

MOS INTEGRATED CIRCUIT $\mu PD4723$

RS-232 LINE DRIVER/RECEIVER AT 3.3 V/5 V

The μ PD4723 is a high-breakdown voltage silicon gate CMOS line driver/receiver based on the EIA/TIA-232-E standard. The internal DC/DC converter can switch between multiple voltages, allowing it to operate with a single +3.3 V or +5 V power supply. It also provides standby function.

This IC incorporates 3 driver circuits and 3 receiver circuits. An RS-232 interface circuit can be easily configured by connecting 5 capacitors externally.

Features

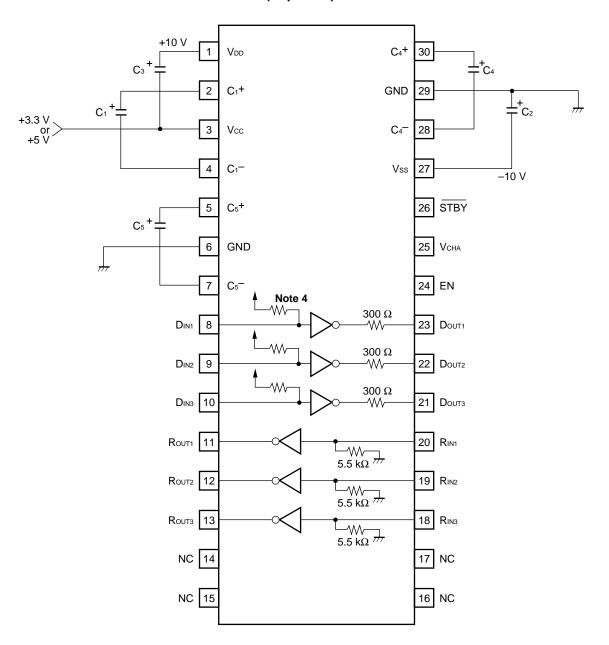
- · Conforms to EIA/TIA-232-E (former name, RS-232C) standards
- Selectable +3.3 V/+5 V single power supply (selected by VcHA pin)
- By setting the standby pin to a low level (standby mode), circuit current can be reduced. At such times, the driver output is in a high-impedance state.
- Even in the standby mode, 2 receiver circuits can operate as inverters without hysteresis width. The other circuit is fixed at a high level.

Ordering Information

Part number	Package
μPD4723GS-GJG	30-pin plastic SSOP (300 mil)



BLOCK DIAGRAM/PIN CONFIGURATION (Top View)



Note 1. VDD and Vss are output pins stepped up internally. These pins should not be loaded directly.

- **2.** Capacitors C_1 to C_5 with a breakdown voltage of 20 V or higher are recommended. And it is recommended to insert the capacitor that is 0.1 μ F to 1 μ F between Vcc and GND.
- 3. If Vcha is kept low level (in 5 V mode), capacitor C5 is not necessary.
- 4. The pull-up resistors at driver input are active resistors.



Truth Table

Driver

STBY	DIN	DOUT	Remarks
L	×	Z	Standby mode (DC/DC converter is stopped)
Н	L	Н	Space level output
Н	Н	L	Mark level output

Receiver

OTDV	ENI	R	IN	Rouт		Powerle.
STBY	EN	R ₂ to R ₃	R ₁	R ₂ to R ₃	R ₁	Remarks
L	L	×	×	Н	Н	Standby mode 1 (DC/DC converter is stopped)
L	Н	L	×	Н	Н	Standby mode 2 (DC/DC converter is stopped, R_2 and R_3 are operated)
L	Н	Н	×	L	Н	Standby mode 2 (DC/DC converter is stopped, R_2 and R_3 are operated)
Н	×	L	-	Н		Mark level input
Н	×	Н		L	-	Space level input

3 V \leftrightarrow 5 V switching $^{Note\ 5}$

Vсна	Operating mode
L 5 V mode (double step-up)	
Н	3 V mode (3 times step-up)

H: high-level, L: low-level, Z: high-impedance, x: H or L

Note 5. When switching V_{CHA} , standby mode must be selected ($\overline{STBY} = L$).



ABSOLUTE MAXIMUM RATINGS (TA = 25 °C)

Parameter	Symbol	Ratings	Unit
Supply Voltage (VcHA = L)	Vcc	-0.5 to +7.0	V
Supply Voltage (VcHA = H)	Vcc	-0.5 to +4.5	V
Driver Input Voltage	Din	-0.5 to Vcc +0.5	V
Receiver Input Voltage	Rin	-30.0 to +30.0	V
Control Input Voltage (STBY, VcHA, EN)	Vin	-0.5 to Vcc +0.5	V
Driver Output Voltage	D оит	-25.0 to +25.0 ^{Note 6}	V
Receiver Output Voltage	Rоит	-0.5 to Vcc +0.5	V
Input Current (DIN, STBY, VCHA, EN)	lin	±20.0	mA
Operating Ambient Temperature	TA	-40 to +85	°C
Storage Temperature	Tstg	−55 to + 150	°C
Total Power Dissipation	Рт	0.5	W

Note 6. Pulse width = 1 ms, duty = 10 % MAX.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage (Vcha = L, 5 V mode)	Vcc	4.5	5.0	5.5	V
Supply Voltage (Vcha = H, 3 V mode)	Vcc	3.0	3.3	3.6	V
High-Level Input Voltage (D _{IN})	Vıн	2.0		Vcc	V
Low-Level Input Voltage (DIN)	VıL	0		0.8	٧
High Level Input Voltage (STBY, Vcha, EN)	ViH	2.4		Vcc	V
Low Level Input Voltage (STBY, VcHA, EN)	VIL	0		0.6	٧
Receiver Input Voltage	Rın	-30		+30	V
Operating Ambient Temperature	TA	-40		+85	°C
Capacitance of External Capacitor	Note 7	0.33		4.7	μF

Note 7. In low temperature (below 0 °C), the capacitance of electrolytic capacitor becomes lower. Therefore, set higher values when using in low temperature.

Concerning the wiring length between the capacitor and the IC, the shorter the better.

Capacitors with good frequency characteristics such as tantalum capacitors, laminated ceramic capacitors, and aluminum electrolytic capacitors for switching power supply are recommended for the external capacitors.



ELECTRICAL SPECIFICATIONS (TOTAL)

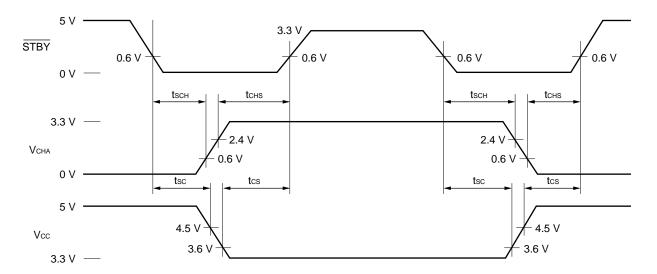
(UNLESS OTHERWISE SPECIFIED, $T_A = -40$ to +85 °C, C₁ to C₅ = 1 μ F)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	lan	Vcc = +3.3 V, No load, R _{IN} pin OPEN, STBY = H			14	mA
Circuit Current	Icc1	$\frac{\text{Vcc} = +5.0 \text{ V}, \text{ No load, Rin pin OPEN,}}{\text{STBY}} = \text{H}$			10	mA
Circuit Current	lcc2	Vcc = +3.3 V, RL = 3 $\underline{\text{k}\Omega}$ (Dout), DIN = GND, RIN, ROUT pin OPEN, $\overline{\text{STBY}}$ = H			35	mA
Circuit Current	ICC2	Vcc = +5.0 V,RL = 3 $k\Omega$ (Dout), DIN = GND, RIN, ROUT pin OPEN, \overline{STBY} = H			28	mA
		$Vcc = +3.3 \text{ V}$, No load, D _{IN} and R _{IN} pins are OPEN, $\overline{\text{STBY}} = \text{L}$, EN = L, TA = 25 °C		1	3	μΑ
Circuit Current at Standby	Іссз	$V_{CC} = +3.3 \text{ V}$, No load, D _{IN} and R _{IN} pins are OPEN, $\overline{\text{STBY}} = \text{L}$, EN = L		5		μΑ
(Standby Mode 1)		$Vcc = +5.0 \text{ V}$, No load, D _{IN} and R _{IN} pins are OPEN, $\overline{\text{STBY}} = \text{L}$, EN = L, TA = 25 °C		2	5	μΑ
		Vcc = +5.0 V, No load, D _{IN} and R _{IN} pins are OPEN, STBY = L, EN = L		10		μΑ
		Vcc = +3.3 V, No load, D _{IN} and R _{IN} pins are OPEN, $\overline{\text{STBY}}$ = L, EN = H, T _A = 25 °C		1	3	μΑ
Circuit Current at Standby	Icc4	Vcc = +3.3 V, No load, D _{IN} and R _{IN} pins are OPEN, STBY = L, EN = H		5		μΑ
(Standby Mode 2)		Vcc = +5.0 V, No load, D _{IN} and R _{IN} pins are OPEN, STBY = L, EN = H, T _A = 25 °C		2	5	μΑ
		Vcc = +5.0 V, No load, D _{IN} and R _{IN} pins are OPEN, $\overline{\text{STBY}}$ = L, EN = H		10		μΑ
High-Level Input Voltage	VIH	Vcc = +3.0 to +5.5 V, STBY, VcHA, EN pin	2.4			V
Low-Level Input Voltage	VIL	Vcc = +3.0 to +5.5 V, STBY, Vcha, EN pin			0.6	V
High-Level Input Current	Іін	Vcc = +5.5 V, Vı = 5.5 V, STBY, Vcha, EN pin			1	μΑ
Low-Level Input Current	lı∟	Vcc = +5.5 V, VI = 0 V, STBY, VcHA, EN pin			-1	μΑ
Land Constitution		Driver input and receiver input Vcc = +3.3 V, for GND, f = 1 MHz			10	pF
Input Capacitance	Cin	Driver input and receiver input Vcc = +5.0 V, for GND, f = 1 MHz			10	pF
STBY — VCHA Time	tscн	$Vcc = +3.0 \text{ to } 5.5 \text{ V}, \overline{\text{STBY}} \downarrow \rightarrow \text{V}_{\text{CHA}}, \overline{\text{Note 8}}$	1			μs
V _{CHA} — STBY Time	tснs	Vcc = +3.0 to 5.5 V, VcHA → STBY ↑, Note 8	1			μs
STBY — Vcc Time	tsc	$Vcc = +3.0 \text{ to } 5.5 \text{ V}, \overline{\text{STBY}} \downarrow \rightarrow Vcc, \overline{\text{Note 8}}$	1			μs
Vcc — STBY Time	tcs	$Vcc = +3.0 \text{ to } 5.5 \text{ V}, Vcc \rightarrow \overline{\text{STBY}} \uparrow, \text{Note 8}$	1			μs

^{*} The TYP. values are for reference at $T_A = 25$ °C.



Note 8. Measuring point





ELECTRICAL SPECIFICATIONS (DRIVER)

(UNLESS OTHERWISE SPECIFIED, $T_A = -40$ to +85 °C, C₁ to C₅ = 1 μ F)

3 V mode (unless otherwise specified, VcHA = H, Vcc = 3.0 to 3.6 V)

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∟	Vcc = +3.6 V, Vı = 0 V			-25	μΑ
High-Level Input Current	Іін	Vcc = +3.6 V, Vı = 3.6 V			1.0	μΑ
		Vcc = +3.3 V, R _L = ∞, T _A = 25 °C		±9.5		V
Output Voltage	VDO	Vcc = +3.3 V, R _L = 3 k Ω , T _A = T _{opt}	±5.0	±6.0		V
		Vcc = +3.0 V, R_L = 3 kΩ, T_A = +25 °C	±5.0			V
Output Short-Circuit Current	Isc	Vcc = +3.3 V, for GND			±40	mA
OL D. Note 9	0.0	C_L = 10 pF, R_L = 3 to 7 k Ω	3.0		30	V/μs
Slew-Rate ^{Note 9}	SR	$C_L = 2 500 \text{ pF}, R_L = 3 \text{ to } 7 \text{ k}\Omega$	3.0		30	V/μs
Propagation Delay Time ^{Note 9}	t _{PHL}	RL = 3 kW, CL = 2 500 pF		2.5		μs
Output Resistor	Ro	$V_{CC} = V_{DD} = V_{SS} = 0 \text{ V}$ $V_{OUT} = \pm 2 \text{ V}$	300			Ω
Standby Output Transfer Time	t DAZ	$R_L = 3 \text{ k}\Omega$, $C_L = 2 500 \text{ pF}$, Note 10		4	10	μs
Standby Output Transfer Time	t dza	$R_L = 3 \text{ k}\Omega$, $C_L = 2 500 \text{ pF}$, Note 10		1	3	ms
Power-On Output Transfer Time	t pra	$R_L = 3 \text{ k}\Omega$, $C_L = 2 500 \text{ pF}$, Note 11		1	3	ms

^{*} The TYP. values are for reference at $T_A = 25$ °C.

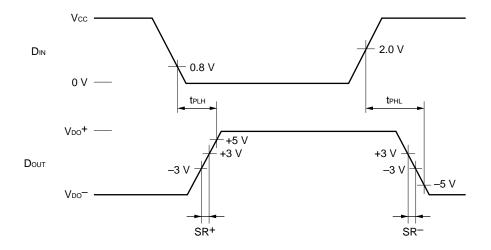


5 V mode (unless otherwise specified, Vcha = L, Vcc = +5.0 V \pm 10 %)

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∟	Vcc = +5.5 V, Vı = 0 V			-40	μΑ
High-Level Input Current	Іін	Vcc = +5.5 V, Vı = 5.5 V			1.0	μΑ
		Vcc = +5.0 V, R _L = ∞, T _A = 25 °C		±9.7		V
Output Voltage	VDO	$Vcc = +5.0 \text{ V}, \text{ RL} = 3 \text{ k}\Omega, \text{ TA} = \text{T}_{opt}$	±6.0			V
		$Vcc = +4.5 \text{ V}, \text{ RL} = 3 \text{ k}\Omega, \text{ TA} = \text{T}_{opt}$	±5.0			V
Output Short-Circuit Current	Isc	Vcc = +5.0 V, for GND			±40	mA
OL D. Noto 0		C_L = 10 pF, R_L = 3 to 7 k Ω	4.0		30	V/μs
Slew-RateNote 9	SR	$C_L = 2 500 \text{ pF}, R_L = 3 \text{ to } 7 \text{ k}\Omega$	4.0		30	V/μs
Propagation Delay Time ^{Note 9}	t _{PHL}	$R_L = 3 \text{ k}\Omega$, $C_L = 2 500 \text{ pF}$		2		μs
Output Resistor	Ro	$V_{CC} = V_{DD} = V_{SS} = 0 \text{ V}$ $V_{OUT} = \pm 2 \text{ V}$	300			Ω
Standby Output Transfer Time	t DAZ	$R_L = 3 \text{ k}\Omega$, $C_L = 2 500 \text{ pF}$, Note 10		4	10	μs
Standby Output Transfer Time	t dza	$R_L = 3 \text{ k}\Omega$, $C_L = 2 500 \text{ pF}$, Note 10		0.5	1	ms
Power-On Output Transfer Time	t PRA	$R_L = 3 \text{ k}\Omega, C_L = 2 500 \text{ pF}, \text{Note } 12$		0.5	1	ms

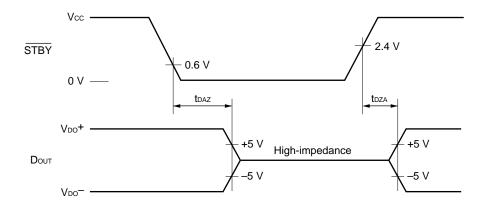
^{*} The TYP. values are for reference at T_A = 25 °C.

Note 9. Measuring point



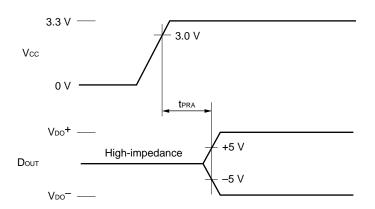


Note 10. Measuring point



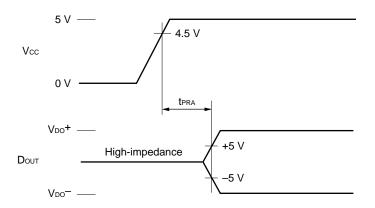
Driver outputs are indefinite during transition time (tdzA).

Note 11. Measuring point



Driver outputs are indefinite during transition time (tpra).

Note 12. Measuring point



Driver outputs are indefinite during transition time (t_{PRA}).



ELECTRICAL SPECIFICATIONS (RECEIVER)

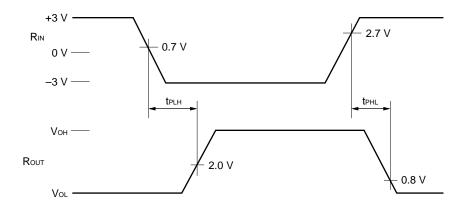
(UNLESS OTHERWISE SPECIFIED, Vcc = 3.0 to 5.5 V, TA = -40 to +85 °C, C1 to C5 = 1 μ F)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Low-Level Output Voltage	Vol	IOUT = 4 mA, STBY = H			0.4	V
High-Level Output Voltage	Vон	IOUT = -4 mA , STBY = H	Vcc - 0.4			V
Low-Level Output Voltage	V _{OL2}	IOUT = 4 mA, STBY = L			0.5	V
High-Level Output Voltage	V _{OH2}	IOUT = 4 mA, STBY = L	Vcc - 0.5			V
Propagation Delay Time (STBY = H)	t _{PHL}	$R_{IN} \rightarrow R_{OUT}, C_L = 150 \text{ pF}$ $V_{CC} = +3.0 \text{ V,} \text{Note } 13$		0.2		μs
Propagation Delay Time (STBY = L)	t _{PHL}	$R_{IN} \rightarrow R_{OUT}, C_L = 150 \text{ pF}$ Vcc = +3.0 V, Note 14		0.1		μs
Propagation Delay Time (STBY = L)	t _{PHA} t _{PAH}	$EN \rightarrow RouT$, $CL = 150 pF$ Vcc = +3.0 V, Note 15		100	300	ns
Input Resistor	Rı		3	5.5	7	kΩ
Input Pin Open Voltage	Vio				0.5	V
	Vıн	Vcc = +3.0 to +5.5 V	1.7	2.3	2.7	V
Input Threshold ($\overline{STBY} = H$)	VIL	Vcc = +3.0 to +5.5 V	0.7	1.1	1.7	V
	Vн	Vcc = +3.0 to +5.5 V (Hysteresis width)	0.5	1.2	1.8	V
Input Threshold	VIH	Vcc = +3.0 to +5.5 V, R _{IN1} , R _{IN2}	2.7	1.5		V
$(\overline{STBY} = L, EN = H)$	VIL	Vcc = +3.0 to +5.5 V, Rin1, Rin2		1.5	0.7	V
Standby Output Transfer Time	t DAH	Note 16		0.2	1	μs
0		V _{CHA} = H (3 V mode) ^{Note 16}		0.6	3	ms
Standby Output Transfer Time	t dha	V _{CHA} = L (5 V mode) ^{Note 16}		0.3	1	ms
		V _{CHA} = H (3 V mode) ^{Note 17}		1	3	ms
Power-On Reset Release Time	t pra	V _{CHA} = L (5 V mode) ^{Note 18}		0.5	1	ms

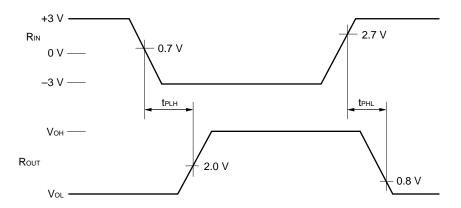
^{*} The TYP. values are for reference at T_A = 25 °C.



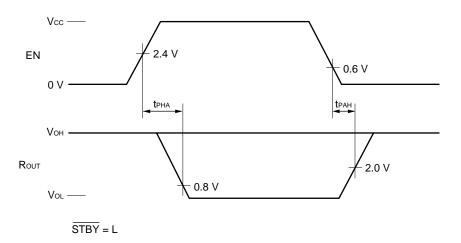
Note 13. Measuring point



Note 14. Measuring point

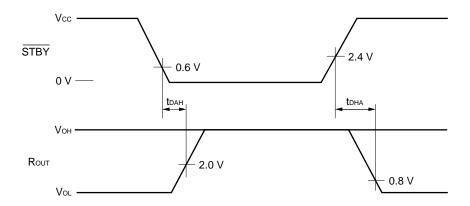


Note 15. Measuring point



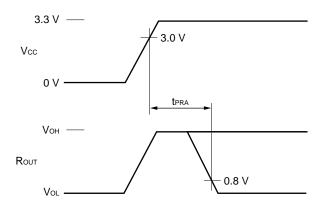


Note 16. Measuring point



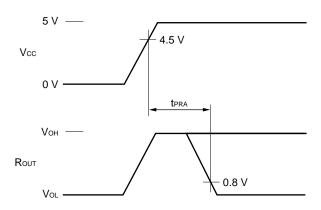
Receiver outputs are indefinite during transition time (tdha).

Note 17. Measuring point



Receiver outputs are indefinite during reset release time (tpra).

Note 18. Measuring point



Receiver outputs are indefinite during reset release time (tpra).

REFERENCE MATERIAL

- IC PACKAGE MANUAL (C10943X)
- NEC SEMICONDUCTOR DEVICE RELIABILITY/QUALITY (IEI-1212)



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 SURFACE MOUNT DEVICE

For more details, refer to our document "SMT MANUAL" (C10535E).

μ PD4723GS-GJG

Soldering process	Soldring 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: 2, Exposure limit*: None	IR30-00-2
VPS	Peak package's surface temperature: 215 °C or below, Reflow time: 40 seconds or below (200 °C or higher), Number of reflow process: 2, Exposure limit*: 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*: None	WS60-00-1
Partial heating method	Terminal temperature: 300 °C or below, Flow time: 10 seconds or below, Exposure limit*: None	0

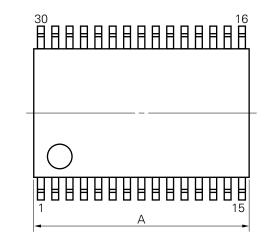
^{*} Exposure limit before soldering after dry-pack package is opened. Storage conditions: 25 °C and relative humidity at 65 % or less.

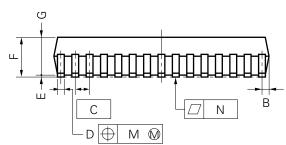
Note Do not apply more than a single process at once, except for "Partial heating method".



PACKAGE DRAWINGS

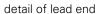
30 PIN PLASTIC SHRINK SOP (300 mil)

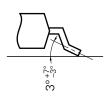


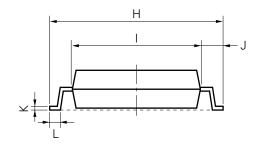


NOTE

Each lead centerline is located within 0.10 mm (0.004 inch) of its true position (T.P.) at maximum material condition.







P30GS-65-300B-1

ITEM	MILLIMETERS	INCHES
А	10.11 MAX.	0.398 MAX.
В	0.51 MAX.	0.020 MAX.
С	0.65 (T.P.)	0.026 (T.P.)
D	$0.30^{+0.10}_{-0.05}$	0.012+0.004
Е	0.125±0.075	0.005±0.003
F	2.0 MAX.	0.079 MAX.
G	1.7±0.1	0.067±0.004
Н	8.1±0.2	0.319±0.008
I	6.1±0.2	0.240±0.008
J	1.0±0.2	0.039+0.009
K	0.15+0.10	0.006+0.004
L	0.5±0.2	0.020+0.008
М	0.10	0.004
N	0.10	0.004

[MEMO]

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