

# BIPOLAR ANALOG INTEGRATED CIRCUIT

# $\mu$ PC79Mxx Series

### THREE TERMINAL NEGATIVE VOLTAGE REGULATOR

#### <R> DESCRIPTION

The  $\mu$ PC79Mxx Series are three-terminal negative output voltage stabilization power supply circuit of fixed output voltage. It regulates non-stabilized DC input voltage to output stabilized fixed voltage.

The six types of voltage value are  $-5\text{ V}$ ,  $-8\text{ V}$ ,  $-12\text{ V}$ ,  $-15\text{ V}$ ,  $-18\text{ V}$  and  $-24\text{ V}$ , and they can be respectively used as power supply circuit with maximum current capacity 500 mA.

#### FEATURES

- Output current : 500 mA
- On-chip some protection circuits  
(over current protection, SOA protection and thermal shut down)
- Low noise

#### <R> ORDERING INFORMATION

Part Number	Package	Output Voltage	Marking	Package Type
$\mu$ PC79M05HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-5\text{ V}$	79M05	Packed in envelope
$\mu$ PC79M05HF-AZ <sup>Note</sup>	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-5\text{ V}$	79M05	Packed in envelope
$\mu$ PC79M08HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-8\text{ V}$	79M08	Packed in envelope
$\mu$ PC79M08HF-AZ <sup>Note</sup>	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-8\text{ V}$	79M08	Packed in envelope
$\mu$ PC79M12HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-12\text{ V}$	79M12	Packed in envelope
$\mu$ PC79M12HF-AZ <sup>Note</sup>	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-12\text{ V}$	79M12	Packed in envelope
$\mu$ PC79M15HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-15\text{ V}$	79M15	Packed in envelope
$\mu$ PC79M15HF-AZ <sup>Note</sup>	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-15\text{ V}$	79M15	Packed in envelope
$\mu$ PC79M18HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-18\text{ V}$	79M18	Packed in envelope
$\mu$ PC79M18HF-AZ <sup>Note</sup>	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-18\text{ V}$	79M18	Packed in envelope
$\mu$ PC79M24HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-24\text{ V}$	79M24	Packed in envelope
$\mu$ PC79M24HF-AZ <sup>Note</sup>	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	$-24\text{ V}$	79M24	Packed in envelope

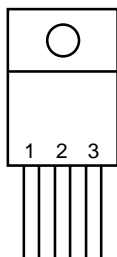
**Note** Pb-free (This product does not contain Pb in external electrode).

**Remark** Output voltage  $-5\text{ V}$  product is written in the text as  $\mu$ PC79M05.  
It applies to other output voltage products as same.

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Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.

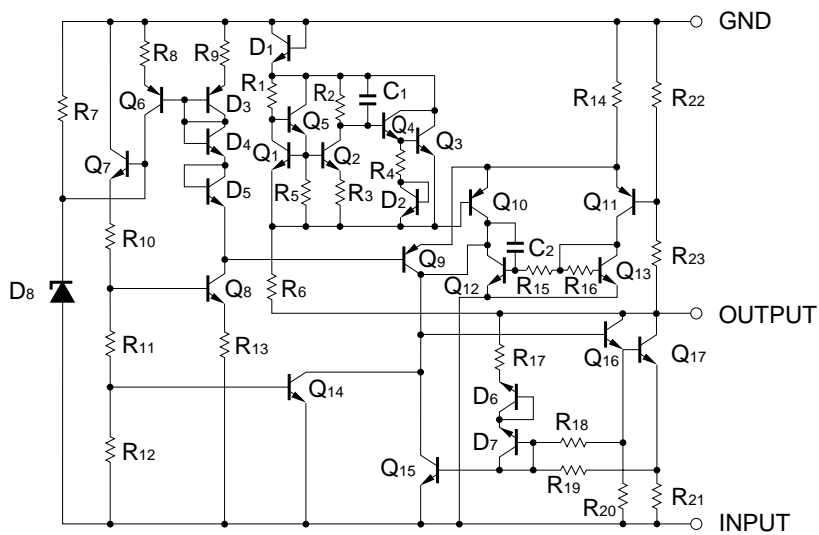
**PIN CONFIGURATION (Marking Side)**

3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)



- 1: GND
- 2: INPUT
- 3: OUTPUT

**EQUIVALENT CIRCUIT**



**ABSOLUTE MAXIMUM RATINGS (TA = 25°C, unless otherwise specified)**

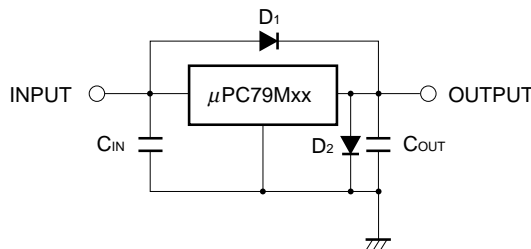
Parameter	Symbol	Rating	Unit
Input Voltage	V <sub>IN</sub>	-35/-40 <sup>Note1</sup>	V
Internal Power Dissipation	P <sub>T</sub>	15 <sup>Note2</sup>	W
Operating Ambient Temperature	T <sub>A</sub>	-20 to +85	°C
Operating Junction Temperature	T <sub>J</sub>	-20 to +150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C
Thermal Resistance (junction to case)	R <sub>th(J-C)</sub>	7	°C/W
Thermal Resistance (junction to ambient)	R <sub>th(J-A)</sub>	65	°C/W

**Notes 1.** μPC79M05, 08, 12, 15, 18 : -35 V, μPC79M24 : -40 V

**2.** Internally limited. When operating junction temperature rise above 150°C, the internal protection circuit shutdown output voltage.

<R> **Caution** Product quality may suffer if the absolute maximum rating is exceeded even momentarily for any parameter. That is, the absolute maximum ratings are rated values at which the product is on the verge of suffering physical damage, and therefore the product must be used under conditions that ensure that the absolute maximum ratings are not exceeded.

<R> **TYPICAL CONNECTION**



C<sub>IN</sub> : Required if regulator is located an appreciable distance from power supply filter. (More than 2 μF)

C<sub>OUT</sub>: Connect it within 2 cm from OUTPUT pin and GND pin (More than 1 μF).

D<sub>1</sub> : Needed for V<sub>IN</sub> > V<sub>O</sub>.

D<sub>2</sub> : Needed for V<sub>O</sub> > GND.

**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	Type Number	MIN.	TYP.	MAX.	Unit
Input Voltage	V <sub>IN</sub>	μPC79M05	-7	-10	-25	V
		μPC79M08	-10.5	-14	-25	V
		μPC79M12	-14.5	-19	-30	V
		μPC79M15	-17.5	-23	-30	V
		μPC79M18	-21	-27	-33	V
		μPC79M24	-27	-33	-38	V
Output Current	I <sub>O</sub>	All	5		350	mA
Operating Ambient Temperature	T <sub>A</sub>	All	-20		+85	°C
Operating Junction Temperature	T <sub>J</sub>	All	-20		+125	°C

<R>

ELECTRICAL CHARACTERISTICS

μPC79M05 (V<sub>IN</sub> = -10 V, I<sub>O</sub> = 350 mA, 0°C ≤ T<sub>J</sub> ≤ +125°C, C<sub>IN</sub> = 2.2 μF, C<sub>OUT</sub> = 1 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = 25°C	-4.8	-5.0	-5.2	V
		-7 V ≤ V <sub>IN</sub> ≤ -25 V, 5 mA ≤ I <sub>O</sub> ≤ 350 mA	-4.75		-5.25	V
Line Regulation	REG <sub>IN</sub>	T <sub>J</sub> = 25°C, -7 V ≤ V <sub>IN</sub> ≤ -25 V		18	50	mV
		T <sub>J</sub> = 25°C, -8 V ≤ V <sub>IN</sub> ≤ -18 V		10	30	mV
Load Regulation	REG <sub>L</sub>	T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>O</sub> ≤ 500 mA		15	100	mV
		T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>O</sub> ≤ 350 mA		10		mV
Quiescent Current	I <sub>BIAS</sub>	T <sub>J</sub> = 25°C		4.3	6.0	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	-8 V ≤ V <sub>IN</sub> ≤ -25 V			0.5	mA
		5 mA ≤ I <sub>O</sub> ≤ 350 mA			0.4	mA
Output Noise Voltage	V <sub>n</sub>	T <sub>J</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz		45	200	μV <sub>r.m.s.</sub>
Ripple Rejection	R•R	T <sub>J</sub> = 25°C, -8 V ≤ V <sub>IN</sub> ≤ -18 V, f = 120 Hz, I <sub>O</sub> = 100 mA	50	72		dB
Dropout Voltage	V <sub>DIF</sub>	T <sub>J</sub> = 25°C		1.1		V
Short Circuit Current	I <sub>Oshort</sub>	T <sub>J</sub> = 25°C, V <sub>IN</sub> = -25 V		500		mA
Peak Output Current	I <sub>Opeak</sub>	T <sub>J</sub> = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5 mA		0.2		mV/°C

μPC79M08 (V<sub>IN</sub> = -14 V, I<sub>O</sub> = 350 mA, 0°C ≤ T<sub>J</sub> ≤ +125°C, C<sub>IN</sub> = 2.2 μF, C<sub>OUT</sub> = 1 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V <sub>O</sub>	T <sub>J</sub> = 25°C	-7.7	-8.0	-8.3	V
		-10.5 V ≤ V <sub>IN</sub> ≤ -25 V, 5 mA ≤ I <sub>O</sub> ≤ 350 mA	-7.6		-8.4	V
Line Regulation	REG <sub>IN</sub>	T <sub>J</sub> = 25°C, -10.5 V ≤ V <sub>IN</sub> ≤ -25 V		20	80	mV
		T <sub>J</sub> = 25°C, -11 V ≤ V <sub>IN</sub> ≤ -21 V		15	50	mV
Load Regulation	REG <sub>L</sub>	T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>O</sub> ≤ 500 mA		20	160	mV
		T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>O</sub> ≤ 350 mA		15		mV
Quiescent Current	I <sub>BIAS</sub>	T <sub>J</sub> = 25°C		4.3	6.0	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	-10.5 V ≤ V <sub>IN</sub> ≤ -25 V			0.5	mA
		5 mA ≤ I <sub>O</sub> ≤ 350 mA			0.4	mA
Output Noise Voltage	V <sub>n</sub>	T <sub>J</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz		65	220	μV <sub>r.m.s.</sub>
Ripple Rejection	R•R	T <sub>J</sub> = 25°C, -11.5 V ≤ V <sub>IN</sub> ≤ -21.5 V, f = 120 Hz, I <sub>O</sub> = 100 mA	50	66		dB
Dropout Voltage	V <sub>DIF</sub>	T <sub>J</sub> = 25°C		1.1		V
Short Circuit Current	I <sub>Oshort</sub>	T <sub>J</sub> = 25°C, V <sub>IN</sub> = -25 V		500		mA
Peak Output Current	I <sub>Opeak</sub>	T <sub>J</sub> = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> /ΔT	I <sub>O</sub> = 5 mA		0.3		mV/°C

**μPC79M12 (V<sub>IN</sub> = -19 V, I<sub>o</sub> = 350 mA, 0°C ≤ T<sub>J</sub> ≤ +125°C, C<sub>IN</sub> = 2.2 μF, C<sub>OUT</sub> = 1 μF, unless otherwise specified)**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V <sub>o</sub>	T <sub>J</sub> = 25°C	-11.5	-12.0	-12.5	V
		-14.5 V ≤ V <sub>IN</sub> ≤ -30 V, 5 mA ≤ I <sub>o</sub> ≤ 350 mA	-11.4		-12.6	V
Line Regulation	REG <sub>IN</sub>	T <sub>J</sub> = 25°C, -14.5 V ≤ V <sub>IN</sub> ≤ -30 V		25	80	mV
		T <sub>J</sub> = 25°C, -15 V ≤ V <sub>IN</sub> ≤ -25 V		20	50	mV
Load Regulation	REG <sub>L</sub>	T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>o</sub> ≤ 500 mA		35	240	mV
		T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>o</sub> ≤ 350 mA		25		mV
Quiescent Current	I <sub>BIAS</sub>	T <sub>J</sub> = 25°C		4.4	6.0	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	-14.5 V ≤ V <sub>IN</sub> ≤ -30 V			0.5	mA
		5 mA ≤ I <sub>o</sub> ≤ 350 mA			0.4	mA
Output Noise Voltage	V <sub>n</sub>	T <sub>J</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz		125	280	μV <sub>r.m.s.</sub>
Ripple Rejection	R•R	T <sub>J</sub> = 25°C, -15 V ≤ V <sub>IN</sub> ≤ -25 V, f = 120 Hz, I <sub>o</sub> = 100 mA	50	64		dB
Dropout Voltage	V <sub>DIF</sub>	T <sub>J</sub> = 25°C		1.1		V
Short Circuit Current	I <sub>Oshort</sub>	T <sub>J</sub> = 25°C, V <sub>IN</sub> = -30 V		400		mA
Peak Output Current	I <sub>Opeak</sub>	T <sub>J</sub> = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	ΔV <sub>o</sub> /ΔT	I <sub>o</sub> = 5 mA		0.4		mV/°C

**μPC79M15 (V<sub>IN</sub> = -23 V, I<sub>o</sub> = 350 mA, 0°C ≤ T<sub>J</sub> ≤ +125°C, C<sub>IN</sub> = 2.2 μF, C<sub>OUT</sub> = 1 μF, unless otherwise specified)**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V <sub>o</sub>	T <sub>J</sub> = 25°C	-14.4	-15.0	-15.6	V
		-17.5 V ≤ V <sub>IN</sub> ≤ -30 V, 5 mA ≤ I <sub>o</sub> ≤ 350 mA	-14.25		-15.75	V
Line Regulation	REG <sub>IN</sub>	T <sub>J</sub> = 25°C, -17.5 V ≤ V <sub>IN</sub> ≤ -30 V		30	80	mV
		T <sub>J</sub> = 25°C, -18 V ≤ V <sub>IN</sub> ≤ -28 V		25	50	mV
Load Regulation	REG <sub>L</sub>	T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>o</sub> ≤ 500 mA		50	240	mV
		T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>o</sub> ≤ 350 mA		35		mV
Quiescent Current	I <sub>BIAS</sub>	T <sub>J</sub> = 25°C		4.4	6.0	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	-17.5 V ≤ V <sub>IN</sub> ≤ -30 V			0.5	mA
		5 mA ≤ I <sub>o</sub> ≤ 350 mA			0.4	mA
Output Noise Voltage	V <sub>n</sub>	T <sub>J</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz		150	360	μV <sub>r.m.s.</sub>
Ripple Rejection	R•R	T <sub>J</sub> = 25°C, -18.5 V ≤ V <sub>IN</sub> ≤ -28.5 V, f = 120 Hz, I <sub>o</sub> = 100 mA	50	62		dB
Dropout Voltage	V <sub>DIF</sub>	T <sub>J</sub> = 25°C		1.1		V
Short Circuit Current	I <sub>Oshort</sub>	T <sub>J</sub> = 25°C, V <sub>IN</sub> = -30 V		400		mA
Peak Output Current	I <sub>Opeak</sub>	T <sub>J</sub> = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	ΔV <sub>o</sub> /ΔT	I <sub>o</sub> = 5 mA		0.6		mV/°C

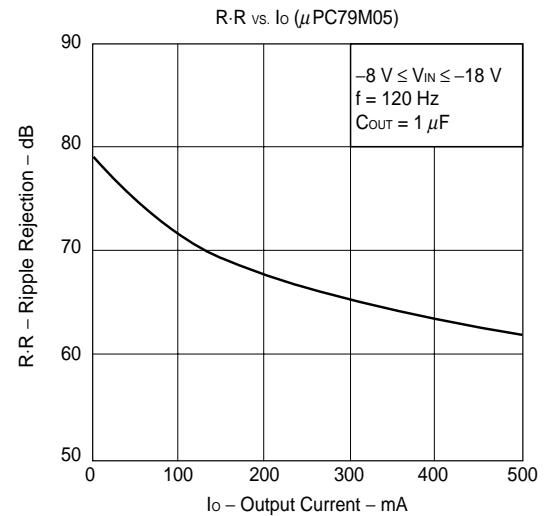
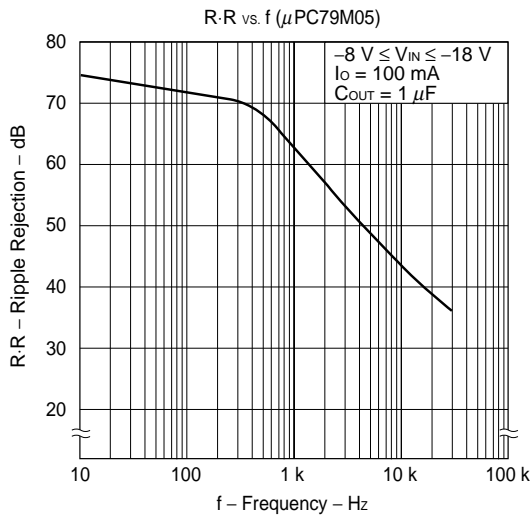
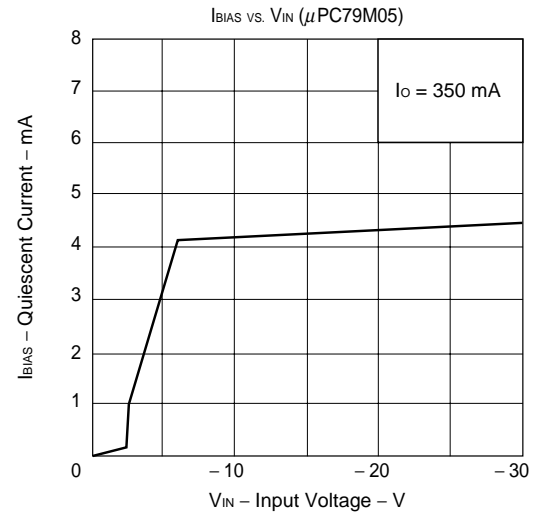
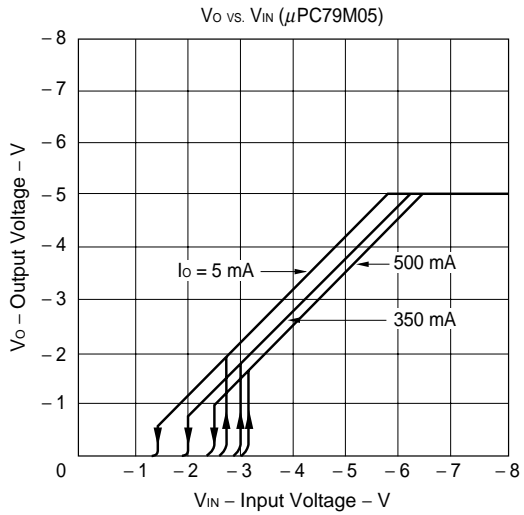
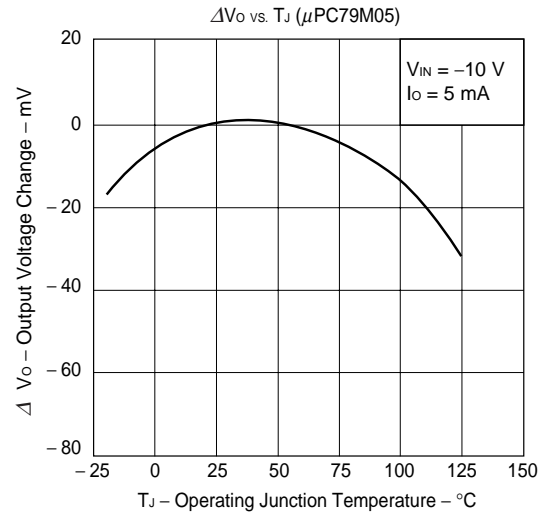
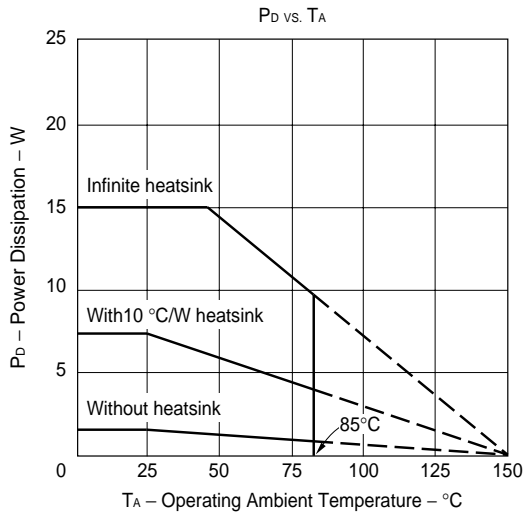
**μPC79M18 (V<sub>IN</sub> = -27 V, I<sub>o</sub> = 350 mA, 0°C ≤ T<sub>J</sub> ≤ +125°C, C<sub>IN</sub> = 2.2 μF, C<sub>OUT</sub> = 1 μF, unless otherwise specified)**

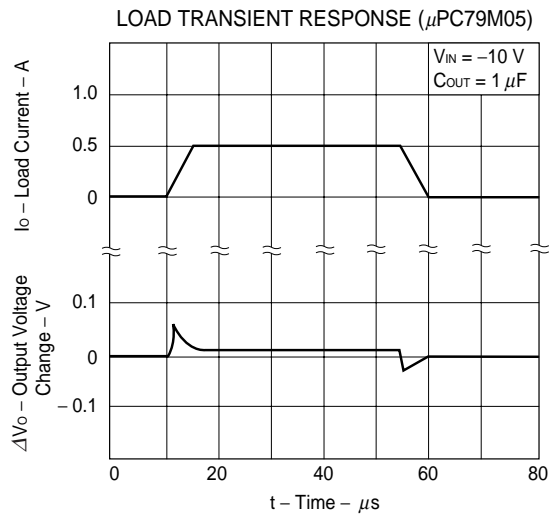
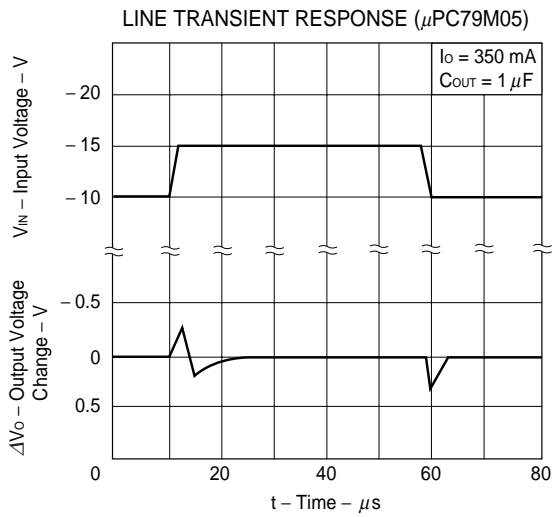
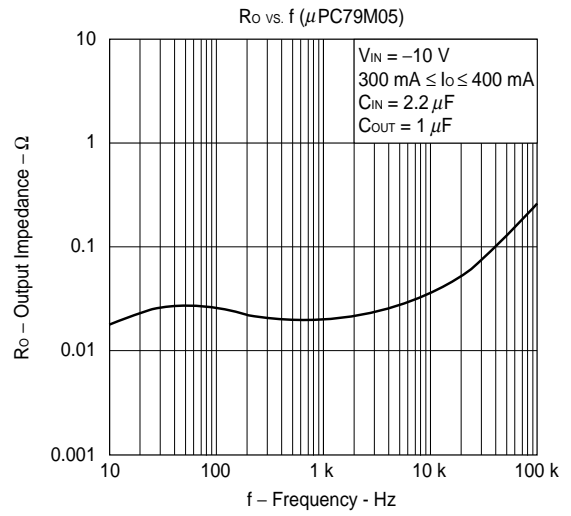
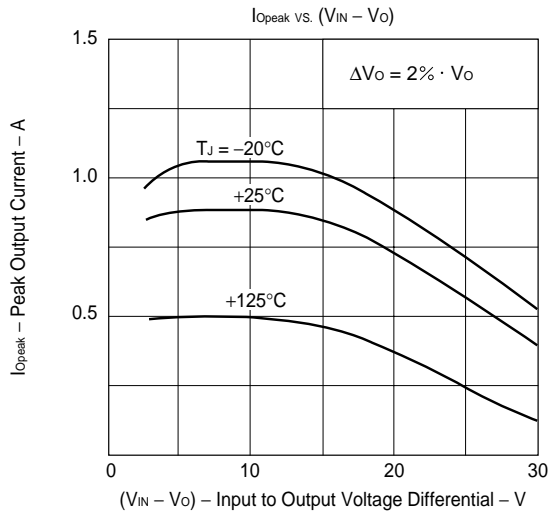
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V <sub>o</sub>	T <sub>J</sub> = 25°C	-17.3	-18.0	-18.7	V
		-21 V ≤ V <sub>IN</sub> ≤ -33 V, 5 mA ≤ I <sub>o</sub> ≤ 350 mA	-17.1		-18.9	V
Line Regulation	REG <sub>IN</sub>	T <sub>J</sub> = 25°C, -21 V ≤ V <sub>IN</sub> ≤ -33 V		30	80	mV
		T <sub>J</sub> = 25°C, -24 V ≤ V <sub>IN</sub> ≤ -30 V		25	50	mV
Load Regulation	REG <sub>L</sub>	T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>o</sub> ≤ 500 mA		60	300	mV
		T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>o</sub> ≤ 350 mA		45		mV
Quiescent Current	I <sub>BIAS</sub>	T <sub>J</sub> = 25°C		4.4	6.0	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	-21 V ≤ V <sub>IN</sub> ≤ -33 V			0.5	mA
		5 mA ≤ I <sub>o</sub> ≤ 350 mA			0.4	mA
Output Noise Voltage	V <sub>n</sub>	T <sub>J</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz		200	440	μV <sub>r.m.s.</sub>
Ripple Rejection	R•R	T <sub>J</sub> = 25°C, -22 V ≤ V <sub>IN</sub> ≤ -32 V, f = 120 Hz, I <sub>o</sub> = 100 mA	50	60		dB
Dropout Voltage	V <sub>DIF</sub>	T <sub>J</sub> = 25°C		1.1		V
Short Circuit Current	I <sub>Oshort</sub>	T <sub>J</sub> = 25°C, V <sub>IN</sub> = -33 V		350		mA
Peak Output Current	I <sub>Opeak</sub>	T <sub>J</sub> = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	ΔV <sub>o</sub> /ΔT	I <sub>o</sub> = 5 mA		0.8		mV/°C

**μPC79M24 (V<sub>IN</sub> = -33 V, I<sub>o</sub> = 350 mA, 0°C ≤ T<sub>J</sub> ≤ +125°C, C<sub>IN</sub> = 2.2 μF, C<sub>OUT</sub> = 1 μF, unless otherwise specified)**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V <sub>o</sub>	T <sub>J</sub> = 25°C	-23.0	-24.0	-25.0	V
		-27 V ≤ V <sub>IN</sub> ≤ -38 V, 5 mA ≤ I <sub>o</sub> ≤ 350 mA	-22.8		-25.2	V
Line Regulation	REG <sub>IN</sub>	T <sub>J</sub> = 25°C, -27 V ≤ V <sub>IN</sub> ≤ -38 V		30	80	mV
		T <sub>J</sub> = 25°C, -30 V ≤ V <sub>IN</sub> ≤ -36 V		25	50	mV
Load Regulation	REG <sub>L</sub>	T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>o</sub> ≤ 500 mA		80	360	mV
		T <sub>J</sub> = 25°C, 5 mA ≤ I <sub>o</sub> ≤ 350 mA		50		mV
Quiescent Current	I <sub>BIAS</sub>	T <sub>J</sub> = 25°C		4.5	6.0	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	-27 V ≤ V <sub>IN</sub> ≤ -38 V			0.5	mA
		5 mA ≤ I <sub>o</sub> ≤ 350 mA			0.4	mA
Output Noise Voltage	V <sub>n</sub>	T <sub>J</sub> = 25°C, 10 Hz ≤ f ≤ 100 kHz		250	600	μV <sub>r.m.s.</sub>
Ripple Rejection	R•R	T <sub>J</sub> = 25°C, -28 V ≤ V <sub>IN</sub> ≤ -38 V, f = 120 Hz, I <sub>o</sub> = 100 mA	50	57		dB
Dropout Voltage	V <sub>DIF</sub>	T <sub>J</sub> = 25°C		1.1		V
Short Circuit Current	I <sub>Oshort</sub>	T <sub>J</sub> = 25°C, V <sub>IN</sub> = -38 V		200		mA
Peak Output Current	I <sub>Opeak</sub>	T <sub>J</sub> = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	ΔV <sub>o</sub> /ΔT	I <sub>o</sub> = 5 mA		1.0		mV/°C

TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

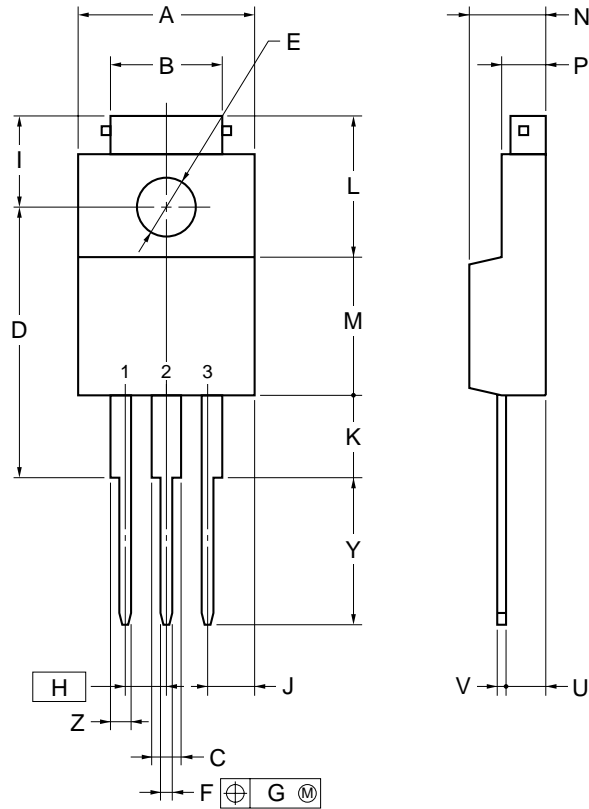






<R> PACKAGE DRAWING (Unit: mm)

3PIN PLASTIC SIP (MP-45G)



**NOTE**

Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	10.0±0.2
B	7.0±0.2
C	1.50±0.2
D	17.0±0.3
E	∅3.3±0.2
F	0.75±0.10
G	0.25
H	2.54 (T.P.)
I	5.0±0.3
J	2.46±0.2
K	5.0±0.2
L	8.5±0.2
M	8.5±0.2
N	4.5±0.2
P	2.8±0.2
U	2.4±0.5
V	0.65±0.10
Y	8.9±0.7
Z	1.30±0.2

P3HF-254B-4

**<R> RECOMMENDED SOLDERING CONDITIONS**

The μPC79Mxx Series should be soldered and mounted under the following recommended conditions.

For soldering methods and conditions other than those recommended below, contact an NEC Electronics sales representative.

For technical information, see the following website.

**Semiconductor Device Mount Manual (<http://www.necel.com/pkg/en/mount/index.html>)**

**Through-hole devices**

**μPC79M05HF, 79M08HF, 79M12HF, 79M15HF, 79M18HF, 79M24HF,**

**μPC79M05HF-AZ, 79M08HF-AZ, 79M12HF-AZ, 79M15HF-AZ, 79M18HF-AZ, 79M24HF-AZ : 3-PIN PLASTIC SIP (MP-45G)**

**(Isolated TO-220)**

Process	Conditions	Symbol
Wave soldering (only to leads)	Solder temperature: 260°C or below, Flow time: 10 seconds or less, Maximum number of flow processes: 1 time.	WS60-00-1
Partial heating method	Pin temperature: 350°C or below, Heat time: 3 seconds or less (Per each pin).	P350

**Caution For through-hole device, the wave soldering process must be applied only to leads, and make sure that the package body does not get jet soldered.**

**<R> REFERENCE DOCUMENTS**

Document Name	Document No.
Usage of Three-Terminal Regulators User's Manual	G12702E
Semiconductor Device Mount Manual	<a href="http://www.necel.com/pkg/en/mount/index.html">http://www.necel.com/pkg/en/mount/index.html</a>
Review of Quality and Reliability Handbook Information	C12769E

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