

# BIPOLAR ANALOG INTEGRATED CIRCUIT

# $\mu$ PC2918,2925,2926

## THREE-TERMINAL LOW DROPOUT VOLTAGE REGULATOR

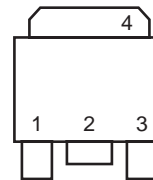
### ★ DESCRIPTION

The  $\mu$ PC2918, 2925 and 2926 are three-terminal low dropout voltage regulators with the 1-A output. The  $\mu$ PC2918 outputs 1.8 V, the  $\mu$ PC2925 outputs 2.5 V and the  $\mu$ PC2926 outputs 2.6 V. Since these regulators use a PNP transistor for the output stage, they achieve a low dropout voltage of 0.7 V TYP. at  $I_o = 1$  A and minimize the power dissipation of the IC. As a result, these regulators can be used to realize sets with lower voltage and power dissipation.

### FEATURES

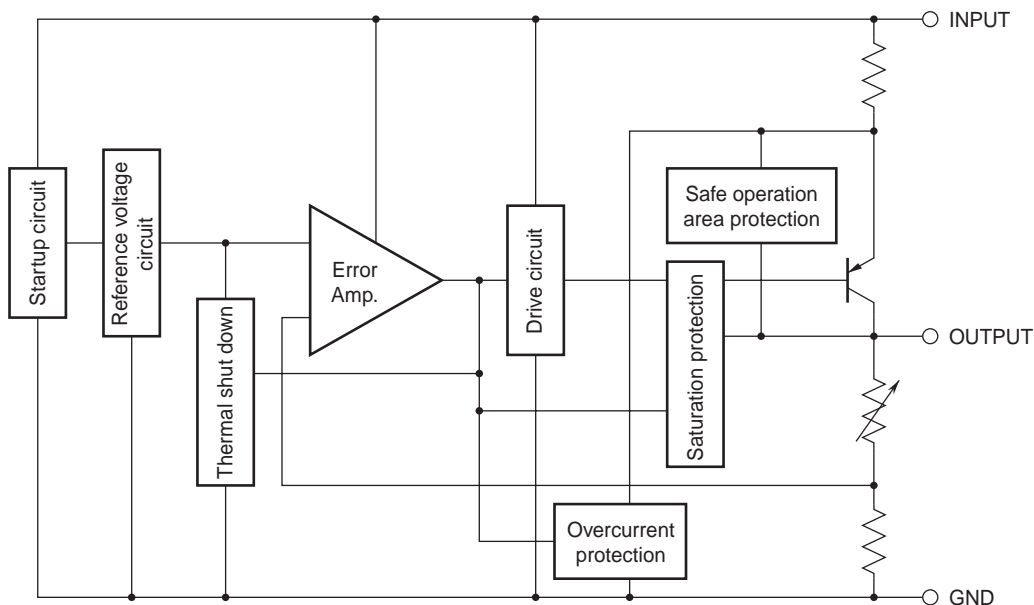
- Output current capacity: 1 A
- Low dropout voltage ( $V_{DIF} = 0.5$  V MAX. (at  $I_o = 0.5$  A))
- Output voltage accuracy:  $\pm 2\%$
- On-chip saturation protector rising edge of input voltage (at low input voltage)
- On-chip overcurrent limiter and thermal protection
- On-chip output transistor safe operation area protection

### PIN CONFIGURATION (Marking Side)



- 1: INPUT
- 2: GND
- 3: OUTPUT
- 4: GND (Fin)

### BLOCK DIAGRAM



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 Not all devices/types available in every country. Please check with local NEC representative for availability and additional information.

★ ORDERING INFORMATION

Part Number	Package	Marking	Packing Type
μPC29xxT	MP-3Z (SC-63)	29xx	<ul style="list-style-type: none"> <li>• Bag stuffing</li> </ul>
μPC29xxT-E1	MP-3Z (SC-63)	29xx	<ul style="list-style-type: none"> <li>• Embossed-type taping (16mm tape)</li> <li>• Pin 1 on drawout side</li> <li>• 2000 pcs/reel</li> </ul>
μPC29xxT-E2	MP-3Z (SC-63)	29xx	<ul style="list-style-type: none"> <li>• Embossed-type taping (16mm tape)</li> <li>• Pin 1 at takeup side</li> <li>• 2000 pcs/reel</li> </ul>
μPC29xxT-T1	MP-3Z (SC-63)	29xx	<ul style="list-style-type: none"> <li>• Adhesive-type taping (32mm tape)</li> <li>• Pin 1 on drawout side</li> <li>• 1500 pcs/reel</li> </ul>
μPC29xxT-T2	MP-3Z (SC-63)	29xx	<ul style="list-style-type: none"> <li>• Adhesive-type taping (32mm tape)</li> <li>• Pin 1 at takeup side</li> <li>• 1500 pcs/reel</li> </ul>
μPC29xxHB	MP-3 (SC-64)	29xx	<ul style="list-style-type: none"> <li>• Bag stuffing</li> </ul>

"xx" mark of the part number and marking columns expresses output voltage.

Example

Output Voltage	Part Number	Marking
1.8V	μPC2918T	2918
2.5V	μPC2925T	2925
2.6V	μPC2926T	2926

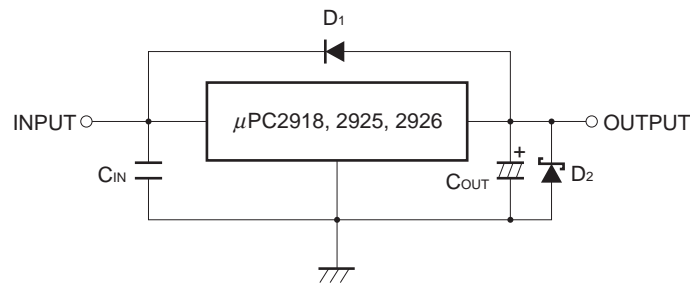
**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise specified)**

Parameter	Symbol	Rating	Unit
Input Voltage	V <sub>IN</sub>	-0.3 to +20	V
Internal Power Dissipation (T <sub>c</sub> = 25°C)	P <sub>T</sub>	10 <sup>Note</sup>	W
Operating Ambient Temperature	T <sub>A</sub>	-30 to +85	°C
Operating Junction Temperature	T <sub>J</sub>	-30 to +150	°C
Storage Temperature	T <sub>stg</sub>	-55 to +150	°C
Thermal Resistance (junction to case)	R <sub>th(J-C)</sub>	12.5	°C/W
Thermal Resistance (junction to ambient)	R <sub>th(J-A)</sub>	125	°C/W

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

**Caution** If the absolute maximum rating of any of the above parameters is exceeded even momentarily, the quality of the product may be degraded. In other words, absolute maximum ratings specify the values exceeding which the product may be physically damaged. Be sure to use the product with these ratings never exceeded.

★ **TYPICAL CONNECTION**



C<sub>IN</sub>: 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<sub>IN</sub> 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<sub>IN</sub> is 0.1 μF or higher for the voltage and temperature range to be used.

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

D<sub>1</sub>: If the OUTPUT pin has a higher voltage than the INPUT pin, connect a diode.

D<sub>2</sub>: If the OUTPUT pin has a lower voltage than the GND pin, connect a Schottky barrier diode.

**Caution** Make sure that no voltage is applied to the OUTPUT pin from external.

**RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	Type Number	MIN.	TYP.	MAX.	Unit
Input Voltage	V <sub>IN</sub>	μPC2918	2.8		16	V
		μPC2925	3.5		16	V
		μPC2926	3.6		16	V
Output Current	I <sub>o</sub>	All	0		1	A
Operating Ambient Temperature	T <sub>A</sub>	All	-30		+85	°C
Operating Junction Temperature	T <sub>J</sub>	All	-30		+125	°C

★

**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. Moreover, using the MAX. value for all the recommended operating conditions is not guaranteed to be safe.

**ELECTRICAL CHARACTERISTICS**

μPC2918 (T<sub>J</sub> = 25°C, V<sub>IN</sub> = 2.8 V, I<sub>o</sub> = 0.5 A, C<sub>IN</sub> = 0.1 μF, C<sub>OUT</sub> = 10 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V <sub>o</sub>		1.764	1.8	1.836	V
		2.8 V ≤ V <sub>IN</sub> ≤ 5 V, 0 A ≤ I <sub>o</sub> ≤ 1 A, 0°C ≤ T <sub>J</sub> ≤ 125°C	(1.71)		(1.854)	V
Line Regulation	REG <sub>IN</sub>	2.8 V ≤ V <sub>IN</sub> ≤ 16 V		6	25	mV
Load Regulation	REG <sub>L</sub>	0 A ≤ I <sub>o</sub> ≤ 1 A		7	30	mV
Quiescent Current	I <sub>BIAS</sub>	I <sub>o</sub> = 0 A		2	4	mA
		I <sub>o</sub> = 1 A		20	60	mA
Startup Quiescent Current	I <sub>BIAS (s)</sub>	V <sub>IN</sub> = 2.4 V, I <sub>o</sub> = 0 A		10	30	mA
		V <sub>IN</sub> = 2.4 V, I <sub>o</sub> = 1 A			80	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	2.8 V ≤ V <sub>IN</sub> ≤ 16 V, 0°C ≤ T <sub>J</sub> ≤ 125°C		2.9	20	mA
Output Noise Voltage	V <sub>n</sub>	10 Hz ≤ f ≤ 100 kHz		40		μV <sub>r.m.s.</sub>
Ripple Rejection	R•R	f = 120 Hz, 2.8 V ≤ V <sub>IN</sub> ≤ 9 V	45	60		dB
Dropout Voltage	V <sub>DIF</sub>	I <sub>o</sub> = 0.5 A		0.25	0.5	V
		I <sub>o</sub> = 1 A, 0°C ≤ T <sub>J</sub> ≤ 125°C		0.7		V
Short Circuit Current	I <sub>o short</sub>	V <sub>IN</sub> = 2.8 V	1.2	1.7	3.0	A
		V <sub>IN</sub> = 16 V		1.2		A
Peak Output Current	I <sub>o peak</sub>	V <sub>IN</sub> = 2.8 V	1.0	1.5	3.0	A
		V <sub>IN</sub> = 16 V		1.1		A
Temperature Coefficient of Output Voltage	ΔV <sub>o</sub> / ΔT	I <sub>o</sub> = 5 mA, 0°C ≤ T <sub>J</sub> ≤ 125°C		-0.4		mV/°C

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

μPC2925 (T<sub>J</sub> = 25°C, V<sub>IN</sub> = 3.5 V, I<sub>o</sub> = 0.5 A, C<sub>IN</sub> = 0.1 μF, C<sub>OUT</sub> = 10 μF, unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V <sub>O</sub>		2.45	2.5	2.55	V
		3.5 V ≤ V <sub>IN</sub> ≤ 5 V, 0 A ≤ I <sub>o</sub> ≤ 1 A, 0°C ≤ T <sub>J</sub> ≤ 125°C	(2.375)		(2.575)	V
Line Regulation	REG <sub>IN</sub>	3.5 V ≤ V <sub>IN</sub> ≤ 16 V		6	25	mV
Load Regulation	REG <sub>L</sub>	0 A ≤ I <sub>o</sub> ≤ 1 A		7	30	mV
Quiescent Current	I <sub>BIAS</sub>	I <sub>o</sub> = 0 A		2	4	mA
		I <sub>o</sub> = 1 A		20	60	mA
Startup Quiescent Current	I <sub>BIAS (s)</sub>	V <sub>IN</sub> = 2.4 V, I <sub>o</sub> = 0 A		10	30	mA
		V <sub>IN</sub> = 3.0 V, I <sub>o</sub> = 1 A			80	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	3.5 V ≤ V <sub>IN</sub> ≤ 16 V, 0°C ≤ T <sub>J</sub> ≤ 125°C		2.9	20	mA
Output Noise Voltage	V <sub>n</sub>	10 Hz ≤ f ≤ 100 kHz		40		μV <sub>r.m.s.</sub>
Ripple Rejection	R•R	f = 120 Hz, 3.5 V ≤ V <sub>IN</sub> ≤ 9 V	45	60		dB
Dropout Voltage	V <sub>DIF</sub>	I <sub>o</sub> = 0.5 A		0.25	0.5	V
		I <sub>o</sub> = 1 A, 0°C ≤ T <sub>J</sub> ≤ 125°C		0.7		V
Short Circuit Current	I <sub>short</sub>	V <sub>IN</sub> = 3.5 V	1.2	1.7	3.0	A
		V <sub>IN</sub> = 16 V		1.2		A
Peak Output Current	I <sub>opeak</sub>	V <sub>IN</sub> = 3.5 V	1.0	1.5	3.0	A
		V <sub>IN</sub> = 16 V		1.1		A
Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> / ΔT	I <sub>o</sub> = 5 mA, 0°C ≤ T <sub>J</sub> ≤ 125°C		-0.5		mV/°C

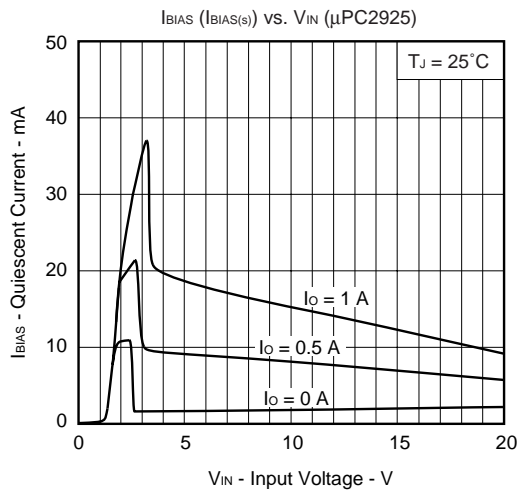
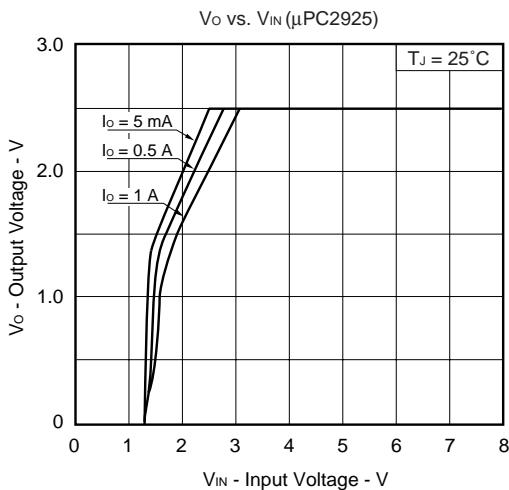
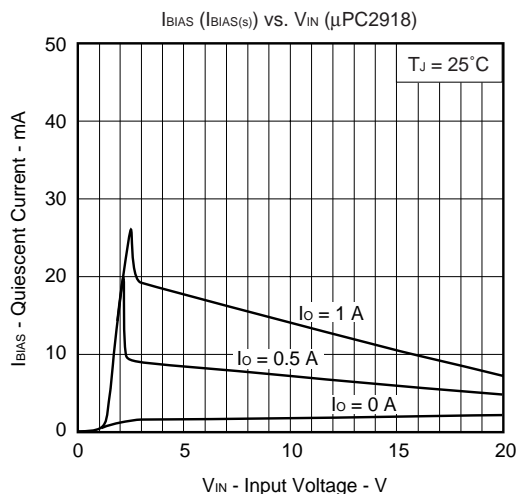
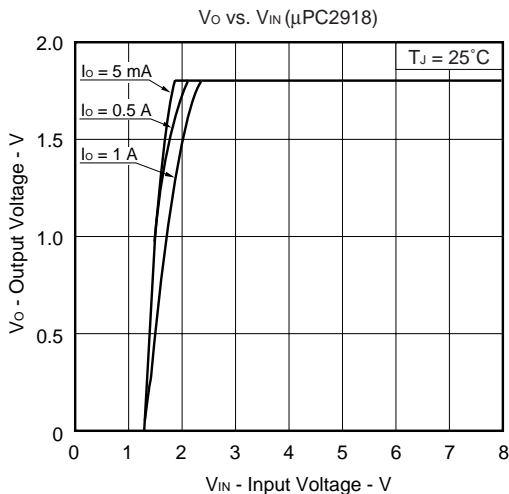
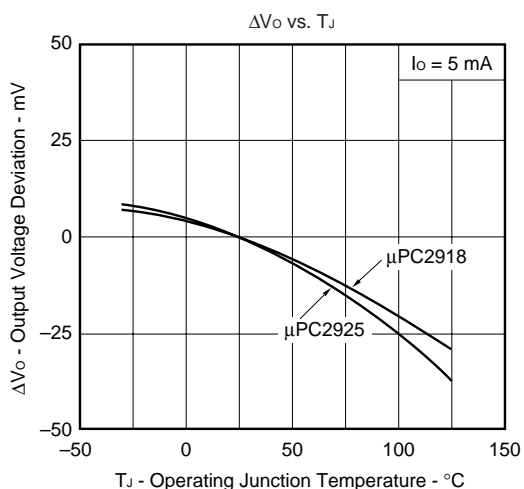
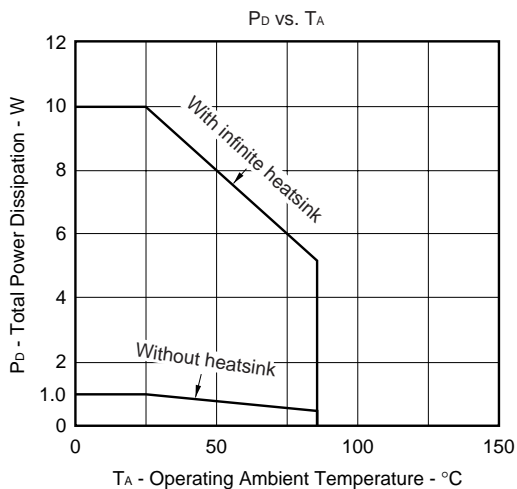
**Remark** Values in parentheses have been measured during product design and are provided as reference values.

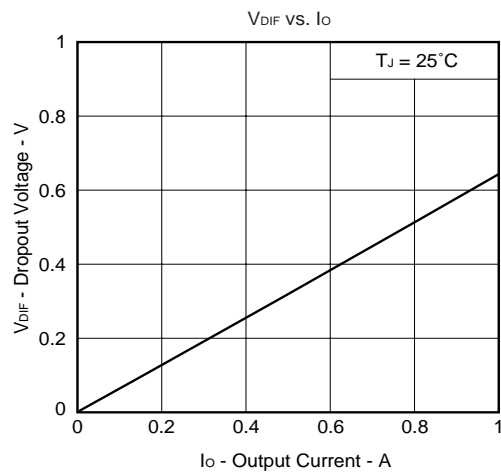
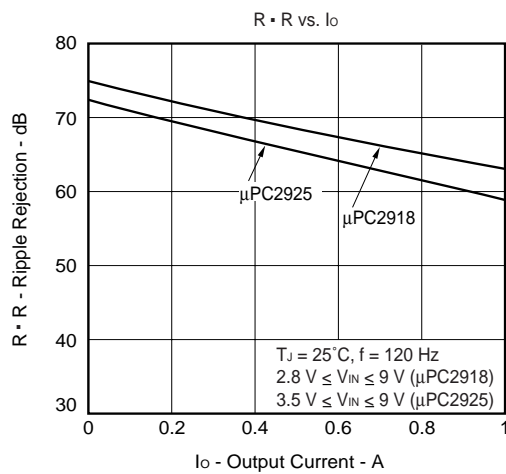
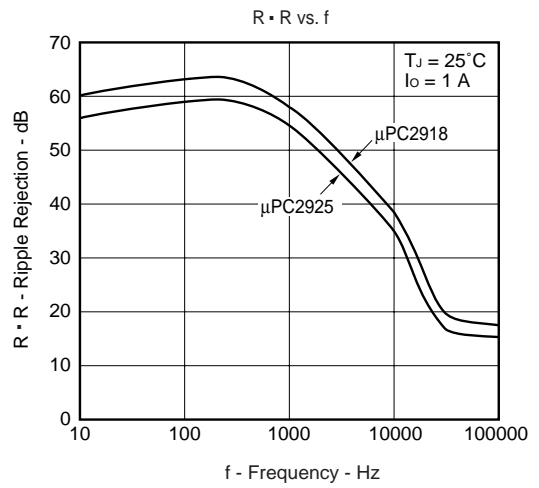
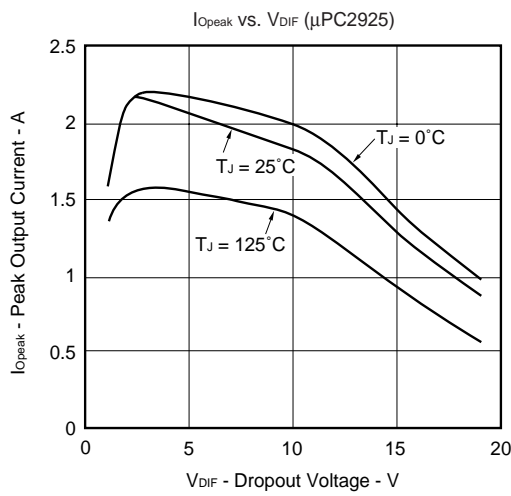
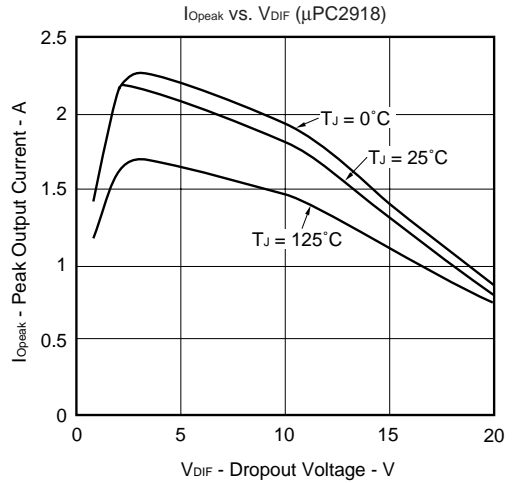
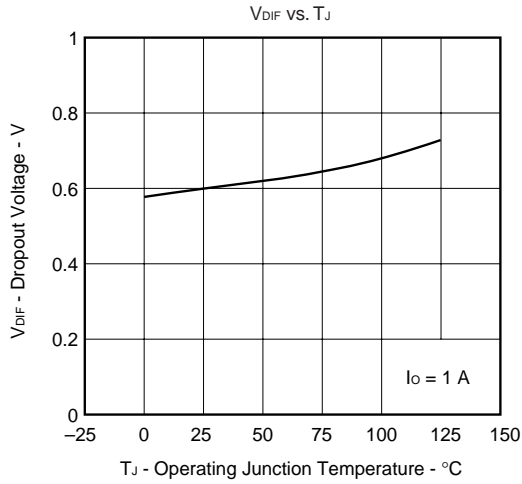
★ μPC2926 (T<sub>J</sub> = 25°C, V<sub>IN</sub> = 3.6 V, I<sub>o</sub> = 0.5 A, C<sub>IN</sub> = 0.1 μF, C<sub>OUT</sub> = 10 μF, unless otherwise specified)

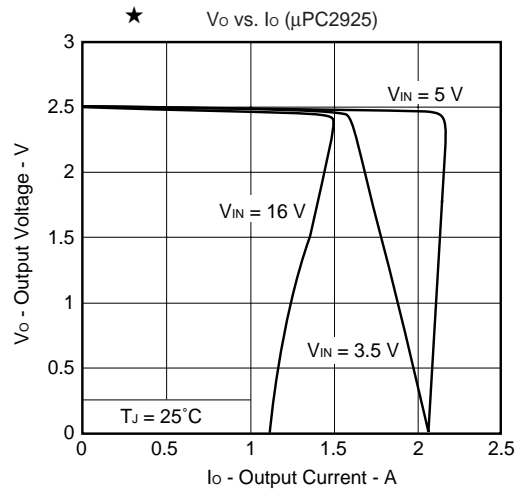
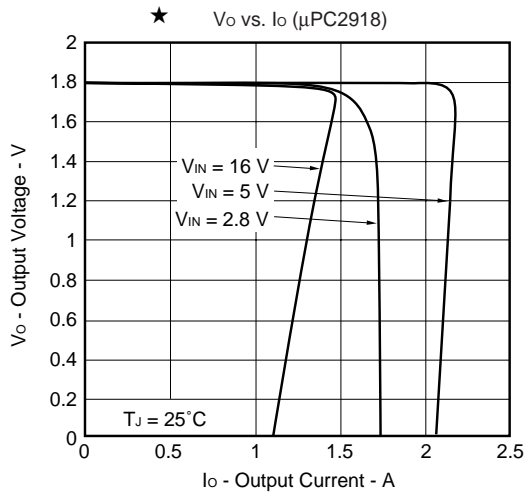
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V <sub>O</sub>		2.548	2.6	2.652	V
		3.6 V ≤ V <sub>IN</sub> ≤ 5 V, 0 A ≤ I <sub>o</sub> ≤ 1 A, 0°C ≤ T <sub>J</sub> ≤ 125°C	(2.470)		(2.678)	V
Line Regulation	REG <sub>IN</sub>	3.6 V ≤ V <sub>IN</sub> ≤ 16 V		6	25	mV
Load Regulation	REG <sub>L</sub>	0 A ≤ I <sub>o</sub> ≤ 1 A		7	30	mV
Quiescent Current	I <sub>BIAS</sub>	I <sub>o</sub> = 0 A		2	4	mA
		I <sub>o</sub> = 1 A		20	60	mA
Startup Quiescent Current	I <sub>BIAS (s)</sub>	V <sub>IN</sub> = 2.4 V, I <sub>o</sub> = 0 A		10	30	mA
		V <sub>IN</sub> = 3.0 V, I <sub>o</sub> = 1 A			80	mA
Quiescent Current Change	ΔI <sub>BIAS</sub>	3.6 V ≤ V <sub>IN</sub> ≤ 16 V, 0°C ≤ T <sub>J</sub> ≤ 125°C		2.9	20	mA
Output Noise Voltage	V <sub>n</sub>	10 Hz ≤ f ≤ 100 kHz		40		μV <sub>r.m.s.</sub>
Ripple Rejection	R•R	f = 120 Hz, 3.6 V ≤ V <sub>IN</sub> ≤ 9 V	45	60		dB
Dropout Voltage	V <sub>DIF</sub>	I <sub>o</sub> = 0.5 A		0.25	0.5	V
		I <sub>o</sub> = 1 A, 0°C ≤ T <sub>J</sub> ≤ 125°C		0.7		V
Short Circuit Current	I <sub>short</sub>	V <sub>IN</sub> = 3.6 V	1.2	1.7	3.0	A
		V <sub>IN</sub> = 16 V		1.2		A
Peak Output Current	I <sub>opeak</sub>	V <sub>IN</sub> = 3.6 V	1.0	1.5	3.0	A
		V <sub>IN</sub> = 16 V		1.1		A
Temperature Coefficient of Output Voltage	ΔV <sub>O</sub> / ΔT	I <sub>o</sub> = 5 mA, 0°C ≤ T <sub>J</sub> ≤ 125°C		-0.5		mV/°C

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

TYPICAL CHARACTERISTICS (Reference Values)



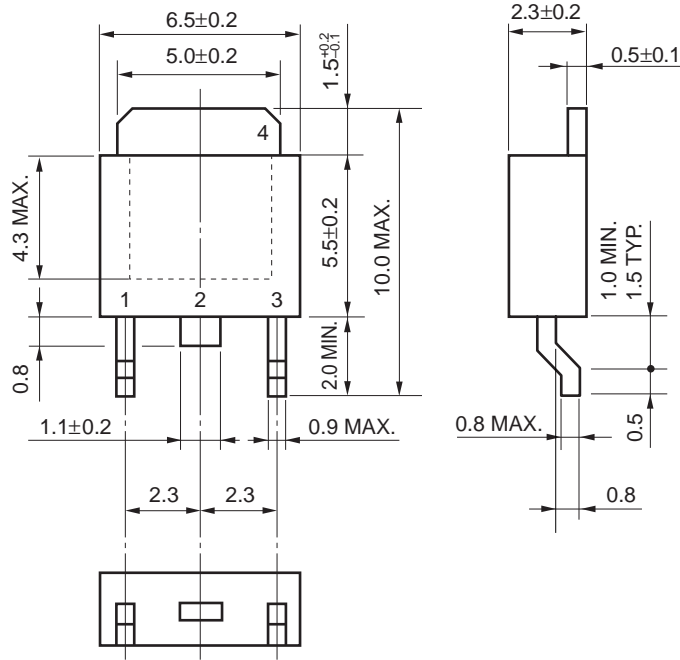




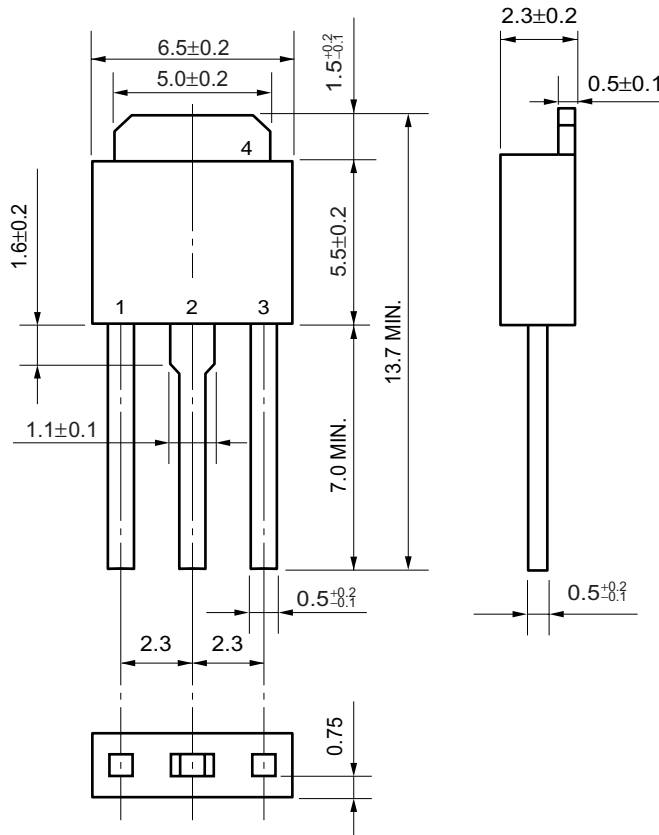


PACKAGE DRAWINGS

MP-3Z (SC-63) (Unit: mm)



★ MP-3 (SC-64) (Unit: mm)



★ RECOMMENDED SOLDERING CONDITIONS

The μPC2918, 2925 and 2926 should be soldered and mounted under the following recommended conditions.

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

For soldering methods and conditions other than those recommended below, contact our sales representative.

Type of Surface Mount Device

μPC2918T, μPC2925T, μPC2926T: MP-3Z(SC-63)

Process	Conditions	Symbol
Infrared Ray Reflow	Peak temperature: 235°C or below (Package surface temperature), Reflow time: 30 seconds or less (at 210°C or higher), Maximum number of reflow processes: 3 times or less.	IR35-00-3
Vapor Phase Soldering	Peak temperature: 215°C or below (Package surface temperature), Reflow time: 40 seconds or less (at 200°C or higher), Maximum number of reflow processes: 3 times or less.	VP15-00-3
Wave Soldering	Solder temperature: 260°C or below, Flow time: 10 seconds or less, Maximum number of flow processes: 1 time, Pre-heating temperature: 120°C or below (Package surface temperature).	WS60-00-1
Partial Heating Method	Pin temperature: 300°C or below, Heat time: 3 seconds or less (Per each side of the device).	—

**Caution** Apply only one kind of soldering condition to a device, except for "partial heating method", or the device will be damaged by heat stress.

Type of Through-hole Device

μPC2918HB, μPC2925HB, μPC2926HB: MP-3(SC-64)

Process	Conditions
Wave Soldering (only to leads)	Solder temperature: 260°C or below, Flow time: 10 seconds or less
Partial Heating Method	Pin temperature: 300°C or below, Heat time: 3 seconds or less (Per each pin).

**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  $\mu$ PC2918, 2925, and 2926 are used with an input voltage that is lower than the value indicated in the recommended operating conditions, a large quiescent current flows through the device due to saturation of the transistor of the output stage. (Refer to the  $I_{BIAS}$  ( $I_{BIAS(S)}$ ) vs.  $V_{IN}$  curves in TYPICAL CHARACTERISTICS).

These products have 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 when the device starts up.

**REFERENCE DOCUMENTS**

Document Name	Document No.
Usage of Three-Terminal Regulators User's Manual	G12702E
Voltage Regulator of SMD Information	G11872E
Semiconductor Device Mounting Technology Manual Information	C10535E
SEMICONDUCTOR SELECTION GUIDE - Products and Packages-	X13769X

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