NEC

BIPOLAR ANALOG INTEGRATED CIRCUIT

μPC29L00 Series

THREE TERMINAL LOW DROPOUT VOLTAGE REGULATOR

DESCRIPTION

μPC29L00 Series are low dropout regulators which have 100 mA capable for the output current.
The variation of output voltage is 3 V, 3.3 V, 4 V and 5 V.

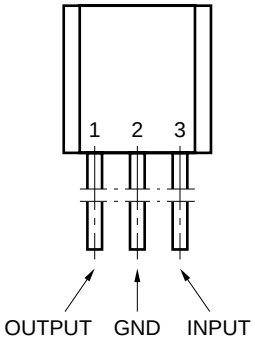
FEATURES

- Low dropout voltage. $V_{DIF} \leq 0.3$ V
- Built-in overcurrent protection circuit.
- Built-in thermal shut-down circuit.

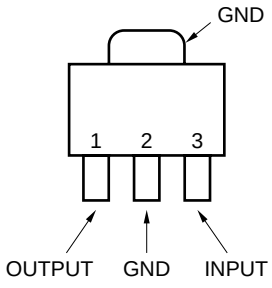
CONNECTION DIAGRAM

(TOP VIEW)

μPC29L00J Series



μPC29L00T Series



ORDERING INFORMATION

Output Voltage	Type Number	Package
3 V	μPC29L03J	TO-92
	μPC29L03T	SOT-89
3.3 V	μPC29L33J	TO-92
	μPC29L33T	SOT-89
4 V	μPC29L04J	TO-92
	μPC29L04T	SOT-89
5 V	μPC29L05J	TO-92
	μPC29L05T	SOT-89

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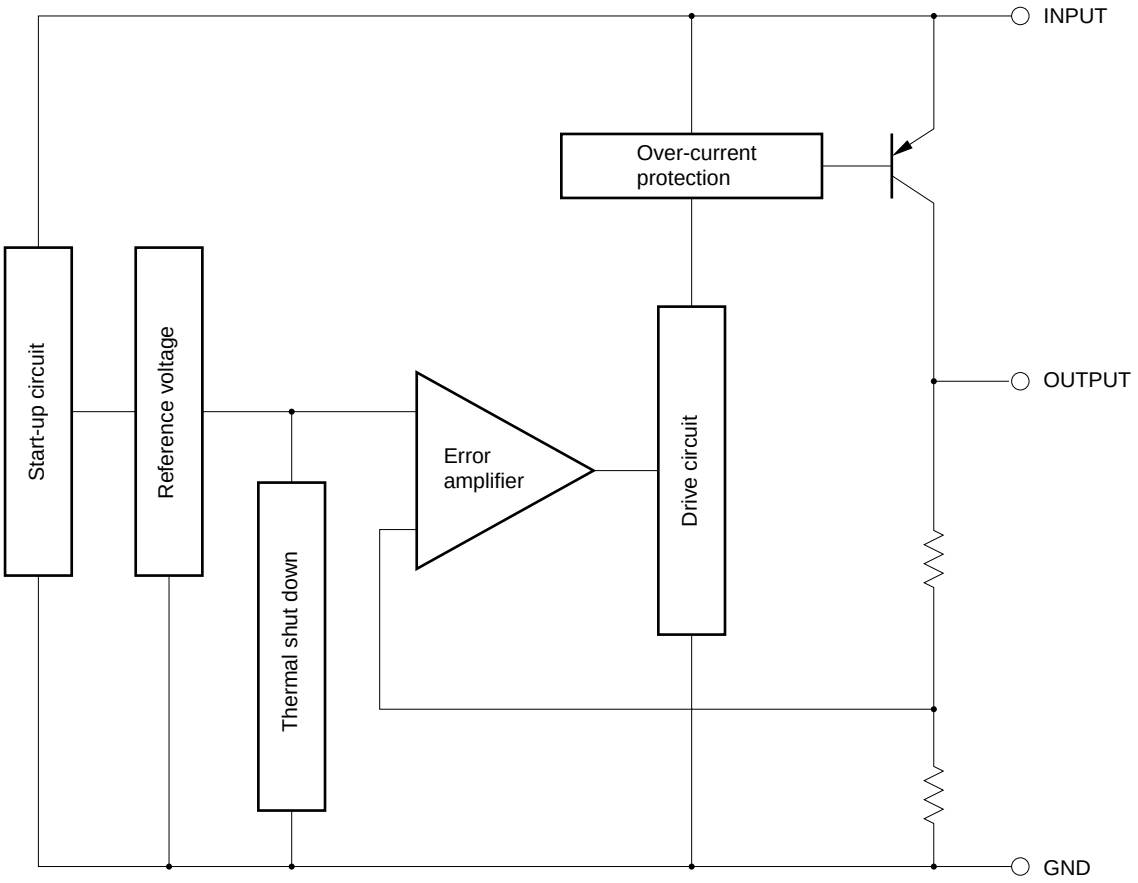
BLOCK DIAGRAM



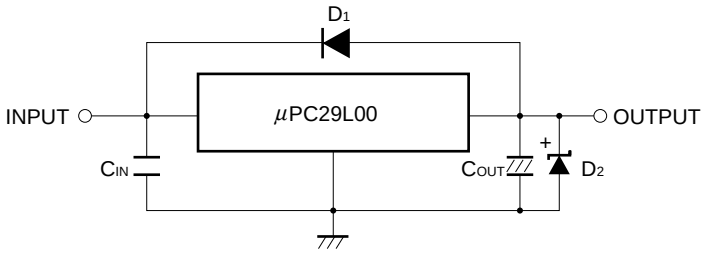
ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C, Unless otherwise specified.)

PARAMETER	SYMBOL		RATING	UNIT
Input Voltage	V_{IN}		16	V
Internal Power Dissipation	P_T	J	700 Note 1	mW
		T	400 Note 1	
			2000 Note 1, 2	
Operating Ambient Temperature Range	T_A		–30 to +85	°C
Operating Junction Temperature Range	T_J		–30 to +150	°C
Storage Temperature Range	T_{stg}		–55 to +150	°C
Thermal Resistance (Junction to Case)	$R_{th(J-C)}$	J	–	°C/W
		T	30	
Thermal Resistance (Junction to Ambient)	$R_{th(J-A)}$	J	180	°C/W
		T	315	
			62.5 Note 2	

Notes 1. $T_A \leq 25$ °C

2. With the 16 $cm^2 \times 0.7$ mm ceramic substrate

TYPICAL CONNECTION



C_{IN} : 0.1 to 0.47 μF.

C_{OUT} : More than 10 μF.

D_1 : Need for $V_O > V_{IN}$.

D_2 : Need for $V_O <$ GND.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TYPE NUMBER	MIN.	TYP.	MAX.	UNIT
Input Voltage	V_{IN}	μPC29L03	3.5		9	V
		μPC29L33	3.8		9	
		μPC29L04	4.5		12	
		μPC29L05	5.5		12	
Output Current	I_O	All	0		40	mA
Operating Ambient Temperature Range	T_A	All	–30		+85	°C
Operating Junction Temperature Range	T_J	All	–30		+125	°C

ELECTRICAL CHARACTERISTICS

μPC29L03 (V_{IN} = 4 V, I_O = 40 mA, T_J = 25 ˚C, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O		2.88	3.0	3.12	V
		3.5 V ≤ V_{IN} ≤ 9 V, 1 mA ≤ I_O ≤ 40 mA, 0 ˚C ≤ T_J ≤ 125 ˚C	2.85		3.15	
		4.5 V ≤ V_{IN} ≤ 5.5 V, 1 mA ≤ I_O ≤ 100 mA, 0 ˚C ≤ T_J ≤ 125 ˚C	2.85		3.15	
Line Regulation	REG_{IN}	3.5 V ≤ V_{IN} ≤ 12 V		4	50	mV
		3.5 V ≤ V_{IN} ≤ 9 V		2	20	
Load Regulation	REG_L	1 mA ≤ I_O ≤ 100 mA		37	50	mV
		1 mA ≤ I_O ≤ 40 mA		15	20	
Quiescent Current	I_{BIAS}	I_O = 0		1.5	2.0	mA
		I_O = 100 mA		10	20	mA
Start-up Current	$I_{BIAS(S)}$	I_O = 0 mA, before V_O regulation		6	20	mA
Quiescent Current Change	ΔI_{BIAS}	4 V ≤ V_{IN} ≤ 12 V, 0 ˚C ≤ T_J ≤ 125 ˚C			1.0	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		25		μV_{rms}
Ripple Rejection	R·R	f = 120 Hz, 4 V ≤ V_{IN} ≤ 9 V	48	66		dB
Dropout Voltage	V_{DIF}	I_O = 40 mA, 0 ˚C ≤ T_J ≤ 125 ˚C		0.15	0.3	V
Peak Output Current	I_{Opeak}	V_{IN} = 5 V		190		mA
Short Circuit Current	I_{Oshort}	V_{IN} = 12 V		100		mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA, 0 ˚C ≤ T_J ≤ 125 ˚C		–0.5		mV/˚C

ELECTRICAL CHARACTERISTICS

μPC29L33 (V_{IN} = 5 V, I_O = 40 mA, T_J = 25 ˚C, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O		3.17	3.3	3.43	V
		3.8 V ≤ V_{IN} ≤ 10 V, 1 mA ≤ I_O ≤ 40 mA, 0 ˚C ≤ T_J ≤ 125 ˚C	3.14		3.46	
		4.5 V ≤ V_{IN} ≤ 5.5 V, 1 mA ≤ I_O ≤ 100 mA, 0 ˚C ≤ T_J ≤ 125 ˚C	3.14		3.46	
Line Regulation	REG_{IN}	3.8 V ≤ V_{IN} ≤ 12 V		4	50	mV
		3.8 V ≤ V_{IN} ≤ 9 V		2	20	
Load Regulation	REG_L	1 mA ≤ I_O ≤ 100 mA		37	50	mV
		1 mA ≤ I_O ≤ 40 mA		16	20	
Quiescent Current	I_{BIAS}	I_O = 0		1.5	2.0	mA
		I_O = 100 mA		10	20	mA
Start-up Current	$I_{BIAS(S)}$	I_O = 0 mA, before V_O regulation		19	30	mA
Quiescent Current Change	ΔI_{BIAS}	4.3 V ≤ V_{IN} ≤ 12 V, 0 ˚C ≤ T_J ≤ 125 ˚C			1.0	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		28		μV_{rms}
Ripple Rejection	R·R	f = 120 Hz, 4.3 V ≤ V_{IN} ≤ 9 V	48	65		dB
Dropout Voltage	V_{DIF}	I_O = 40 mA, 0 ˚C ≤ T_J ≤ 125 ˚C		0.15	0.3	V
Peak Output Current	I_{Opeak}	V_{IN} = 5 V		190		mA
Short Circuit Current	I_{Oshort}	V_{IN} = 12 V		100		mA
Temperature Coefficient of Output Voltage	$\Delta V_O/\Delta T$	I_O = 5 mA, 0 ˚C ≤ T_J ≤ 125 ˚C		–0.6		mV/˚C

ELECTRICAL CHARACTERISTICS

μPC29L04 (V_{IN} = 6 V, I_O = 40 mA, T_J = 25 ˚C, Unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O		3.84	4.0	4.16	V
		4.5 V ≤ V_{IN} ≤ 12 V, 1 mA ≤ I_O ≤ 40 mA, 0 ˚C ≤ T_J ≤ 125 ˚C	3.80		4.20	
		V_{IN} = 6 V, 1 mA ≤ I_O ≤ 100 mA, 0 ˚C ≤ T_J ≤ 125 ˚C	3.80		4.20	
Line Regulation	REG_{IN}	4.5 V ≤ V_{IN} ≤ 12 V		4	30	mV
Load Regulation	REG_L	1 mA ≤ I_O ≤ 100 mA		33	60	mV
		1 mA ≤ I_O ≤ 40 mA		14	30	
Quiescent Current	I_{BIAS}	I_O = 0		1.6	2.0	mA
		I_O = 100 mA		10	20	mA
Start-up Current	$I_{BIAS(S)}$	I_O = 0 mA, before V_O regulation		20	50	mA
Quiescent Current Change	ΔI_{BIAS}	4.5 V ≤ V_{IN} ≤ 12 V, 0 ˚C ≤ T_J ≤ 125 ˚C			1.0	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		35		μV_{rms}
Ripple Rejection	R·R	f = 120 Hz, 5 V ≤ V_{IN} ≤ 10 V	47	65		dB
Dropout Voltage	V_{DIF}	I_O = 40 mA, 0 ˚C ≤ T_J ≤ 125 ˚C		0.15	0.3	V
Peak Output Current	I_{Opeak}	V_{IN} = 6 V		220		mA
Short Circuit Current	I_{Oshort}	V_{IN} = 12 V		100		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

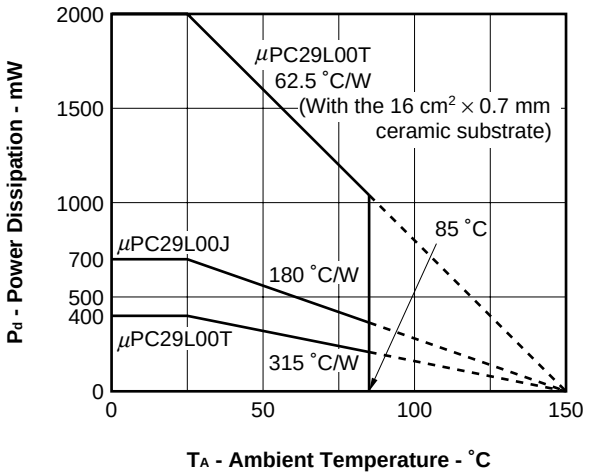
ELECTRICAL CHARACTERISTICS

μPC29L05 (V_{IN} = 6 V, I_O = 40 mA, T_J = 25 ˚C, Unless otherwise specified)

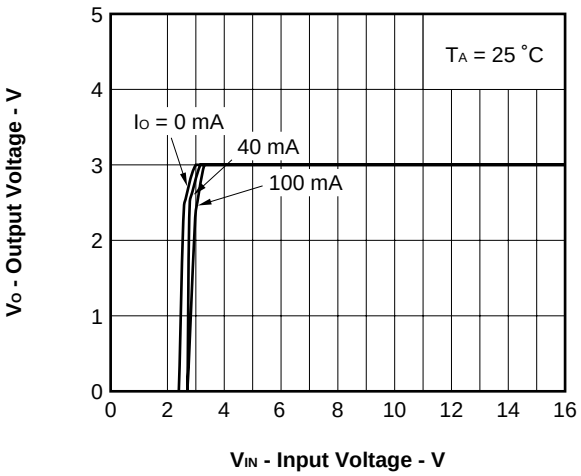
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage	V_O		4.8	5.0	5.2	V
		5.5 V ≤ V_{IN} ≤ 12 V, 1 mA ≤ I_O ≤ 40 mA, 0 ˚C ≤ T_J ≤ 125 ˚C	4.75		5.25	
		V_{IN} = 6 V, 1 mA ≤ I_O ≤ 100 mA, 0 ˚C ≤ T_J ≤ 125 ˚C	4.75		5.25	
Line Regulation	REG_{IN}	5.5 V ≤ V_{IN} ≤ 12 V		4	30	mV
Load Regulation	REG_L	1 mA ≤ I_O ≤ 100 mA		35	80	mV
		1 mA ≤ I_O ≤ 40 mA		15	30	
Quiescent Current	I_{BIAS}	I_O = 0		1.6	2.0	mA
		I_O = 100 mA		10	20	mA
Start-up Current	$I_{BIAS(S)}$	I_O = 0 mA, before V_O regulation		50	90	mA
Quiescent Current Change	ΔI_{BIAS}	6 V ≤ V_{IN} ≤ 12 V, 0 ˚C ≤ T_J ≤ 125 ˚C			1.0	mA
Output Noise Voltage	V_n	10 Hz ≤ f ≤ 100 kHz		40		μV_{rms}
Ripple Rejection	R·R	f = 120 Hz, 6 V ≤ V_{IN} ≤ 11 V	46	62		dB
Dropout Voltage	V_{DIF}	I_O = 40 mA, 0 ˚C ≤ T_J ≤ 125 ˚C		0.15	0.3	V
Peak Output Current	I_{Opeak}	V_{IN} = 7 V		210		mA
Short Circuit Current	I_{Oshort}	V_{IN} = 12 V		100		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

TYPICAL CHARACTERISTICS

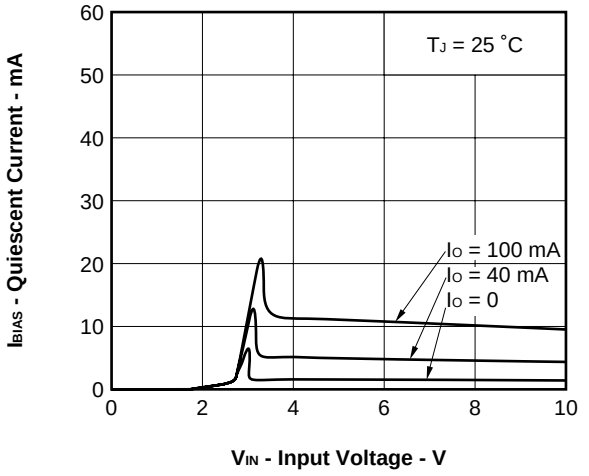
P_d - T_A



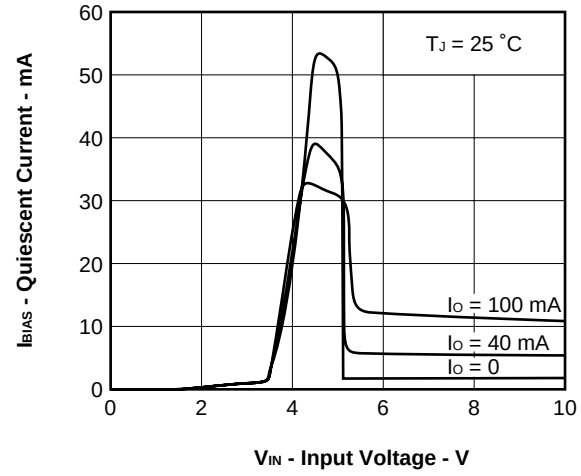
V_O - V_{IN} (μPC29L03)



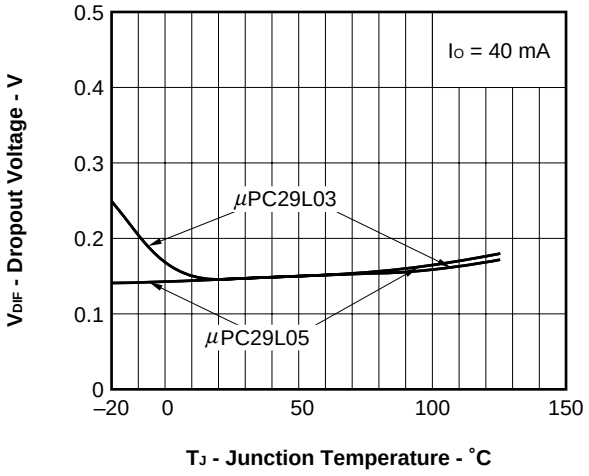
I_{BIAS} ($I_{BIAS(S)}$) - V_{IN} (μPC29L03)



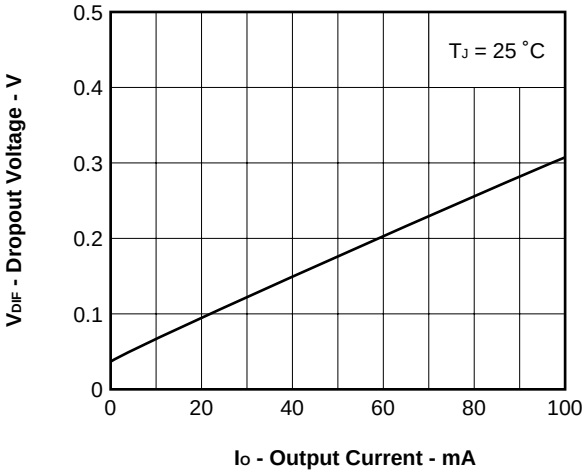
I_{BIAS} ($I_{BIAS(S)}$) - V_{IN} (μPC29L05)



V_{DIF} - T_J

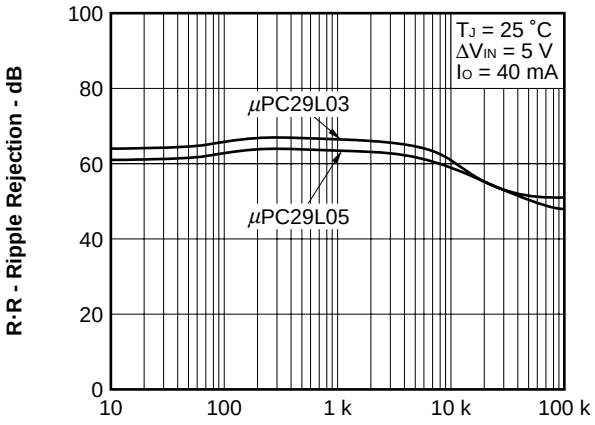


V_{DIF} - I_O

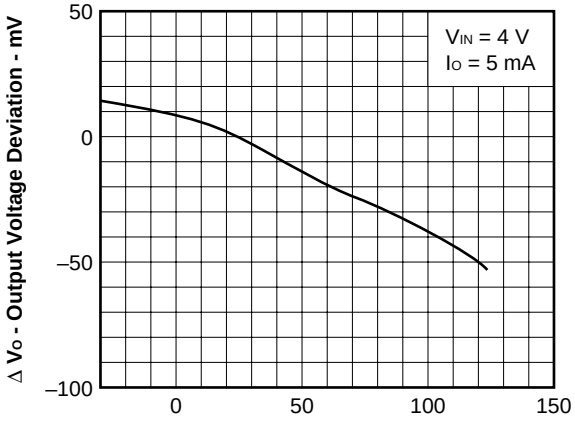


TYPICAL CHARACTERISTICS

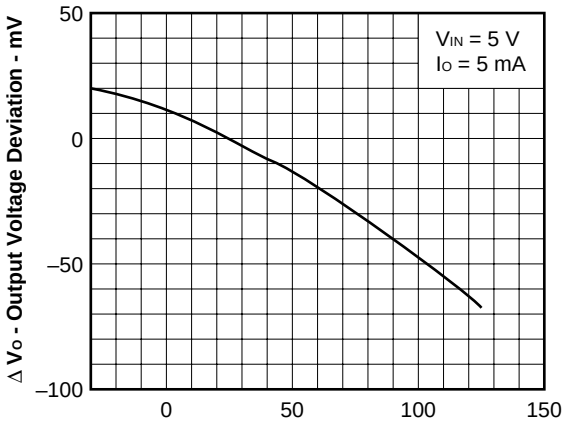
R·R - f



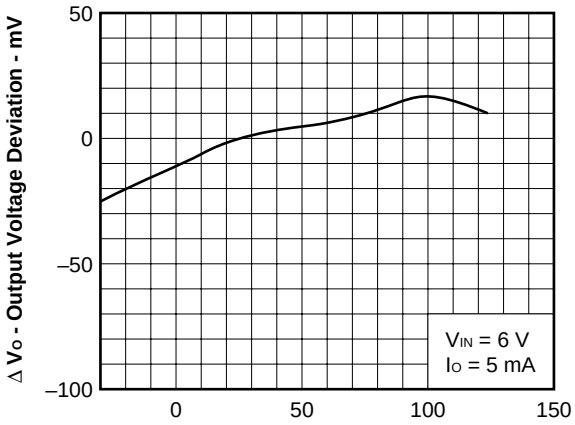
Δ VO - TJ (μPC29L03)



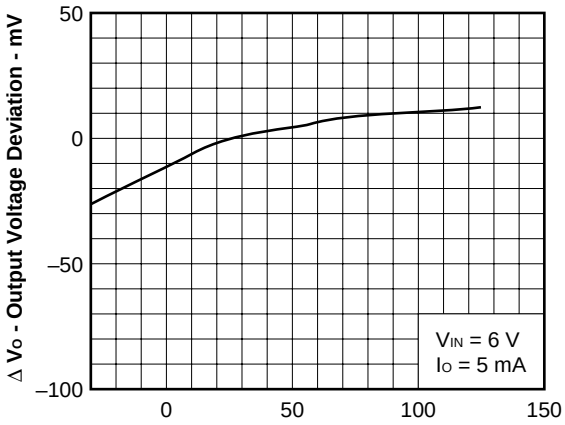
Δ VO - TJ (μPC29L33)



Δ VO - TJ (μPC29L04)



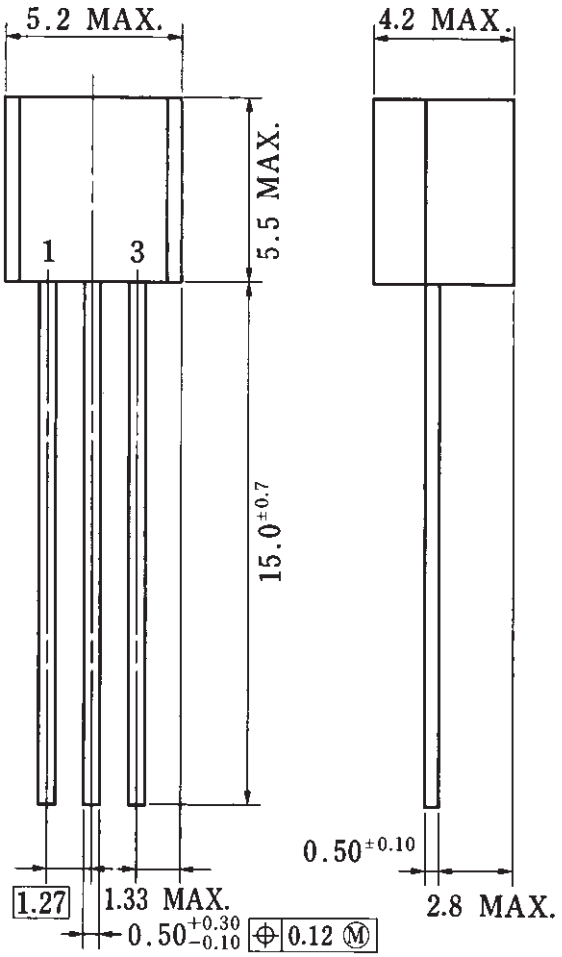
Δ VO - TJ (μPC29L05)



PACKAGE DIMENSIONS (Unit: mm)

μPC29L00J Series

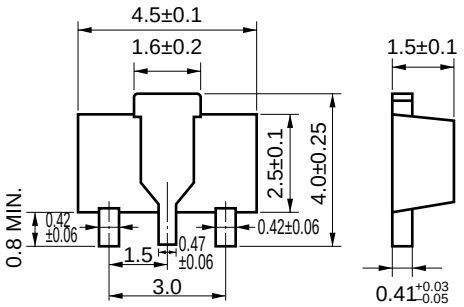
3PIN PLASTIC SIP (TO-92)



P3J−127B

μPC29L00T Series

SOT-89



RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

TYPES OF THROUGH HOLE MOUNT DEVICE

μPC29L00J Series

Soldering Process	Soldering Conditions	Symbol
Wave soldering	Solder temperature: 260 °C or below. Flow Time: 10 seconds or below.	

TYPES OF SURFACE MOUNT DEVICE

For more details, refer to our document **"Semiconductor Device Mounting Manual"** (IEI-1207).

μPC29L00T Series

Soldering Process	Soldering Conditions	Symbol
Infrared ray reflow	Peak package's temperature: 235 °C or below. Reflow time: 30 seconds or below (210 °C or higher). Number of flow process: 2. Exposure limit **Note**: None.	IR35-00-2
Vapor phase soldering	Peak package's temperature: 215 °C or below. Reflow time: 40 seconds or below (200 °C or higher). Number of flow process: 2. Exposure limit **Note**: None.	VP15-00-2
Wave soldering	Solder temperature: 260 °C or below. Flow time: 10 seconds or below. Number of flow process: 1. Exposure limit **Note**: None.	WS60-00-1

Note Exposure limit before soldering after dry-pack package is opened.

Remark Storage conditions: 25 °C and relative humidity at 65 % or less.

Caution Do not apply more than a single process at once, except for "Partial heating method".

REFERENCE

Document Name	Document No.
NEC semiconductor device reliability/quality control system.	IEI-1212
Quality grade on NEC semiconductor devices.	IEI-1209
Semiconductor device mounting technology manual.	IEI-1207
Semiconductor device package manual.	IEI-1213
Guide to quality assurance for semiconductor devices.	MEI-1202
Semiconductor selection guide.	MF-1134

[MEMO]

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