
$$\beta(Q1) \geq \frac{I_{O\ Max}}{I_{REG\ Max}}$$

$$R1 = \frac{0.9}{I_{REG}} = \frac{\beta(Q1)V_{BE(Q1)}}{I_{REG\ Max}\ (\beta + 1) - I_{O\ Max}}$$

Dual Supply Operational Amplifier Supply
(±15 V@1.0 A)



High Output Current, Short Circuit Protected



$$R_{SC} = \frac{0.8}{I_{SC}}$$

$$R1 = \frac{\beta V_{BE(Q1)}}{I_{REG\ Max}\ (\beta + 1) - I_{O\ Max}}$$

Positive and Negative Regulator