

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>)

Send any inquiries to <http://www.renesas.com/inquiry>.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
 - “Standard”: Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.
 - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
 - “Specific”: Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

RS-232 LINE DRIVER/RECEIVER

The μ PD4711B is a high-voltage silicon gate CMOS line driver/receiver conforming to the EIA/TIA-232-E standard. It can operate with a single +5 V power source because it is provided with a DC-DC converter. In addition, this line driver/receiver has many ancillary functions, including output control, threshold select, and standby functions. Because the μ PD4711B is provided with two output driver circuits and two receiver circuits, it can constitute an RS-232 interface circuit with a single chip.

FEATURES

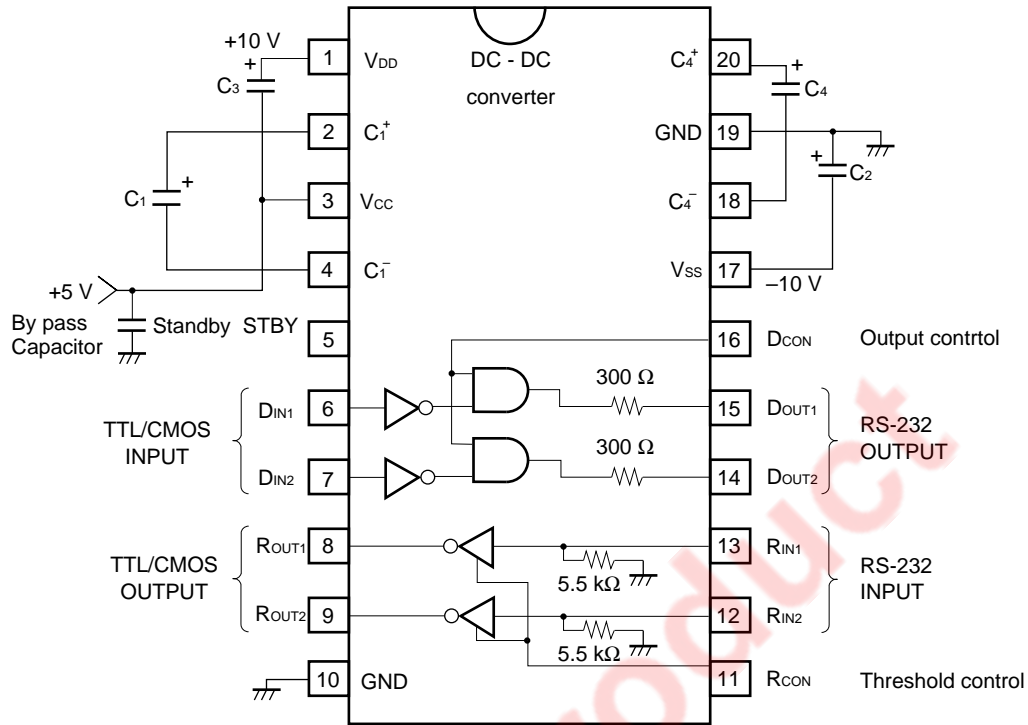
- Conforms to EIA/TIA-232-E (RS-232C) standard
- +5 V single power source
- Threshold select pin selecting two types of threshold voltages
- Standby mode can be set by making standby pin high to reduce circuit current.
- Three-state output configuration. Both driver and receiver outputs go into high-impedance state in standby mode.

ORDERING INFORMATION

Part Number	Package
μ PD4711BCX	20-pin plastic DIP (300 mil)
μ PD4711BGS	20-pin plastic SOP (300 mil)

The information in this document is subject to change without notice.

BLOCK DIAGRAM/PIN CONFIGURATION (Top View)



- * V_{DD} and V_{SS} are output pins of voltages internally boosted. Connecting a load directly to these pins is not recommended.
- ** The standby pin is internally pulled down.
- *** Use capacitors with a working voltage of 16 V or higher as C₁ through C₄. Insert a bypass capacitor about 0.1 to 1 μF between V_{CC} pin to GND pin.

TRUTH TABLE

Drivers

STBY	D _{CON}	D _{IN}	D _{OUT}	Remark
H	X	X	Z	Standby mode (DC-DC converter stops)
L	L	X	L	Mark level output
L	H	L	H	Space level output
L	H	H	L	Mark level output

Receivers

STBY	R _{IN}	R _{OUT}	Remark
H	X	Z	Stanby mode (DC-DC converter stops)
L	L	H	Mark level input
L	H	L	Space level input

Receiver input threshold voltage

R _{CON}	R _{IN1} to R _{IN2}
L	A mode
H	B mode

H: high level, L: low level, Z: high impedance, X: H or L

EOL Product

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Parameter	Symbol	Ratings	Unit
Supply voltage	V _{CC}	-0.5 to +6.0	V
Driver input voltage	D _{IN}	-0.5 to V _{CC} +0.5	V
Receiver input voltage	R _{IN}	-30.0 to +30.0	V
Driver output voltage	D _{OUT}	-25.0 to +25.0 ^{Note 1}	V
Receiver output voltage	R _{OUT}	-0.5 to V _{CC} + 0.5	V
Receiver input current	I _{IN}	±60.0	mA
Operating temperature range	T _A	-40 to +85	°C
Storage temperature range	T _{stg}	-55 to +150	°C
Power dissipation	P _T	0.5	W

Note 1. Pulse width: 1 ms, duty factor: 10 % MAX.

RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply voltage	V _{CC}	4.5	5.0	5.5	V
Receiver input voltage	R _{IN}	-30		+30	V
Operating temperature range	T _A	-20		80	°C
External capacitance	Note 2	1.0	22	47	μF

Note 2. The capacitance of an electrolytic capacitor decreases at a low temperature (0 °C or lower). Determine the capacitance of the capacitor to be used taking this into consideration when the μPD4711B is used at a low temperature. Keep the wiring length between the capacitor and IC as short as possible.

ELECTRICAL CHARACTERISTICS (OVERALL)

(Unless otherwise specified, V_{CC} = +5 V ±10 %, T_A = -20 °C to +80 °C, C₁ to C₄ = 22 μF)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Circuit current	I _{CC1}	V _{CC} = +5 V, no load, R _{IN} pin open (Standby pin open)		4.5	9.0	mA
Circuit current	I _{CC2}	V _{CC} = +5 V, R _L = 3 kΩ (D _{OUT}), D _{IN} = GND, R _{IN} and R _{OUT} pins open (Standby pin open)		15.0	25.0	mA
Standby circuit current	I _{CC} (Standby)	V _{CC} = +5 V, no load, R _{IN} pin open (Standby pin high)		50	120	μA
Standby low-level input voltage	V _{IL} (Standby)	Note 3			0.8	V
Standby high-level input voltage	V _{IH} (Standby)		2.0			V
Input capacitance	C _{IN}	Driver input and receiver input V _{CC} = +5 V, vs. GND, f = 1 MHz			10	pF

* TYP.: Typical (reference) value at T_A = 25 °C.

Note 3. Because the standby pin is internally pulled down, if the standby pin is left open, operating mode is in effect.

ELECTRICAL CHARACTERISTICS (DRIVER)

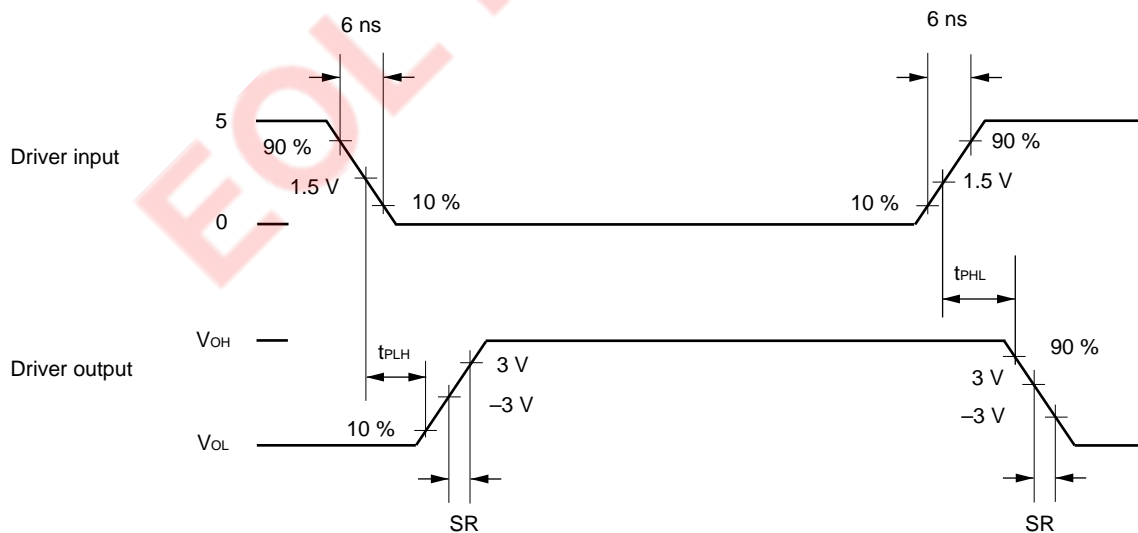
(Unless otherwise specified, $V_{CC} = +5\text{ V} \pm 10\%$, $T_A = -20\text{ }^\circ\text{C}$ to $+80\text{ }^\circ\text{C}$, C_1 to $C_4 = 22\text{ }\mu\text{F}$)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Low-level input voltage	V_{IL}				0.8	V
High-level input voltage	V_{IH}		2.0			V
Low-level input current	I_{IL}		0		-1.0	μA
High-level input current	I_{IH}		0		1.0	μA
Output voltage	V_{DO}	$V_{CC} = +5.0\text{ V}$, $R_L = \infty$, $T_A = 25\text{ }^\circ\text{C}$		± 9.7		V
		$V_{CC} = +5.0\text{ V}$, $R_L = 3\text{ k}\Omega$	± 5.5			V
		$V_{CC} = +4.5\text{ V}$, $R_L = 3\text{ k}\Omega$	± 5.0			V
Output short current	I_{SC}	$V_{CC} = +5.0\text{ V}$, vs. GND		± 15	± 40	mA
Slew rate	SR	$C_L = 10\text{ pF}$, $R_L = 3\text{ to }7\text{ k}\Omega$	1.5	11	30	V/ μs
		$C_L = 2500\text{ pF}$, $R_L = 3\text{ to }7\text{ k}\Omega$	1.5	6	30	V/ μs
Propagation delay time ^{Note 4}	t_{PHL}	$R_L = 3.5\text{ k}\Omega$, $C_L = 2500\text{ pF}$				
	t_{PLH}			0.8		μs
Output resistance	R_O	$V_{CC} = V_{DD} = V_{SS} = 0\text{ V}$ $V_{OUT} = \pm 2\text{ V}$	300			Ω
Standby output transition time	t_{DAZ}	Note 5		4	10	μs
Standby output transition time	t_{DZA}	Note 5		25	50	ms

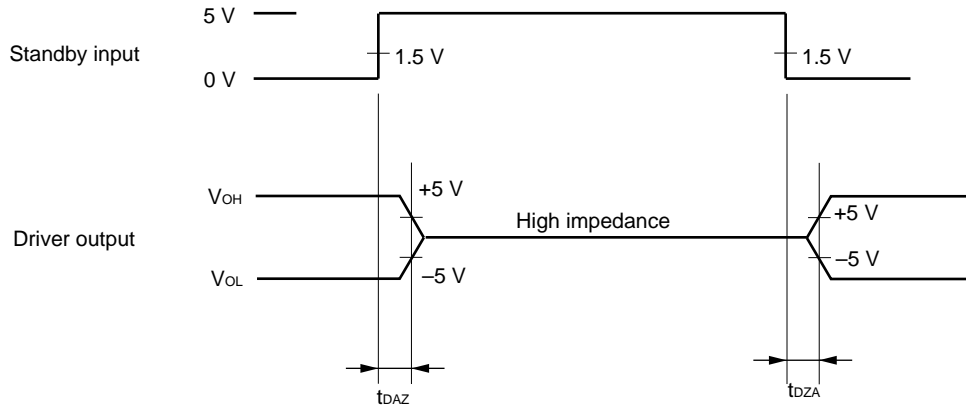
* TYP.: Typical (reference) value at $T_A = 25\text{ }^\circ\text{C}$.

Note 4. Test point

If the output control pin is made low, the driver output goes low regardless of the driver input state.



Note 5. Test Point



Do not perform communication within the standby output transition time t_{DZA} on power application or on releasing the standby mode.

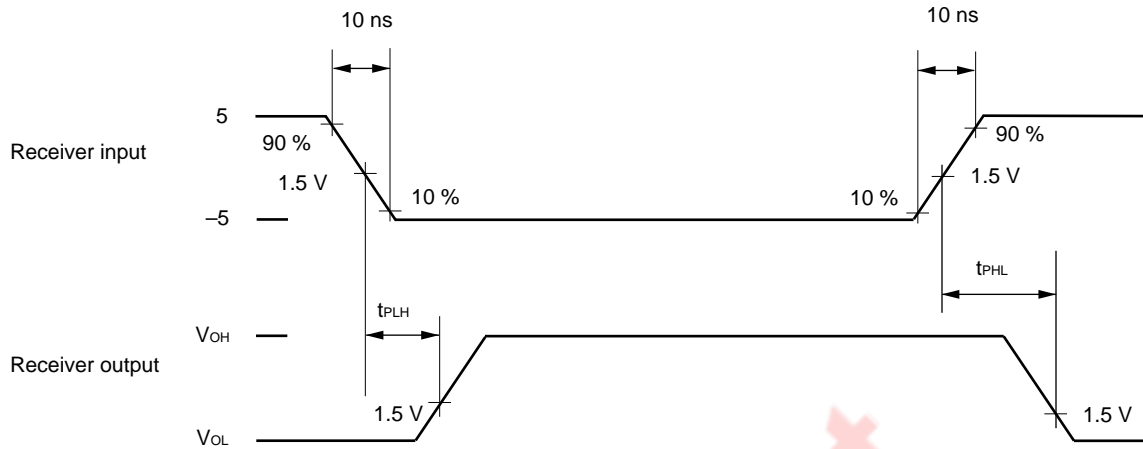
ELECTRICAL CHARACTERISTICS (RECEIVER)

(Unless otherwise specified, V_{CC} = +5 V ± 10 %, T_A = -20 °C to +80 °C, C₁ to C₄ = 22 μF)

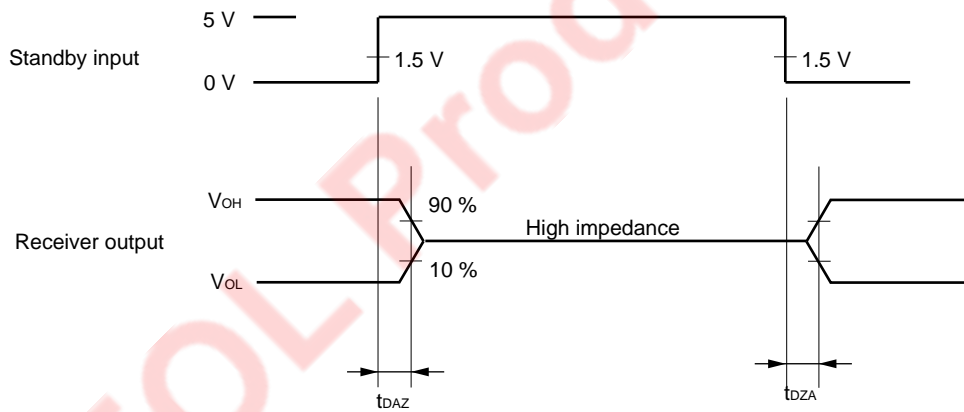
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Low-level output voltage	V _{OL}	I _{OUT} = 4 mA			0.4	V
High-level output voltage	V _{OH}	I _{OUT} = -4 mA	V _{CC} -0.8			V
Low-level input voltage	V _{IL}	R _{CON} pin			0.8	V
High-level input voltage	V _{IH}	R _{CON} pin	2.0			V
Propagation delay time ^{Note 6}	t _{PHL} t _{PLH}	R _L = 1 kΩ, C _L = 150 pF		0.13		μs
Input current	I _{IN}	V _{IN} = ±5 V		1		mA
Input resistance	R _i	V _{IN} = ±3 to ±25	3	5	7	kΩ
Input pin release voltage	V _{IO}	Input threshold A mode only			0.5	V
Input threshold A mode (R _{CON} pin low)	V _{IH}	V _{CC} = +5 V	1.6	2.2	2.6	V
	V _{IL}	V _{CC} = +5 V	0.6	1	1.6	V
	V _H	V _{CC} = +5 V (hysteresis width)	0.5	1.2	1.8	V
Input threshold B mode (R _{CON} pin high)	V _{IH}	V _{CC} = +5 V	1.6	2.2	2.6	V
	V _{IL}	V _{CC} = +5 V	-0.4	-1.8	-3.0	V
	V _H	V _{CC} = +5 V (hysteresis width)	2.6	4.0	5.4	V
Standby output transition time	t _{DAZ}	Note 7		0.4	1	μs
Standby output transition time	t _{DZA}	Note 7		0.03	10	ms

* TYP.: Typical (reference) value at T_A = 25 °C.

Note 6. Test Point



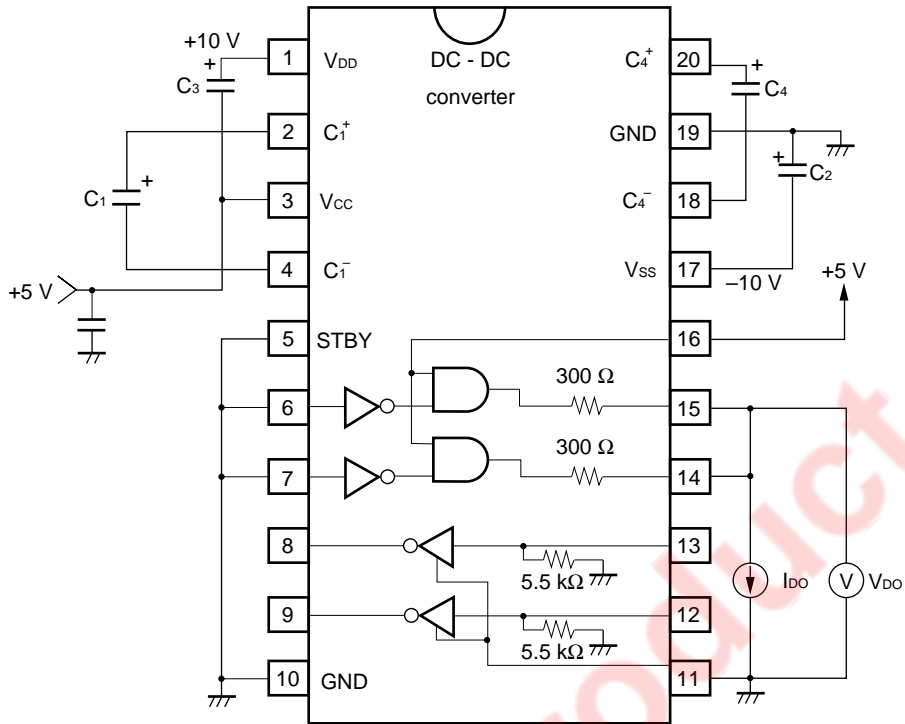
Note 7. Test Point



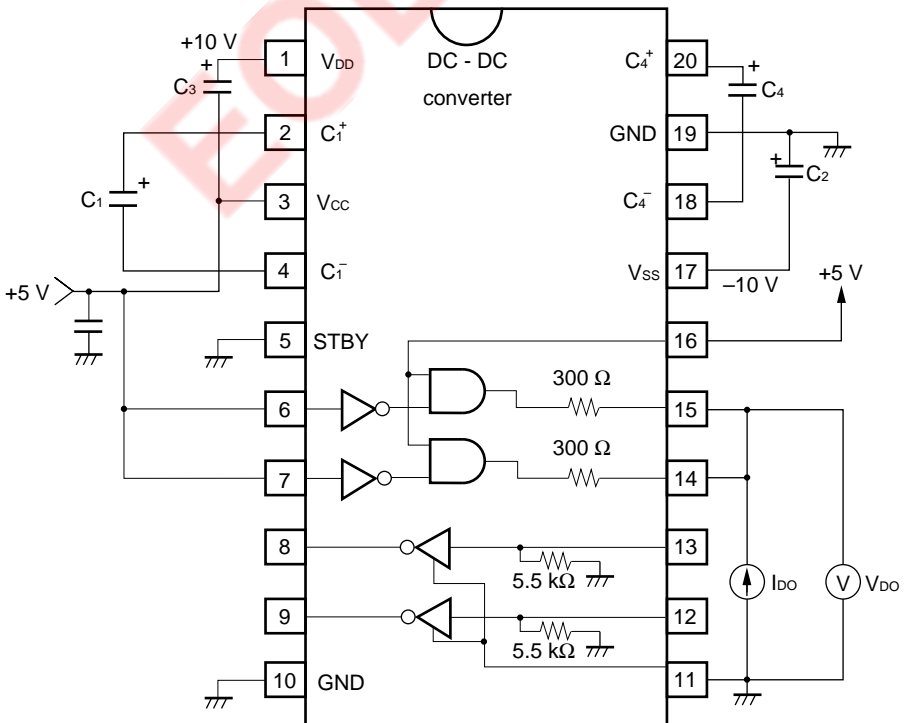
The receiver output is undefined during the standby output transition time t_{DZA} . Do not perform communication in the standby output transition time t_{DZA} on power application or on releasing the standby mode.

TEST CIRCUIT

Driver output voltage/Output current (+ side)

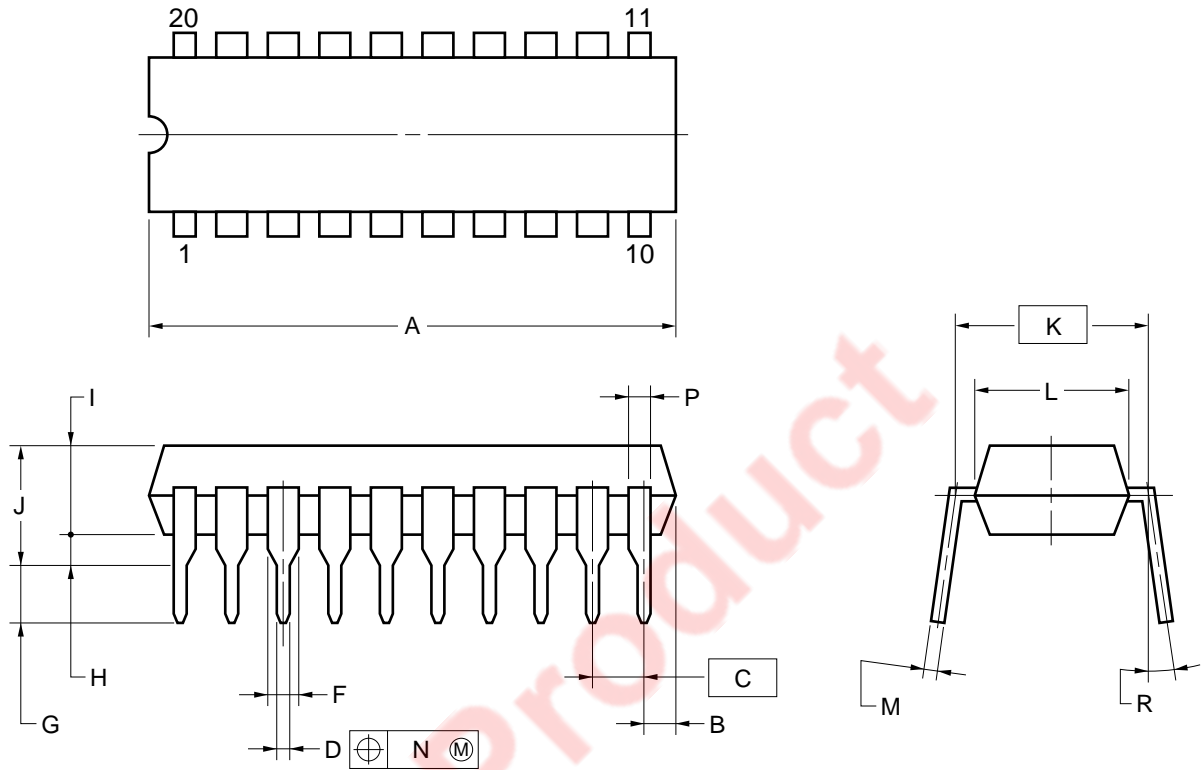


Driver output voltage/Output current (- side)



PACKAGE DRAWINGS

20PIN PLASTIC DIP (300 mil)



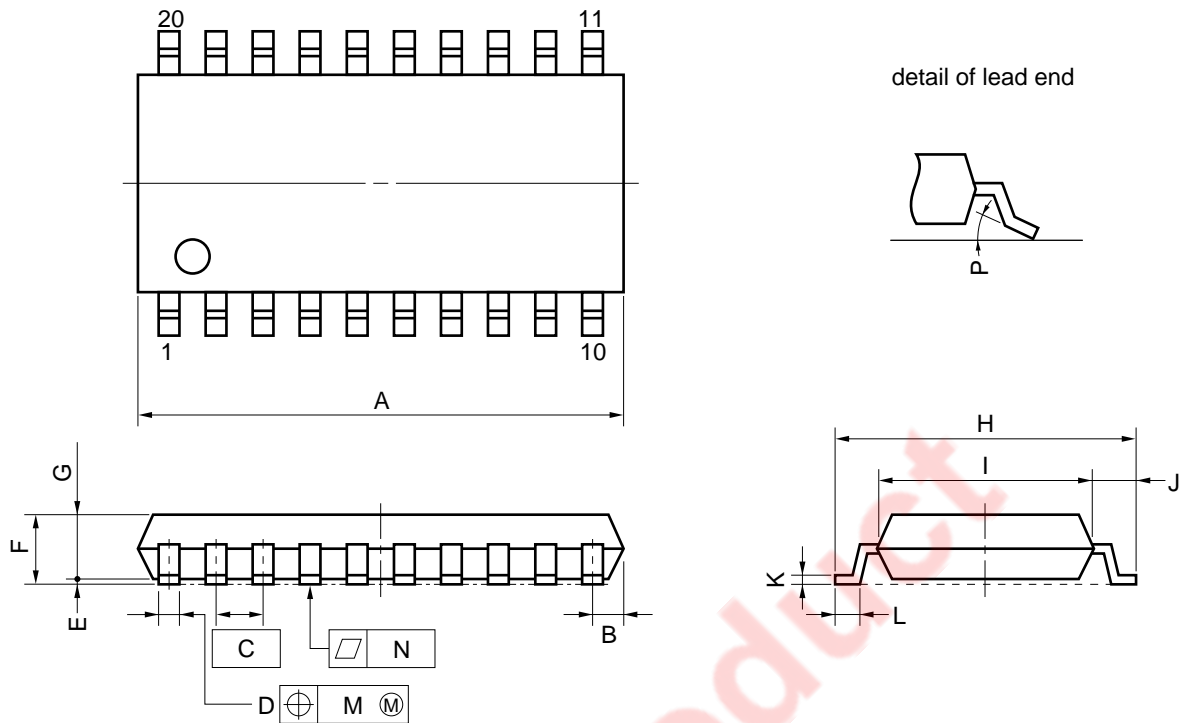
NOTES

- 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	25.40 MAX.	1.000 MAX.
B	1.27 MAX.	0.050 MAX.
C	2.54 (T.P.)	0.100 (T.P.)
D	0.50±0.10	0.020 ^{+0.004} _{-0.005}
F	1.1 MIN.	0.043 MIN.
G	3.5±0.3	0.138±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	6.4	0.252
M	0.25 ^{+0.10} _{-0.05}	0.010 ^{+0.004} _{-0.003}
N	0.25	0.01
P	0.9 MIN.	0.035 MIN.
R	0~15°	0~15°

P20C-100-300A,C-1

20 PIN PLASTIC SOP (300 mil)



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	13.00 MAX.	0.512 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
P	3° ^{+7°} _{-3°}	3° ^{+7°} _{-3°}

P20GM-50-300B, C-4

RECOMMENDED SOLDERING CONDITIONS

Soldering the μPD4711B under the conditions listed in the table below is recommended.

For soldering methods and conditions other than those recommended, consult NEC.

Surface mount type

For the details of the recommended soldering conditions of the surface mount type, refer to Information document “Semiconductor Device Mounting Technology Manual” C10535EJ7V0IF00.

μPD4711BGS

Soldering Method	Soldering Condition	Recommended Condition Symbol
Infrared reflow	Package peak temperature: 235 °C, Time: 30 seconds MAX. (210 °C MIN.), Number of times: 2, Number of days: not limited*	IR35-00-2
VPS	Package peak temperature: 215 °C, Time: 40 seconds MAX. (200 °C MIN.), Number of times: 2, Number of days: not limited*	VP15-00-2
Wave soldering	Soldering bath temperature: 260 °C MAX., Time: 10 seconds MAX., Number of times: 1, Number of days: not limited*	WS60-00-1
Pin partial heating	Pin temperature: 300 °C MAX (lead temperature), Time: 3 seconds MAX. (per lead pin), Number of days: not limited*	

* The number of days the device can be stored at 25 °C, 65 % RH MAX. after the dry pack has been opened.

Caution Do not use two or more soldering methods in combination (except the pin partial heating method).

Through-hole type

μPD4711BCX

Soldering Method	Soldering Conditions
Wave soldering	Soldering bath temperature: 260 °C MAX., Time: 10 seconds MAX.

Reference documents

“NEC Semiconductor Device Reliability/Quality Control System” (IEI-1212)

“Quality Grade on NEC Semiconductor Devices” (IEI-1209)

“Semiconductor Device Mounting Technology Manual” C10535EJ7V0IF00

[MEMO]

No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Corporation. NEC Corporation assumes no responsibility for any errors which may appear in this document.

NEC Corporation does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from use of a device described herein or any other liability arising from use of such device. No license, either express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Corporation or others.

While NEC Corporation has been making continuous effort to enhance the reliability of its semiconductor devices, the possibility of defects cannot be eliminated entirely. To minimize risks of damage or injury to persons or property arising from a defect in an NEC semiconductor device, customers must incorporate sufficient safety measures in its design, such as redundancy, fire-containment, and anti-failure features.

NEC devices are classified into the following three quality grades:

"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.