DATA SHEET



MOS INTEGRATED CIRCUIT μ PD4714A

RS-232 LINE DRIVER/RECEIVER

The μ PD4714A is a high-voltage silicon gate CMOS line dirver/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 μ PD4714A is provided with three output driver circuits and five receiver circuits, it can constitute an RS-232 interface circuit with a single chip.

FEATURES

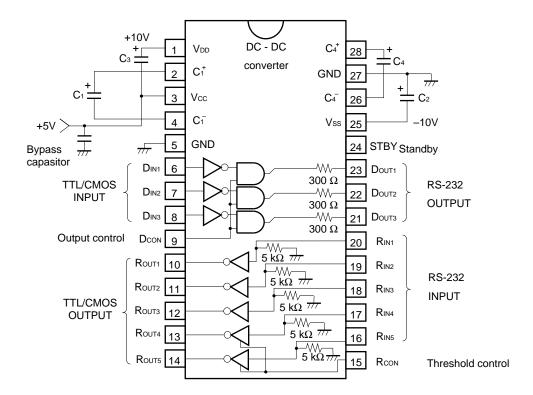
- Conforms to EIA/TIA-232-E (RS-232C) standard
- +5 V single power source
- Threshold select pin selecting two types of threshold voltages
- Standby mode can be set by making standby pin high to reduce circuit current.
- Three-state output configuration. Both driver and receiver outputs go into high-impedance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

ORDERING INFORMATION

Part Number	Package	
μPD4714ACY	28-pin plastic DIP (400 mil)	
μPD4714AGT	28-pin plastic SOP (375 mil)	



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 capasitor about 0.1 to 1 μF between Vcc pin to GND pin.



TRUTH TABLE

Drivers

STBY	DCON	Din	D оит	Remark
Н	Х	Х	Z	Standby mode (DC-DC converter stops)
L	L	Х	L	Mark level output
L	Н	L	Н	Space level output
L	Н	Н	L	Mark level output

Receivers

STBY	Rin	Rоит	Remark
Н	Х	Z	Stanby mode (DC-DC converter stops)
L	L	Н	Mark level input
L	Н	L	Space level input

Receiver input threshold voltage

Rcon	RIN1 to RIN3	RIN4 to RIN5
L	A mode	A mode
Н	A mode	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	Vcc	-0.5 to +6.0	V
Driver input voltage	Din	-0.5 to Vcc +0.5	V
Receiver input voltage	Rin	-30.0 to +30.0	V
Driver output voltage	Dout	-25.0 to +25.0 Note1	V
Receiver output voltage	Rоит	-0.5 to Vcc + 0.5	V
Receiver input current	lin	±60.0	mA
Operating temperature range	TA	-40 to +85	°C
Storage temperature range	T _{stg}	−55 to +150	°C
Power dissipation	Рт	0.5	W

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

RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply voltage	Vcc	4.5	5.0	5.5	V
Receiver input voltage	Rın	-25		+25	V
Operating temperature range	TA	-20		80	°C
External capacitance	Note 2	4.7		47	μF

Note 2. The capacitance of an electrolytic capacitor decreases at a low temperature (0 $^{\circ}$ C or lower). Determine the capacitance of the capacitor to be used taking this into consideration when the μ PD4714A 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, Vcc = +5 V \pm 10 %, T_A = -20 °C to +80 °C, C₁ to C₄ = 22 μ F)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Circuit current		Vcc = +5 V, no load, R _{IN} pin open				
	Icc ₁	(Standby pin open)		7.0	18.0	mA
Circuit current		$Vcc = +5 \text{ V}, \text{ RL} = 3 \text{ k}\Omega \text{ (Dout)}, \text{ DIN} = \text{GND},$				
	Icc2	RIN and ROUT pins open		23.0	40.0	mA
		(Standby pin open)				
Standby circuit current	Icc	Vcc = +5 V, no load, R _{IN} pin open				
	(Standby)	(Standby pin high)		50	120	μΑ
Standby low-level	VIL	Note 3				
input voltage	(Standby)				0.8	V
Standby high-level	Vıн					
input voltage	(Standby)		2.0			V
Standby high-level	Іін	Vcc = +5.5 V				
input current	(Standby)	V ₁ = 5.5 V			100	μΑ
Standby low-level	lıL	Vcc = +5.5 V				
input current	(Standby)	V1 = 0 V			-1	μΑ
Input capacitance		Driver input and receiver input			4.0	1
	Cin	Vcc = +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, Vcc = +5 V \pm 10 %, T_A = -20 °C to +80 °C, C₁ to C₄ = 22 μ F)

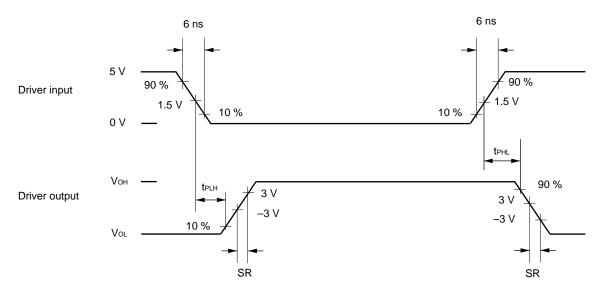
Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Low-level input voltage	VIL				0.8	V
High-level input voltage	ViH		2.0			V
Low-level input current	lı∟		0		-1.0	μΑ
High-level input current	Іін		0		1.0	μΑ
Output voltage		Vcc = +5.0 V, R _L = ∞, T _A = 25 °C		±9.7		V
	VDO	$Vcc = +5.0 \text{ V}, \text{ RL} = 3 \text{ k}\Omega$	±5.5			V
		$Vcc = +4.5 \text{ V}, \text{ RL} = 3 \text{ k}\Omega$	±5.0			V
Output short current	Isc	Vcc = +5.0 V, vs. GND		±15	±40	mA
Slew rate		$C_L = 10 \text{ pF}, R_L = 3 \text{ to } 7 \text{ k}\Omega$	1.5	9	30	V/μs
	SR	$C_L = 2500 \text{ pF}, R_L = 3 \text{ to } 7 \text{ k}\Omega$	1.5	5	30	V/μs
Propagation delay time Note 4	t PHL					
	t PLH	$R_L = 3.5 \text{ k}\Omega$, $C_L = 2500 \text{ pF}$		0.8		μs
Output resistance		Vcc = Vdd = Vss = 0 V				
	Ro	Vout = ±2 V	300	500		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.

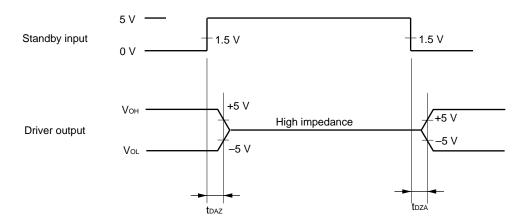


Note 4. Test point

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.



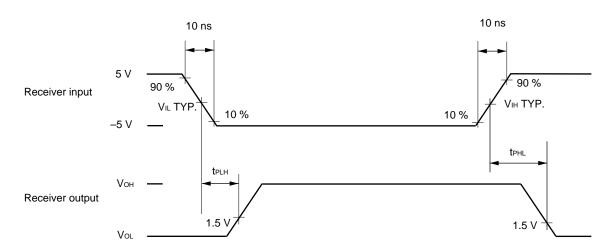
ELECTRICAL CHARACTERISTICS (RECEIVER) (Unless otherwise specified, Vcc = +5 V \pm 10 %, T_A = -20 °C to +80 °C, C₁ to C₄ = 22 μ F)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Low-level output voltage	Vol	IOUT = 4 mA			0.4	V
High-level output voltage	Vон	lо∪т = −4 mA	Vcc			V
	VOH	IOUT = -4 IIIA	-0.8			V
Low-level input voltage	VIL	Rcon pin			0.8	V
High-level input voltage	ViH	Rcon pin	2.0			V
Propagation delay time Note 7	t PHL	D 410 0 450 5		0.40		
	tplH	$R_L = 1 \text{ k}\Omega, C_L = 150 \text{ pF}$		0.13		μs
Input current	lin			1		mA
Input resistance	Rı		3	5	7	kΩ
Input pin release voltage	Vio	Input threshold A mode only			0.5	V
Input threshold A mode	Vıн	Vcc = +5 V	1.6	2.2	2.6	V
(Rcon pin low)	VIL	Vcc = +5 V	0.6	1	1.6	V
	Vн	Vcc = +5 V (hysteresis width)	0.5	1.2	1.8	V
Input threshold B mode Note 6	ViH	Vcc = +5 V	1.6	2.2	2.6	٧
(Rcon pin high)	VIL	Vcc = +5 V	-0.4	-1.8	-3.0	V
	Vн	Vcc = +5 V (hysteresis width)	2.6	4.0	5.4	٧
Standby output transition time	t DAZ	Note 8		0.4	1	μs
Standby output transition time	t dza	Note 8		1.0	10	ms

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

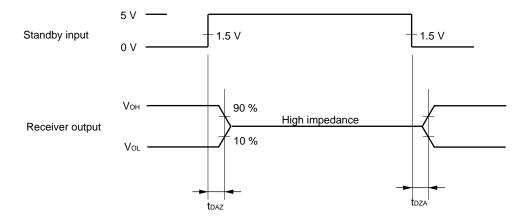
Note 6. This data is applicable to receivers 4 and 5 only. Receiver 1 to 3 are fixed in A mode.

Note 7. Test Point





Note 8. Test Point

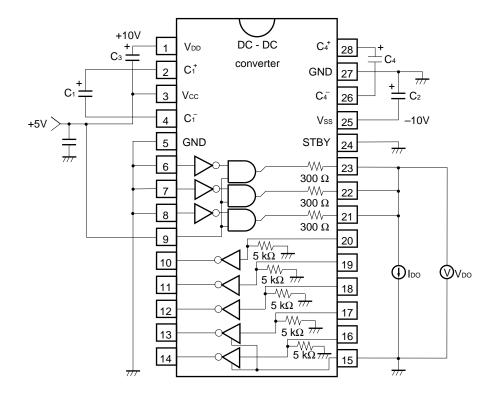


The receiver output is undefined during the standby output transition time t_{DZA} . Do not perform communication in the standby output transition time t_{DZA} on power application or on releasing the standby mode.

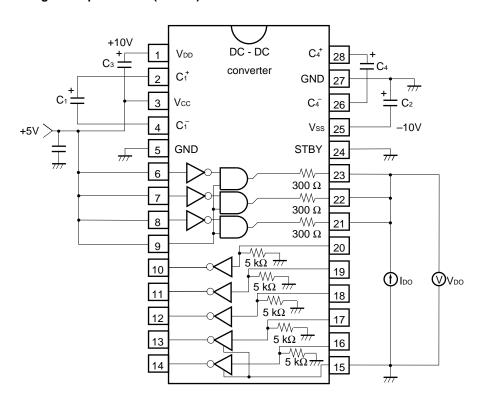


TEST CIRCUIT

Driver output voltage / Output current (+ side)



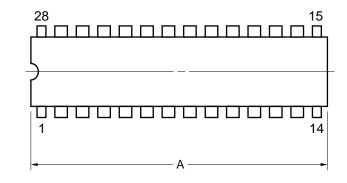
Driver output voltage / Outpit current (- side)

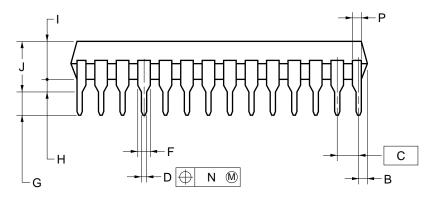


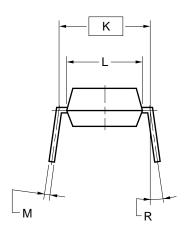


PACKAGE DRAWINGS

28PIN PLASTIC DIP (400 mil)







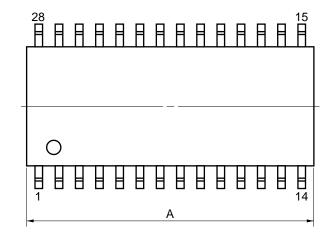
NOTES

- 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.

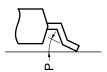
ITEM	MILLIMETERS	INCHES
Α	35.56 MAX.	1.400 MAX.
В	1.27 MAX.	0.050 MAX.
С	2.54 (T.P.)	0.100 (T.P.)
D	0.50±0.10	$0.020^{+0.004}_{-0.005}$
F	1.1 MIN.	0.043 MIN.
G	3.5±0.3	0.138±0.012
Н	0.51 MIN.	0.020 MIN.
1	4.31 MAX.	0.170 MAX.
J	5.72 MAX.	0.226 MAX.
K	10.16 (T.P.)	0.400 (T.P.)
L	8.6	0.339
М	$0.25^{+0.10}_{-0.05}$	$0.010^{+0.004}_{-0.003}$
N	0.25	0.01
Р	0.9 MIN.	0.035 MIN.
R	0~15°	0~15°
	-	D000 100 100 1

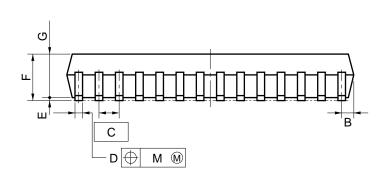
P28C-100-400-1

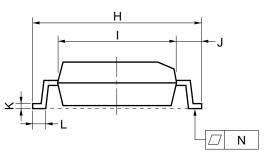
28 PIN PLASTIC SOP (375 mil)



detail of lead end







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
Α	18.07 MAX.	0.712 MAX.
В	0.78 MAX.	0.031 MAX.
С	1.27 (T.P.)	0.050 (T.P.)
D	$0.40^{+0.10}_{-0.05}$	$0.016^{+0.004}_{-0.003}$
Е	0.1±0.1	0.004±0.004
F	2.9 MAX.	0.115 MAX.
G	2.50	0.098
Н	10.3±0.3	$0.406^{+0.012}_{-0.013}$
I	7.2	0.283
J	1.6	0.063
K	$0.15^{+0.10}_{-0.05}$	$0.006^{+0.004}_{-0.002}$
L	0.8±0.2	$0.031^{+0.009}_{-0.008}$
М	0.12	0.005
N	0.15	0.006
Р	3°+7°	3°+7°

P28GM-50-375B-3



RECOMMENDED SOLDERING CONDITIONS

Soldering the μ PD4714A 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).

μ PD4714AGT

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

μ PD4714ACY

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)

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.