DATA SHEET

NEC

MOS INTEGRATED CIRCUIT

μPD4711B

RS-232 LINE DRIVER/RECEIVER

The μPD4711B is a high-voltage silicon gate CMOS line driver/reciever 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 μPD4711B is provided with two output driver circuits and two receiver circuits, it can constitute an RS-232 interface circuit with a single chip.

FEATURES

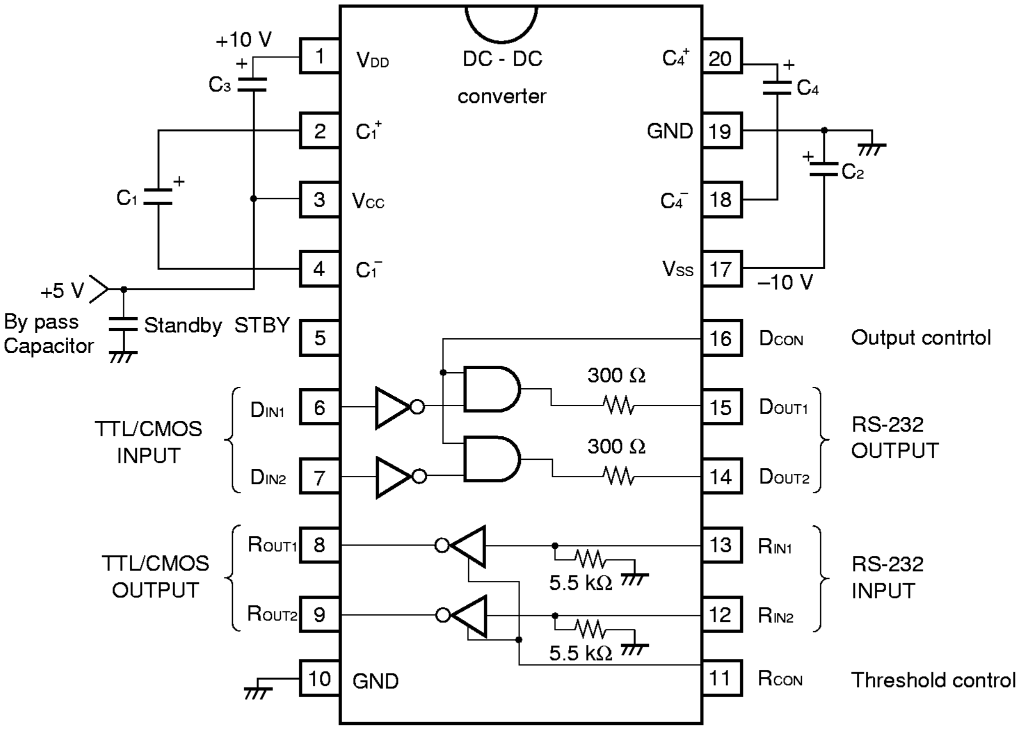
- Conforms to EIA/TIA-232-E (RS-232C) standard
- +5 V single power source
- Threshold select pin selecting two types of threshold voltages
- Standby mode can be set by making standby pin high to reduce circuit current.
- Three-state output configuration. Both driver and receiver outputs go into high-impedance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

ORDERING INFORMATION

Part Number	Package
μPD4711BCX	20-pin plastic DIP (300 mil)
μPD4711BGS	20-pin plastic SOP (300 mil)

Document No. S10315EJ3V1DS00 (3rd edition)
Date Published April 1997 N
Printed in Japan

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 C_1 through C_4. Insert a bypass capasitor 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

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, C_1 to C_4 = 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.

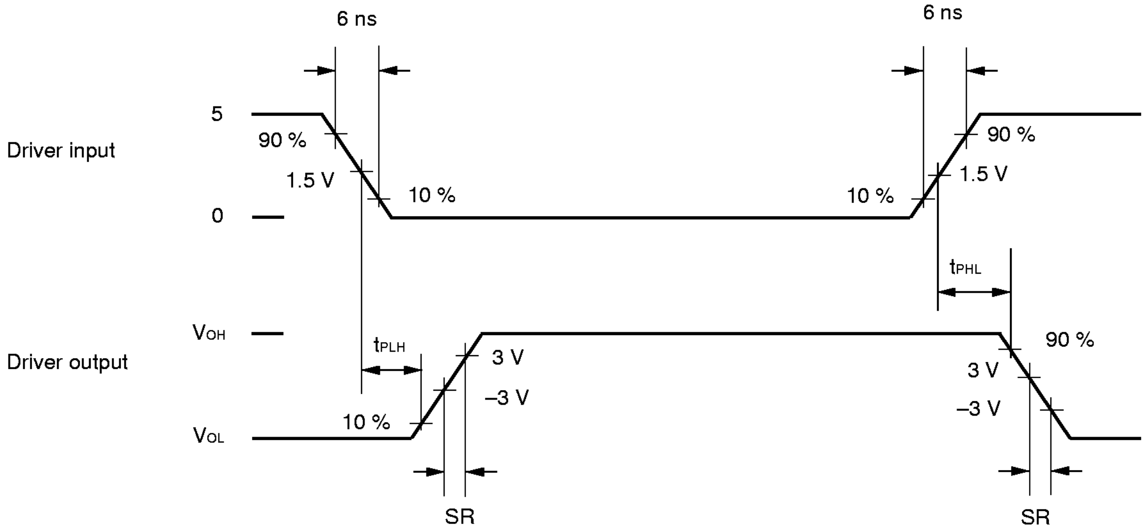
ELECTRICAL CHARACTERISTICS (DRIVER)
(Unless otherwise specified, V_{CC} = +5 V ±10 %, T_A = –20 ˚C to +80 ˚C, C_1 to C4 = 22 μF)

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 V, R_L = ∞, T_A = 25 ˚C		±9.7		V
		V_{CC} = +5.0 V, R_L = 3 kΩ	±5.5			V
		V_{CC} = +4.5 V, R_L = 3 kΩ	±5.0			V
Output short current	I_{SC}	V_{CC} = +5.0 V, vs. GND		±15	±40	mA
Slew rate	SR	C_L = 10 pF, R_L = 3 to 7 kΩ	1.5	11	30	V/μs
		C_L = 2500 pF, R_L = 3 to 7 kΩ	1.5	6	30	V/μs
Propagation delay time**Note 4**	t_{PHL} t_{PLH}	R_L = 3.5 kΩ, C_L = 2500 pF		0.8		μs
Output resistance	R_O	V_{CC} = V_{DD} = V_{SS} = 0 V V_{OUT} = ±2 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

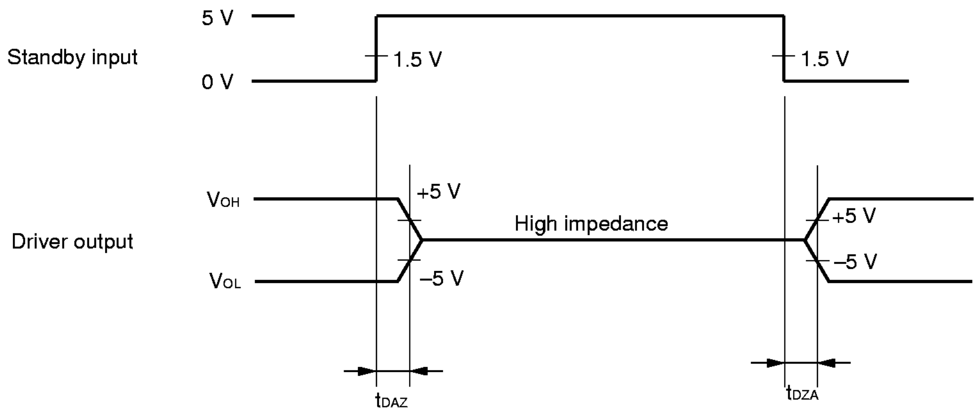
* TYP.: Typical (reference) value at T_A = 25 ˚C.

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.

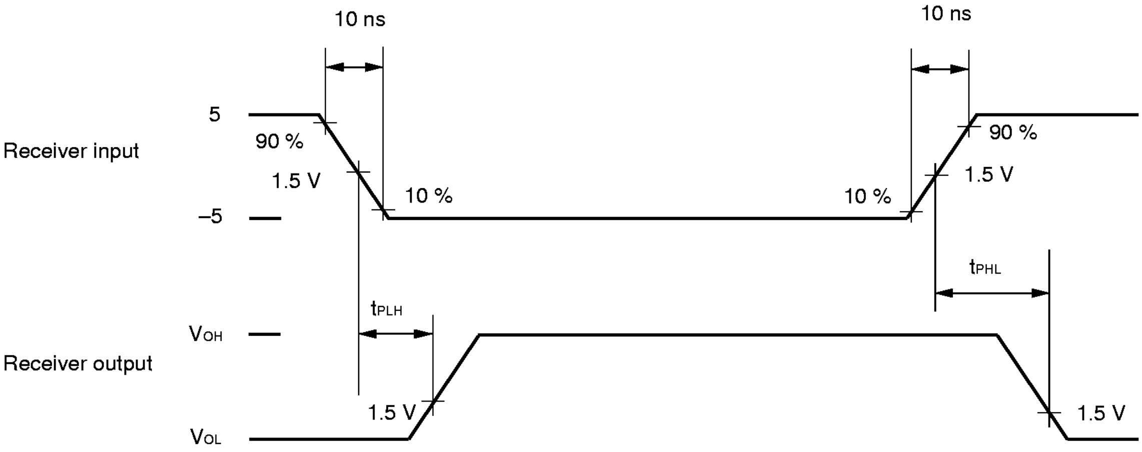
ELECTRICAL CHARACTERISTICS (RECEIVER)

(Unless otherwise specified, V_{CC} = +5 V ± 10 %, T_A = −20 °C to +80 °C, C_1 to C_4 = 22 μF)

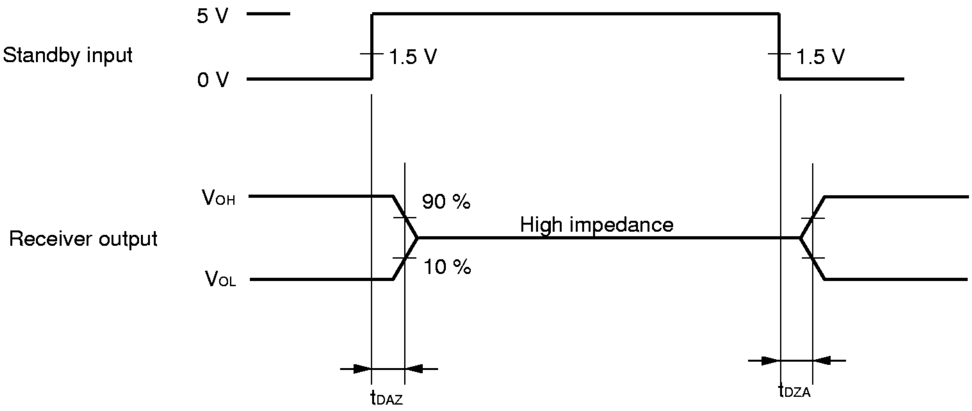
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Low-level output voltage	V_{OL}	I_{OUT} = 4 mA			0.4	V
High-level output voltage	V_{OH}	I_{OUT} = −4 mA	V_{CC} −0.8			V
Low-level input voltage	V_{IL}	R_{CON} pin			0.8	V
High-level input voltage	V_{IH}	R_{CON} pin	2.0			V
Propagation delay time[Note 6]	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



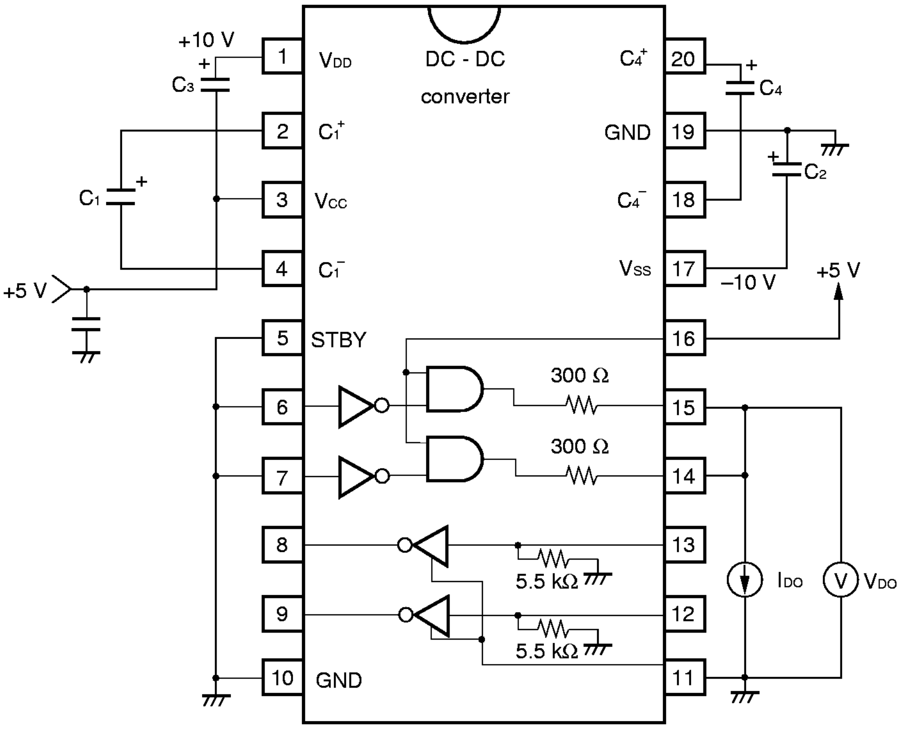
Note 7. Test Point



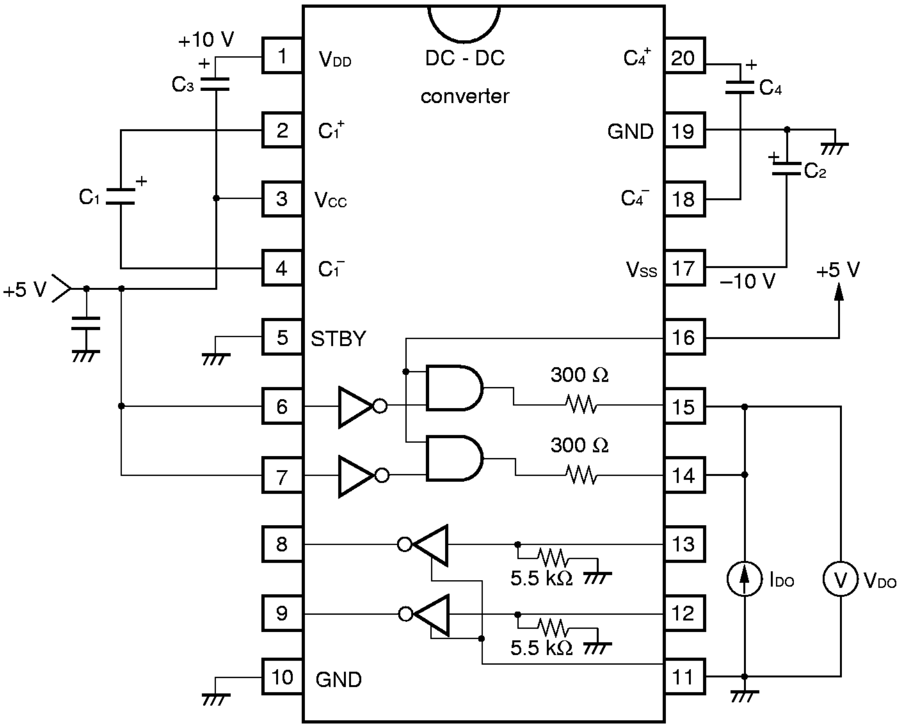
The receiver output is undefined during the standby output transition time t_{DZA}. Do not perform communication in the standby output transition time t_{DZA} on power application or on releasing the standby mode.

TEST CIRCUIT

Driver output voltage/Output current (+ side)

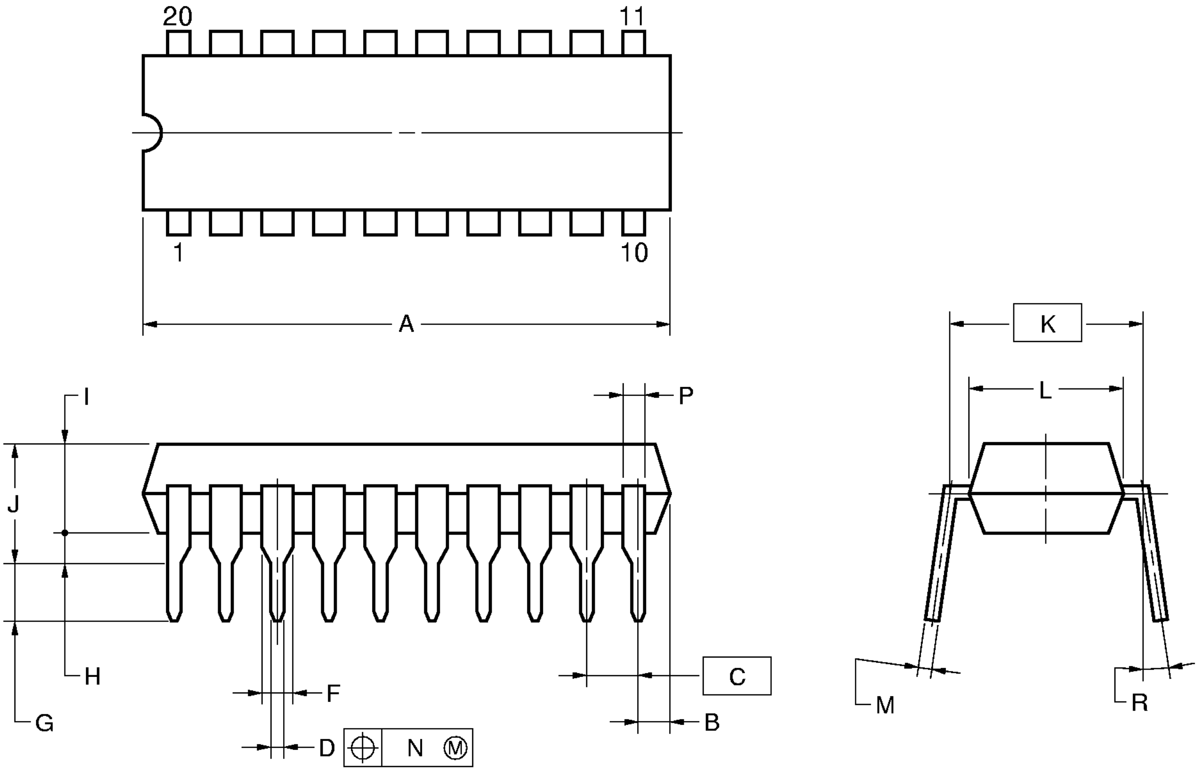


Driver output voltage/Output current (– side)



PACKAGE DRAWINGS

20PIN PLASTIC DIP (300 mil)



NOTES

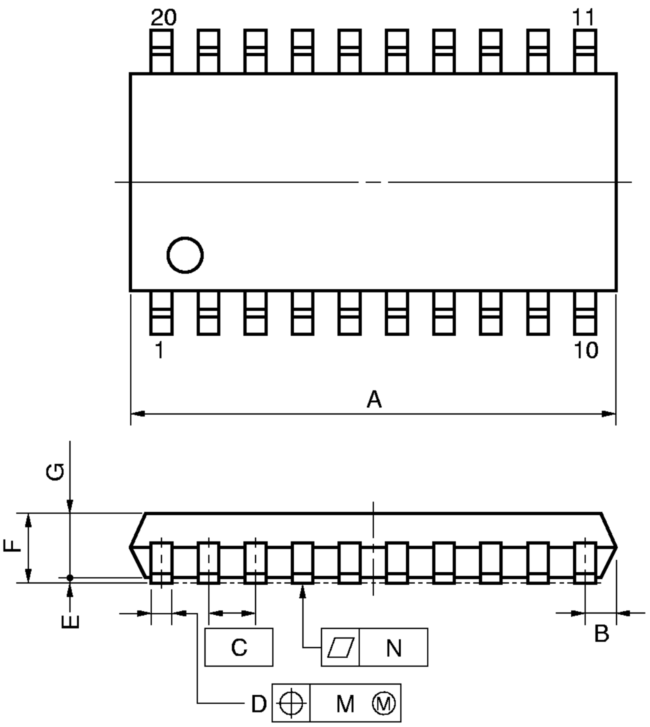
1) Each lead centerline is located within 0.25 mm (0.01 inch) of its true position (T.P.) at maximum material condition.

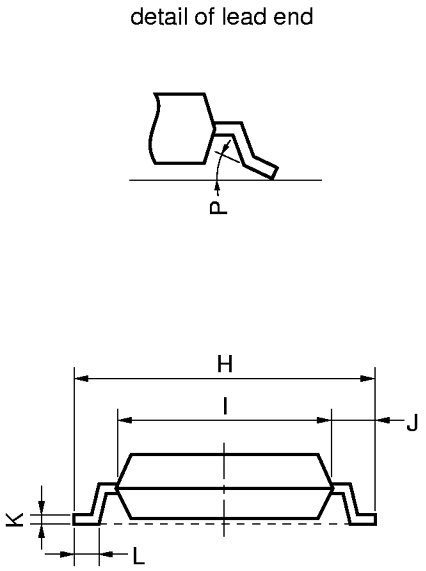
2) Item "K" to center of leads when formed parallel.

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).

Throught-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