To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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RENESAS

BIPOLAR ANALOG INTEGRATED CIRCUITS

μPC1100, μPC1150

DUAL SWITCHING REGULATOR CONTROL CIRCUIT

DESCRIPTION

The μPC1100, μPC1150 are PWM type dual switching regulator control circuits which incorporate 2.5 V voltage reference, variable frequency oscillator, two sets of synchronized switching control circuits, timer latch short protection circuit and ON/OFF control circuit on a single monolithic chip. The μPC1100, μPC1150 feature low supply voltage operation, low stand-by current and low supply current therefore, these ICs are the optimum choise for battery operated portable equipments power supply and other DC-DC converter applications. Two ICs are available in accordance with short protection method.

FEATURES

- Two outputs synchronized operation
- Wide supply voltage range 3.6 V $\leqq V_{CC} \leqq$ 40 V
- Low stand-by and supply current stand-by mode; 2.2 mA, operation mode; 2.5 mA
- Timer latch short protection circuit
- μPC1100 – Two outputs cut off when one channel becomes short state.
- μPC1150 – Only short channel cuts off.
- Internal ON/OFF control circuit

ORDERING INFORMATION

PART NUMBER	PACKAGE	QUALITY GRADE
μPC1100C	16 pin Plastic DIP (300 mil)	Standard
μPC1100GS	16 pin Plastic SOP (300 mil)	
μPC1150C	16 pin Plastic DIP (300 mil)	
μPC1150GS	16 pin Plastic SOP (300 mil)	

Please refer to "Quality grade on NEC Semiconductor Devices" (Document number IEI-1209) published by NEC Corporation to know the specification of quality grade on the devices and its recommended applications.

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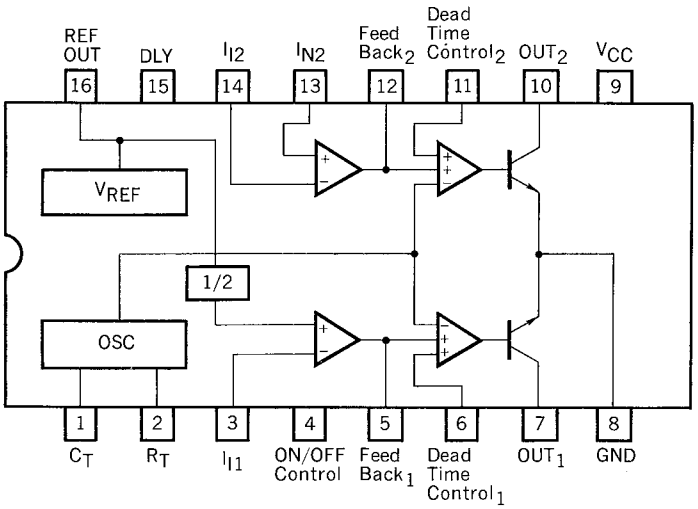
CONNECTION DIAGRAM (Top View)



ABSOLUTE MAXIMUM RATING (T_a = 25 °C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	41	V
Error Amplifier Input Voltage	V_I	20	V
Output Voltage	V_O	41	V
Output Current	I_O	25	mA
Total Power Dissipation C Package	P_{T1}	1 000	mW
Total Power Dissipation GS Package	P_{T2}	694	mW
Operating Temperature Range	T_{opt}	−20 to +85	°C
Storage Temperature Range	T_{stg}	−55 to +150	°C

RECOMMENDED OPERATING CONDITIONS

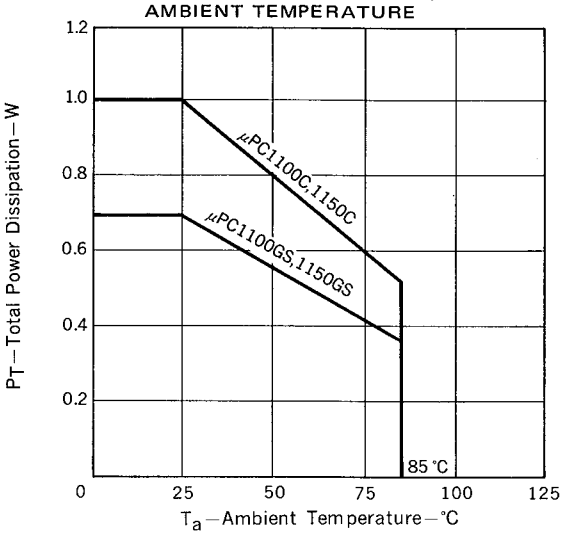
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V_{CC}	3.6		40	V
Error Amplifier Input Voltage	V_I	1.05		1.45	V
Output Voltage	V_O			40	V
Output Current	I_O			20	mA
Current into Feed-back Terminal	I_{FT}			45	μA
Timing Capacitor	C_T	150		15 000	pF
Timing Resistor	R_T	5.1		100	kΩ
Oscillator Frequency	f_{osc}	1		500	kHz

ELECTRICAL CHARACTERISTICS (T_a = −20 °C to +85 °C, V_{CC} = 6 V, f_{osc} = 100 kHz)

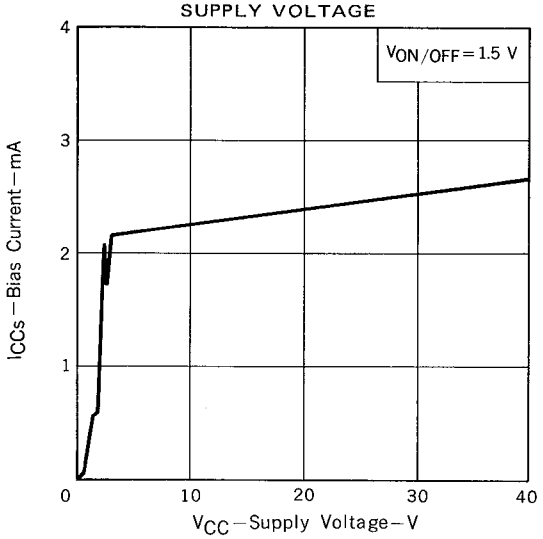
BLOCK	PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Under Voltage Lock-out Section	Start-up Voltage	$V_{CC(L\ to\ H)}$		2.72		V	T_a=25 °C, I_{REF}=0.1 mA
	Stop Voltage	$V_{CC(H\ to\ L)}$		2.60		V	T_a=25 °C, I_{REF}=0.1 mA
	Hysteresis Voltage	V_H	80	120		mV	T_a=25 °C, I_{REF}=0.1 mA
	Reset Voltage (V_{CC})	V_R	2.3	2.7		V	T_a=25 °C, I_{REF}=0.1 mA
Reference Voltage Section	Reference Voltage	V_{REF}	2.40	2.50	2.60	V	I_{REF}=1 mA
	Line Regulation	REG_{IN}		2	12.5	mV	3.6 V≦V_{CC}≦40 V
	Load Regulation	REG_L		1	7.5	mV	0.1 mA≦I_{REF}≦1 mA
	Temperature Coefficient	$\Delta V_{REF}/\Delta T$	−1	−0.1	1	%	−20 °C≦T_a≦+25 °C, I_{REF}=0
			−1	−0.2	1	%	+25 °C≦T_a≦+85 °C, I_{REF}=0
	Short Circuit Current	$I_{o\ short}$	2.5	10	30	mA	V_{REF}=0
Oscillator Section	Oscillation Frequency	f_{osc}	80	100	120	kHz	C_T=680 pF, R_T=11 kΩ
	Frequency Line Regulation	$\Delta f/\Delta V_{CC}$		0.1		%	T_a=25 °C, 3.6 V≦V_{CC}≦40 V
	Frequency Temperature Coefficient	$\Delta f/\Delta T$	−5	2	5	%	−20 °C≦T_a≦+25 °C
			−5	−2	5	%	+25 °C≦T_a≦+85 °C
Dead-Time Control Section	Input Bias Current	I_{BD}			1	μA	
	Low Level Threshold Voltage	$V_{TH(L)}$	1.20	1.45		V	On-duty 0 %
	High Level Threshold Voltage	$V_{TH(H)}$		2.05	2.25	V	On-duty 100 %
Error Amplifier Section	Input Offset Voltage	V_{IO}	−10		10	mV	V_O Amp=1.25 V
	Input Offset Current	I_{IO}	−100		100	nA	V_O Amp=1.25 V
	Input Bias Current	I_B		160	500	nA	V_O Amp=1.25 V
	Common Mode Input Voltage	V_{ICR}	1.05		1.45	V	3.6 V≦V_{CC}≦40 V
	Open Loop Voltage Gain	A_V	70	80		dB	R_{NF}=200 kΩ
	Unity Gain Bandwidth	f_{unity}		1.5		MHz	
	Common Mode Rejection Ratio	CMR	60	80		dB	
	Maximum Output Voltage	V_{om+}	V_{REF}−0.1			V	
		V_{om-}			1.0	V	
	Output Sink Current	I_{OSINK}	0.5	1.6		mA	V_{ID}=−0.1 V, V_{OAMP}=1.15 V
	Output Source Current	$I_{OSOURCE}$	−45	−70		μA	V_{ID}=0.1 V, V_{OAMP}=2.3 V
Output Section	Collector Cutoff Current	I_{LEAK}			100	μA	V_O=40 V
		$I_{LEAK(OFF)}$			10	μA	V_{CC}=0, V_O=40 V
	Collector Saturation Voltage	V_{OSAT}		0.95	1.3	V	I_O=20 mA
	Output Voltage Rise Time	t_r			150	ns	R_O=500 Ω
	Output Voltage Fall Time	t_f			180	ns	R_O=500 Ω
Short Circuit Protection Section	Input Sense Voltage	V_{TH}	2.05	2.25	2.45	V	T_a=25 °C
	UV Sense Voltage (15 pin)	V_{UV}	0.5	0.6	0.8	V	T_a=25 °C
	Source Current	I_{OUV}	10	15	25	μA	T_a=25 °C, V_{DLY}=0
	Delay Time	t_{DLY}		55		ms	C_{DLY}=1 μF
ON/OFF Control Section	ON/OFF Threshold Voltage	V_{CTL}	0.6	1.0	1.2	V	V_{REF}=0
	Stand-by Current	I_{CCI}			10	μA	$V_{ON/OFF}$ (4 pin)=0
Total	Stand-by Current	I_{CCs}		2.2	3.1	mA	$V_{ON/OFF}$ (4 pin)=1.5 V, No Output Voltage
	Bias Current	I_{CCa}		2.5	3.4	mA	C_T=680 pF, R_T=11 kΩ, $V_{ON/OFF}$ (4 pin)=1.5 V

TYPICAL CHARACTERISTICS (T_a = 25 °C, V_{CC} = 6 V)

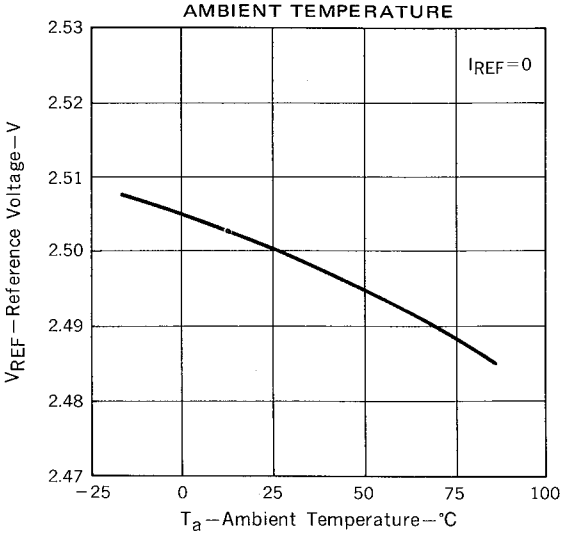
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



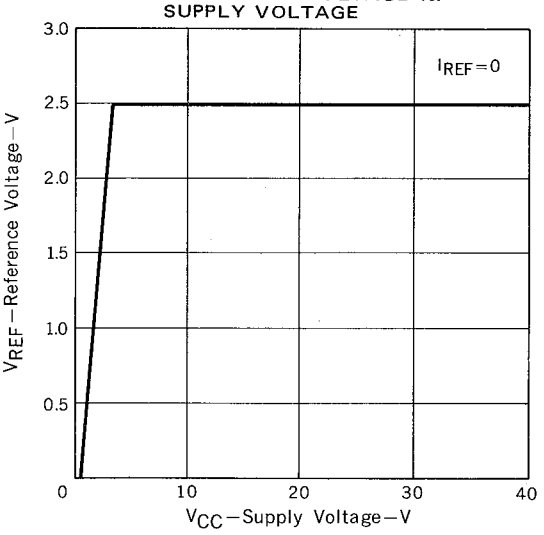
STAND-BY CURRENT vs. SUPPLY VOLTAGE



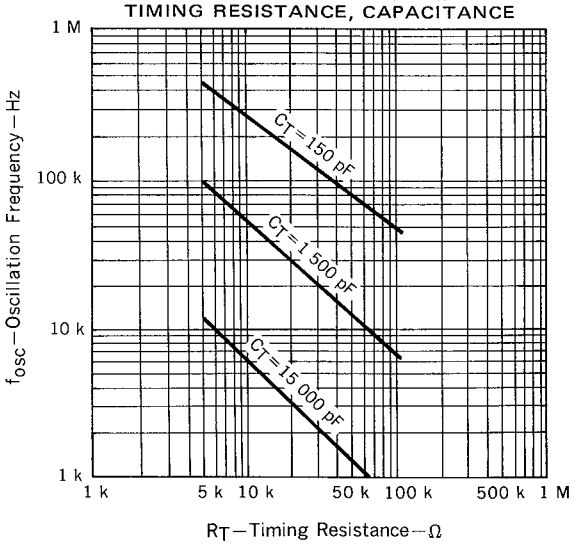
REFERENCE VOLTAGE vs. AMBIENT TEMPERATURE



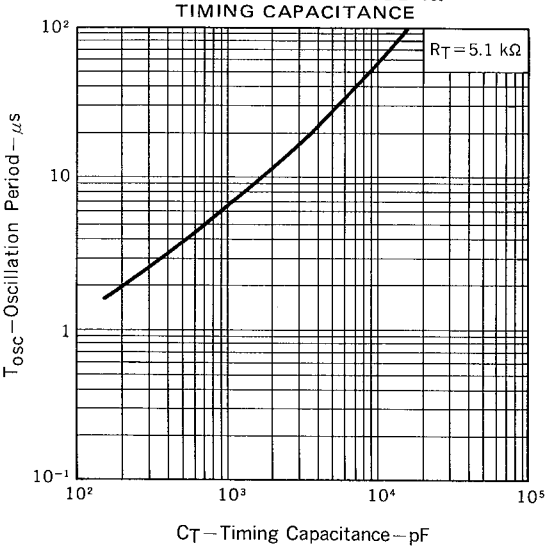
REFERENCE VOLTAGE vs. SUPPLY VOLTAGE



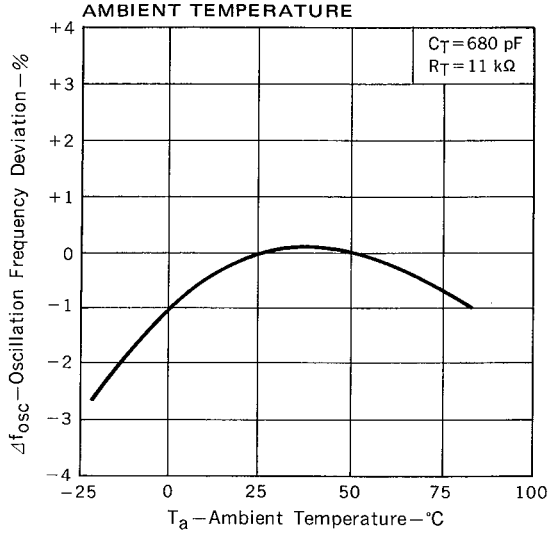
OSCILLATION FREQUENCY vs. TIMING RESISTANCE, CAPACITANCE



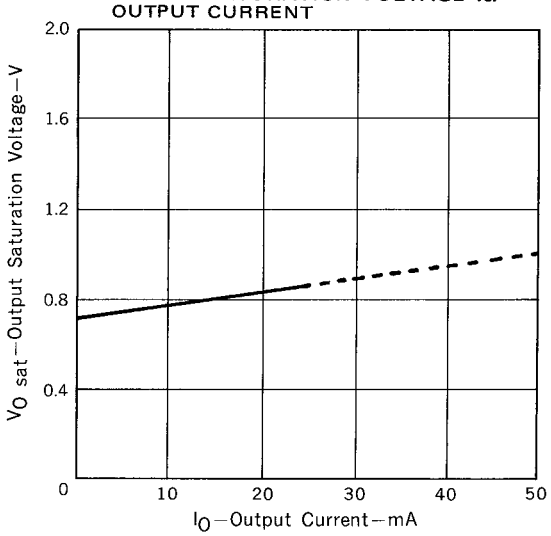
OSCILLATION PERIOD vs. TIMING CAPACITANCE



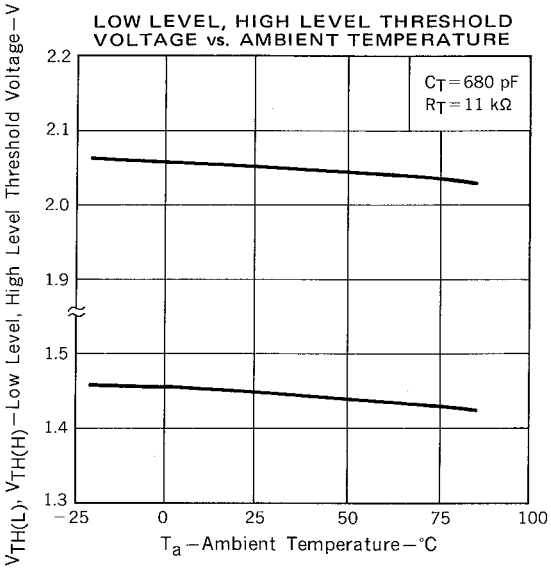
OSCILLATION FREQUENCY DEVIATION vs. AMBIENT TEMPERATURE



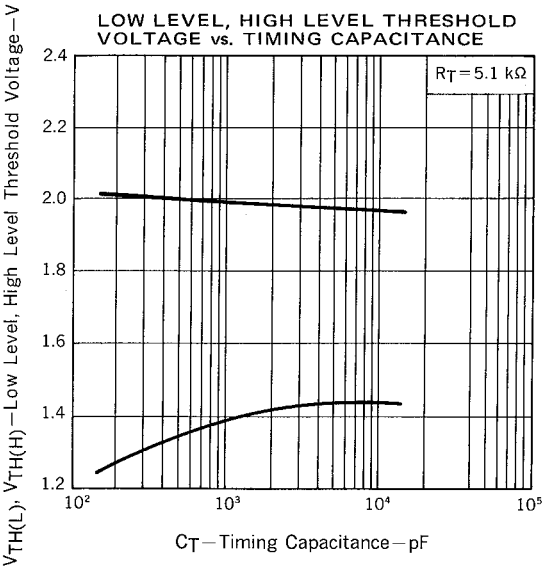
OUTPUT SATURATION VOLTAGE vs. OUTPUT CURRENT



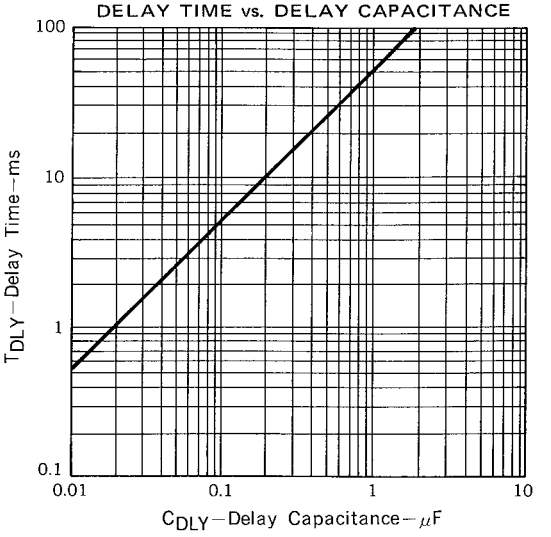
LOW LEVEL, HIGH LEVEL THRESHOLD VOLTAGE vs. AMBIENT TEMPERATURE



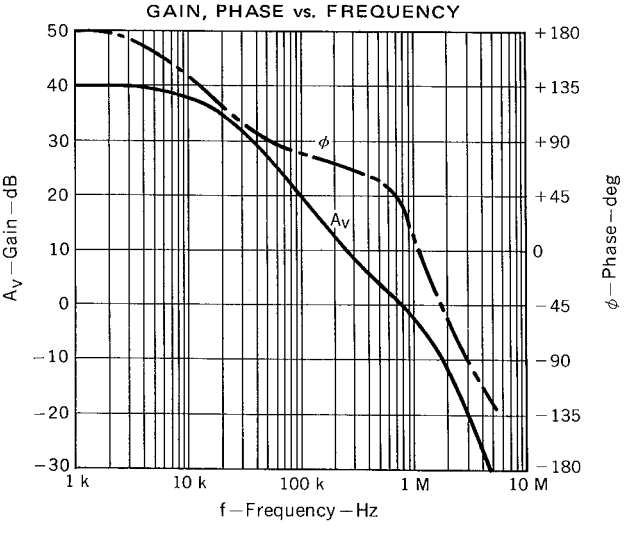
LOW LEVEL, HIGH LEVEL THRESHOLD VOLTAGE vs. TIMING CAPACITANCE



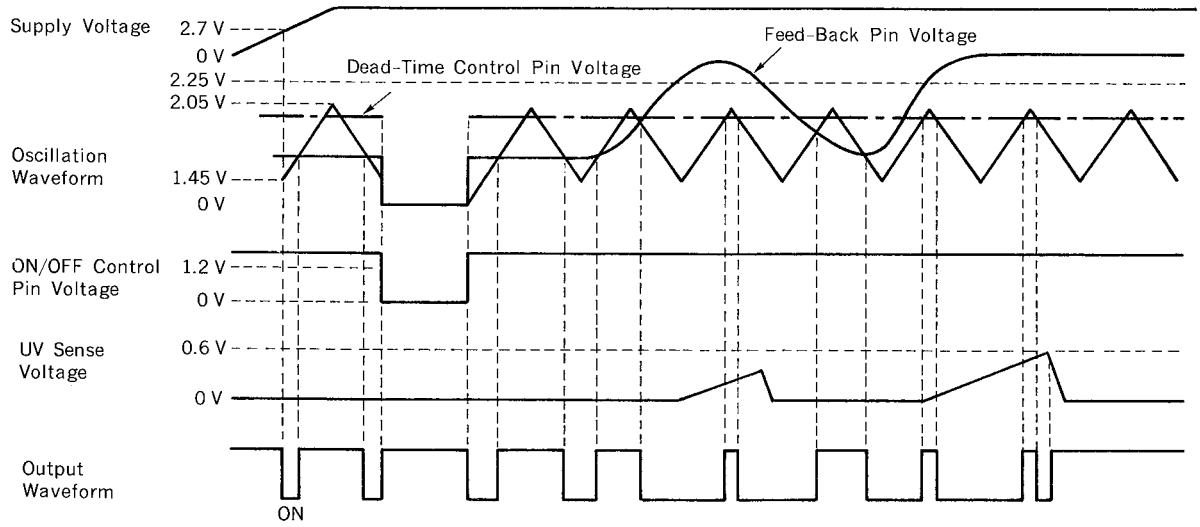
DELAY TIME vs. DELAY CAPACITANCE



GAIN, PHASE vs. FREQUENCY

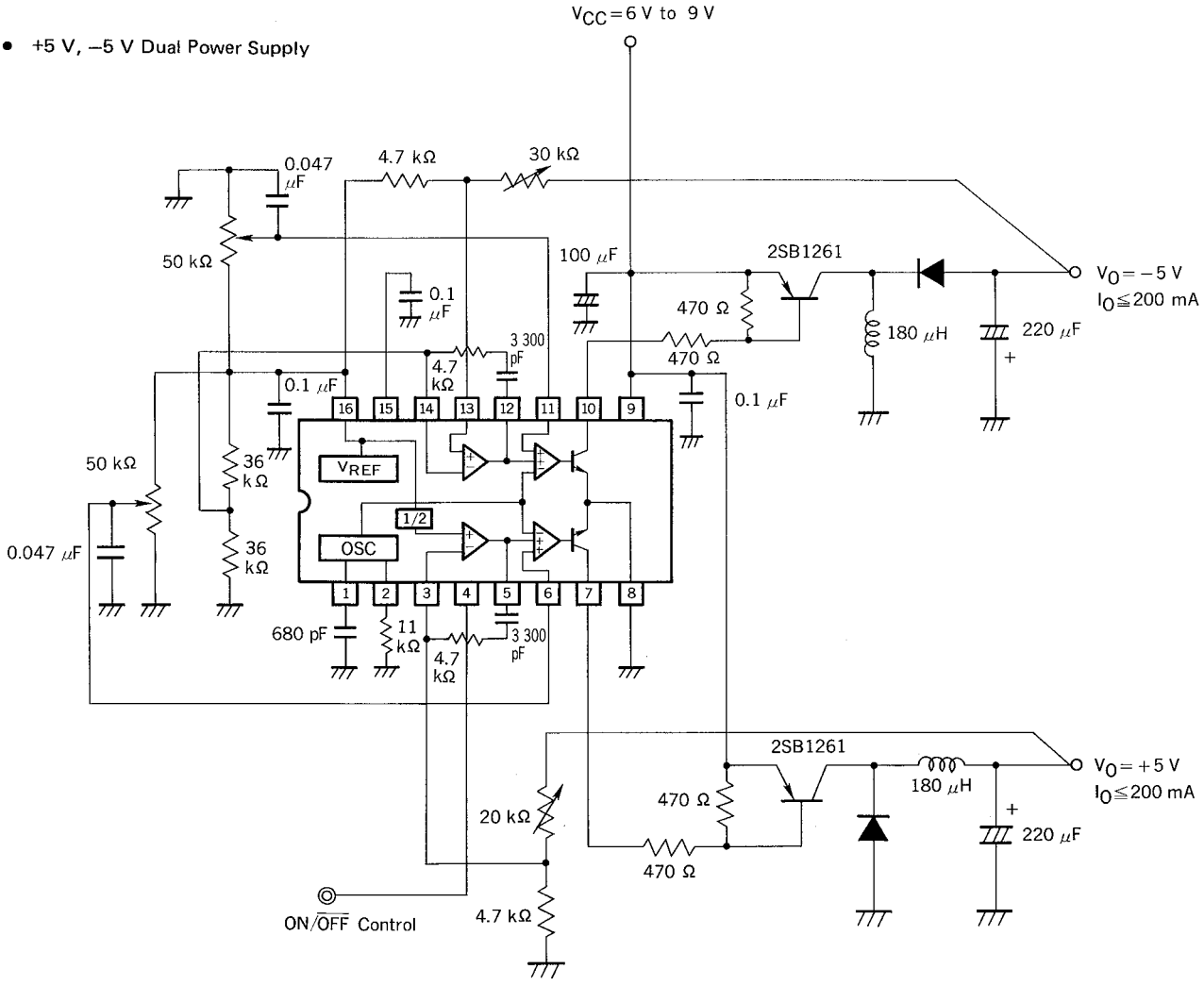


OPERATING WAVEFORMS



TYPICAL APPLICATION CIRCUIT

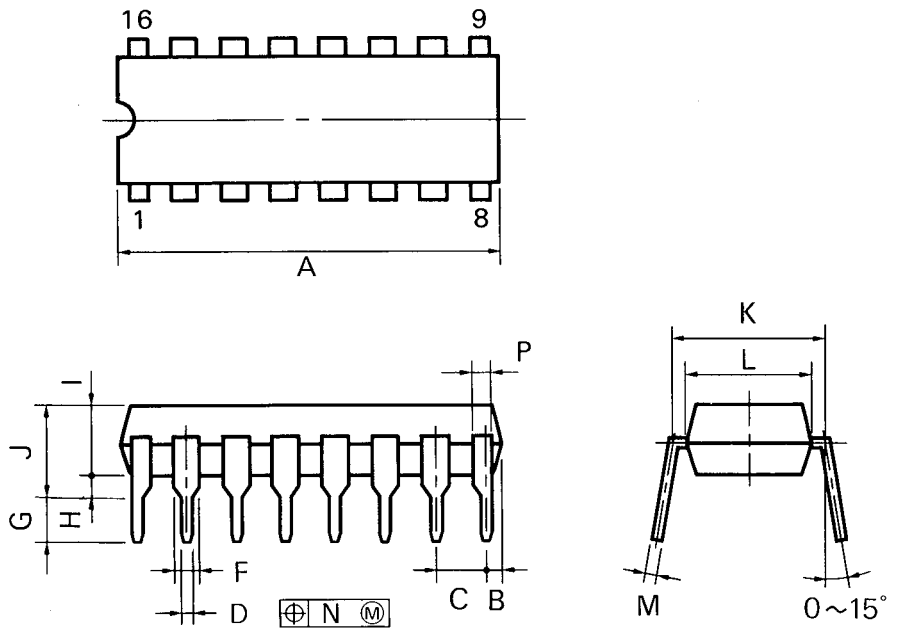
- +5 V, −5 V Dual Power Supply



PACKAGE DIMENSIONS

16 PIN PLASTIC DIP (300 mil)

μPC1100C, μPC1150C



P16C-100-300B

NOTES

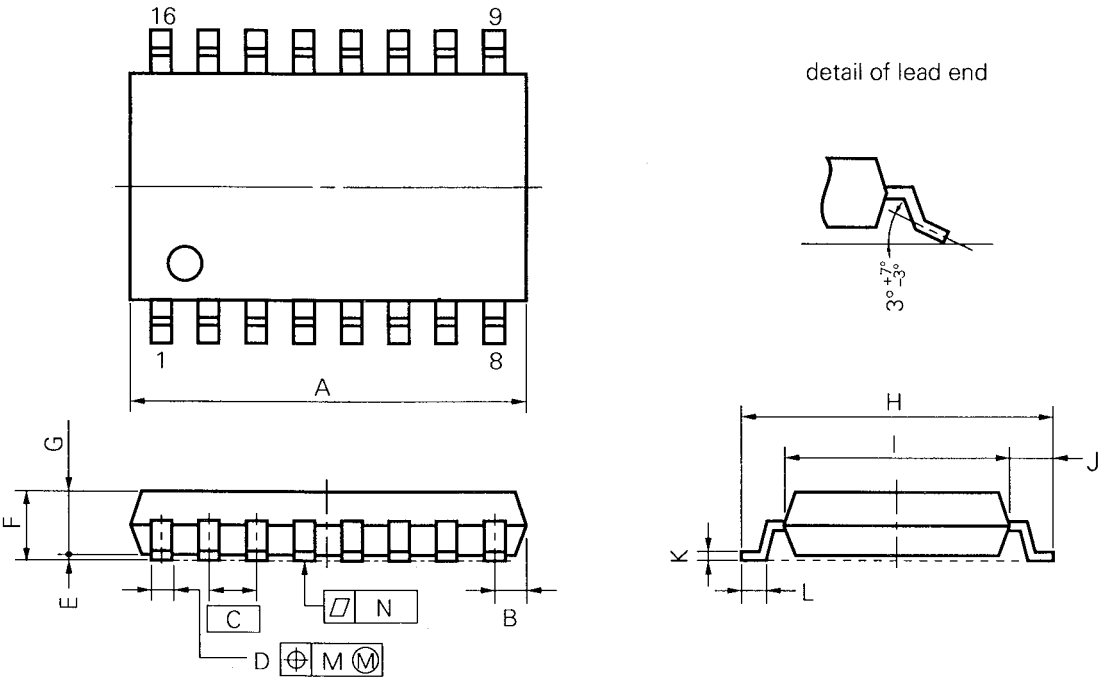
1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

2) Item "K" to center of leads when formed parallel.

ITEM	MILLIMETERS	INCHES
A	20.32 MAX.	0.800 MAX.
B	1.27 MAX.	0.050 MAX.
C	2.54 (T.P.)	0.100 (T.P.)
D	$0.50^{\pm 0.10}$	$0.020^{+0.004}_{-0.005}$
F	1.1 MIN.	0.043 MIN.
G	$3.5^{\pm 0.3}$	$0.138^{\pm 0.012}$
H	0.51 MIN.	0.020 MIN.
I	4.31 MAX.	0.170 MAX.
J	5.08 MAX.	0.200 MAX.
K	7.62 (T.P.)	0.300 (T.P.)
L	6.5	0.256
M	$0.25^{+0.10}_{-0.05}$	$0.010^{+0.004}_{-0.003}$
N	0.25	0.01
P	1.1 MIN.	0.043 MIN.

16 PIN PLASTIC SOP (300 mil)

μPC1100GS, μPC1150GS



P16GM-50-300B-3

NOTE

Each lead centerline is located within 0.12 mm (0.005 inch) of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS	INCHES
A	10.46 MAX.	0.412 MAX.
B	0.78 MAX.	0.031 MAX.
C	1.27 (T.P.)	0.050 (T.P.)
D	$0.40^{+0.10}_{-0.05}$	$0.016^{+0.004}_{-0.003}$
E	0.1±0.1	0.004±0.004
F	1.8 MAX.	0.071 MAX.
G	1.55	0.061
H	7.7±0.3	0.303±0.012
I	5.6	0.220
J	1.1	0.043
K	$0.20^{+0.10}_{-0.05}$	$0.008^{+0.004}_{-0.002}$
L	0.6±0.2	$0.024^{+0.008}_{-0.009}$
M	0.12	0.005
N	0.10	0.004

RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be set 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 SURFACE MOUNT DEVICE

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (IEI-1207).

μPC1100GS, μPC1150GS

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature: 230 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 1, Exposure limit*: None	IR30-00-1
VPS	Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: 1, Exposure limit*: None	VP15-00-1

*: Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

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

TYPES OF THROUGH HOLE MOUNT DEVICE

μPC1100C, μPC1150C

Soldering process	Soldering conditions	Symbol
Wave soldering	Solder temperature: 260 °C or below, Flow time: 10 seconds or below	

REFERENCE

Document Name	Document No.
Quality control of NEC semiconductor devices	TEM-1202
Quality control guide of semiconductor devices	MEI-1202
Assembly manual of semiconductor devices	IEI-1207
NEC semiconductor device reliability/quality control system	IEI-1212

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M4 92.6