NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2250 SERIES

LOW-SATURATED STABILIZED POWER SUPPLY WITH SYSTEM RESET PIN

DESCRIPTION

The μPC2250 series is a collection of low-saturated 4-pin stabilized power supplies with a pin that outputs a reset signal when a drop in the input voltage is detected.

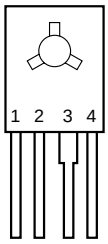
Because the reverse leakage current of these power supplies is about 1 μA even if a voltage is applied to the output pin when the input voltage is cut off, these power supplies are ideal for systems with on-board microprocessors requiring battery backup.

FEATURES

- Low minimum voltage difference between input and output
  V_{DIF} = 0.15 V TYP. (at I_O = 40 mA)
- Outputs reset signal (active-low) when the input voltage or output voltage drops.
- Low reverse leakage current during back up
  I_{OLK} = 1 μA TYP.
- Low circuit operating current under no load
  I_{BIAS} = 1.3 mA TYP.

PIN CONFIGURATION (Marking Side)

4-pin plastic SIP (TO-126)
μPC2251H, 2253H, 2255H

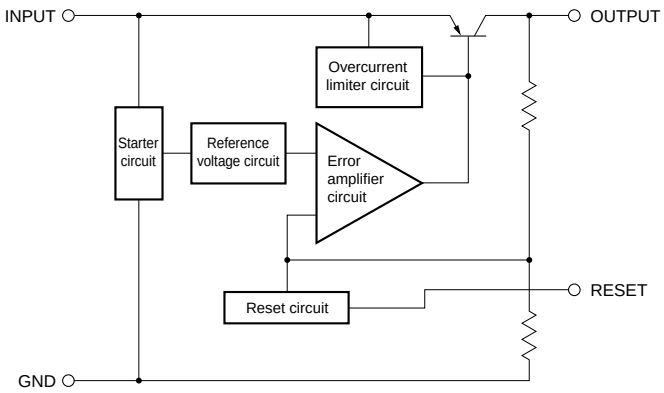


1: INPUT
2: RESET
3: GND
4: OUTPUT

ORDERING INFORMATION

Part Number	Package	Output Voltage
μPC2251H	4-pin plastic SIP (TO-126)	3 V
μPC2253H	4-pin plastic SIP (TO-126)	5 V (TYPE1)
μPC2255H	4-pin plastic SIP (TO-126)	5 V (TYPE2)

BLOCK DIAGRAM



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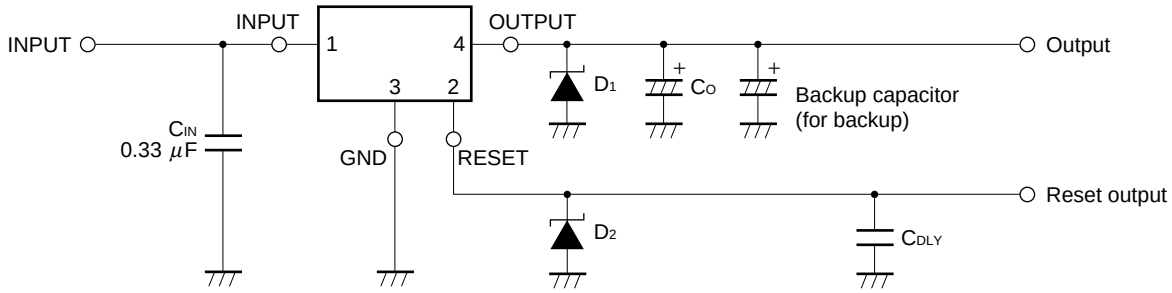
ABSOLUTE MAXIMUM RATINGS (Unless otherwise specified, T_A = 25°C)

Parameter	Symbol	Rating	Unit
Input Voltage	V_{IN}	–0.3 to +12	V
Total Power Dissipation	P_T	1.2[Note]	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)	$R_{th\ (J–C)}$	10	°C/W
Thermal Resistance (Junction to Ambient)	$R_{th\ (J–A)}$	104	°C/W

Note The total loss is limited by an internal circuit. Where T_J > 150°C, an internal protection circuit cuts off the output.

Caution If any of the parameters exceeds the absolute maximum ratings, even momentarily, the quality of the product may be impaired. The absolute maximum ratings are values that may physically damage the product(s). Be sure to use the product(s) within the ratings.

STANDARD CONNECTION



C_{IN} : Determine the capacitance depending on the line between the power supply smoothing circuit and input pin. Be sure to connect this capacitor to prevent abnormal oscillation. Use of a capacitor, such as a film capacitor, with excellent voltage and temperature characteristics is recommended. Note that some laminated ceramic capacitors have poor temperature and voltage characteristics. When using a laminated ceramic capacitor, the capacitance must be stable in the voltage and temperature ranges used.

C_O : Must be 10 μF or more. Be sure to connect this capacitor to prevent oscillation and to improve transient load stability.
Connect C_{IN} and C_O as close to the IC (within 1 to 2 cm) as possible.

D_1, D_2 : Connect Schottky barrier diodes (with a low forward voltage) if the voltage on the OUTPUT and RESET pins is lower than that on the GND pin.

μPC2251

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Input Voltage	V_{IN}	3.5	4	9	V
Output Current	I_O	0		40	mA
Operating Junction Temperature	T_J	–20		+125	°C

Caution The recommended operating range may be exceeded without causing any problems provided that the absolute maximum ratings are not exceeded. However, if the device is operated in a way that exceeds the recommended operating conditions, the margin between the actual conditions of use and the absolute maximum ratings is small, and therefore thorough evaluation is necessary. The recommended operating conditions do not imply that the device can be used with all values at their maximum values.

ELECTRICAL SPECIFICATIONS

(Unless otherwise specified, V_{IN} = 4 V, I_O = 40 mA, T_J = 25°C, C_{IN} = 0.33 μF, C_O = 10 μF.)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_{O1}		2.88	3.00	3.12	V
	V_{O2}	3.5 V ≤ V_{IN} 9 V, 1 mA ≤ Io ≤ 40 mA, 0°C ≤ T_J ≤ 125°C	2.85		3.15	V
Line Regulation	REG_{IN}	3.5 V ≤ V_{IN} ≤ 12 V			50	mV
		3.5 V ≤ V_{IN} ≤ 9 V			20	mV
Load Regulation	REG_L	1 mA ≤ I_O ≤ 100 mA			50	mV
		1 mA ≤ I_O ≤ 40 mA			20	mV
Quiescent Current	I_{BIAS}	I_O = 0 A			2.0	mA
		I_O = 100 mA		8.0		mA
Quiescent Current Change	ΔI_{BIAS}	4 V ≤ V_{IN} ≤ 12 V			1.0	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		70		$\mu V_{r.m.s.}$
Ripple Rejection	R•R	f= 120 Hz, 4 V ≤ V_{IN} ≤ 9 V	48			dB
Dropout Voltage	V_{DIF}	I_O = 40 mA, 0°C ≤ T_J ≤ 125°C		0.15	0.30	V
Short Circuit Current	I_{Oshort}	V_{IN} = 12 V		15		mA
Peak Output Current	I_{Opeak}	V_{IN} = 4 V		150		mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA, 0°C ≤ T_J ≤ 125°C		0.2		mV/°C
OFF Output Leakage Current	I_{OLK}	V_{IN} = 0 V, V_O = 3.0 V			10	μA
Reset Start Output Voltage	V_{ORT}	0°C ≤ T_J ≤ 125°C	V_{O1}–0.2		V_{O1}–0.1	V
Reset Output Saturated Voltage	$V_{RT(sat)}$	I_R = 1.6 mA			0.8	V

μPC2253

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Input Voltage	V_{IN}	5.5	6	12	V
Output Current	I_O	0		40	mA
Operating Junction Temperature	T_J	–20		+125	°C

Caution The recommended operating range may be exceeded without causing any problems provided that the absolute maximum ratings are not exceeded. However, if the device is operated in a way that exceeds the recommended operating conditions, the margin between the actual conditions of use and the absolute maximum ratings is small, and therefore thorough evaluation is necessary. The recommended operating conditions do not imply that the device can be used with all values at their maximum values.

ELECTRICAL SPECIFICATIONS

(Unless otherwise specified, V_{IN} = 6 V, I_O = 40 mA, T_J = 25°C, C_{IN} = 0.33 μF, C_O = 10 μF.)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_{O1}		4.8	5.0	5.2	V
	V_{O2}	5.5 V ≤ V_{IN} ≤ 12 V, 1 mA ≤ I_O ≤ 40 mA, 0°C ≤ T_J ≤ 125°C	4.75		5.25	V
Line Regulation	REG_{IN}	5.5 V ≤ V_{IN} ≤ 12 V			30	mV
Load Regulation	REG_L	1 mA ≤ I_O ≤ 100 mA			80	mV
		1 mA ≤ I_O ≤ 40 mA			30	mV
Quiescent Current	I_{BIAS}	I_O = 0 A			2.0	mA
		I_O = 100 mA		8.0		mA
Quiescent Current Change	ΔI_{BIAS}	6 V ≤ V_{IN} ≤ 12 V			1.0	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		130		$\mu V_{r.m.s.}$
Ripple Rejection	R•R	f= 120 Hz, 6 V ≤ V_{IN} ≤ 11 V	46			dB
Dropout Voltage	V_{DIF}	I_O = 40 mA, 0°C ≤ T_J ≤ 125°C		0.15	0.30	V
Short Circuit Current	I_{Oshort}	V_{IN} = 12 V		15		mA
Peak Output Current	I_{Opeak}	V_{IN} = 6 V		150		mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA, 0°C ≤ T_J ≤ 125°C		0.3		mV/°C
OFF Output Leakage Current	I_{OLK}	V_{IN} = 0 V, V_O = 5.0 V			10	μA
Reset Start Output Voltage	V_{ORT}	0°C ≤ T_J ≤ 125°C	2.70	2.85	3.00	V
Reset Output Saturated Voltage	$V_{RT(sat)}$	I_R = 1.6 mA			0.8	V

μPC2255

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Input Voltage	V_{IN}	5.5	6	12	V
Output Current	I_O	0		40	mA
Operating Junction Temperature	T_J	–20		+125	°C

Caution The recommended operating range may be exceeded without causing any problems provided that the absolute maximum ratings are not exceeded. However, if the device is operated in a way that exceeds the recommended operating conditions, the margin between the actual conditions of use and the absolute maximum ratings is small, and therefore thorough evaluation is necessary. The recommended operating conditions do not imply that the device can be used with all values at their maximum values.

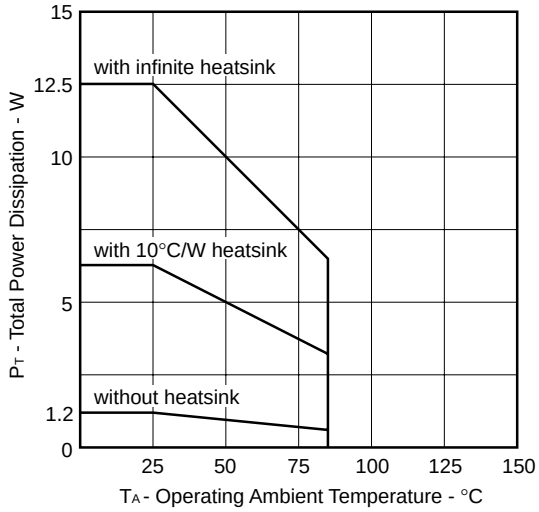
ELECTRICAL SPECIFICATIONS

(V_{IN} = 6 V, I_O = 40 mA, T_J = 25°C, C_{IN} = 0.33 μF, C_O = 10 μF.)

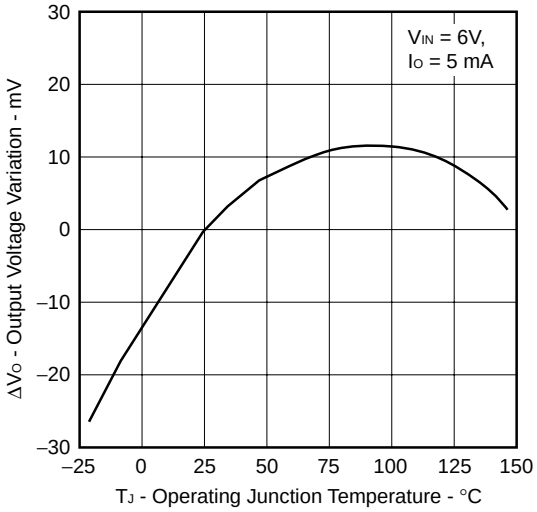
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_{O1}		4.8	5.0	5.2	V
	V_{O2}	5.5 V ≤ V_{IN} ≤ 12 V, 1 mA ≤ Io ≤ 40 mA, 0°C ≤ T_J ≤ 125°C	4.75		5.25	V
Line Regulation	REG_{IN}	5.5 V ≤ V_{IN} ≤ 12 V			30	mV
Load Regulation	REG_L	1 mA ≤ I_O ≤ 100 mA			80	mV
		1 mA ≤ I_O ≤ 40 mA			30	mV
Quiescent Current	I_{BIAS}	I_O = 0 A			2.0	mA
		I_O = 100 mA		8.0		mA
Quiescent Current Change	ΔI_{BIAS}	6 V ≤ V_{IN} ≤ 12 V			1.0	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		130		$\mu V_{r.m.s.}$
Ripple Rejection	R•R	f = 120 Hz, 6 V ≤ V_{IN} ≤ 11 V	46			dB
Dropout Voltage	V_{DIF}	I_O = 40 mA, 0°C ≤ T_J ≤ 125°C		0.15	0.30	V
Short Circuit Current	I_{Oshort}	V_{IN} = 12 V		15		mA
Peak Output Current	I_{Opeak}	V_{IN} = 6 V		150		mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA, 0°C ≤ T_J ≤ 125°C		0.3		mV/°C
OFF Output Leakage Current	I_{OLK}	V_{IN} = 0 V, V_O = 5.0 V			10	μA
Reset Start Output Voltage	V_{ORT}	0°C ≤ T_J ≤ 125°C	V_{O1}–0.3		V_{O1}–0.2	V
Reset Output Saturated Voltage	$V_{RT(sat)}$	I_R = 1.6 mA			0.8	V

CHARACTERISTIC CURVES (Unless otherwise specified, T_A = 25ºC. Reference values)

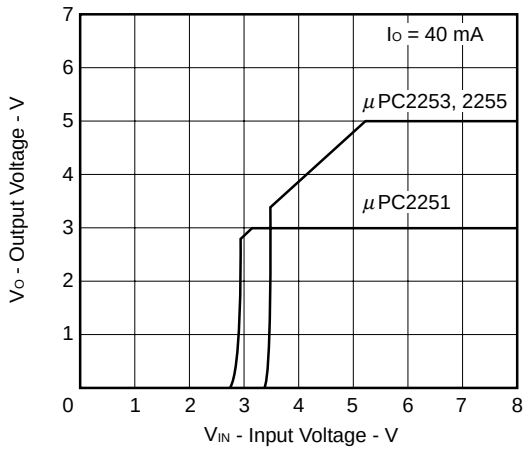
P_T vs. T_A Characteristics



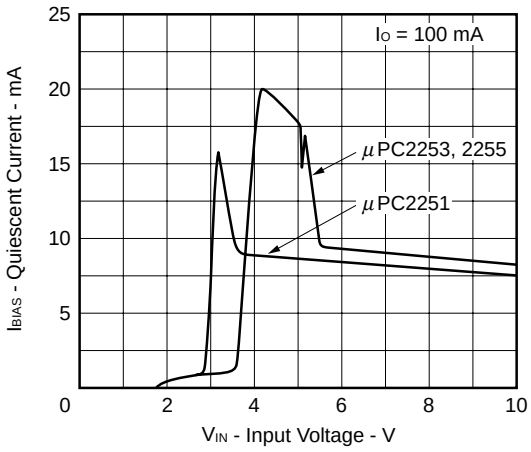
ΔV_O - T_J Characteristics



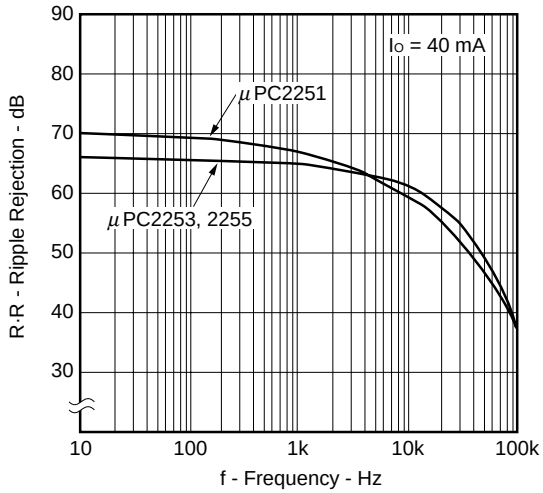
V_O - V_{IN} Characteristics



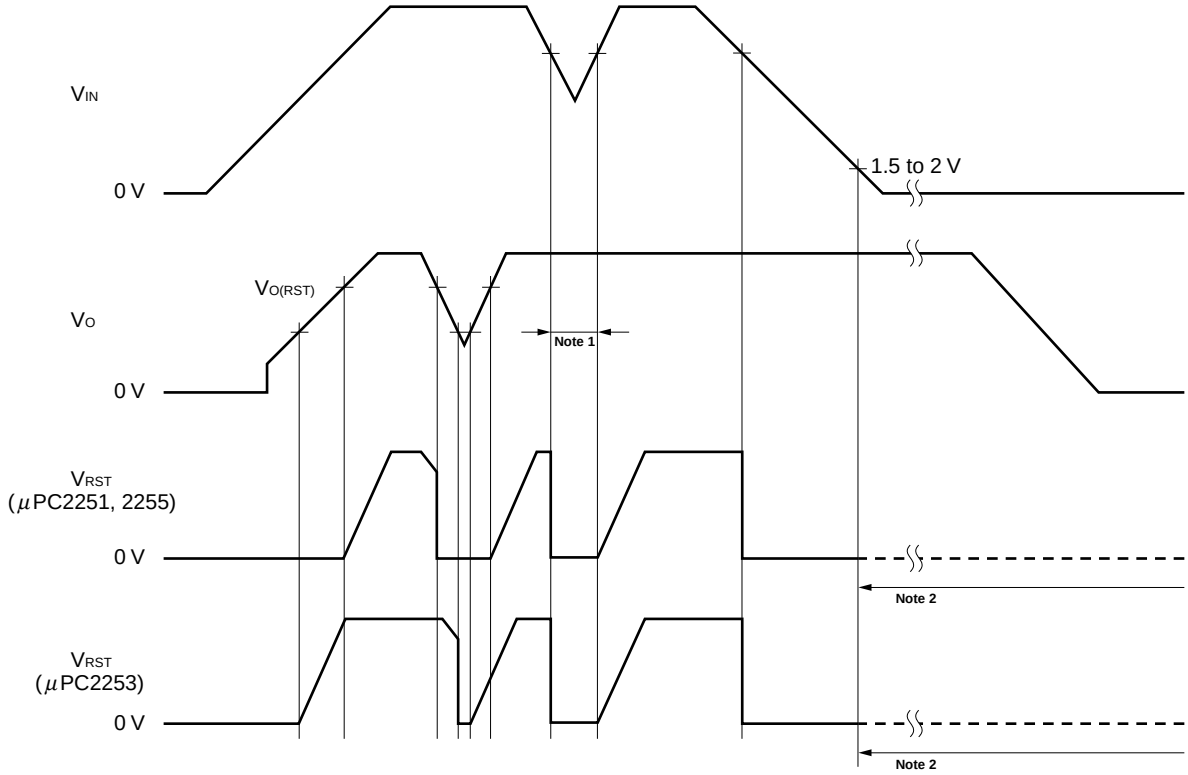
I_{BIAS} - V_{IN} Characteristics



R·R - f Characteristics



RESET OUTPUT CHARACTERISTICS (with standard connection)



Notes 1. The reset signal is output if the circuit enters backup status when the input voltage falls below the output voltage.

2. The reset output is undefined if the input voltage is 1.5 to 2 V or lower.

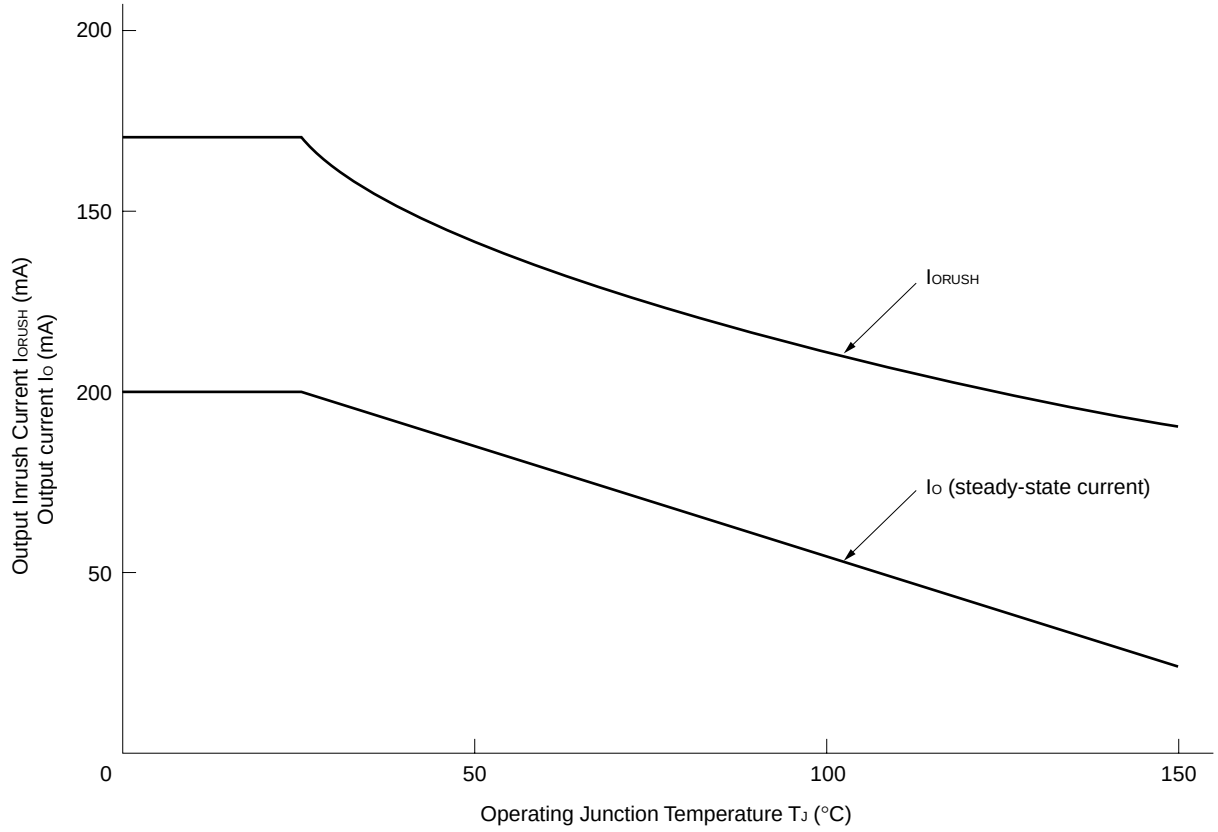
NOTES ON CORRECT USE

Keep the output current of the μPC2250 series to within I_O (steady-state current) in Figure 1 at the operating junction temperature (T_J).

Keep the output current, including the inrush current to the output capacitor, to within I_{ORUSH} in the figure when starting the circuit.

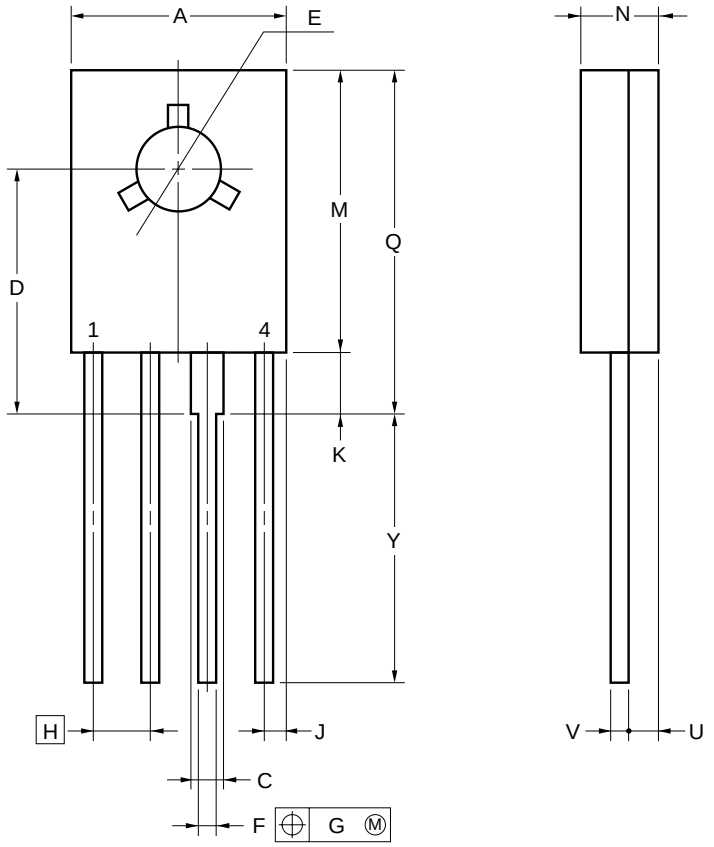
If these current limits are exceeded, the output voltage may not rise to the specified level because of the operation of the overcurrent limiter circuit.

Figure 1. Output Current Limits of μPC2250 Series



PACKAGE DRAWINGS

4 PIN PLASTIC SIP (TO-126)



NOTE
Each lead centerline is located within 0.2 mm (0.008 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	8.5 MAX.	0.335 MAX.
C	1.1 MIN.	0.043 MIN.
D	9.7±0.3	0.382±0.012
E	ϕ3.2±0.1	ϕ0.126±0.004
F	0.65±0.1	$0.026^{+0.004}_{-0.005}$
G	0.2	0.008
H	2.0	0.079
J	1.25 MAX.	0.05 MAX.
K	2.3 MIN.	0.09 MIN.
M	11.5 MAX.	0.453 MAX.
N	2.7±0.2	$0.106^{+0.009}_{-0.008}$
Q	14.5 MAX.	0.571 MAX.
U	1.7 MAX.	0.067 MAX.
V	0.55±0.1	$0.022^{+0.004}_{-0.005}$
Y	13.5±0.7	$0.531^{+0.029}_{-0.028}$

P4HP-200B-1

RECOMMENDED SOLDERING CONDITIONS

Solder this product under the following recommended conditions.

For details of the recommended soldering conditions, refer to information document **Semiconductor Device Mounting Technology Manual (C10535E)**.

For soldering methods and conditions other than those recommended, consult NEC.

Through Hole Type Soldering Conditions

μPC2251H, 2253H, 2255H: 4-pin plastic SIP (TO-126)

Soldering Method	Soldering Conditions
Wave soldering (Pins only)	Solder bath temperature: 260°C max., Time: 10 sec max.
Partial heating	Pin temperature: 300°C max., Time: 3 sec max. (per pin)

Caution When soldering this product using wave soldering, exercise care that the solder does not come in direct contact with the package.

[MEMO]

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