DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC3033,3005

LOW-SATURATION STABILIZED POWER SUPPLY WITH ON/OFF FUNCTION (OUTPUT CURRENT: 1 A)

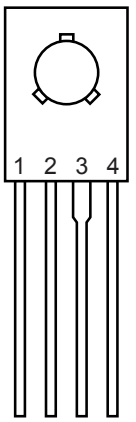
DESCRIPTION

The μPC3033 and 3005 are low-saturation type regulators with an output current of 1 A at respective output voltages of 3.3 V and 5 V. These regulators are also provided with an ON/OFF function, which reduces the dissipation when there is no load, making them ideal for systems requiring low power consumption. Since output voltage accuracy is as high as ±1%, it can respond also to the application of which high precision is required.

FEATURES

- ON/OFF pin for output control (active-high)
- Output voltage accuracy: V_O = ±1% (when T_A = 25°C)
- Output current capacitance: 1 A
<R> - Low dropout voltage: V_{DIF} = 0.6 V MAX. (at I_O = 0.5 A)
- On-chip inrush current protection circuit for when input voltage rises (when input voltage is low level)
- On-chip overcurrent and thermal protection circuit

PIN CONFIGURATION (Marking Side)



1: INPUT
2: ON/OFF
3: GND
4: OUTPUT

APPLICATIONS

Digital TV, Audio, Air conditioner, etc.

ORDERING INFORMATION

Part Number	Package	Marking	Output Voltage
μPC3033H	4-pin plastic SIP (TO-126)	C3033	3.3 V
μPC3033H-AZ [Note]	4-pin plastic SIP (TO-126)	C3033	3.3 V
μPC3005H	4-pin plastic SIP (TO-126)	C3005	5 V
μPC3005H-AZ [Note]	4-pin plastic SIP (TO-126)	C3005	5 V

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

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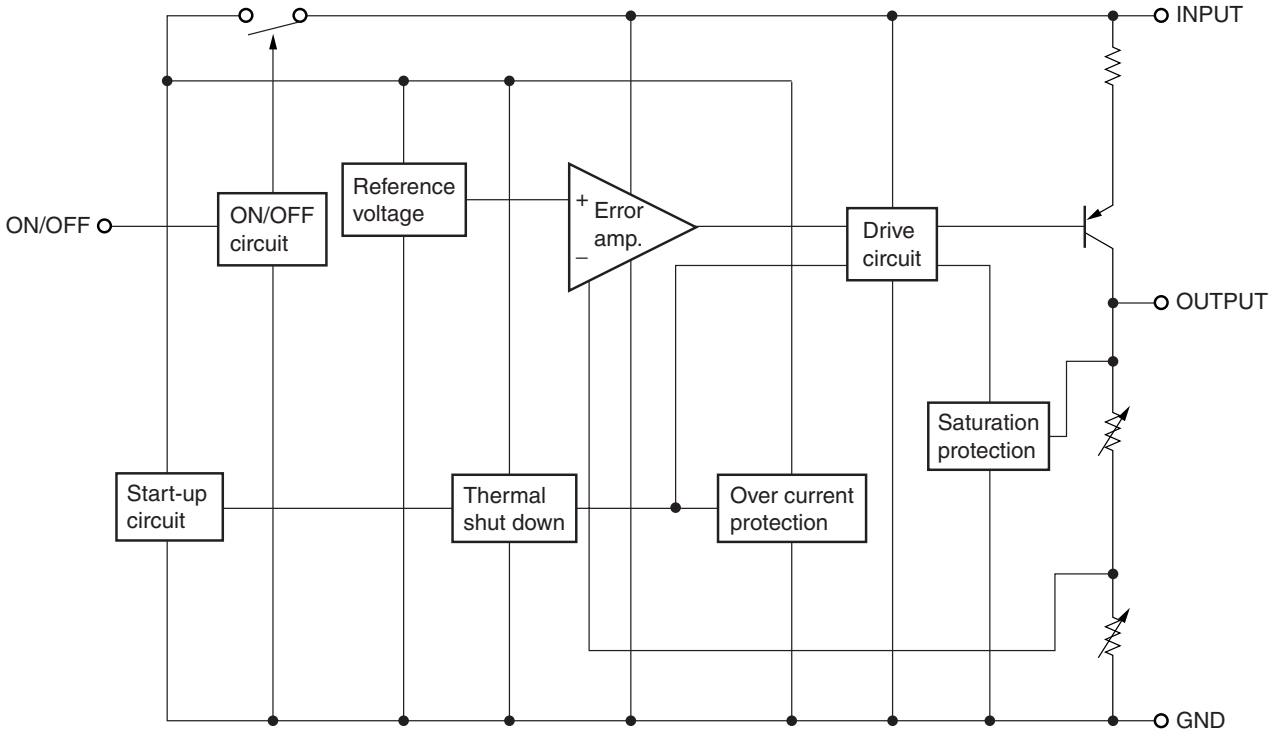
The mark <R> shows major revised points.
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

BLOCK DIAGRAM



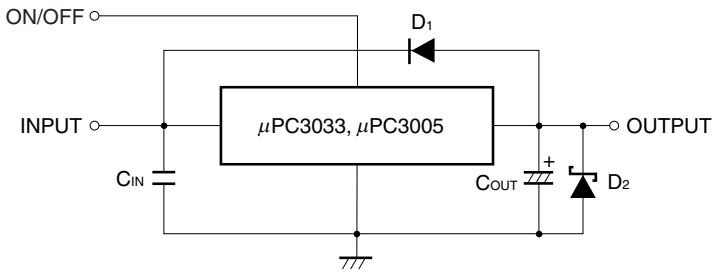
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, unless otherwise specified.)

Parameter	Symbol	Rating	Unit
Input Voltage	V_{IN}	−0.3 to +8.0	V
ON/OFF Pin Voltage	$V_{ON/OFF}$	−0.3 to +8.0	V
Internal Power Dissipation (T_C = 25°C) Note	P_T	12.5	W
Operating Ambient Temperature	T_A	−40 to +85	°C
Operating Junction Temperature	T_J	−40 to +150	°C
Storage Temperature	T_{stg}	−55 to +150	°C
Thermal Resistance (Junction to Ambient)	$R_{th(J-A)}$	110	°C/W
Thermal Resistance (Junction to Case)	$R_{th(J-C)}$	10	°C/W

Note Internally limited. When the operating junction temperature rises over 150°C, the internal circuit shuts down the output voltage.

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.

TYPICAL CONNECTION



C_{IN}: 0.1 μF or higher. Set this value according to the length of the line between the regulator and INPUT pin. Be sure to connect C_{IN} to prevent parasitic oscillation. Use of a film capacitor or other capacitor with excellent voltage and temperature characteristics is recommended. If using a laminated ceramic capacitor, it is necessary to ensure that C_{IN} is 0.1 μF or higher for the voltage and temperature range to be used.

C_{OUT}: 10 μF or higher. Be sure to connect C_{OUT} to prevent oscillation and improve excessive load regulation. Place C_{IN} and C_{OUT} as close as possible to the IC pins (within 1 to 2 cm). Also, use an electrolytic capacitor with low impedance characteristics if considering use at sub-zero temperatures.

D_1: If the OUTPUT pin has a higher voltage than the INPUT pin, connect a diode.

D_2: If the OUTPUT pin has a lower voltage than the GND pin, connect a Schottky barrier diode.

Caution Ensure that voltage is not applied to the OUTPUT pin externally.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Corresponding Model	MIN.	TYP.	MAX.	Unit
<R> Input Voltage	V_{IN}	μPC3033	4.3		7.5	V
<R>		μPC3005	6.0		7.5	V
ON/OFF Pin Voltage	$V_{ON/OFF}$	All	0		V_{IN}	V
Output Current	I_O	All	0		1.0	A
Operating Ambient Temperature	T_A	All	–40		+85	°C
Operating Junction Temperature	T_J	All	–40		+125	°C

<R> **Caution Use of conditions other than the above-listed recommended operating conditions is not a problem as long as the absolute maximum ratings are not exceeded. However, since the use of such conditions diminishes the margin of safety, careful evaluation is required before such conditions are used.**

ELECTRICAL CHARACTERISTICS

μPC3033 (T_J = 25°C, V_{IN} = 5 V, $V_{ON/OFF}$ = 5 V, I_O = 0.5 A, C_{IN} = 0.1 μF, C_{OUT} = 10 μF, unless otherwise specified.)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_{O1}		3.267	3.3	3.333	V
	V_{O2}	–20°C ≤ T_J ≤ +70°C, I_O = 50 mA	(3.234)		(3.366)	V
Line Regulation	REG_{IN}	4.3 V ≤ V_{IN} ≤ 6 V		2.0	9.0	mV
Load Regulation	REG_L	5 mA ≤ I_O ≤ 1 A		10.0	66.0	mV
Quiescent Current	I_{BIAS1}	I_O = 0 A		2.0	4.0	mA
	I_{BIAS2}	I_O = 0.5 A		15.0	30.0	mA
Startup Quiescent Current	$I_{BIAS(S)}$	V_{IN} = 3.1 V, I_O = 0 A		9.0	25.0	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		80		$μV_{r.m.s.}$
<R> Ripple Rejection	R·R	f = 120 Hz, 4.3 V ≤ V_{IN} ≤ 6 V		59		dB
Dropout Voltage	V_{DIF}	I_O = 0.5 A		0.4	0.6	V
Short Circuit Current	I_{Oshort}			0.6		A
Peak Output Current	I_{Opeak}		1.0	1.5		A
<R> Temperature Coefficient of Output Voltage	$ΔV_O/ΔT$	0°C ≤ T_J ≤ 125°C		|0.16|		mV/°C
ON Voltage	V_{ON}	V_{IN} = 7 V, I_O = 0 A	2.0			V
OFF Voltage	V_{OFF}	V_{IN} = 7 V, I_O = 0 A			0.8	V
ON/OFF Pin Current (ON state)	$I_{ON/OFF}$	$V_{ON/OFF}$ = 5 V		85	200	μA
Standby Current	$I_{BIAS(OFF)}$	$V_{ON/OFF}$ = 0 V			10	μA

Remark Values in parentheses have been measured during product design and are provided as reference values.

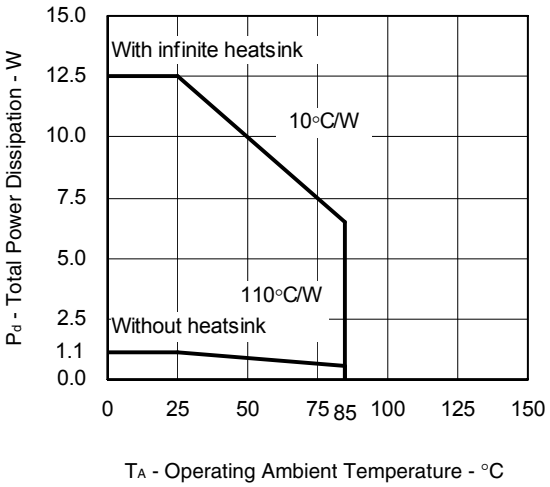
μPC3005 (T_J = 25°C, V_{IN} = 6 V, $V_{ON/OFF}$ = 6 V, I_O = 0.5 A, C_{IN} = 0.1 μF, C_{OUT} = 10 μF, unless otherwise specified.)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_{O1}		4.95	5.0	5.05	V
	V_{O2}	−20°C ≤ T_J ≤ +70°C, I_O = 50 mA	(4.90)		(5.10)	V
Line Regulation	REG_{IN}	6 V ≤ V_{IN} ≤ 7 V		2.0	9.0	mV
Load Regulation	REG_L	5 mA ≤ I_O ≤ 1 A		20.0	66.0	mV
Quiescent Current	I_{BIAS1}	I_O = 0 A		2.0	4.0	mA
<R>	I_{BIAS2}	I_O = 0.5 A		18.0	30.0	mA
<R> Startup Quiescent Current	$I_{BIAS(S)}$	V_{IN} = 4.8 V, I_O = 0 A		9.0	25.0	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		120		$\mu V_{r.m.s.}$
Ripple Rejection	R·R	f = 120 Hz, 6 V ≤ V_{IN} ≤ 7 V		54		dB
<R> Dropout Voltage	V_{DIF}	I_O = 0.5 A		0.28	0.6	V
Short Circuit Current	I_{Oshort}			0.6		A
<R> Peak Output Current	I_{Opeak}		1.0	1.5		A
<R> Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	0°C ≤ T_J ≤ 125°C		|0.4|		mV/°C
ON Voltage	V_{ON}	V_{IN} = 7 V, I_O = 0 A	2.0			V
OFF Voltage	V_{OFF}	V_{IN} = 7 V, I_O = 0 A			0.8	V
ON/OFF Pin Current (ON state)	$I_{ON/OFF}$	$V_{ON/OFF}$ = 7 V		130	200	μA
Standby Current	$I_{BIAS(OFF)}$	$V_{ON/OFF}$ = 0 V			10	μA

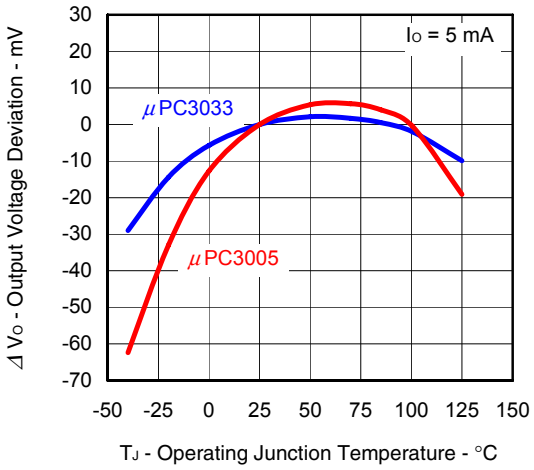
Remark Values in parentheses have been measured during product design and are provided as reference values.

<R> **TYPICAL CHARACTERISTICS (T_A = 25°C)**

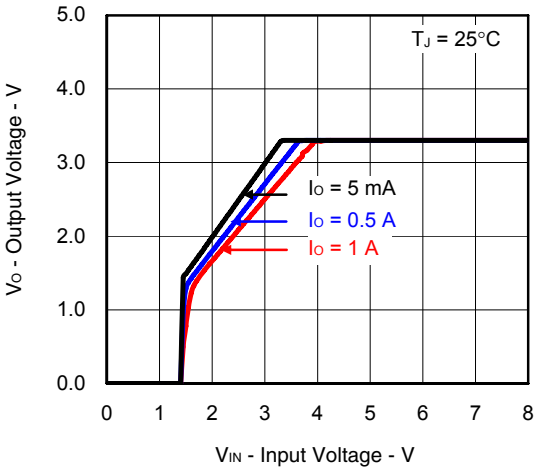
P_d vs. T_A



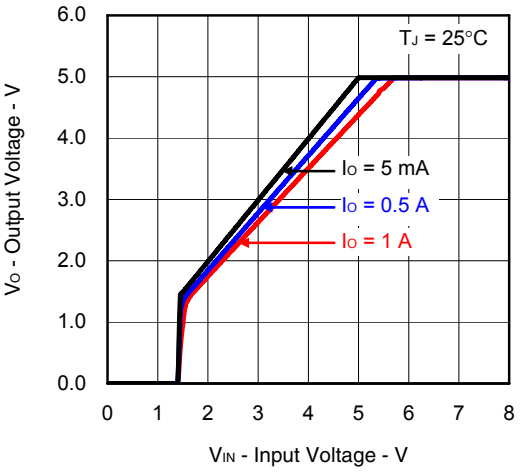
Δ V_O vs.T_J



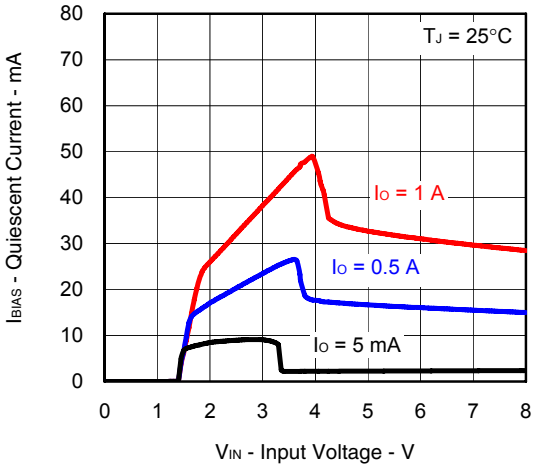
V_O vs. V_{IN} (μPC3033)



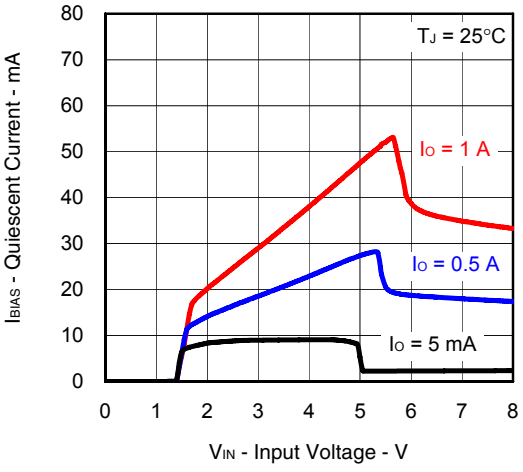
V_O vs. V_{IN} (μPC3005)



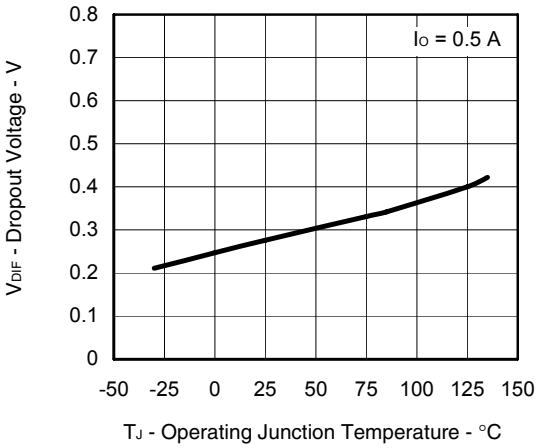
I_{BIAS} ($I_{BIAS(S)}$) vs. V_{IN} (μPC3033)



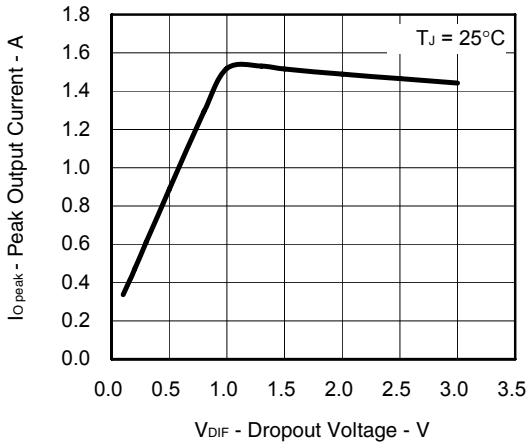
I_{BIAS} ($I_{BIAS(S)}$) vs. V_{IN} (μPC3005)



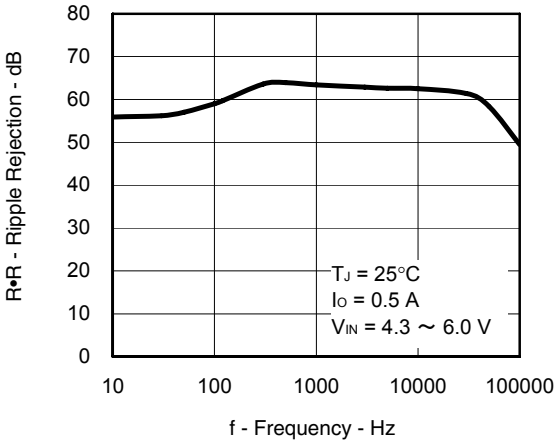
V_{DIF} vs. T_J (μPC3005)



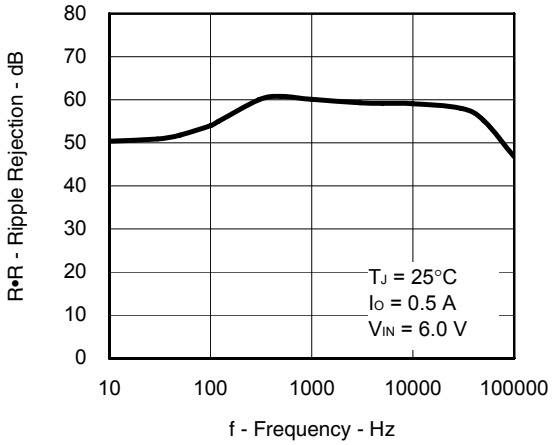
$I_{O\,peak}$ vs. V_{DIF} (μPC3005)



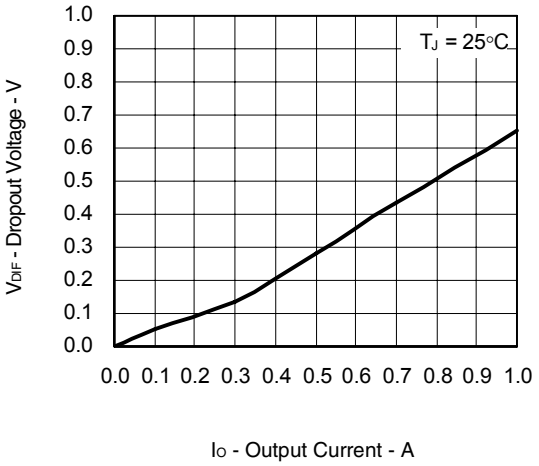
R•R vs. f (μPC3033)



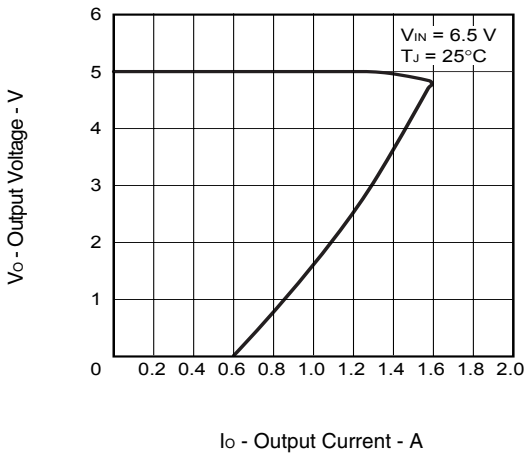
R•R vs. f (μPC3005)



V_{DIF} vs. I_O (μPC3005)

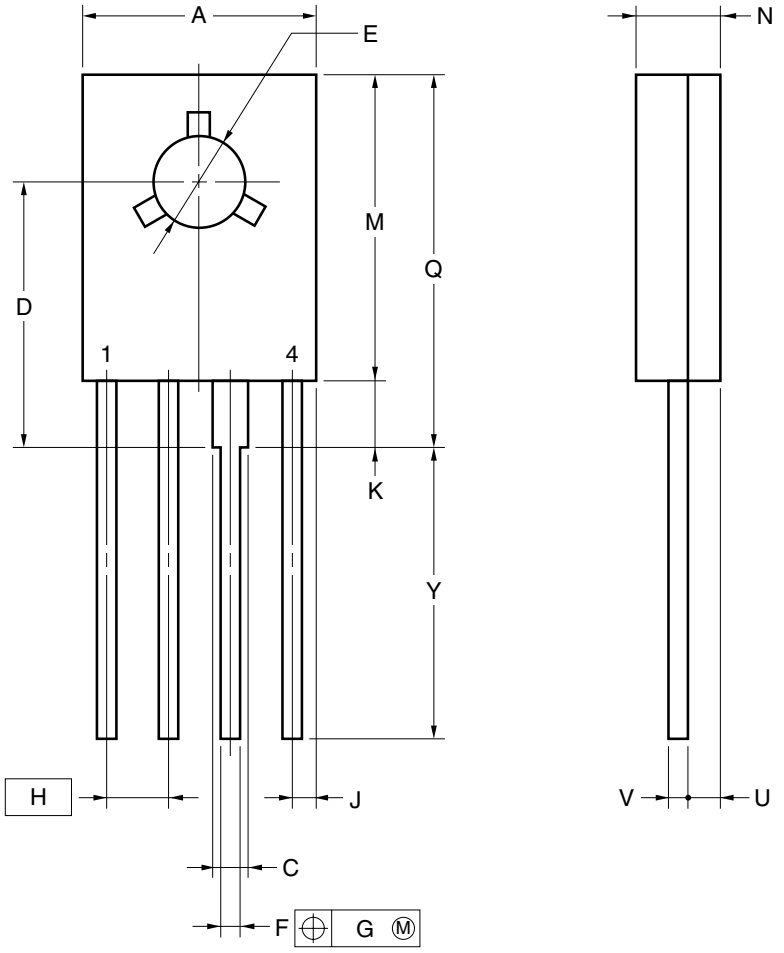


V_O vs. I_O (μPC3005)



PACKAGE DRAWING (Unit: mm)

4-PIN PLASTIC SIP (TO-126)



NOTE

Each lead centerline is located within 0.2 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	8.5 MAX.
C	1.1 MIN.
D	9.7±0.3
E	φ3.2±0.1
F	0.65±0.1
G	0.2
H	2.0
J	1.25 MAX.
K	2.3 MIN.
M	11.5 MAX.
N	2.7±0.2
Q	14.5 MAX.
U	1.7 MAX.
V	0.55±0.1
Y	13.5±0.7

P4HP-200B-2

RECOMMENDED SOLDERING CONDITIONS

The μPC3033,3005 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

μPC3033H, μPC3005H: 4-pin plastic SIP (TO-126)

	Process	Conditions	Recommend
<R>	Wave soldering (only to leads)	Solder temperature: 260°C or below, Flow time: 10 seconds or less.	WS60-00-1
<R>	Partial heating method	Pin temperature: 300°C or below, Heat time: 3 seconds or less (Per each pin).	P300

μPC3033H-AZ, μPC3005H-AZ: 4-pin plastic SIP (TO-126) [Note]

	Process	Conditions	Recommend
<R>	Wave soldering (only to leads)	Solder temperature: 260°C or below, Flow time: 10 seconds or less.	WS60-00-1
<R>	Partial heating method	Pin temperature: 350°C or below, Heat time: 3 seconds or less (Per each pin).	P350

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

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.

NOTES ON USE

When the μPC3033 or μPC3005 is used with an input voltage that is lower than the value prescribed in the recommended operating conditions, a large quiescent current flows through the device due to saturation at the transistor of the output stage. The specifications of these characteristics are prescribed by the item “Startup Quiescent Current ($I_{BIAS(S)}$)”.

These products have a saturation protector, but a current of up to 80 mA MAX. may flow through the device. Thus the power supply on the input side must have sufficient capacity to allow this quiescent current to pass through when the device is started up.

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
SEMICONDUCTOR SELECTION GUIDE - Products and Packages -	X13769X

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