NEC

MOS INTEGRATED CIRCUIT

μPD16805

MONOLITHIC H BRIDGE DRIVER CIRCUIT

μPD16805 is the monolithic and H bridge driver IC which consists of a CMOS control circuit and a MOS output stage. As compared with the driver of a MOS process using the conventional bipolar transistor, reduction of consumption current and power consumption is possible. With this product, clockwise and the inversion, and the brake function are built in, and it is the best for the drive circuit of the motor for film winding up of a camera, and the motor for auto focus/zooms.

The package has adopted the 16 pin SOP and the 24 pin TSSOP, and corresponds to reduction of mounting area and mounting height. This product corresponds to the drive current to 1.0 A (DC).

FEATURES

- High drive current
  $I_{D(pulse)}$ = 4.2 A MAX. at PW ≤ 200 ms (single pulse)
  $I_{D(DC)}$ = 1.0 A (DC)
- Low-ON resistance (sum of the upper and lower sides MOS FET)
  R_{ON} = 0.4 Ω TYP. at I_D = 1.0 A
- Standby function that turns OFF charge pump circuit
- Compact surface mount package
  16-pin plastic SOP (1.27 mm pitch)
  24-pin plastic TSSOP (0.5 mm pitch)

ORDERING INFORMATION

Part Number	Package
μPD16805GS	16-pin plastic SOP (7.64 mm (300))
μPD16805MA-6A5	24-pin plastic TSSOP (5.72 mm (225))

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ABSOLUTE MAXIMUM RATINGS

(T_A = 25°C, Glass epoxy substrate 100 mm × 100 mm × 1 mm, 15% copper foil)

Parameter	Symbol	Conditions	Rating	Unit
Supply voltage	V_{DD}	Control section	−0.5 to +6.5/+8.0[Note]	V
	V_M	Motor section	−0.5 to +6.5/+8.0[Note]	V
V_G pin applied voltage	V_G		15	V
Input voltage	V_{IN}		−0.5 to V_{DD} +0.5	V
H bridge drive current	$I_{D(DC)}$	DC	1.0	A
H bridge drive current	$I_{D(pulse)}$	PW ≤ 200 ms (single pulse)	4.2	A/ch
Power consumption	P_T	GS	1.0	W
		MA-6A5	0.7	W
Peak junction temperature	$T_{CH(MAX)}$		150	°C
Storage temperature	T_{stg}		−55 to +150	°C

Note When the charge pump is used/when VG power-source supply from the exterior.

RECOMMENDED OPERATING CONDITIONS

(T_A = 25°C, Glass epoxy substrate 100 mm × 100 mm × 1 mm, 15% copper foil)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Supply voltage	V_{DD}	During normal operation	3.0		6.0/7.5[Note 2]	V
		All input pins are low	2.5			
	V_M		0.5			V
Charge pump capacitance	C_1 to C_3			0.01		μF
V_G pin applied voltage[Note 1]	V_G	At the time of external input	11		14	V
Operating temperature	T_A	Ambient temperature	−30		60	°C

Notes 1. When voltage is impressed to VG terminal from the exterior

2. When the charge pump is used/when VG power-source supply from the exterior.

ELECTRICAL SPECIFICATIONS

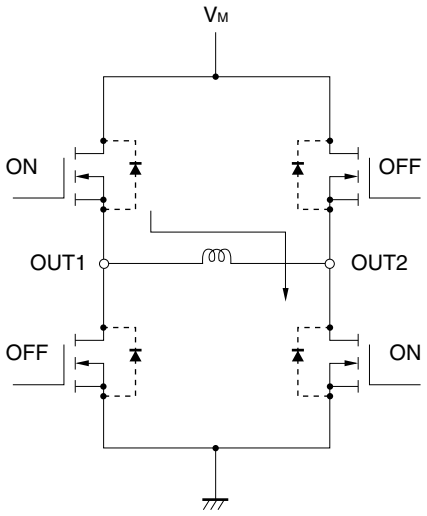
(Unless otherwise specified, V_{DD} = recommended operating condition, V_M = 0.5 to 6.0 V)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
V_{DD} pin current	I_{DD1}	V_{DD} = 5 V, T_A = Recommended conditions Control pins at high level		0.6	2.0	mA
	I_{DD2}	V_{DD} = 5 V, T_A = Recommended conditions Control pins at low level		0.3	10	μA
V_M pin current	I_{M1}	T_A = Reommended conditions Control pins at low level		0.1	10	μA
	I_{M2}	Control pins at low level			1.0	μA
H bridge ON resistance	R_{ON}	I_D = 1 A, V_{DD} = V_M = 5 V C_1 = C_2 = C_3 = 0.01 μF sum of the upper and lower sides MOSFET		0.4	0.6	Ω
High-level input voltage	V_{IH}	T_A = Recommended conditions	0.6 × V_{DD}			V
Low-level input voltage	V_{IL}	T_A = Recommended conditions			0.2 × V_{DD}	V
Charge pump circuit turn-ON time	t_{ONG}	V_{DD} = V_M = 5 V, T_A = Recommended conditions C_1 = C_2 = C_3 = 0.01 μF I_D = 1 A		0.5	1.0	ms
H bridge output circuit turn-ON time	t_{ONH}				10	μs
H bridge output circuit turn-OFF time	t_{OFFH}				5.0	μs
Control pin input pull-down resistor	R_{IND}		35	50	65	kΩ
		T_A = Recommended conditions	25		75	kΩ

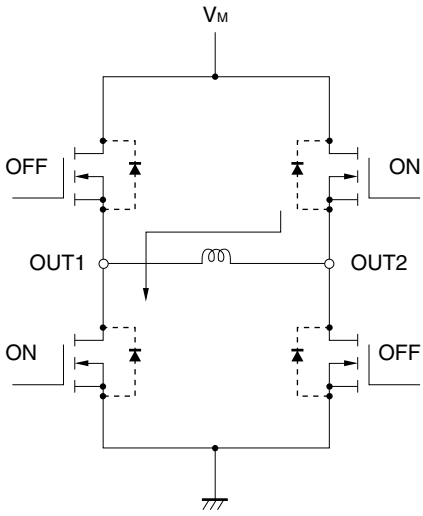
FUNCTION TABLE

Input Signal				Function
IN1	IN2	INC	STB	
H	H	H	H	Brake mode
H	L	H	H	Forward mode
L	H	H	H	Reverse mode
L	L	H	H	Stop mode
X	X	L	H	Stop mode
X	X	X	L	Standby mode

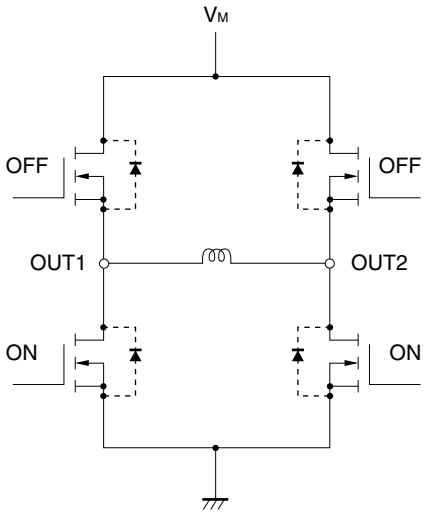
Forward mode



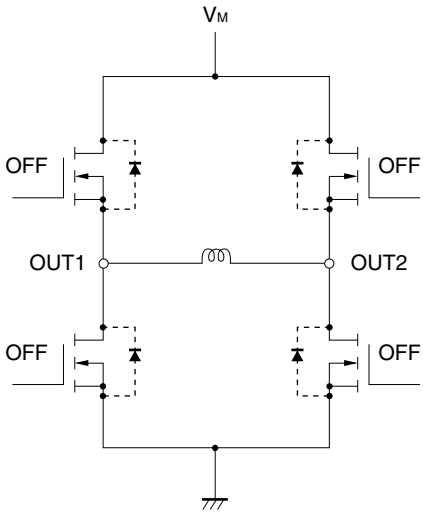
Reverse mode



Brake mode

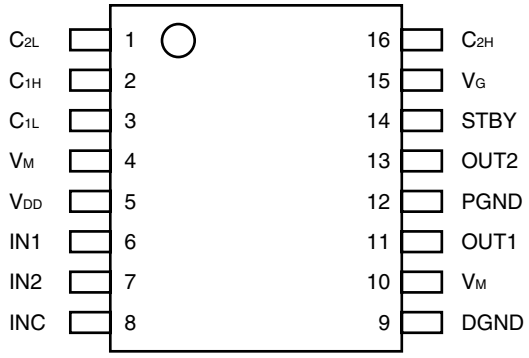


Stop mode



Terminal function

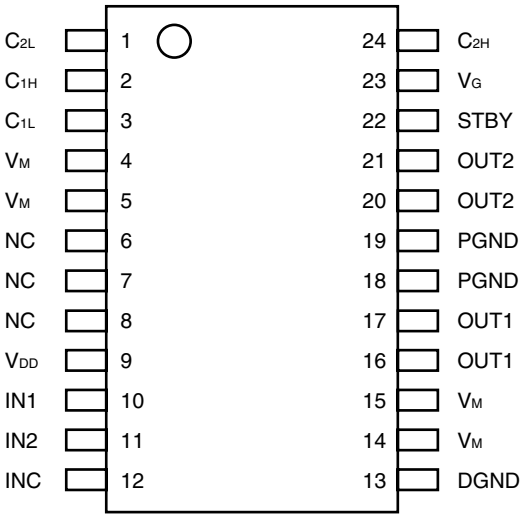
- **μPD16805GS**
  Package: 16 pin plastic SOP



Terminal No.	Terminal name	Terminal function
1	C_{2L}	The capacitor connection terminal for charge pumps
2	C_{1H}	The capacitor connection terminal for charge pumps
3	C_{1L}	The capacitor connection terminal for charge pumps
4	V_M	Motor block supply voltage input terminal
5	V_{DD}	Control block supply voltage input terminal
6	IN1	Input terminal
7	IN2	Input terminal
8	INC	Input terminal
9	DGND	Control block GND terminal
10	V_M	Motor block supply voltage input terminal
11	OUT1	Output terminal
12	PGND	Output block GND terminal
13	OUT2	Output terminal
14	STBY	Standby terminal
15	V_G	Gate input terminal
16	C_{2H}	The capacitor connection terminal for charge pumps

Terminal function

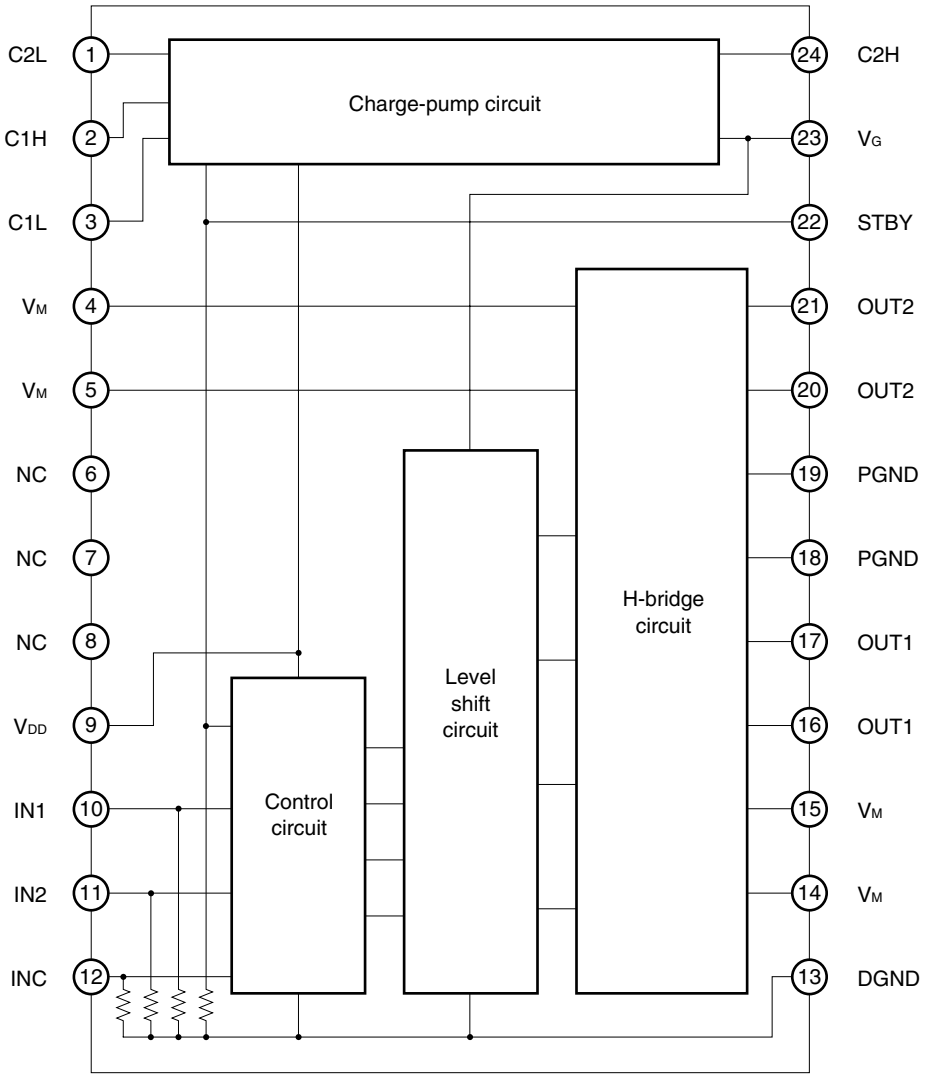
- **μPD16805MA-6A5**
  Package: 24 pin plastic TSSOP



Terminal No.	Terminal name	Terminal function
1	C_{2L}	The capacitor connection terminal for charge pumps
2	C_{1H}	The capacitor connection terminal for charge pumps
3	C_{1L}	The capacitor connection terminal for charge pumps
4	V_M	Motor block supply voltage input terminal
5	V_M	Motor block supply voltage input terminal
6	NC	no used terminal
7	NC	no used terminal
8	NC	no used terminal
9	V_{DD}	Control block supply voltage input terminal
10	IN1	Input terminal
11	IN2	Input terminal
12	INC	Input terminal
13	DGND	Control block GND terminal
14	V_M	Motor block supply voltage input terminal
15	V_M	Motor block supply voltage input terminal
16	OUT1	Output terminal
17	OUT1	Output terminal
18	PGND	Output block GND terminal
19	PGND	Output block GND terminal
20	OUT2	Output terminal
21	OUT2	Output terminal
22	STBY	Standby terminal
23	V_G	Gate input terminal
24	C_{2H}	The capacitor connection terminal for charge pumps

Notice Please connect all the terminals that have plural. (V_M, OUT1, OUT2, PGND)
No used terminals are connected to ground.

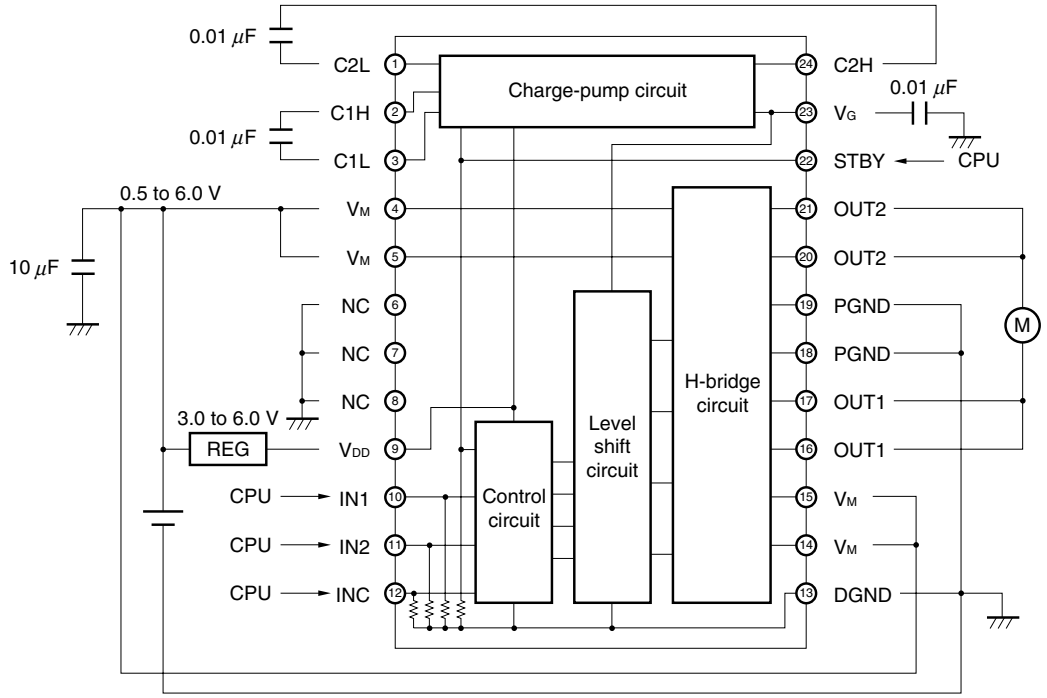
BLOCK DIAGRAM



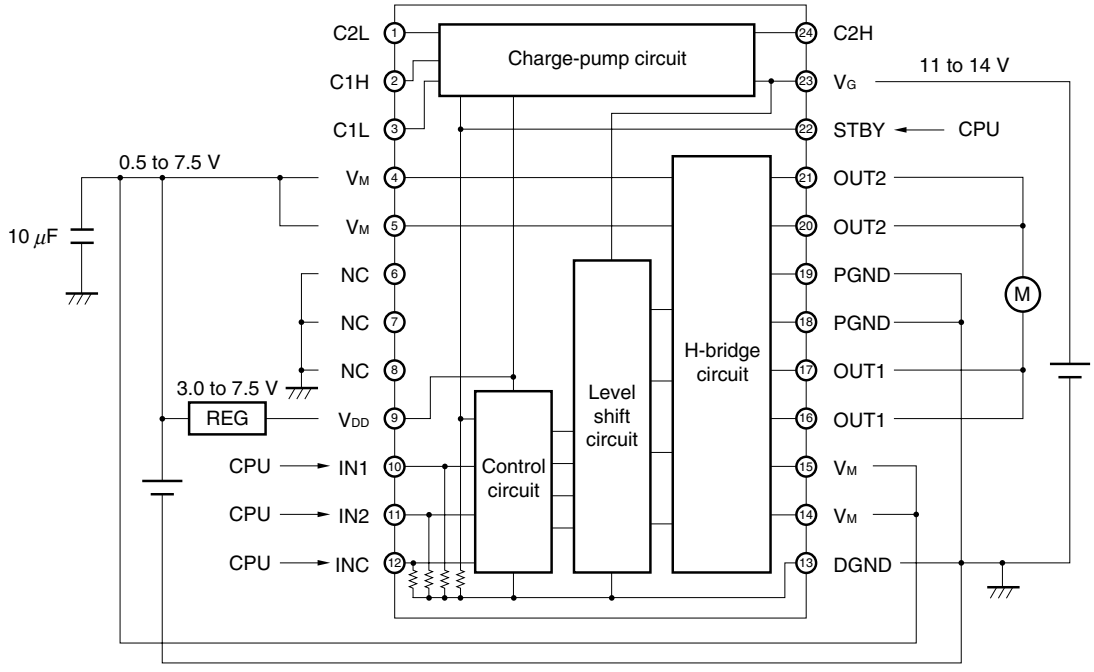
The connection diagram of μPD16805MA-6A5 shows the block diagram. It of μPD16805GS does not change, except that there are not NC and plural terminals. The plural terminal should connect all terminals.

The example of standard connection

(1) using charge pump circuit



(2) unusing charge pump circuit



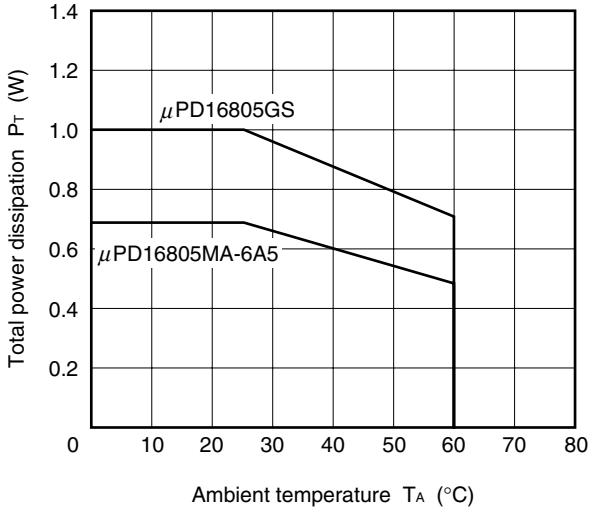
The connection diagram of μPD16805MA-6A5 is shown by the inside of a figure.

This circuit diagrams are an example of connection, and are not intended for use in actual design-ins.

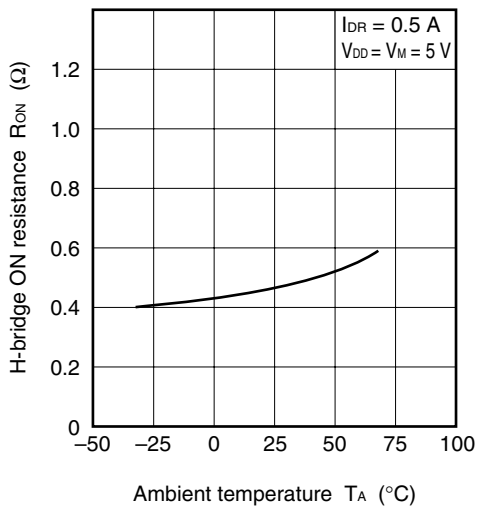
Moreover, it recommendeds inserting an about several μF capacitor between VM-GND for surge voltage protection of the output stage.

TYPICAL CHARACTERISTICS (T_A = 25°C)

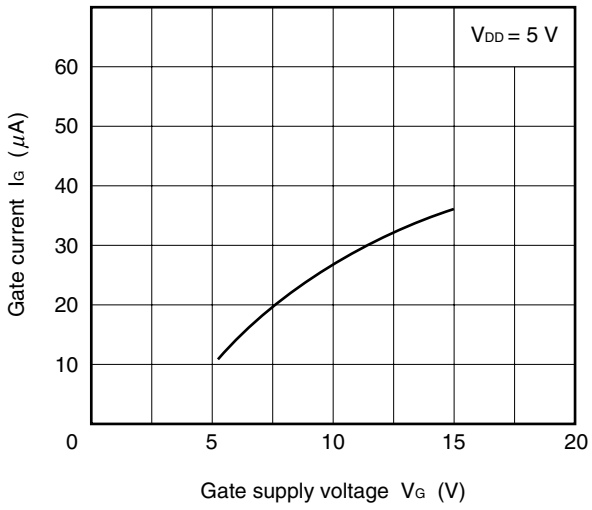
P_T-T_A characteristics



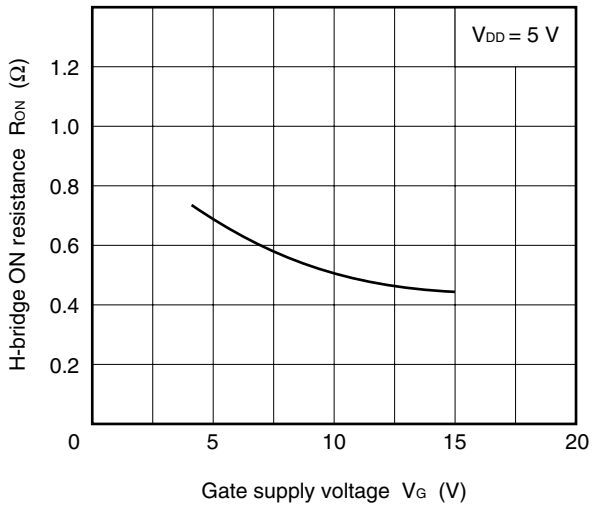
R_{ON}-T_A characteristics



V_G-I_G characteristics

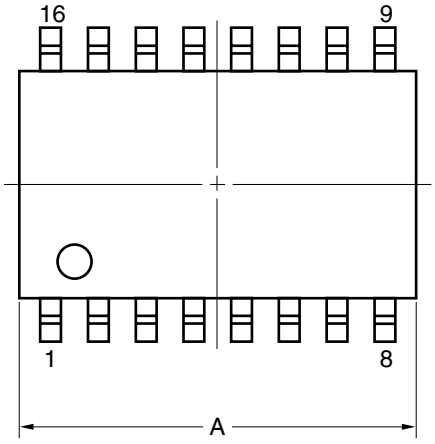


V_G-R_{ON} characteristics

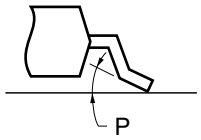


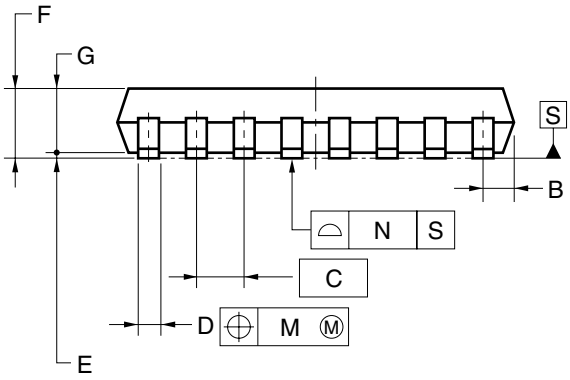
PACKAGE DIMENSION (μPD16805GS)

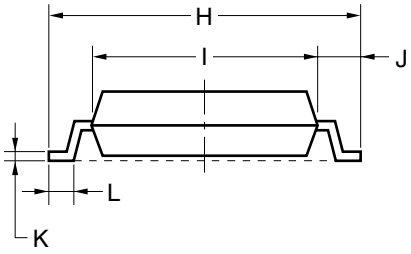
16-PIN PLASTIC SOP (7.62 mm (300))



detail of lead end







NOTE

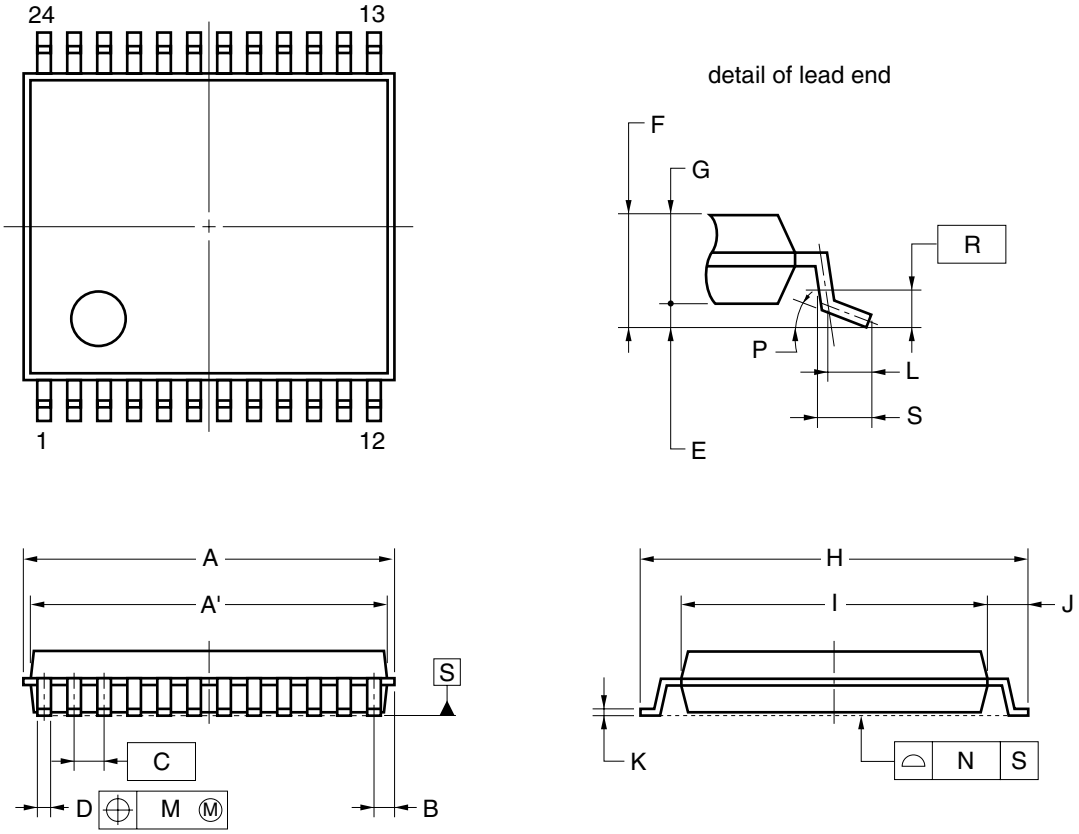
Each lead centerline is located within 0.12 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	10.2±0.2
B	0.78 MAX.
C	1.27 (T.P.)
D	$0.42^{+0.08}_{-0.07}$
E	0.1±0.1
F	1.65±0.15
G	1.55
H	7.7±0.3
I	5.6±0.2
J	1.1±0.2
K	$0.22^{+0.08}_{-0.07}$
L	0.6±0.2
M	0.12
N	0.10
P	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$

P16GM-50-300B-6

PACKAGE DIMENSION (μPD16805MA-6A5)

24-PIN PLASTIC TSSOP (5.72 mm (225))



NOTE

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

ITEM	MILLIMETERS
A	6.65±0.10
A'	6.5±0.1
B	0.575
C	0.5 (T.P.)
D	0.22±0.05
E	0.1±0.05
F	1.2 MAX.
G	1.0±0.05
H	6.4±0.1
I	4.4±0.1
J	1.0±0.1
K	0.17±0.025
L	0.5
M	0.10
N	0.08
P	$3^{\circ}{}^{+5^{\circ}}_{-3^{\circ}}$
R	0.25
S	0.6±0.15

P24MA-50-6A5

RECOMMENDED SOLDERING CONDITIONS

It is recommended to solder this under the conditions described below.

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

For details of the recommended soldering conditions, refer to information document **"Semiconductor Device Mounting Technology Manual"**.

μPD16805GS

Soldering Method	Soldering Conditions	Recommended Conditions Symbol
Infrared reflow	Peak package temperature: 235°C, Time: 30 seconds MAX. (210°C MIN.), Number of times: 2 MAX.	IR35-00-2
VPS	Peak package temperature: 215°C, Time: 40 seconds MAX. (200°C MIN.), Number of times: 2 MAX.	VP15-00-2

The number of storage days at 25°C, 65% RH after the dry pack has been opened

μPD16805MA-6A5

Soldering Method	Soldering Conditions	Recommended Conditions Symbol
Infrared reflow	Package peak temperature: 235°C; Duration: 30 sec. max. (210°C or above): Number of times: Max. 3; Time limit: None[Note] Flux: Rosin type flux with reduced chlorine content (chlorine 0.2 Wt% or less) is recommended.	IR35-00-3
VPS	Package peak temperature: 215°C; Duration: 40 sec. max. (200°C or above): Number of times:3; Time limit: None[Note] Flux: Rosin type flux with reduced chlorine content (chlorine 0.2 Wt% or less) is recommended.	VP15-00-3
Wave soldering	Package peak temperature: 260°C or less, Duration: 10 sec. Max.,. Preparatory heating temperature: 120°C or less; Number of times: 1 Flux: Rosin type flux with reduced chlorine content (chlorine 0.2 Wt% or less) is recommended.	WS60-00-1

Note The number of storage days at 25°C, 65% RH after the dry pack has been opened

Caution Use of more than one soldering method should be avoided.

[MEMO]

[MEMO]

[MEMO]

NOTES FOR CMOS DEVICES

① PRECAUTION AGAINST ESD FOR SEMICONDUCTORS

Note:

Strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred. Environmental control must be adequate. When it is dry, humidifier should be used. It is recommended to avoid using insulators that easily build static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work bench and floor should be grounded. The operator should be grounded using wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with semiconductor devices on it.

② HANDLING OF UNUSED INPUT PINS FOR CMOS

Note:

No connection for CMOS device inputs can be cause of malfunction. If no connection is provided to the input pins, it is possible that an internal input level may be generated due to noise, etc., hence causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using a pull-up or pull-down circuitry. Each unused pin should be connected to V_{DD} or GND with a resistor, if it is considered to have a possibility of being an output pin. All handling related to the unused pins must be judged device by device and related specifications governing the devices.

③ STATUS BEFORE INITIALIZATION OF MOS DEVICES

Note:

Power-on does not necessarily define initial status of MOS device. Production process of MOS does not define the initial operation status of the device. Immediately after the power source is turned ON, the devices with reset function have not yet been initialized. Hence, power-on does not guarantee out-pin levels, I/O settings or contents of registers. Device is not initialized until the reset signal is received. Reset operation must be executed immediately after power-on for devices having reset function.

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