DATA SHEET

NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC2918, 2925, 2926

THREE-TERMINAL LOW DROPOUT VOLTAGE REGULATOR

DESCRIPTION

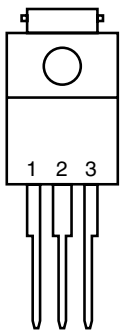
The μPC2918, 2925 and 2926 are three-terminal low dropout voltage regulators with the 1-A output. The μPC2918 outputs 1.8 V, the μPC2925 outputs 2.5 V and the μPC2926 outputs 2.6 V. Since these regulators use a PNP transistor for the output stage, they achieve a low dropout voltage of 0.7 V TYP. at I_O = 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. (I_O = 0.5 A)
- Output voltage accuracy: V_O ± 2%
- On-chip saturation protector rising edge of input voltage (at low input voltage)
- On-chip over-current limiter and thermal protection
- On-chip output transistor safe operation area protection

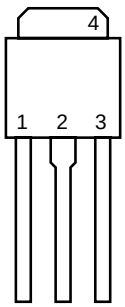
<R> PIN CONFIGURATIONS (Marking Side)

μPC2918HF,
μPC2925HF,
μPC2926HF: Isolated TO-220 (MP-45G)



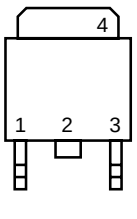
1: INPUT
2: GND
3: OUTPUT

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



1: INPUT
2: GND Note1
3: OUTPUT
4: GND (Fin)

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



1: INPUT
2: GND Note2
3: OUTPUT
4: GND (Fin)

Notes 1. No.2 pin and No.4 fin are common GND.

2. No.2 pin is cut. No.2 pin and No.4 fin are common GND.

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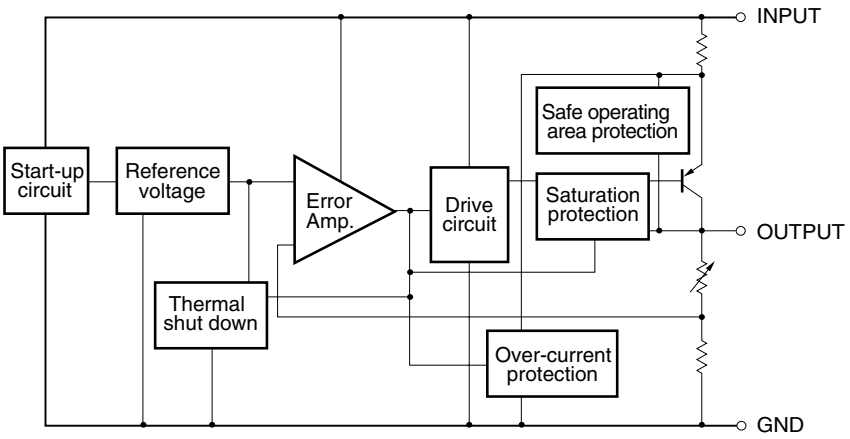
The mark <R> shows major revised points.
The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

BLOCK DIAGRAM



<R> ORDERING INFORMATION

Part Number	Package	Output Voltage	Marking
μPC2918HF	Isolated TO-220 (MP-45G)	1.8 V	2918
μPC2918HB	SC-64 (MP-3)	1.8 V	2918
μPC2918T	SC-63 (MP-3Z)	1.8 V	2918
μPC2925HF	Isolated TO-220 (MP-45G)	2.5 V	2925
μPC2925HB	SC-64 (MP-3)	2.5 V	2925
μPC2925T	SC-63 (MP-3Z)	2.5 V	2925
μPC2926HF	Isolated TO-220 (MP-45G)	2.6 V	2926
μPC2926HB	SC-64 (MP-3)	2.6 V	2926
μPC2926T	SC-63 (MP-3Z)	2.6 V	2926

Remark Tape-packaged products have the symbol -E1, or -E2 suffixed to the part number. Pb-free products have the symbol -AZ, or -AY suffixed to the part number. Refer to the following table for details.

Part Number [Note1]	Package	Package Type
μPC29xxHF	Isolated TO-220 (MP-45G)	• Packed in envelop
μPC29xxHF-AZ [Note2]	Isolated TO-220 (MP-45G)	• Packed in envelop
μPC29xxHB	SC-64 (MP-3)	• Packed in envelop
μPC29xxHB-AZ [Note2]	SC-64 (MP-3)	• Packed in envelop
μPC29xxHB-AY [Note3]	SC-64 (MP-3)	• Packed in envelop
μPC29xxT-E1	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 on draw-out side • 2000 pcs/reel
μPC29xxT-E1-AZ [Note2]	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 on draw-out side • 2000 pcs/reel
μPC29xxT-E1-AY [Note3]	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 on draw-out side • 2000 pcs/reel
μPC29xxT-E2	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 at take-up side • 2000 pcs/reel
μPC29xxT-E2-AZ [Note2]	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 at take-up side • 2000 pcs/reel
μPC29xxT-E2-AY [Note3]	SC-63 (MP-3Z)	• 16 mm wide embossed taping • Pin 1 at take-up side • 2000 pcs/reel

Notes 1. xx stands for symbols that indicate the output voltage.

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

3. Pb-free (This product does not contain Pb in the external electrode, Sn100% plating.)

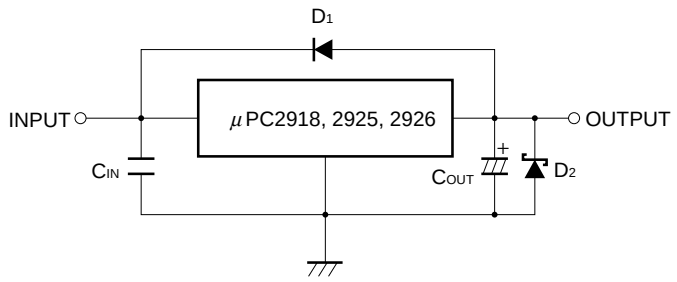
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C, unless otherwise specified)

Parameter	Symbol	Rating		Unit
		μPC2918HF, μPC2925HF, μPC2926HF	μPC2918HB, μPC2925HB, μPC2926HB, μPC2918T, μPC2925T, μPC2926T	
Input Voltage	V_{IN}	20		V
Internal Power Dissipation (T_C = 25°C) Note	P_T	15	10	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)	$R_{th(J-C)}$	7	12.5	°C/W
Thermal Resistance (junction to ambient)	$R_{th(J-A)}$	65	125	°C/W

Note Internally limited. When the operating junction temperature rises above 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. Be sure to connect C_{IN} to prevent parasitic oscillation. Set this value according to the length of the line between the regulator and the INPUT pin. Use of a film capacitor or other capacitor with first-rate 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 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)

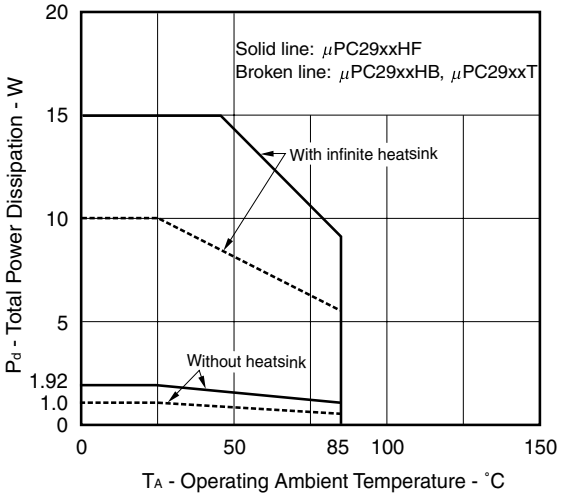
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Output Voltage	V_O		2.548	2.6	2.652	V
		3.6 V ≤ V_{IN} ≤ 5 V, 0 A ≤ I_O ≤ 1 A, 0°C ≤ T_J ≤ 125°C	(2.470)		(2.678)	V
Line Regulation	REG_{IN}	3.6 V ≤ V_{IN} ≤ 16 V		6	25	mV
Load Regulation	REG_L	0 A ≤ I_O ≤ 1 A		7	30	mV
Quiescent Current	I_{BIAS}	I_O = 0 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.

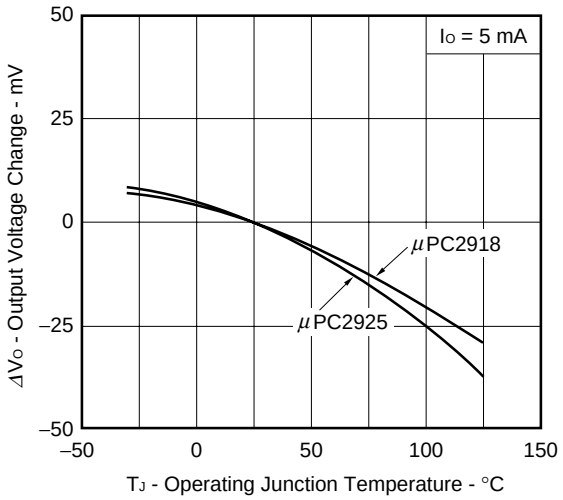
TYPICAL CHARACTERISTICS (Reference Values)

<R>

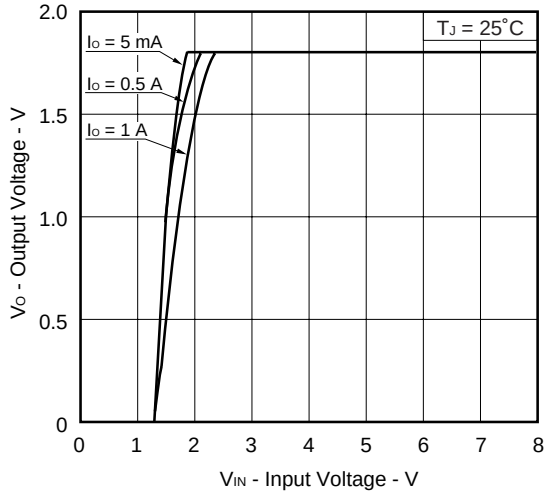
Pd vs. TA



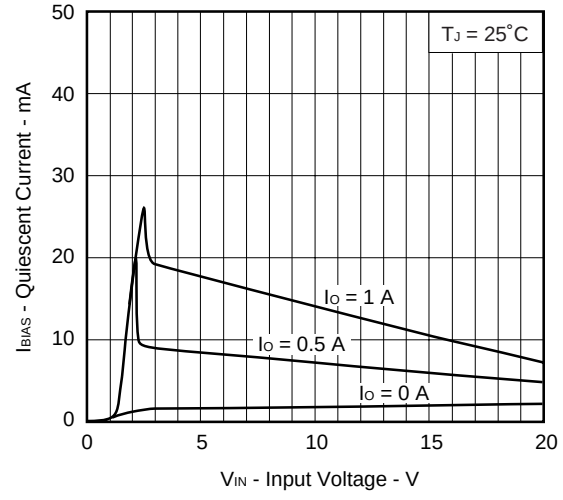
ΔVO vs. TJ



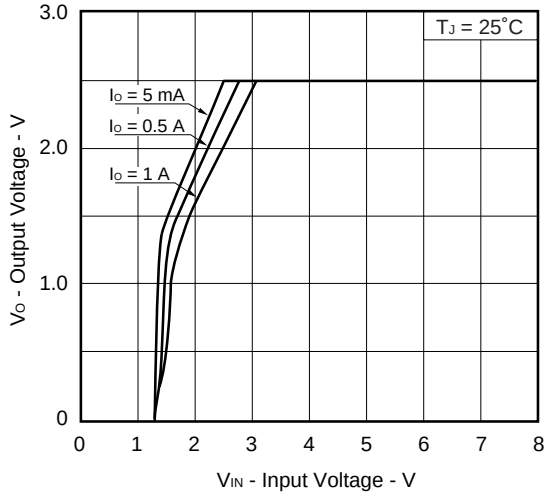
VO vs. VIN (μPC2918)



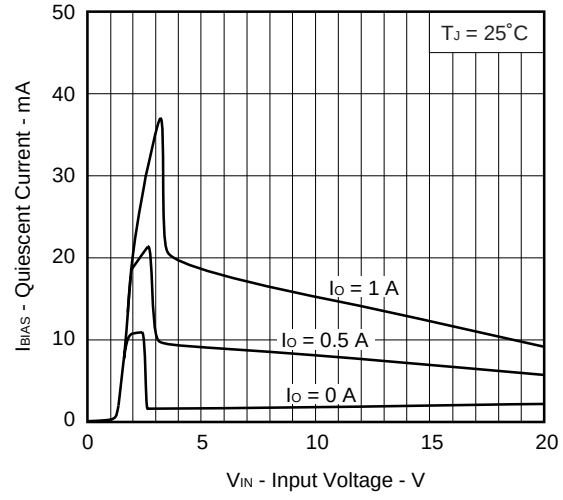
IBIAS (IBIAS(S)) vs. VIN (μPC2918)



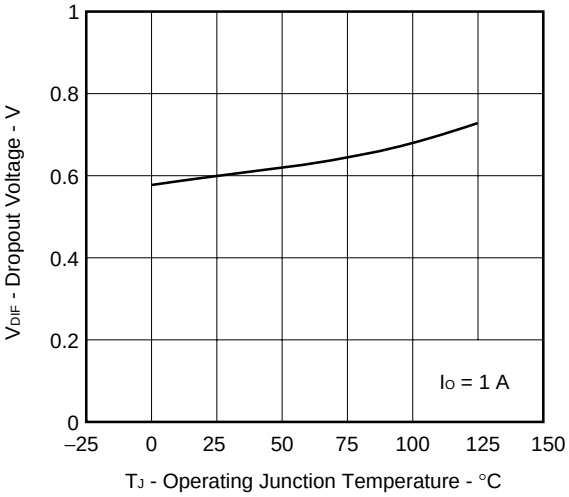
VO vs. VIN (μPC2925)



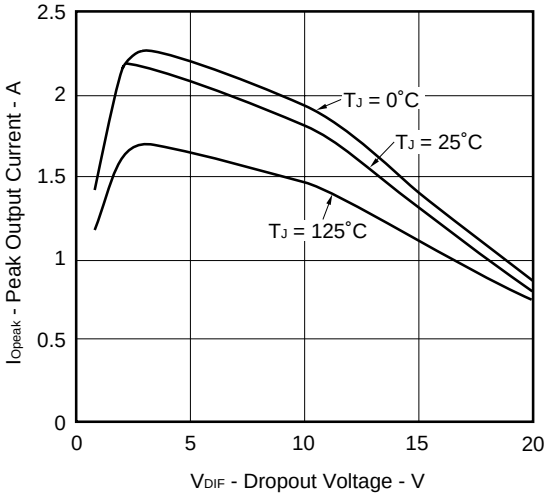
IBIAS (IBIAS(S)) vs. VIN (μPC2925)



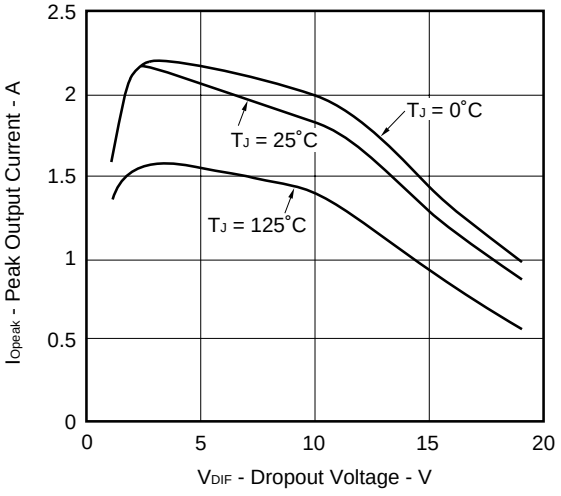
V_{DIF} vs. T_J



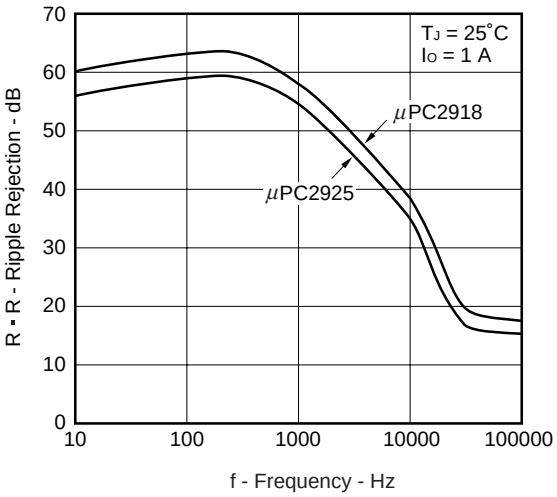
I_{Opeak} vs. V_{DIF} (μPC2918)



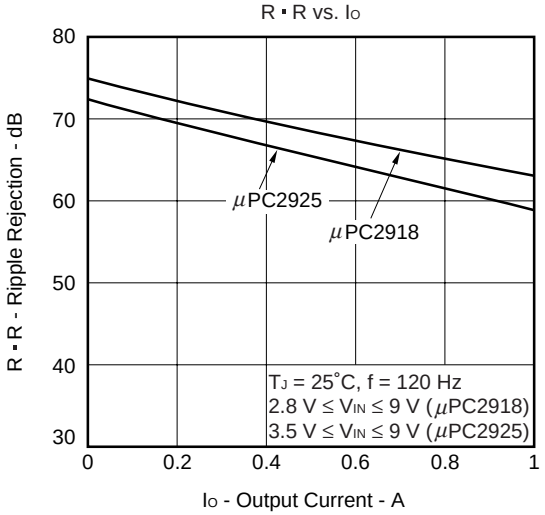
I_{Opeak} vs. V_{DIF} (μPC2925)



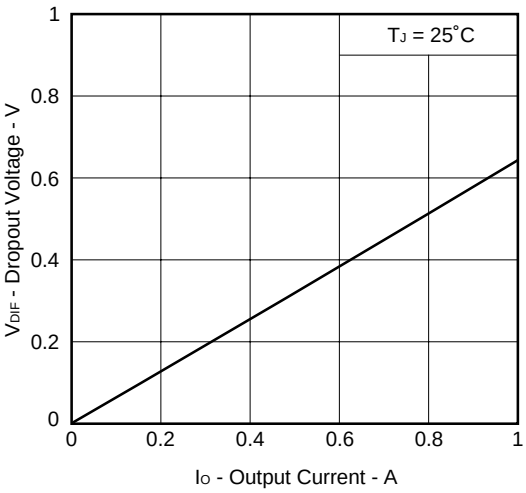
R ▪ R vs. f

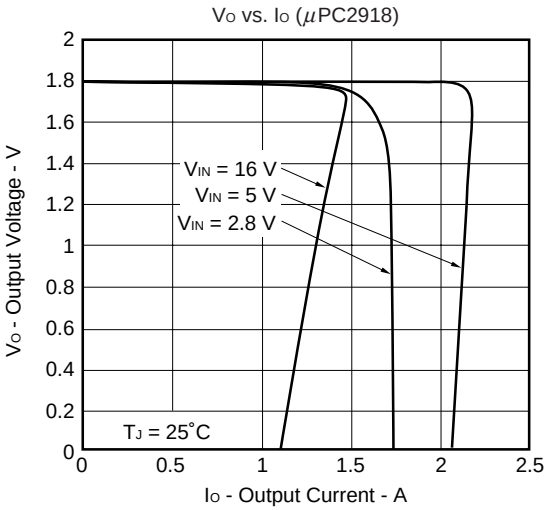


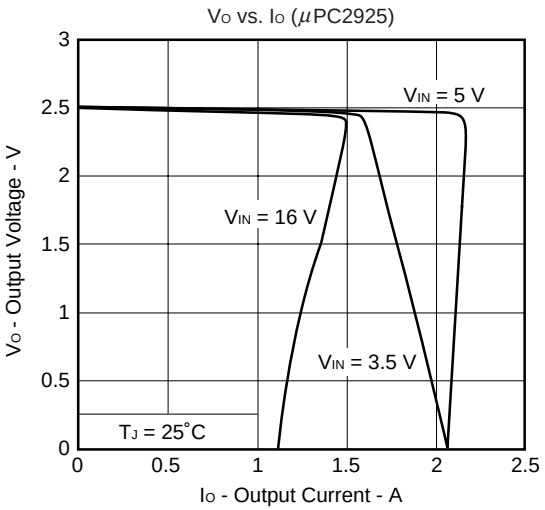
R ▪ R vs. I_O



V_{DIF} vs. I_O



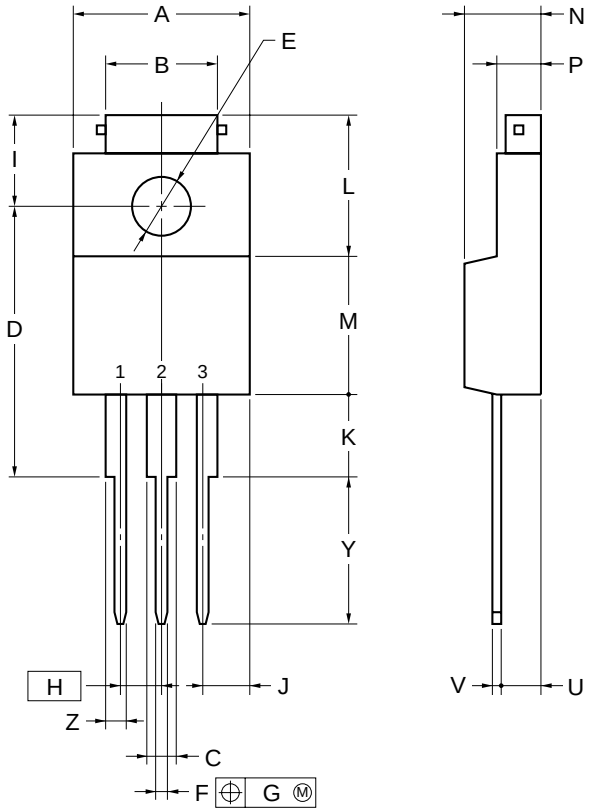

VO vs. IO (μPC2918)
VO - Output Voltage - V
IO - Output Current - A
VIN = 16 V
VIN = 5 V
VIN = 2.8 V
TJ = 25°C
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0.5
1.5
2.5


VO vs. IO (μPC2925)
VO - Output Voltage - V
IO - Output Current - A
VIN = 5 V
VIN = 16 V
VIN = 3.5 V
TJ = 25°C
0
0.5
1
1.5
2
2.5
3

PACKAGE DRAWINGS

μPC2918HF, μPC2925HF, μPC2926HF

3PIN PLASTIC SIP (MP-45G)



NOTE

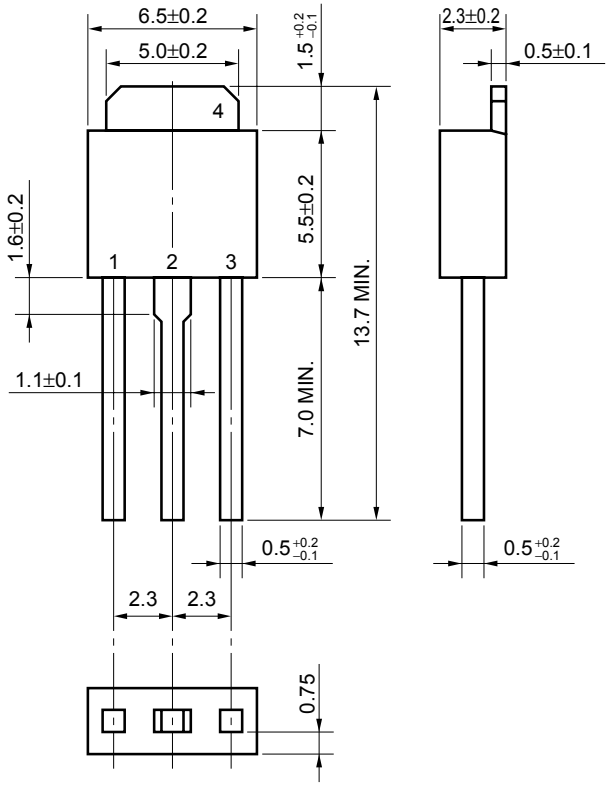
Each lead centerline is located within 0.25 mm of its true position (T.P.) at maximum material condition.

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

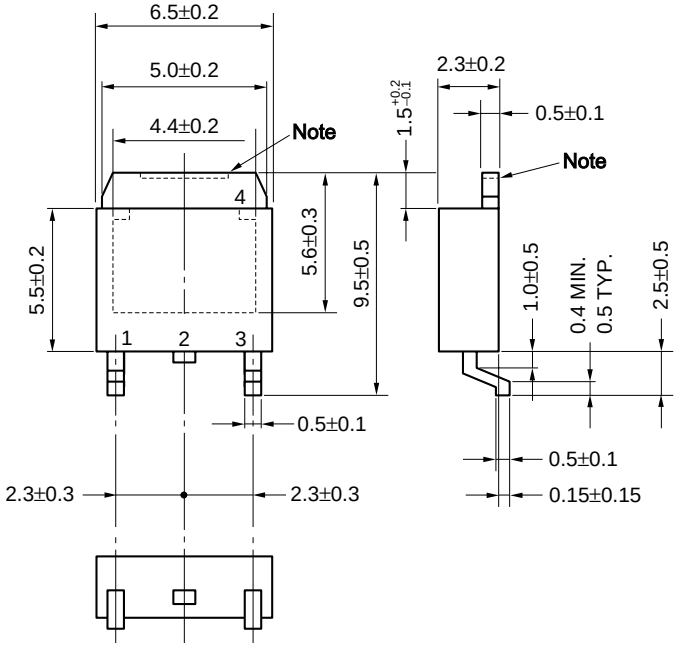
μPC2918HB, μPC2925HB, μPC2926HB

SC-64 (MP-3) (Unit: mm)



μPC2918T, μPC2925T, μPC2926T

<R> **SC-63 (MP-3Z) (Unit: mm)**



Note The depth of notch at the top of the fin is from 0 to 0.2 mm.

<R> RECOMMENDED SOLDERING CONDITIONS

The μPC2918, 2925 and 2926 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)

Surface Mount Device

μPC29xxT Series: SC-63 (MP-3Z)

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
Partial Heating Method	Pin temperature: 350°C or below, Heat time: 3 seconds or less (Per each side of the device).	P350

μPC29xxT-AZ Series [Note1], μPC29xxT-AY Series [Note2]: SC-63 (MP-3Z)

Process	Conditions	Symbol
Infrared Ray Reflow	Peak temperature: 260°C or below (Package surface temperature), Reflow time: 60 seconds or less (at 220°C or higher), Maximum number of reflow processes: 3 times or less.	IR60-00-3
Partial Heating Method	Pin temperature: 350°C or below, Heat time: 3 seconds or less (Per each side of the device).	P350

Notes 1. Pb-free (This product does not contain Pb in the external electrode.)

2. Pb-free (This product does not contain Pb in the external electrode, Sn100% plating.)

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.

Remark Flux: Rosin-based flux with low chlorine content (chlorine 0.2 Wt% or below) is recommended.

Through-hole devices

μPC29xxHF Series, μPC29xxHF-AZ Series [Note1]: Isolated TO-220 (MP-45G)
μPC29xxHB Series, μPC29xxHB-AZ Series [Note1], μPC29xxHB-AY Series [Note2]: SC-64 (MP-3)

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

Notes 1. Pb-free (This product does not contain Pb in the external electrode.)

2. Pb-free (This product does not contain Pb in the external electrode, Sn100% plating.)

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 high 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

	USER'S MANUAL USAGE OF THREE TERMINAL REGULATORS	Document No.G12702E
	INFORMATION VOLTAGE REGULATOR OF SMD	Document No.G11872E
<R>	REVIEW OF QUALITY AND RELIABILITY HANDBOOK	Document No.C12769E
	SEMICONDUCTOR DEVICE MOUNT MANUAL	http://www.necel.com/pkg/en/mount/index.html

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