NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2918,2925,2926

THREE-TERMINAL LOW DROPOUT VOLTAGE REGULATOR

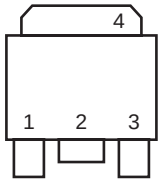
★ DESCRIPTION

The μPC2918, 2925 and 2926 are three-terminal low dropout voltage regulators with the 1-A output. The μPC2918 outputs 1.8 V, the μPC2925 outputs 2.5 V and the μPC2926 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

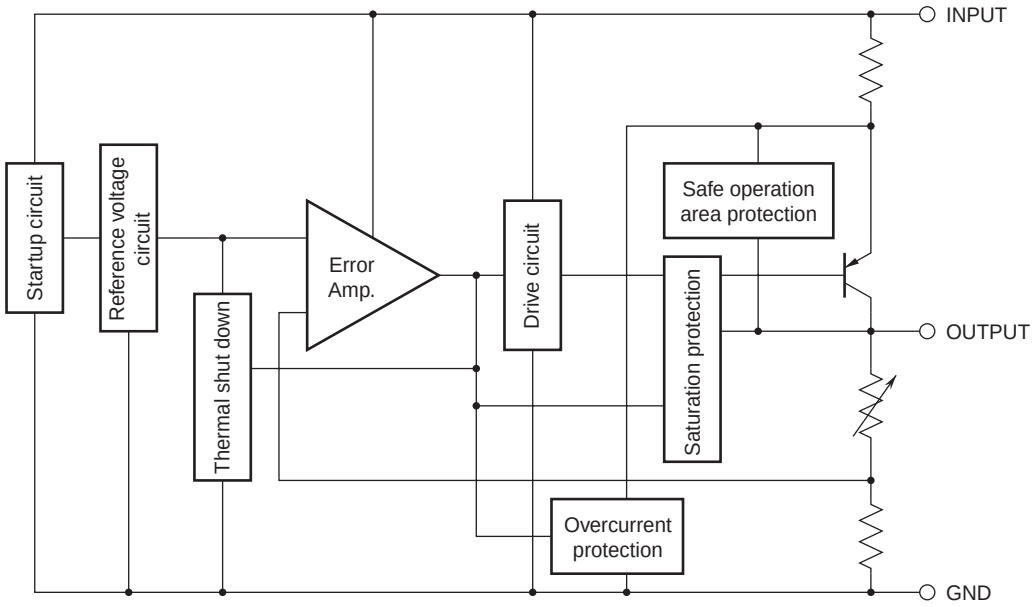
- Output current capacity: 1 A
- Low dropout voltage (V_{DIF} = 0.5 V MAX. (at I_O = 0.5 A))
- Output voltage accuracy: ±2%
- On-chip saturation protector rising edge of input voltage (at low input voltage)
- On-chip overcurrent limiter and thermal protection
- On-chip output transistor safe operation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

PIN CONFIGURATION (Marking Side)



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

BLOCK DIAGRAM



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Document No. G14983EJ3V0DS00 (3rd edition)
Date Published May 2001 NS CP(K)
Printed in Japan

The mark ★ shows major revised points.

★ ORDERING INFORMATION

Part Number	Package	Marking	Packing Type
μPC29xxT	MP-3Z (SC-63)	29xx	• Bag stuffing
μPC29xxT-E1	MP-3Z (SC-63)	29xx	• Embossed-type taping (16mm tape) • Pin 1 on drawout side • 2000 pcs/reel
μPC29xxT-E2	MP-3Z (SC-63)	29xx	• Embossed-type taping (16mm tape) • Pin 1 at takeup side • 2000 pcs/reel
μPC29xxT-T1	MP-3Z (SC-63)	29xx	• Adhesive-type taping (32mm tape) • Pin 1 on drawout side • 1500 pcs/reel
μPC29xxT-T2	MP-3Z (SC-63)	29xx	• Adhesive-type taping (32mm tape) • Pin 1 at takeup side • 1500 pcs/reel
μPC29xxHB	MP-3 (SC-64)	29xx	• Bag stuffing

”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

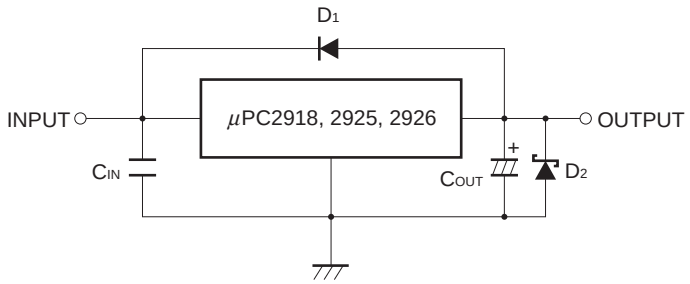
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Parameter	Symbol	Rating	Unit
Input Voltage	V_{IN}	–0.3 to +20	V
Internal Power Dissipation (T_C = 25°C)	P_T	10 Note	W
Operating Ambient Temperature	T_A	–30 to +85	°C
Operating Junction Temperature	T_J	–30 to +150	°C
Storage Temperature	T_{stg}	–55 to +150	°C
Thermal Resistance (junction to case)	$R_{th(J-C)}$	12.5	°C/W
Thermal Resistance (junction to ambient)	$R_{th(J-A)}$	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_{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 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 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_{IN}	μPC2918	2.8		16	V
		μPC2925	3.5		16	V
★		μPC2926	3.6		16	V
Output Current	I_O	All	0		1	A
Operating Ambient Temperature	T_A	All	−30		+85	°C
Operating Junction Temperature	T_J	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_J = 25°C, V_{IN} = 2.8 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_O		1.764	1.8	1.836	V
		2.8 V ≤ V_{IN} ≤ 5 V, 0 A ≤ I_O ≤ 1 A, 0°C ≤ T_J ≤ 125°C	(1.71)		(1.854)	V
Line Regulation	REG_{IN}	2.8 V ≤ V_{IN} ≤ 16 V		6	25	mV
Load Regulation	REG_L	0 A ≤ I_O ≤ 1 A		7	30	mV
Quiescent Current	I_{BIAS}	I_O = 0 A		2	4	mA
		I_O = 1 A		20	60	mA
Startup Quiescent Current	$I_{BIAS\ (s)}$	V_{IN} = 2.4 V, I_O = 0 A		10	30	mA
		V_{IN} = 2.4 V, I_O = 1 A			80	mA
Quiescent Current Change	ΔI_{BIAS}	2.8 V ≤ V_{IN} ≤ 16 V, 0°C ≤ T_J ≤ 125°C		2.9	20	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		40		$\mu V_{r.m.s.}$
Ripple Rejection	R•R	f = 120 Hz, 2.8 V ≤ V_{IN} ≤ 9 V	45	60		dB
Dropout Voltage	V_{DIF}	I_O = 0.5 A		0.25	0.5	V
		I_O = 1 A, 0°C ≤ T_J ≤ 125°C		0.7		V
Short Circuit Current	I_{Oshort}	V_{IN} = 2.8 V	1.2	1.7	3.0	A
		V_{IN} = 16 V		1.2		A
Peak Output Current	I_{Opeak}	V_{IN} = 2.8 V	1.0	1.5	3.0	A
		V_{IN} = 16 V		1.1		A
Temperature Coefficient of Output Voltage	$\Delta V_O / \Delta T$	I_O = 5 mA, 0°C ≤ T_J ≤ 125°C		−0.4		mV/°C

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

μPC2925 (T_J = 25°C, V_{IN} = 3.5 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_O		2.45	2.5	2.55	V
		3.5 V ≤ V_{IN} ≤ 5 V, 0 A ≤ I_O ≤ 1 A, 0°C ≤ T_J ≤ 125°C	(2.375)		(2.575)	V
Line Regulation	REG_{IN}	3.5 V ≤ V_{IN} ≤ 16 V		6	25	mV
Load Regulation	REG_L	0 A ≤ I_O ≤ 1 A		7	30	mV
Quiescent Current	I_{BIAS}	I_O = 0 A		2	4	mA
		I_O = 1 A		20	60	mA
Startup Quiescent Current	$I_{BIAS\ (s)}$	V_{IN} = 2.4 V, I_O = 0 A		10	30	mA
		V_{IN} = 3.0 V, I_O = 1 A			80	mA
Quiescent Current Change	ΔI_{BIAS}	3.5 V ≤ V_{IN} ≤ 16 V, 0°C ≤ T_J ≤ 125°C		2.9	20	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		40		$\mu V_{r.m.s.}$
Ripple Rejection	R•R	f = 120 Hz, 3.5 V ≤ V_{IN} ≤ 9 V	45	60		dB
Dropout Voltage	V_{DIF}	I_O = 0.5 A		0.25	0.5	V
		I_O = 1 A, 0°C ≤ T_J ≤ 125°C		0.7		V
Short Circuit Current	I_{Oshort}	V_{IN} = 3.5 V	1.2	1.7	3.0	A
		V_{IN} = 16 V		1.2		A
Peak Output Current	I_{Opeak}	V_{IN} = 3.5 V	1.0	1.5	3.0	A
		V_{IN} = 16 V		1.1		A
Temperature Coefficient of Output Voltage	$\Delta V_O / \Delta T$	I_O = 5 mA, 0°C ≤ T_J ≤ 125°C		−0.5		mV/°C

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

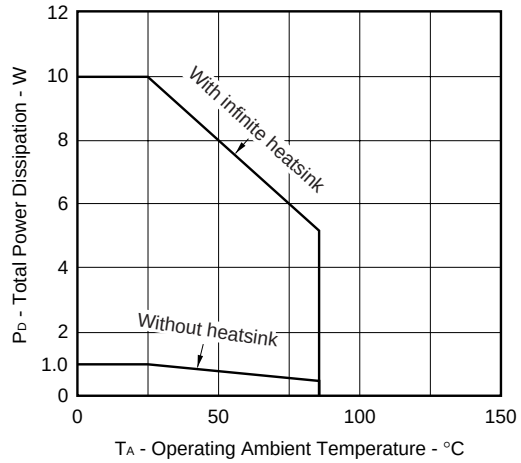
★ **μPC2926 (T_J = 25°C, V_{IN} = 3.6 V, I_O = 0.5 A, C_{IN} = 0.1 μF, C_{OUT} = 10 μF, unless otherwise specified)**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O		2.548	2.6	2.652	V
		3.6 V ≤ V_{IN} ≤ 5 V, 0 A ≤ I_O ≤ 1 A, 0°C ≤ T_J ≤ 125°C	(2.470)		(2.678)	V
Line Regulation	REG_{IN}	3.6 V ≤ V_{IN} ≤ 16 V		6	25	mV
Load Regulation	REG_L	0 A ≤ I_O ≤ 1 A		7	30	mV
Quiescent Current	I_{BIAS}	I_O = 0 A		2	4	mA
		I_O = 1 A		20	60	mA
Startup Quiescent Current	$I_{BIAS\ (s)}$	V_{IN} = 2.4 V, I_O = 0 A		10	30	mA
		V_{IN} = 3.0 V, I_O = 1 A			80	mA
Quiescent Current Change	ΔI_{BIAS}	3.6 V ≤ V_{IN} ≤ 16 V, 0°C ≤ T_J ≤ 125°C		2.9	20	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		40		$\mu V_{r.m.s.}$
Ripple Rejection	R•R	f = 120 Hz, 3.6 V ≤ V_{IN} ≤ 9 V	45	60		dB
Dropout Voltage	V_{DIF}	I_O = 0.5 A		0.25	0.5	V
		I_O = 1 A, 0°C ≤ T_J ≤ 125°C		0.7		V
Short Circuit Current	I_{Oshort}	V_{IN} = 3.6 V	1.2	1.7	3.0	A
		V_{IN} = 16 V		1.2		A
Peak Output Current	I_{Opeak}	V_{IN} = 3. 6 V	1.0	1.5	3.0	A
		V_{IN} = 16 V		1.1		A
Temperature Coefficient of Output Voltage	$\Delta V_O / \Delta T$	I_O = 5 mA, 0°C ≤ T_J ≤ 125°C		−0.5		mV/°C

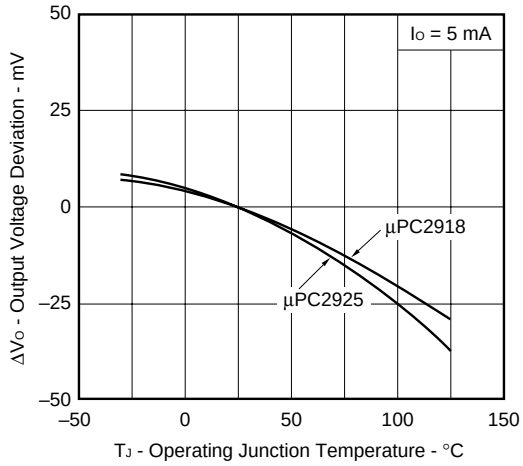
Remark Values in parentheses have been measured during product design and are provided as reference values.

TYPICAL CHARACTERISTICS (Reference Values)

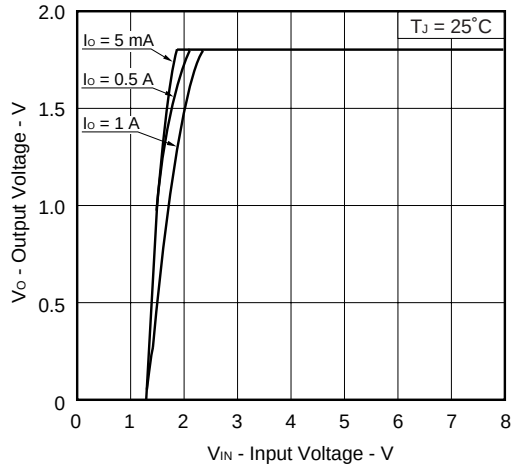
P_D vs. T_A



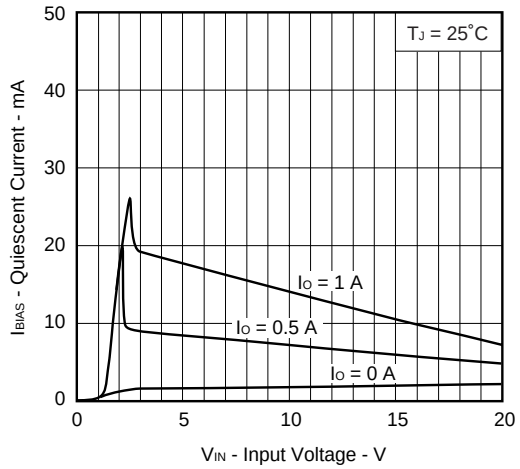
ΔV_O vs. T_J



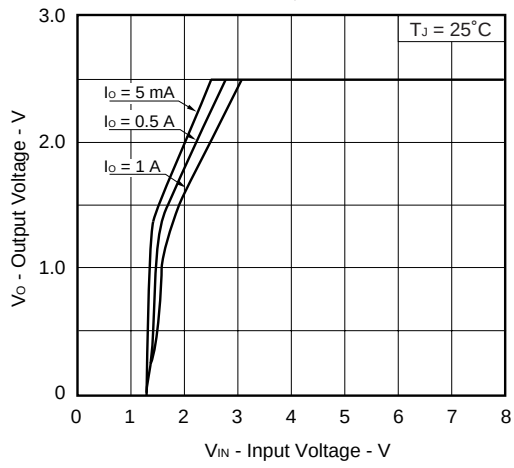
V_O vs. V_{IN} (μPC2918)



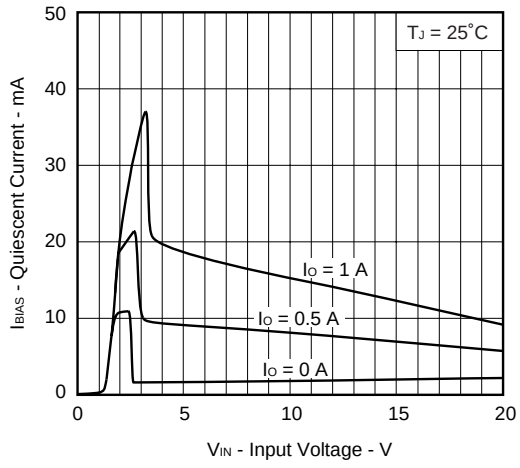
I_{BIAS} ($I_{BIAS(s)}$) vs. V_{IN} (μPC2918)



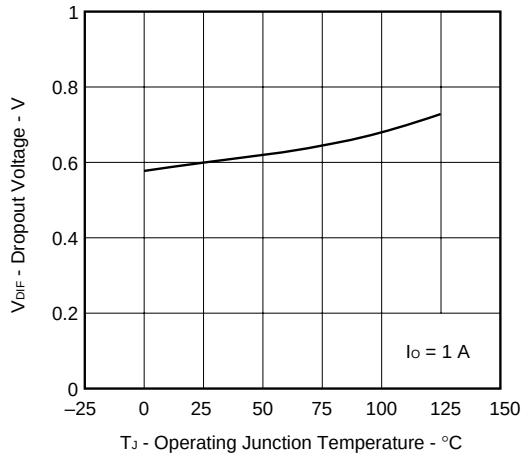
V_O vs. V_{IN} (μPC2925)



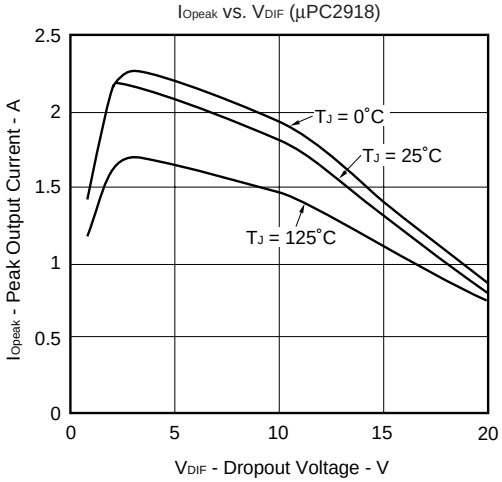
I_{BIAS} ($I_{BIAS(s)}$) vs. V_{IN} (μPC2925)



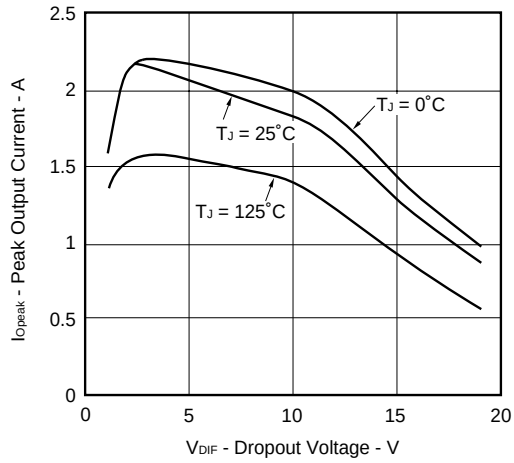
V_{DIF} vs. T_J



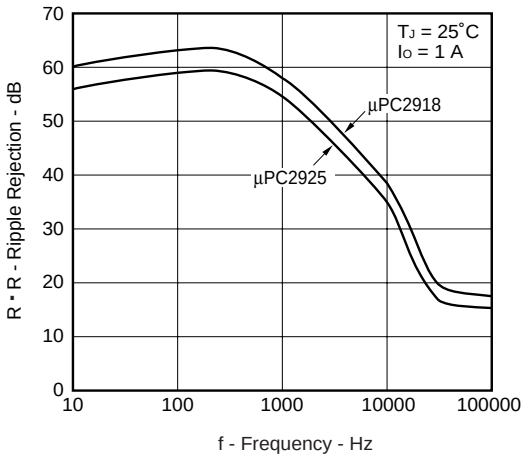
I_{Opeak} vs. V_{DIF} (μPC2918)



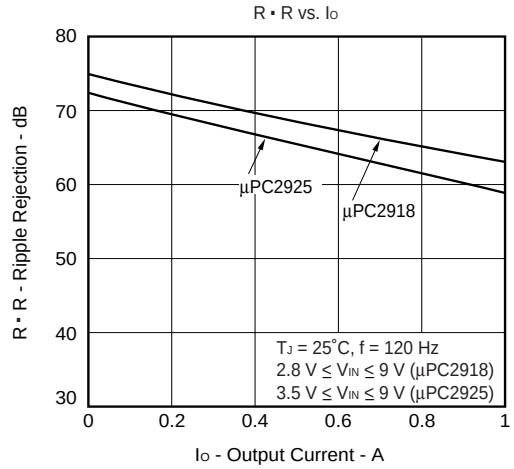
I_{Opeak} vs. V_{DIF} (μPC2925)



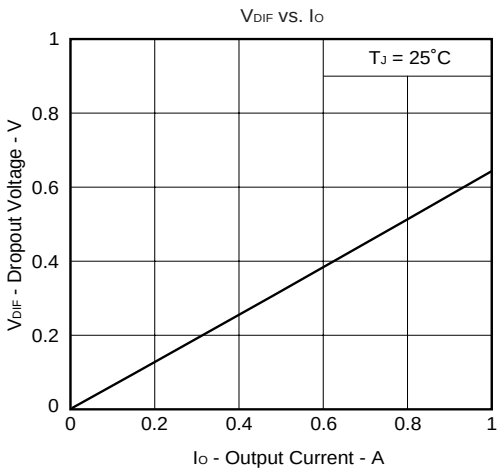
R ▪ R vs. f



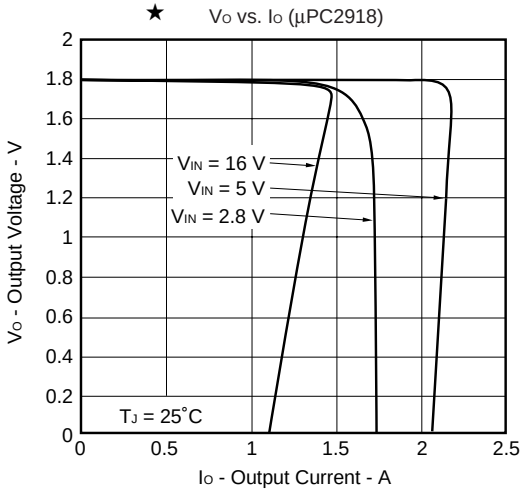
R ▪ R vs. I_O



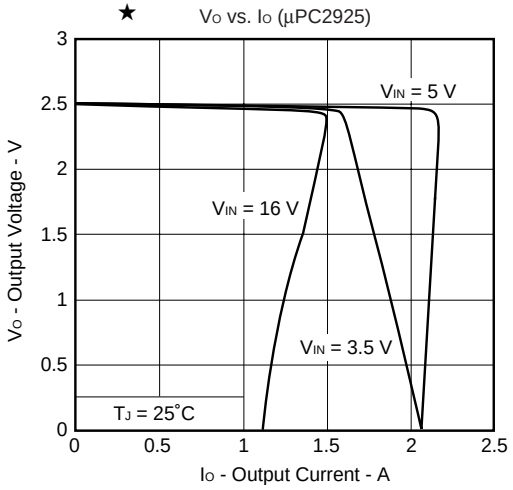
V_{DIF} vs. I_O



★ V_O vs. I_O (μPC2918)

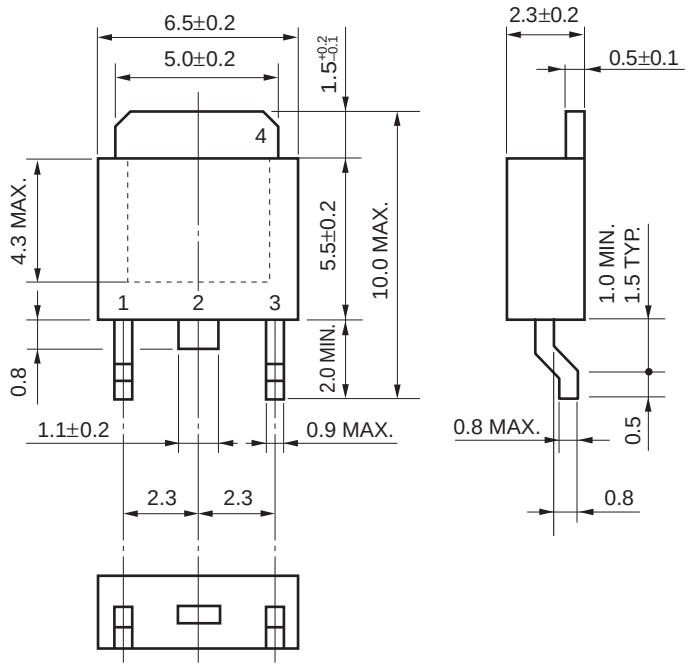


★ V_O vs. I_O (μPC2925)

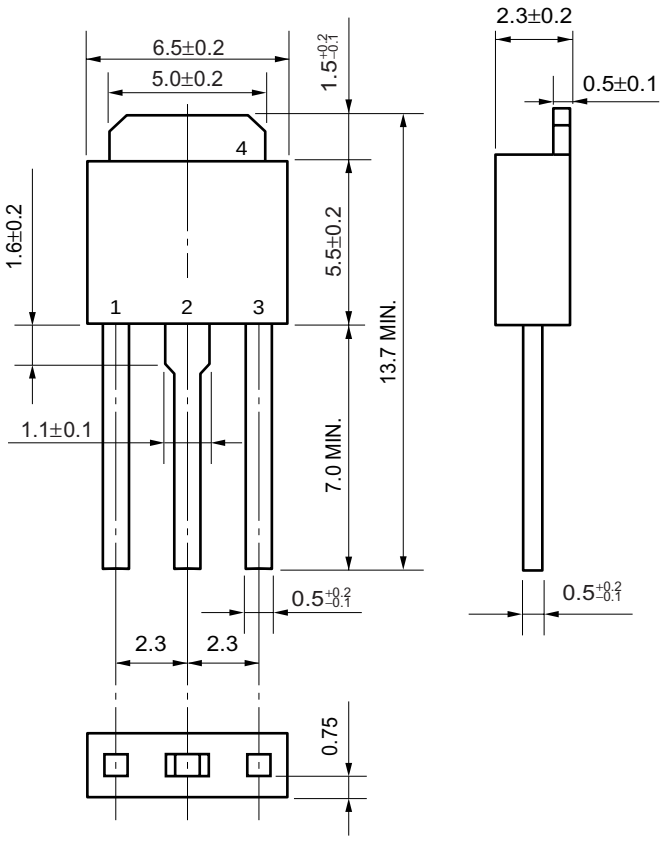


PACKAGE DRAWINGS

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 μPC2918, 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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