

DATA SHEET

16 JUNE 2003

No. 00011
REV 1-03

MIK78XX series • 1A POSITIVE-VOLTAGE REGULATORS



MIK78xx series

POSITIVE-VOLTAGE REGULATORS

REPLACEMENT of:

μA78xx
KA78xx
LM78xx
MC78xx

CONTENTS	Page	CONTENTS	Page
GENERAL DESCRIPTION	1	MIK 7818	7
FEATURES	1	MIK 7824	7
INTERNAL BLOCK DIAGRAM	2	TYPICAL APPLICATIONS	8
PIN DESCRIPTION	2	FIXED-OUTPUT REGULATOR	8
ABSOLUTE MAXIMUM RATINGS	2	POSITIVE REGULATOR IN NEGATIVE CONFIGURATION	8
FREE-AIR TEMPERATURE DISSIPATION DERATING CURVE	2	ADJUSTABLE-OUTPUT REGULATOR	8
CASE TEMPERATURE DISSIPATION DERATING CURVE	2	CURRENT REGULATOR	8
RECOMMENDED OPERATING CONDITIONS	3	REGULATED DUAL SUPPLY	8
ELECTRICAL CHARACTERISTICS	3	OUTPUT POLARITY-REVERSAL-PROTECTION CIRCUIT	8
MIK 7805	3	REVERSE-BIAS-PROTECTION CIRCUIT	8
MIK 7806	4	PHYSICAL DIMENSIONS AND MARKING DIAGRAMS	9
MIK 7808	4	TO-220-3	9
MIK 7809	5	TO-263-3	9
MIK 7810	5	ORDERING INFORMATION	10
MIK 7812	6		
MIK 7815	6		

GENERAL DESCRIPTION

This series of fixed-voltage monolithic integrated-circuit voltage regulators is designed for a wide range of applications. These applications include on-card regulation for elimination of noise and distribution problems associated with single-point regulation. In addition, they can be used with power-pass elements to make high-current voltage regulators. Each of these regulators can deliver up to 1.5 A of output current. The internal limiting and thermal shutdown features of these regulators make them essentially immune to overload.

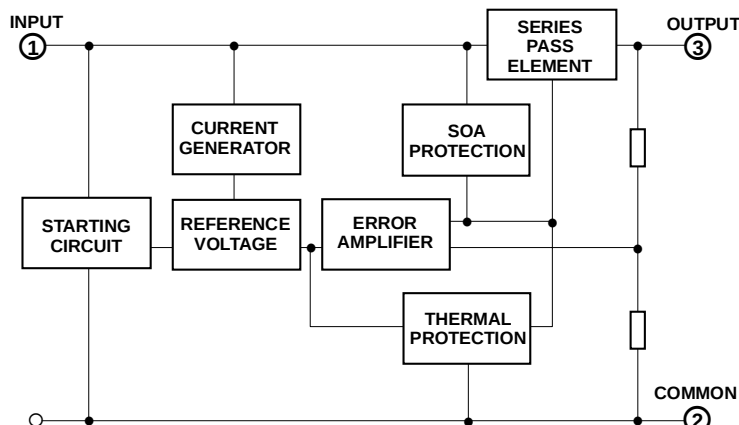
FEATURES

- 3-Terminal Regulators
- Output Current Up to 1.5 A
- No External Components
- Internal Thermal Overload Protection
- High Power Dissipation Capability
- Internal Short-Circuit Current Limiting
- Output Transistor Safe-Area Compensation

MIKRON JSC • <http://www.mikron.ru> • 16 JUNE 2003



INTERNAL BLOCK DIAGRAM



PIN DESCRIPTION

MIK78-xxCT		
TO-220-3		
	1 – INPUT 2 – COMMON 3 – OUTPUT	TAB – COMMON
MIK78-xxCD2T		
TO-263-3		
	1 – INPUT 2 – COMMON 3 – OUTPUT	TAB – COMMON

ABSOLUTE MAXIMUM RATINGS

Over operating free-air temperature range, unless otherwise noted.

SYMBOL	PARAMETER		MAXIMUM	UNIT
V _{IN}	Input voltage	MIK7824	40	V
		All others	35	
P _D	Continuous total dissipation at 25 °C free-air temperature		2	W
P _D	Continuous total dissipation at (or below) 25 °C case temperature		15	
T _A	Operating free-air temperature range		0 to 150	°C
T _C	Operating case temperature range			
T _J	Operating virtual junctions temperature range			
T _{STG}	Storage temperature range		-65 to 150	
T _L	Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds		260	

NOTE:

Stresses above those listed under «Absolute Maximum Ratings» may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions above those indicated in the operation sections of the specifications is not implied.

Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

NOTE: For operation above 25°C free-air or 90°C case temperature, refer to Figures 1 and 2. To avoid exceeding the design maximum virtual junction temperature, these ratings should not be exceeded. The built-in thermal overload protection may be activated at power levels slightly above or below the rated dissipation.

FREE-AIR TEMPERATURE DISSIPATION DERATING CURVE

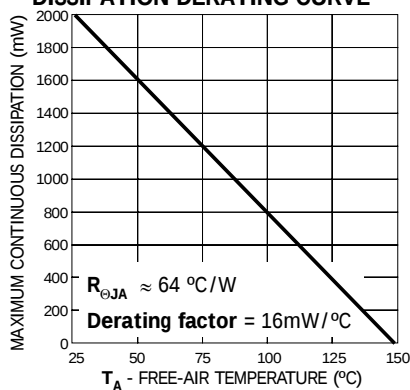


Fig. 1

CASE TEMPERATURE DISSIPATION DERATING CURVE

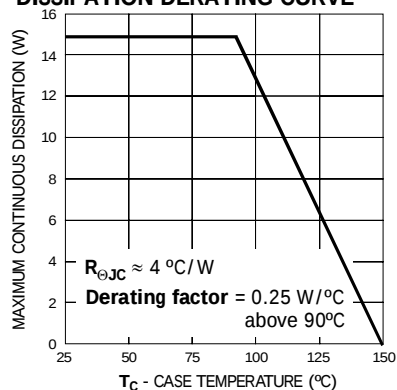


Fig. 2



RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{IN}	Input voltage	MIK7805	7.0	25.0
		MIK7806	8.0	25.0
		MIK7808	10.5	25.0
		MIK7809	11.5	27.0
		MIK7810	12.5	28.0
		MIK7812	14.5	30.0
		MIK7815	17.5	30.0
		MIK7818	21.0	33.0
		MIK7824	27.0	38.0
				V
I_{OUT}	Output current		1.5	A
T_J	Operating virtual junction temperature	0	125	°C

ELECTRICAL CHARACTERISTICS

MIK7805

Electrical characteristics at specified virtual junction temperature, $V_{IN} = 10V$, $I_{OUT} = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN	TYP	MAX	UNIT
Output voltage**	25°C	4.8	5	5.2	V
	$I_{OUT} = 5mA$ to 1A, $V_{IN} = 7V$ to 20V, $P \leq 15W$	4.75	5	5.25	
Input regulation	$V_{IN} = 7V$ to 25V		3	100	mV
	$V_{IN} = 8V$ to 12V		1	50	
Ripple rejection	$V_{IN} = 8V$ to 18V, $f = 120Hz$	0°C to 125°C	62	78	dB
Output regulation	$I_{OUT} = 5mA$ to 1.5A	25°C	15	100	mV
	$I_{OUT} = 250mA$ to 750mA		5	50	
Output resistance	$f = 1KHz$	0°C to 125°C	0.017		Ω
Temperature coefficient of output voltage	$I_{OUT} = 5mA$	0°C to 125°C	-1.1		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz	25°C	40		μV
Dropout voltage	$I_{OUT} = 1A$	25°C	2.0		V
Bias current		25°C	4.2	8	mA
Bias current change	$V_{IN} = 7V$ to 25V	0°C to 125°C		1.3	
	$I_{OUT} = 5mA$ to 1A			0.5	
Short-circuit output current		25°C	750		
Peak output current		25°C	2.2		A

* Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.



ELECTRICAL CHARACTERISTICS

MIK7806

Electrical characteristics at specified virtual junction temperature, $V_{IN} = 11V$, $I_{OUT} = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN	TYP	MAX	UNIT
Output voltage**	25°C	5.75	6	6.25	V
	$I_{OUT} = 5mA$ to 1A, $V_{IN} = 8V$ to 21V, $P \leq 15W$	5.7	6	6.3	
Input regulation	$V_{IN} = 8V$ to 25V		5	120	mV
	$V_{IN} = 9V$ to 13V		1.5	60	
Ripple rejection	$V_{IN} = 9V$ to 19V, $f = 120Hz$	0°C to 125°C	59	75	dB
Output regulation	$I_{OUT} = 5mA$ to 1.5A	25°C	14	120	mV
	$I_{OUT} = 250mA$ to 750mA		4	60	
Output resistance	$f = 1KHz$	0°C to 125°C	0.019		Ω
Temperature coefficient of output voltage	$I_{OUT} = 5mA$	0°C to 125°C	-0.8		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz	25°C	45		μV
Dropout voltage	$I_{OUT} = 1A$	25°C	2.0		V
Bias current		25°C	4.3	8	mA
Bias current change	$V_{IN} = 8V$ to 25V	0°C to 125°C		1.3	
	$I_{OUT} = 5mA$ to 1A			0.5	
Short-circuit output current		25°C	550		
Peak output current		25°C	2.2		A

ELECTRICAL CHARACTERISTICS

MIK7808

Electrical characteristics at specified virtual junction temperature, $V_{IN} = 14V$, $I_{OUT} = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN	TYP	MAX	UNIT
Output voltage**	25°C	7.7	8	8.3	V
	$I_{OUT} = 5mA$ to 1A, $V_{IN} = 10.5V$ to 23V, $P \leq 15W$	7.6	8	8.4	
Input regulation	$V_{IN} = 10.5V$ to 25V	25°C	6	160	mV
	$V_{IN} = 11V$ to 17V		2	80	
Ripple rejection	$V_{IN} = 11.5V$ to 21.5V, $f = 120Hz$	0°C to 125°C	55	72	dB
Output regulation	$I_{OUT} = 5mA$ to 1.5A	25°C	12	160	mV
	$I_{OUT} = 250mA$ to 750mA		4	80	
Output resistance	$f = 1KHz$	0°C to 125°C	0.016		Ω
Temperature coefficient of output voltage	$I_{OUT} = 5mA$	0°C to 125°C	-0.8		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz	25°C	52		μV
Dropout voltage	$I_{OUT} = 1A$	25°C	2.0		V
Bias current		25°C	4.3	8	mA
Bias current change	$V_{IN} = 10.5V$ to 25V	0°C to 125°C		1	
	$I_{OUT} = 5mA$ to 1A			0.5	
Short-circuit output current		25°C	450		
Peak output current		25°C	2.2		A

* Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.



ELECTRICAL CHARACTERISTICS

MIK7809

Electrical characteristics at specified virtual junction temperature, $V_{IN} = 16V$, $I_{OUT} = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN	TYP	MAX	UNIT
Output voltage**	25°C	8.65	9	9.35	V
	$I_{OUT} = 5mA$ to 1A, $V_{IN} = 11.5V$ to 24V, $P \leq 15W$	8.55	9	9.45	
Input regulation	$V_{IN} = 11.5V$ to 27V		7	180	mV
	$V_{IN} = 13V$ to 19V		2	90	
Ripple rejection	$V_{IN} = 12V$ to 22V, $f = 120Hz$	55	70		dB
Output regulation	$I_{OUT} = 5mA$ to 1.5A		12	180	mV
	$I_O = 250mA$ to 750mA		4	90	
Output resistance	$f = 1KHz$		0.018		Ω
Temperature coefficient of output voltage	$I_{OUT} = 5mA$		-1.0		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz		60		μV
Dropout voltage	$I_{OUT} = 1A$		2.0		V
Bias current			4.3	8	mA
Bias current change	$V_{IN} = 11.5V$ to 27V			1	
	$I_{OUT} = 5mA$ to 1A			0.5	
Short-circuit output current			400		
Peak output current			2.2		A

ELECTRICAL CHARACTERISTICS

MIK7810

Electrical characteristics at specified virtual junction temperature, $V_{IN} = 17V$, $I_{OUT} = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN	TYP	MAX	UNIT
Output voltage**	25°C	9.6	10	10.4	V
	$I_{OUT} = 5mA$ to 1A, $V_{IN} = 12.5V$ to 25V, $P \leq 15W$	9.5	10	10.5	
Input regulation	$V_{IN} = 12.5V$ to 28V		7	200	mV
	$V_{IN} = 14V$ to 20V		2	100	
Ripple rejection	$V_{IN} = 13V$ to 23V, $f = 120Hz$	55	71		dB
Output regulation	$I_{OUT} = 5mA$ to 1.5A		12	200	mV
	$I_{OUT} = 250mA$ to 750mA		4	100	
Output resistance	$f = 1KHz$		0.018		Ω
Temperature coefficient of output voltage	$I_{OUT} = 5mA$		-1.0		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz		70		μV
Dropout voltage	$I_{OUT} = 1A$		2.0		V
Bias current			4.3	8	mA
Bias current change	$V_{IN} = 12.5V$ to 28V			1	
	$I_{OUT} = 5mA$ to 1A			0.5	
Short-circuit output current			400		
Peak output current			2.2		A

* Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

**ELECTRICAL CHARACTERISTICS****MIK7812**Electrical characteristics at specified virtual junction temperature, $V_{IN}=19V$, $I_{OUT}=500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN	TYP	MAX	UNIT
Output voltage**	25°C	11.5	12	12.5	V
	$I_{OUT}=5mA$ to 1A, $V_{IN}=14.5V$ to 27V, $P \leq 15W$	11.4	12	12.6	
Input regulation	$V_{IN}=14.5V$ to 30V		10	240	mV
	$V_{IN}=16V$ to 22V		3	120	
Ripple rejection	$V_{IN}=15V$ to 25V, $f=120Hz$	55	71		dB
Output regulation	$I_{OUT}=5mA$ to 1.5A		12	240	mV
	$I_{OUT}=250mA$ to 750mA		4	120	
Output resistance	$f=1KHz$		0.018		Ω
Temperature coefficient of output voltage	$I_{OUT}=5mA$		-1.0		mV/°C
Output noise voltage	$f=10Hz$ to 100 KHz		75		μV
Dropout voltage	$I_{OUT}=1A$		2.0		V
Bias current			4.3	8	mA
Bias current change	$V_{IN}=14.5V$ to 30V			1	
	$I_{OUT}=5mA$ to 1A			0.5	
Short-circuit output current			350		
Peak output current			2.2		A

ELECTRICAL CHARACTERISTICS**MIK7815**Electrical characteristics at specified virtual junction temperature, $V_{IN}=23V$, $I_{OUT}=500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN	TYP	MAX	UNIT
Output voltage**	25°C	14.4	15	15.6	V
	$I_{OUT}=5mA$ to 1A, $V_{IN}=17.5V$ to 30V, $P \leq 15W$	14.25	15	15.75	
Input regulation	$V_{IN}=17.5V$ to 30V		12	300	mV
	$V_{IN}=20V$ to 26V		3	150	
Ripple rejection	$V_{IN}=18.5V$ to 28.5V, $f=120Hz$	54	70		dB
Output regulation	$I_{OUT}=5mA$ to 1.5A		12	300	mV
	$I_{OUT}=250mA$ to 750mA		4	150	
Output resistance	$f=1KHz$		0.019		Ω
Temperature coefficient of output voltage	$I_{OUT}=5mA$		-1.0		mV/°C
Output noise voltage	$f=10Hz$ to 100 KHz		90		μV
Dropout voltage	$I_{OUT}=1A$		2.0		V
Bias current			4.3	8	mA
Bias current change	$V_{IN}=17.5V$ to 30V			1	
	$I_{OUT}=5mA$ to 1A			0.5	
Short-circuit output current			230		
Peak output current			2.1		A

* Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.



ELECTRICAL CHARACTERISTICS

MIK7818

 Electrical characteristics at specified virtual junction temperature, $V_{IN} = 27V$, $I_{OUT} = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN	TYP	MAX	UNIT
Output voltage**	25°C	17.3	18	18.7	V
	$I_{OUT} = 5mA$ to 1A, $V_{IN} = 21V$ to 33V, $P \leq 15W$	17.1	18	18.9	
Input regulation	$V_{IN} = 21V$ to 33V		15	360	mV
	$V_{IN} = 24V$ to 30V		5	180	
Ripple rejection	$V_{IN} = 22V$ to 32V, $f = 120Hz$	53	69		dB
Output regulation	$I_{OUT} = 5mA$ to 1.5A		12	360	mV
	$I_{OUT} = 250mA$ to 750mA		4	180	
Output resistance	$f = 1KHz$		0.022		Ω
Temperature coefficient of output voltage	$I_{OUT} = 5mA$		-1.0		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz		110		μV
Dropout voltage	$I_{OUT} = 1A$		2.0		V
Bias current			4.5	8	mA
Bias current change	$V_{IN} = 21V$ to 33V			1	
	$I_{OUT} = 5mA$ to 1A			0.5	
Short-circuit output current			200		
Peak output current			2.1		A

ELECTRICAL CHARACTERISTICS

MIK7824

 Electrical characteristics at specified virtual junction temperature, $V_{IN} = 33V$, $I_{OUT} = 500mA$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN	TYP	MAX	UNIT
Output voltage**	25°C	23	24	25	V
	$I_{OUT} = 5mA$ to 1A, $V_{IN} = 27V$ to 38V, $P \leq 15W$	22.8	24	25.2	
Input regulation	$V_{IN} = 27V$ to 38V		18	480	mV
	$V_{IN} = 30V$ to 36V		6	240	
Ripple rejection	$V_{IN} = 28V$ to 38V, $f = 120Hz$	50	66		dB
Output regulation	$I_{OUT} = 5mA$ to 1.5A		12	480	mV
	$I_{OUT} = 250mA$ to 750mA		4	240	
Output resistance	$f = 1KHz$		0.028		Ω
Temperature coefficient of output voltage	$I_{OUT} = 5mA$		-1.5		mV/°C
Output noise voltage	$f = 10 Hz$ to 100 KHz		170		μV
Dropout voltage	$I_{OUT} = 1A$		2.0		V
Bias current			4.6	8	mA
Bias current change	$V_{IN} = 27V$ to 38V			1	
	$I_{OUT} = 5mA$ to 1A			0.5	
Short-circuit output current			150		
Peak output current			2.1		A

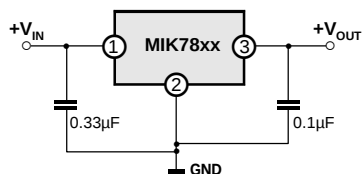
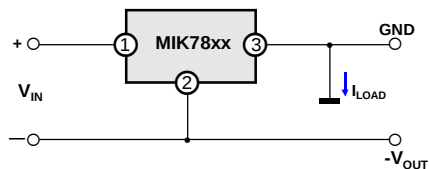
* Pulse testing techniques are used to maintain the junction temperature as close to the ambient temperature as possible. Thermal effects must be taken into account separately.

** This specification applies only for dc power dissipation permitted by absolute maximum ratings.

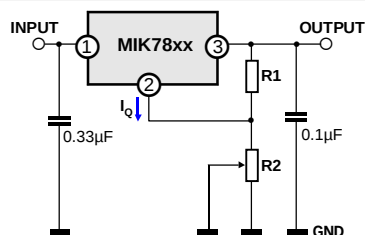


TYPICAL APPLICATIONS

FIXED-OUTPUT REGULATOR

POSITIVE REGULATOR IN NEGATIVE CONFIGURATION
(V_{IN} MUST FLOAT)

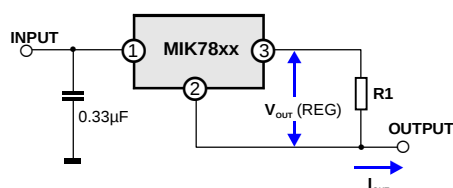
ADJUSTABLE-OUTPUT REGULATOR



$$V_{OUT} = V_{xx} + (V_{xx}/R1 + I_Q) \times R2$$

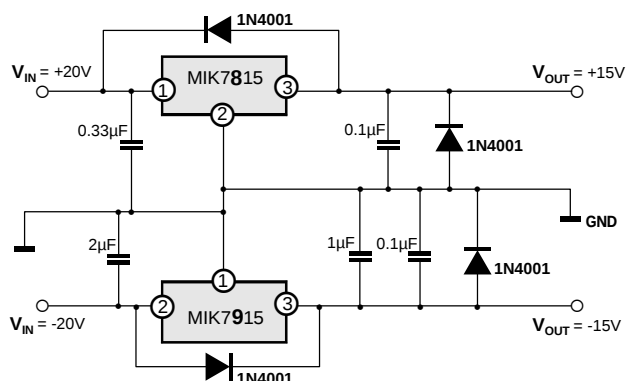
V_{xx} is the nominal output voltage of the fixed regulator

CURRENT REGULATOR

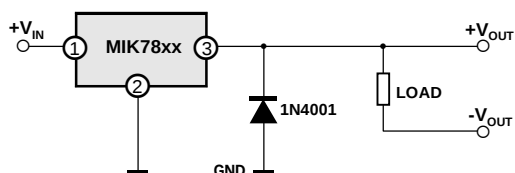


$$I_O = (V_{OUT}/R1) + I_{OUT} \text{ BIAS CURRENT}$$

REGULATED DUAL SUPPLY

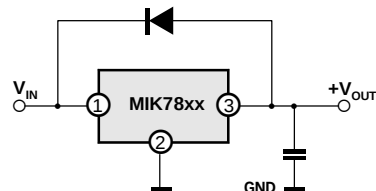


OUTPUT POLARITY-REVERSAL-PROTECTION CIRCUIT



In many cases, a regulator powers a load that is not connected to ground but, instead, is connected to a voltage source of opposite. In these cases, a clamp diode should be connected to the regulator output as shown in this figure. This protects the regulator from output polarity reversals during startup and short-circuit operation.

REVERSE-BIAS-PROTECTION CIRCUIT

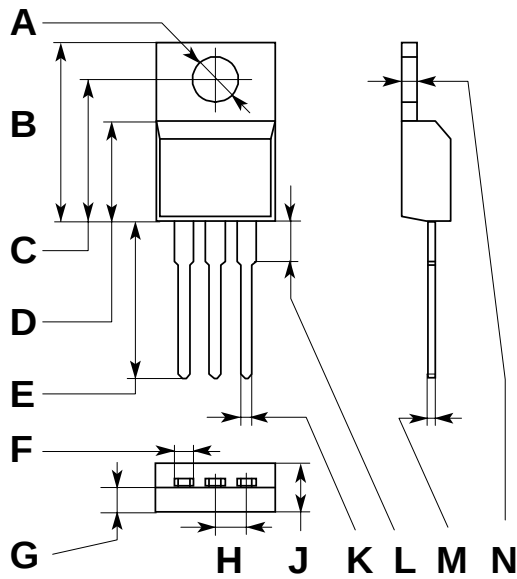


Occasionally, the input voltage to the regulator can collapse faster than the output voltage. This can occur when the input supply is crowbarred during an output overvoltage condition. If the output voltage is greater than approximately 7 V, the emitter-base junction of the series-pass element could break down. To prevent this, a diode shunt can be used as shown in this figure.



PHYSICAL DIMENSIONS AND MARKING DIAGRAMS

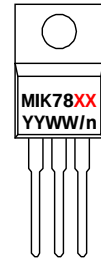
TO-220-3 PACKAGE



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	3.75	3.85	0.147	0.151
B	15.24	15.75	0.600	0.620
C	12.47	12.9	0.491	0.508
D	9.05	9.15	0.356	0.360
E	13.00	14.00	0.511	0.551
F	1.14	1.70	0.044	0.067
G	2.40	2.72	0.094	0.107
H	2.40	2.70	0.094	0.106
J	4.40	4.60	0.173	0.181
K	0.61	0.88	0.024	0.034
L	3.50	3.93	0.137	0.154
M	0.49	0.70	0.019	0.027
N	1.23	1.32	0.048	0.051

TO-220-3

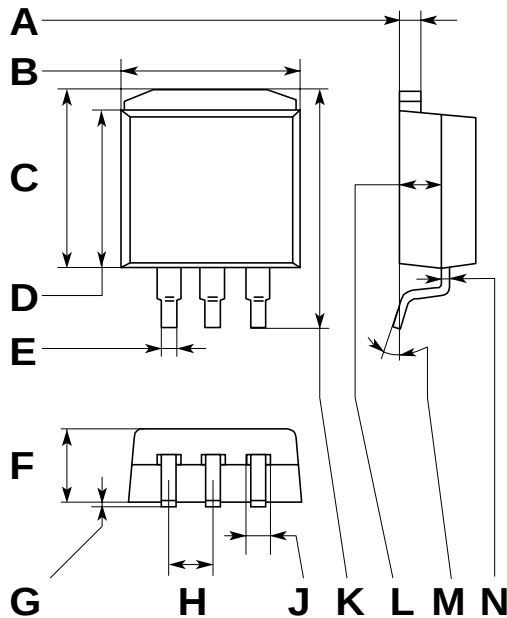
MARKING DIAGRAM



XX — output voltage
(see table below)
YY — Year
WW — Work Week
n — assembly location

XX	OUTPUT VOLTAGE	XX	OUTPUT VOLTAGE
05	5.0	12	12.0
06	6.0	15	15.0
08	8.0	18	18.0
09	9.0	24	24.0
10	10.0		

TO-263-3 PACKAGE



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.143	1.397	0.045	0.055
B	9.804	10.236	0.386	0.403
C	11.074	11.506	0.406	0.418
D	9.042	9.347	0.356	0.368
E	0.660	0.914	0.026	0.036
F	4.318	4.572	0.170	0.180
G	0.000	0.254	0.000	0.010
H	2.540 BSC		0.100 BSC	
J	1.295 REF		0.051 REF	
K	13.691	14.707	0.539	0.579
L	0.457	0.660	0.018	0.026
M	5° REF		5° REF	
N	2.235	2.591	0.088	0.102

TO-263-3

MARKING DIAGRAM



XX — output voltage
(see table below)
Y — Year
WW — Work Week
n — assembly location

XX	OUTPUT VOLTAGE	XX	OUTPUT VOLTAGE
05	5.0	12	12.0
06	6.0	15	15.0
08	8.0	18	18.0
09	9.0	24	24.0
10	10.0		



ORDERING INFORMATION

(THE FORM OF PACKING IS STIPULATED IN THE CONTRACT)

ORDERING NUMBER	OUTPUT VOLTAGE (V)	OPERATING TEMPERATURE (°C)	PACKAGE	SHIPPING
MIK 78 05 CT	5.0	0 ÷ 70	TO-220	50 Units/Rail
MIK 78 06 CT	6.0			
MIK 78 08 CT	8.0			
MIK 78 09 CT	9.0			
MIK 78 10 CT	10.0			
MIK 78 12 CT	12.0			
MIK 78 15 CT	15.0			
MIK 78 18 CT	18.0			
MIK 78 24 CT	24.0	0 ÷ 70	TO-263	50 Units/Rail, 800 Units/Reel
MIK 78 05 CD2T	5.0			
MIK 78 06 CD2T	6.0			
MIK 78 08 CD2T	8.0			
MIK 78 09 CD2T	9.0			
MIK 78 10 CD2T	10.0			
MIK 78 12 CD2T	12.0			
MIK 78 15 CD2T	15.0			
MIK 78 18 CD2T	18.0			
MIK 78 24 CD2T	24.0			

The information presented in this Data sheet is believed to be accurate and reliable. Application circuits shown are typical examples illustrating the operation of the device.

In the interest of product improvement, MIKRON reserves the right to change

specifications and data without notice and can assume no responsibility for the use of any information, devices and application circuits described herein. Reference to products of other manufacturers are solely for convenience and do not imply total equivalency of design, performance, or otherwise.

MIKRON JSC Head Office

Address: 1ST Zapadny Proezd 12, Building 1, Zelenograd, Moscow, Russia, 124460
 Telephone: +7 (095) 535-23-43; 536-85-44
 Fax: +7 (095) 530-92-01
 Email: export@mikron.ru

MIKRON ShenZhen Office

Tel/Fax: +86-755-329-7574
 Voice: +86-755-329-7573
 Email: miksz@963.net