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DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC79Mxx Series

THREE TERMINAL NEGATIVE VOLTAGE REGULATOR

<R> **DESCRIPTION**

The μPC79Mxx 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 V, –8 V, –12 V, –15 V, –18 V and –24 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
μPC79M05HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–5 V	79M05	Packed in envelope
μPC79M05HF-AZ Note	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–5 V	79M05	Packed in envelope
μPC79M08HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–8 V	79M08	Packed in envelope
μPC79M08HF-AZ Note	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–8 V	79M08	Packed in envelope
μPC79M12HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–12 V	79M12	Packed in envelope
μPC79M12HF-AZ Note	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–12 V	79M12	Packed in envelope
μPC79M15HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–15 V	79M15	Packed in envelope
μPC79M15HF-AZ Note	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–15 V	79M15	Packed in envelope
μPC79M18HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–18 V	79M18	Packed in envelope
μPC79M18HF-AZ Note	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–18 V	79M18	Packed in envelope
μPC79M24HF	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–24 V	79M24	Packed in envelope
μPC79M24HF-AZ Note	3-PIN PLASTIC SIP (MP-45G) (Isolated TO-220)	–24 V	79M24	Packed in envelope

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

Remark Output voltage –5 V product is written in the text as μPC79M05.
It applies to other output voltage products as same.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.
Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.

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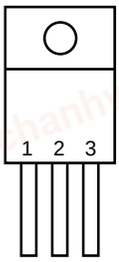
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The mark <R> shows major revised points.
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

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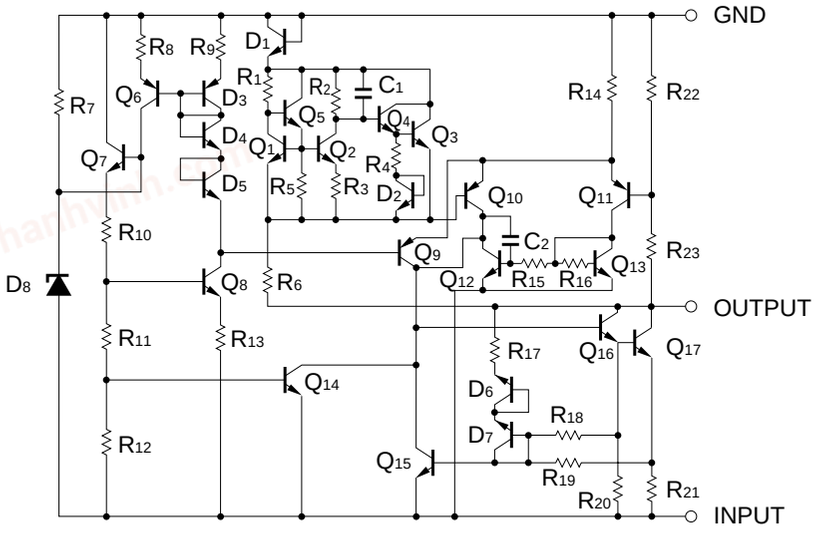
PIN CONFIGURATION (Marking Side)

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



1: GND
2: INPUT
3: OUTPUT

EQUIVALENT CIRCUIT



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

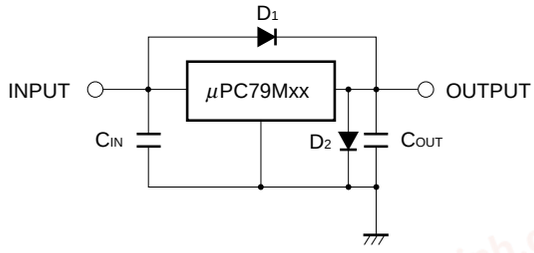
Parameter	Symbol	Rating	Unit
Input Voltage	V_{IN}	–35/–40 Note1	V
Internal Power Dissipation	P_T	15 Note2	W
Operating Ambient Temperature	T_A	–20 to +85	°C
Operating Junction Temperature	T_J	–20 to +150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Thermal Resistance (junction to case)	$R_{th(J-C)}$	7	°C/W
Thermal Resistance (junction to ambient)	$R_{th(J-A)}$	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_{IN} : Required if regulator is located an appreciable distance from power supply filter. (More than 2 μF)

C_{OUT}: Connect it within 2 cm from OUTPUT pin and GND pin (More than 1 μF).

D_1 : Needed for $V_{IN} > V_O$.

D_2 : Needed for $V_O >$ GND.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Type Number	MIN.	TYP.	MAX.	Unit
Input Voltage	V_{IN}	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_O	All	5		350	mA
<R> Operating Ambient Temperature	T_A	All	–20		+85	°C
Operating Junction Temperature	T_J	All	–20		+125	°C

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ELECTRICAL CHARACTERISTICS

μPC79M05 (V_{IN} = –10 V, I_O = 350 mA, 0°C ≤ T_J ≤ +125°C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25°C	–4.8	–5.0	–5.2	V
		–7 V ≤ V_{IN} ≤ –25 V, 5 mA ≤ I_O ≤ 350 mA	–4.75		–5.25	V
Line Regulation	REG_{IN}	T_J = 25°C, –7 V ≤ V_{IN} ≤ –25 V		18	50	mV
		T_J = 25°C, –8 V ≤ V_{IN} ≤ –18 V		10	30	mV
Load Regulation	REG_L	T_J = 25°C, 5 mA ≤ I_O ≤ 500 mA		15	100	mV
		T_J = 25°C, 5 mA ≤ I_O ≤ 350 mA		10		mV
Quiescent Current	I_{BIAS}	T_J = 25°C		4.3	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–8 V ≤ V_{IN} ≤ –25 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	mA
Output Noise Voltage	V_n	T_J = 25°C, 10 Hz ≤ f ≤ 100 kHz		45	200	$\mu V_{r.m.s.}$
Ripple Rejection	R•R	T_J = 25°C, –8 V ≤ V_{IN} ≤ –18 V, f = 120 Hz, I_O = 100 mA	50	72		dB
Dropout Voltage	V_{DIF}	T_J = 25°C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25°C, V_{IN} = –25 V		500		mA
Peak Output Current	I_{Opeak}	T_J = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.2		mV/°C

μPC79M08 (V_{IN} = –14 V, I_O = 350 mA, 0°C ≤ T_J ≤ +125°C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25°C	–7.7	–8.0	–8.3	V
		–10.5 V ≤ V_{IN} ≤ –25 V, 5 mA ≤ I_O ≤ 350 mA	–7.6		–8.4	V
Line Regulation	REG_{IN}	T_J = 25°C, –10.5 V ≤ V_{IN} ≤ –25 V		20	80	mV
		T_J = 25°C, –11 V ≤ V_{IN} ≤ –21 V		15	50	mV
Load Regulation	REG_L	T_J = 25°C, 5 mA ≤ I_O ≤ 500 mA		20	160	mV
		T_J = 25°C, 5 mA ≤ I_O ≤ 350 mA		15		mV
Quiescent Current	I_{BIAS}	T_J = 25°C		4.3	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–10.5 V ≤ V_{IN} ≤ –25 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	mA
Output Noise Voltage	V_n	T_J = 25°C, 10 Hz ≤ f ≤ 100 kHz		65	220	$\mu V_{r.m.s.}$
Ripple Rejection	R•R	T_J = 25°C, –11.5 V ≤ V_{IN} ≤ –21.5 V, f = 120 Hz, I_O = 100 mA	50	66		dB
Dropout Voltage	V_{DIF}	T_J = 25°C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25°C, V_{IN} = –25 V		500		mA
Peak Output Current	I_{Opeak}	T_J = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.3		mV/°C

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μPC79M12 (V_{IN} = –19 V, I_O = 350 mA, 0°C ≤ T_J ≤ +125°C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25°C	–11.5	–12.0	–12.5	V
		–14.5 V ≤ V_{IN} ≤ –30 V, 5 mA ≤ I_O ≤ 350 mA	–11.4		–12.6	V
Line Regulation	REG_{IN}	T_J = 25°C, –14.5 V ≤ V_{IN} ≤ –30 V		25	80	mV
		T_J = 25°C, –15 V ≤ V_{IN} ≤ –25 V		20	50	mV
Load Regulation	REG_L	T_J = 25°C, 5 mA ≤ I_O ≤ 500 mA		35	240	mV
		T_J = 25°C, 5 mA ≤ I_O ≤ 350 mA		25		mV
Quiescent Current	I_{BIAS}	T_J = 25°C		4.4	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–14.5 V ≤ V_{IN} ≤ –30 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	mA
Output Noise Voltage	V_n	T_J = 25°C, 10 Hz ≤ f ≤ 100 kHz		125	280	$\mu V_{r.m.s.}$
Ripple Rejection	R•R	T_J = 25°C, –15 V ≤ V_{IN} ≤ –25 V, f = 120 Hz, I_O = 100 mA	50	64		dB
Dropout Voltage	V_{DIF}	T_J = 25°C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25°C, V_{IN} = –30 V		400		mA
Peak Output Current	I_{Opeak}	T_J = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.4		mV/°C

μPC79M15 (V_{IN} = –23 V, I_O = 350 mA, 0°C ≤ T_J ≤ +125°C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25°C	–14.4	–15.0	–15.6	V
		–17.5 V ≤ V_{IN} ≤ –30 V, 5 mA ≤ I_O ≤ 350 mA	–14.25		–15.75	V
Line Regulation	REG_{IN}	T_J = 25°C, –17.5 V ≤ V_{IN} ≤ –30 V		30	80	mV
		T_J = 25°C, –18 V ≤ V_{IN} ≤ –28 V		25	50	mV
Load Regulation	REG_L	T_J = 25°C, 5 mA ≤ I_O ≤ 500 mA		50	240	mV
		T_J = 25°C, 5 mA ≤ I_O ≤ 350 mA		35		mV
Quiescent Current	I_{BIAS}	T_J = 25°C		4.4	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–17.5 V ≤ V_{IN} ≤ –30 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	mA
Output Noise Voltage	V_n	T_J = 25°C, 10 Hz ≤ f ≤ 100 kHz		150	360	$\mu V_{r.m.s.}$
Ripple Rejection	R•R	T_J = 25°C, –18.5 V ≤ V_{IN} ≤ –28.5 V, f = 120 Hz, I_O = 100 mA	50	62		dB
Dropout Voltage	V_{DIF}	T_J = 25°C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25°C, V_{IN} = –30 V		400		mA
Peak Output Current	I_{Opeak}	T_J = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.6		mV/°C

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μPC79M18 (V_{IN} = –27 V, I_O = 350 mA, 0°C ≤ T_J ≤ +125°C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25°C	–17.3	–18.0	–18.7	V
		–21 V ≤ V_{IN} ≤ –33 V, 5 mA ≤ I_O ≤ 350 mA	–17.1		–18.9	V
Line Regulation	REG_{IN}	T_J = 25°C, –21 V ≤ V_{IN} ≤ –33 V		30	80	mV
		T_J = 25°C, –24 V ≤ V_{IN} ≤ –30 V		25	50	mV
Load Regulation	REG_L	T_J = 25°C, 5 mA ≤ I_O ≤ 500 mA		60	300	mV
		T_J = 25°C, 5 mA ≤ I_O ≤ 350 mA		45		mV
Quiescent Current	I_{BIAS}	T_J = 25°C		4.4	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–21 V ≤ V_{IN} ≤ –33 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	mA
Output Noise Voltage	V_n	T_J = 25°C, 10 Hz ≤ f ≤ 100 kHz		200	440	$\mu V_{r.m.s.}$
Ripple Rejection	R•R	T_J = 25°C, –22 V ≤ V_{IN} ≤ –32 V, f = 120 Hz, I_O = 100 mA	50	60		dB
Dropout Voltage	V_{DIF}	T_J = 25°C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25°C, V_{IN} = –33 V		350		mA
Peak Output Current	I_{Opeak}	T_J = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		0.8		mV/°C

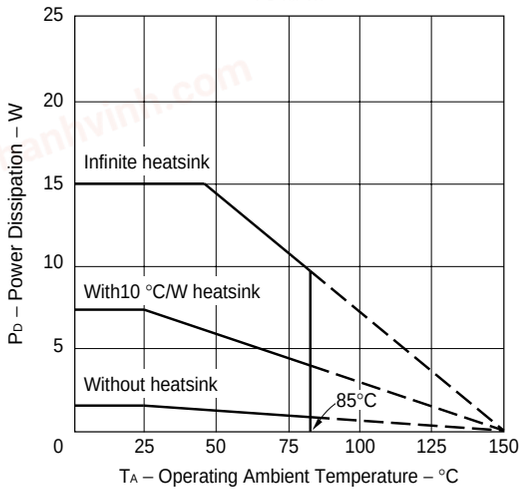
μPC79M24 (V_{IN} = –33 V, I_O = 350 mA, 0°C ≤ T_J ≤ +125°C, C_{IN} = 2.2 μF, C_{OUT} = 1 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O	T_J = 25°C	–23.0	–24.0	–25.0	V
		–27 V ≤ V_{IN} ≤ –38 V, 5 mA ≤ I_O ≤ 350 mA	–22.8		–25.2	V
Line Regulation	REG_{IN}	T_J = 25°C, –27 V ≤ V_{IN} ≤ –38 V		30	80	mV
		T_J = 25°C, –30 V ≤ V_{IN} ≤ –36 V		25	50	mV
Load Regulation	REG_L	T_J = 25°C, 5 mA ≤ I_O ≤ 500 mA		80	360	mV
		T_J = 25°C, 5 mA ≤ I_O ≤ 350 mA		50		mV
Quiescent Current	I_{BIAS}	T_J = 25°C		4.5	6.0	mA
Quiescent Current Change	ΔI_{BIAS}	–27 V ≤ V_{IN} ≤ –38 V			0.5	mA
		5 mA ≤ I_O ≤ 350 mA			0.4	mA
Output Noise Voltage	V_n	T_J = 25°C, 10 Hz ≤ f ≤ 100 kHz		250	600	$\mu V_{r.m.s.}$
Ripple Rejection	R•R	T_J = 25°C, –28 V ≤ V_{IN} ≤ –38 V, f = 120 Hz, I_O = 100 mA	50	57		dB
Dropout Voltage	V_{DIF}	T_J = 25°C		1.1		V
Short Circuit Current	I_{Oshort}	T_J = 25°C, V_{IN} = –38 V		200		mA
Peak Output Current	I_{Opeak}	T_J = 25°C	620	880	1020	mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA		1.0		mV/°C

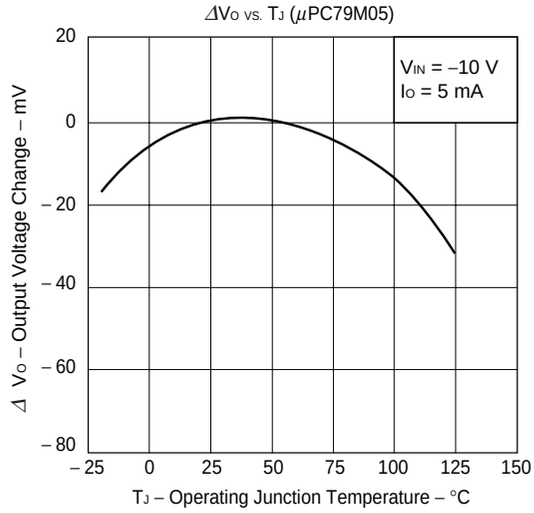
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TYPICAL CHARACTERISTICS (T_J = 25°C, unless otherwise specified)

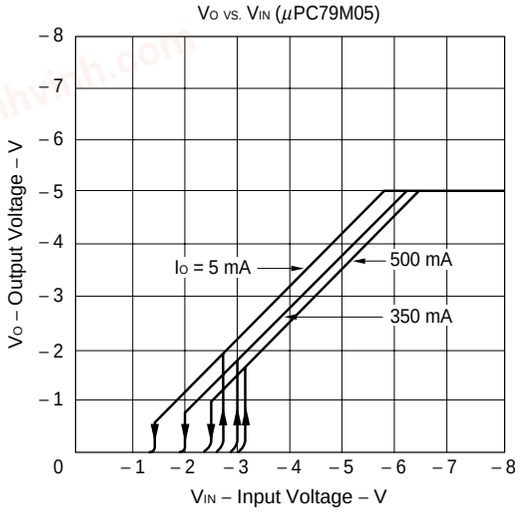
P_D vs. T_A



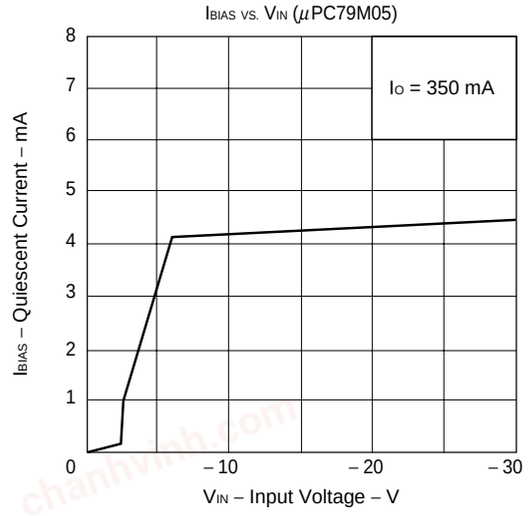
ΔV_O vs. T_J (μPC79M05)



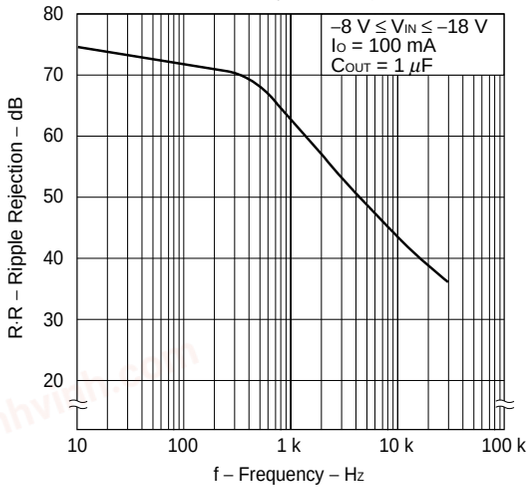
V_O vs. V_{IN} (μPC79M05)



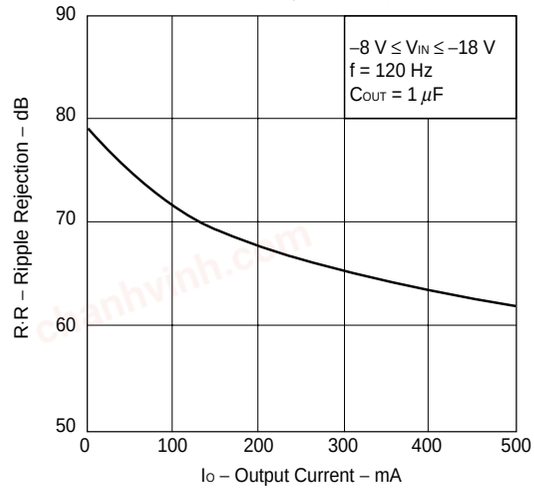
I_{BIAS} vs. V_{IN} (μPC79M05)



R·R vs. f (μPC79M05)

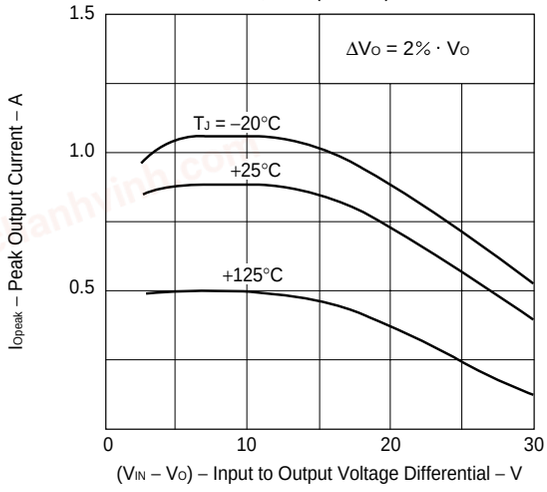


R·R vs. I_O (μPC79M05)

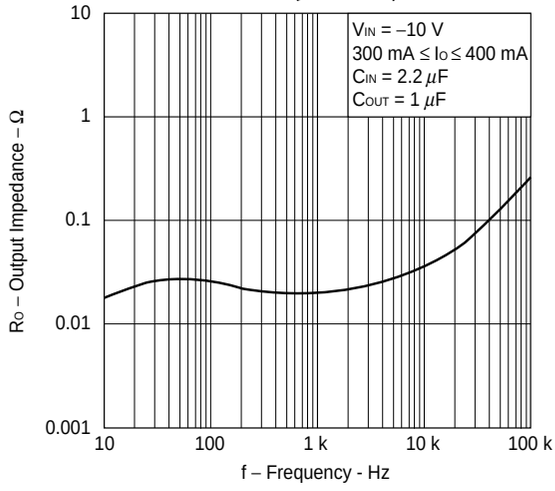


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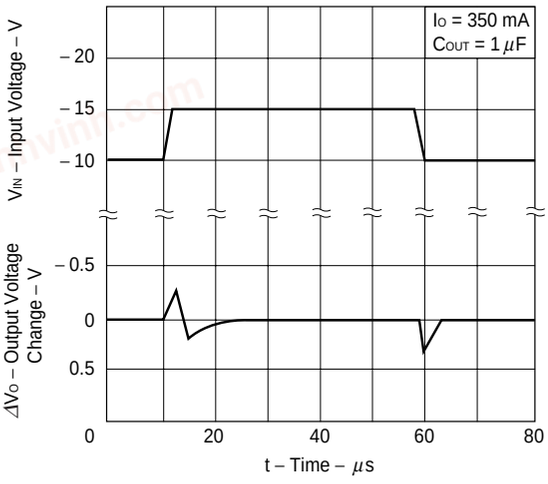
I_{Opeak} vs. (V_{IN} – V_O)



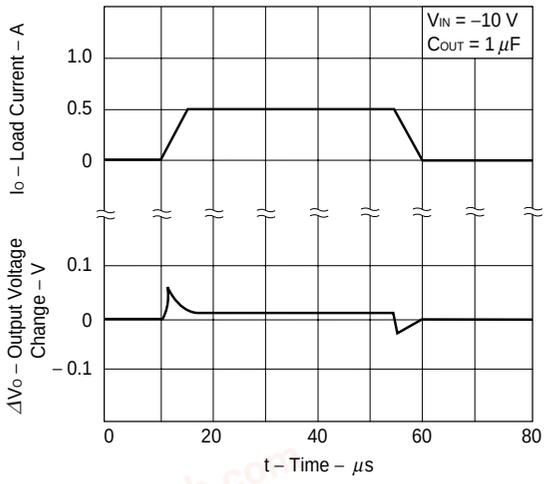
R_O vs. f (μPC79M05)



LINE TRANSIENT RESPONSE (μPC79M05)



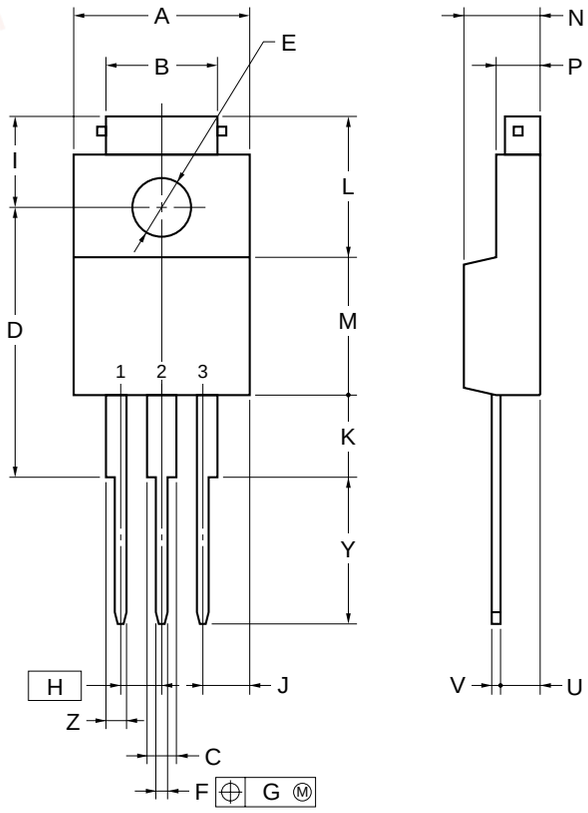
LOAD TRANSIENT RESPONSE (μPC79M05)



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<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	φ3.3±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

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<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	http://www.necel.com/pkg/en/mount/index.html
Review of Quality and Reliability Handbook Information	C12769E

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