NEC

MOS INTEGRATED CIRCUIT

μPD16808

MONOLITHIC DUAL H BRIDGE DRIVER CIRCUIT

DESCRIPTION

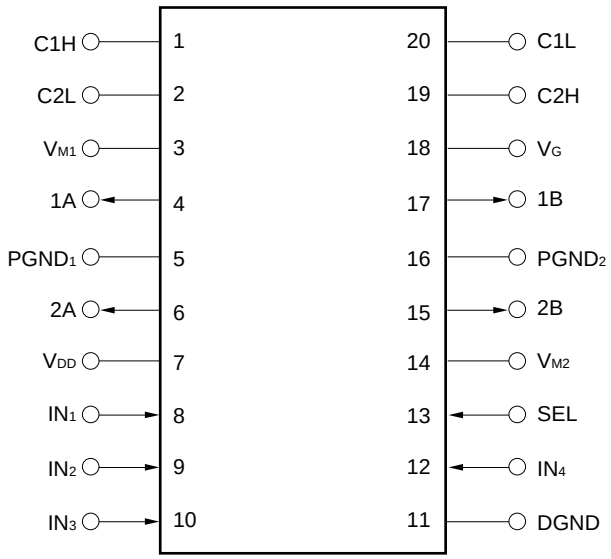
The μPD16808 is a monolithic dual H bridge driver circuit which employing N-channel power MOS FETs for its driver stage. By using the power MOS FETs for the output stage, saturation voltage and power consumption are substantially improved as compared with conventional driver circuits that use bipolar transistors.

Because the dual H bridge driver circuits at the output stage are independent of each other, this IC is ideal as the driver circuit for a 1- to 2-phase excitation bipolar driving stepping motor for the head actuator of an FDD.

FEATURES

- Low ON resistance (sum of ON resistors of top and bottom FETs)
  R_{ON1} = 1.0 Ω TYP. (V_M = 5.0 V)
  R_{ON2} = 1.5 Ω TYP. (V_M = 12.0 V)
- Low current consumption: I_{DD} = 0.4 mA TYP.
- Four input modes independently controlling dual H bridge drivers (with 1- to 2-phase excitation selected)
- Motor voltage 12 V/5 V compatible
- Compact surface mount package: 20-pin plastic SOP (300 mil)

PIN CONFIGURATION (Top View)



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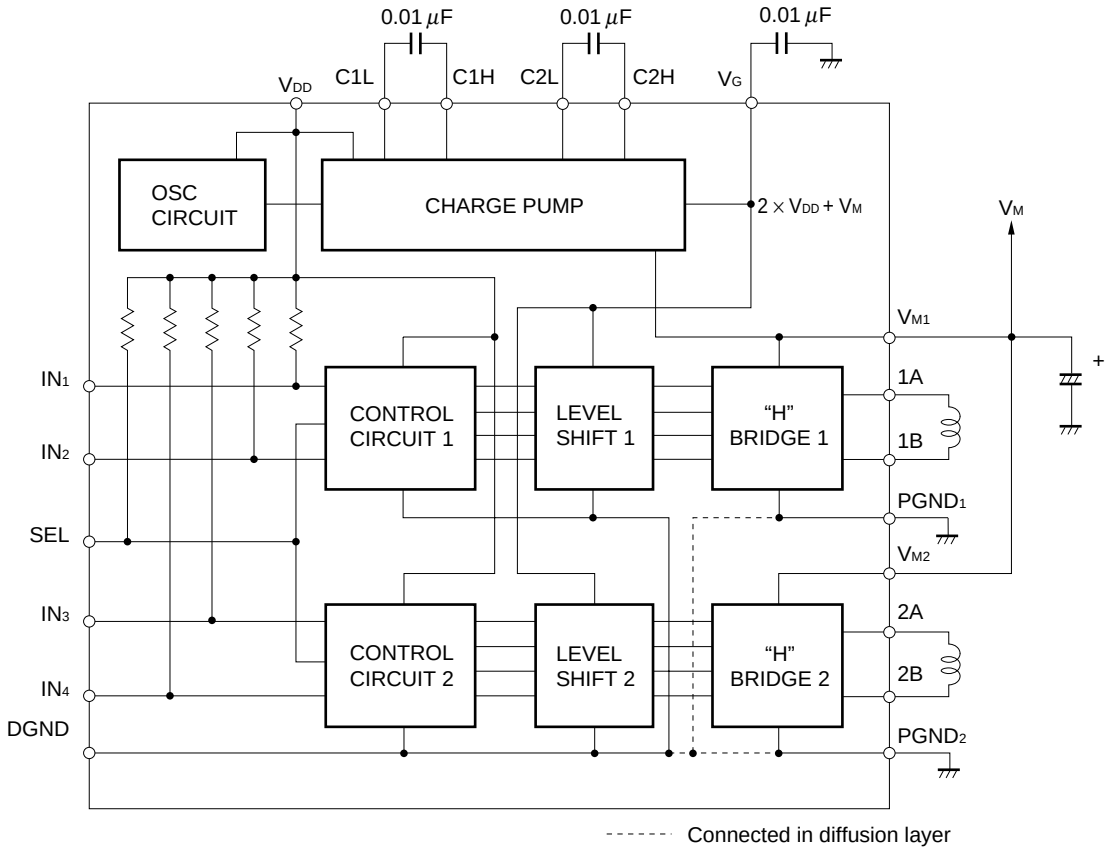
ORDERING INFORMATION

Part Number	Package
μPD16808GS	20-pin plastic SOP (300 mil)

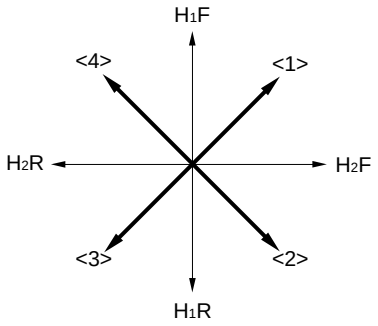
BLOCK DIAGRAM



FUNCTION TABLE

- **With 1- to 2-phase excitation selected (SEL = High)**

Excitation Direction	IN_1	IN_2	IN_3	IN_4	H_1	H_2
——	L	L	L	L	S	S
H_2R	L	L	L	H	S	R
H_2F	L	L	H	L	S	F
——	L	L	H	H	S	S
H_1R	L	H	L	L	R	S
<3>	L	H	L	H	R	R
<2>	L	H	H	L	R	F
H_1R	L	H	H	H	R	S
H_1F	H	L	L	L	F	S
<4>	H	L	L	H	F	R
<1>	H	L	H	L	F	F
H_1F	H	L	H	H	F	S
——	H	H	L	L	S	S
H_2R	H	H	L	H	S	R
H_2F	H	H	H	L	S	F
——	H	H	H	H	S	S



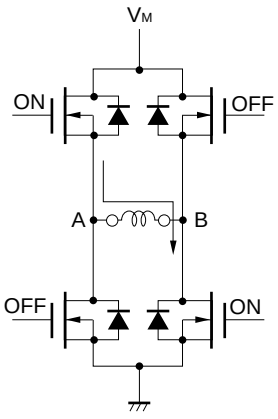
- **With 2-phase excitation selected (SEL = Low)**

Excitation Direction	IN_1	IN_3	IN_4	IN_2	H_1	H_2
<1>	H	H	×	H	F	F
<2>	L	H	×	H	R	F
<3>	L	L	×	H	R	R
<4>	H	L	×	H	F	R
–	×	×	×	L	Stop	

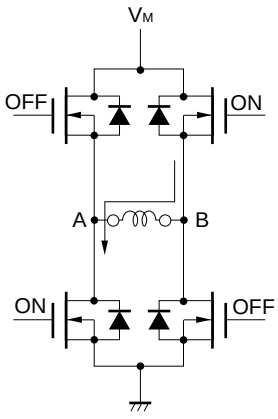
F: Forward R: Reverse S: Stop ×: Don't care

For the excitation waveform timing chart, refer to **APPLICATION CIRCUIT EXAMPLE**.

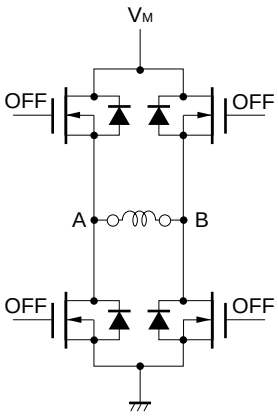
FORWARD



REVERSE



STOP



ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

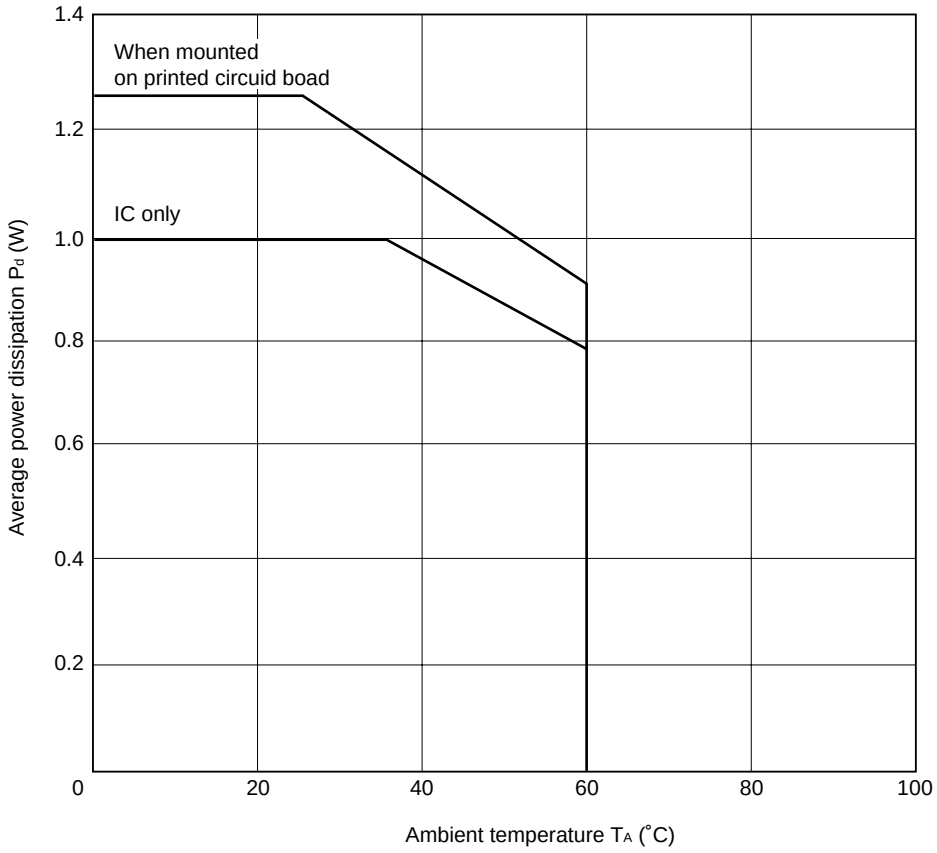
Parameter	Symbol	Rating	Unit
Supply voltage (motor block)	V_M	–0.5 to +15	V
Supply voltage (control block)	V_{DD}	–0.5 to +7	V
Power dissipation	P_{d1}	1.0 Note 1	W
	P_{d2}	1.25 Note 2	
Instantaneous H bridge driver current	I_D (pulse)	±1.0 Note 2, 3	A
Input voltage	V_{IN}	–0.5 to V_{DD} + 0.5	V
Operating temperature range	T_A	0 to 60	°C
Operation junction temperature	$T_{jMAX.}$	150	°C
Storage temperature range	T_{stg}	–55 to +125	°C

Notes 1. IC only

2. When mounted on a printed circuit board (100 × 100 × 1 mm, glass epoxy)

3. t ≤ 5 ms, Duty ≤ 40 %

P_d – T_A Characteristics



RECOMMENDED OPERATING CONDITIONS

Parameter		Symbol	MIN.	TYP.	MAX.	Unit
Supply voltage (motor block)		V_M	4.0	5.0	13.2	V
Supply voltage (control block)		V_{DD}	4.0	5.0	6.0	V
H bridge driver current[Note]	1-/2-phase excitation	I_{DR}			±600	mA
V_M = 5.0 V	2-phase excitation				±450	
Charge pump capacitance		C_1 to C_3	5		20	nF
Operating temperature		T_A	0		60	°C

Note When mounted on a printed circuit board (100 × 100 × 1 mm, glass epoxy)

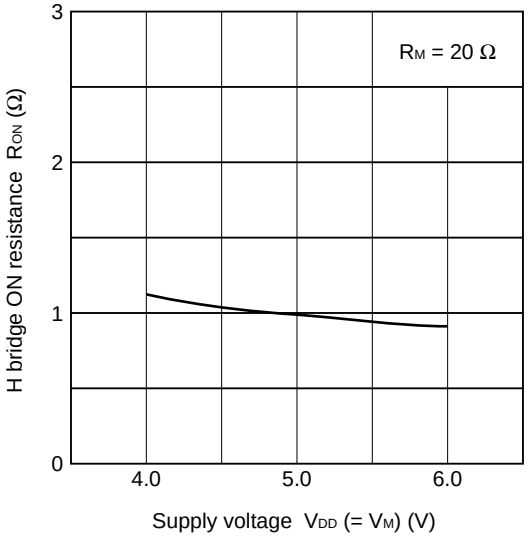
ELECTRICAL SPECIFICATIONS (Within recommended operating conditions unless otherwise specified)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
OFF V_M pin current	I_M	V_M = 6.0 V, V_{DD} = 6.0 V[Note 1]			1.0	μA
		V_M = 13.2 V, V_{DD} = 6.0 V[Note 1]			1.0	mA
V_{DD} pin current	I_{DD}	**Note 2**		0.4	1.0	mA
Control pin high-level input current	I_{IH}	T_A = 25 °C, V_{IN} = V_{DD}			1.0	μA
		0 ≤ T_A ≤ 60 °C, V_{IN} = V_{DD}			2.0	
Control pin low-level input current	I_{IL}	T_A = 25 °C, V_{IN} = 0 V			–0.18	mA
		0 ≤ T_A ≤ 60 °C, V_{IN} = 0 V			–0.25	
Control pin input pull-up resistance	R_{IN}	T_A = 25 °C	35	50	65	kΩ
		0 ≤ T_A ≤ 60 °C	25		75	
Control pin high-level input voltage	V_{IH}		3.0		V_{DD} + 0.3	V
Control pin low-level input voltage	V_{IL}		–0.3		0.8	V
H bridge circuit ON resistance[Note 3]	R_{ON1}	V_{DD} = 5 V, V_M = 5 V		1.0	2.0	Ω
	R_{ON2}	V_{DD} = 5 V, V_M = 12 V		1.5	3.0	Ω
R_{ON} relative accuracy	ΔR_{ON1}	Excitation direction <2>, <4>[Note 4]			±5	%
	ΔR_{ON2}	Excitation direction <1>, <3>			±10	
Charge pump circuit (V_G) turn-ON time	T_{ONG}	V_{DD} = 5 V, V_M = 5 V		0.2	1.0	ms
H bridge circuit turn-ON time	T_{ONH}	C_1 = C_2 = C_3 = 10 nF			5	μs
H bridge circuit turn-OFF time	T_{OFFH}	R_M = 20 Ω			5	μs

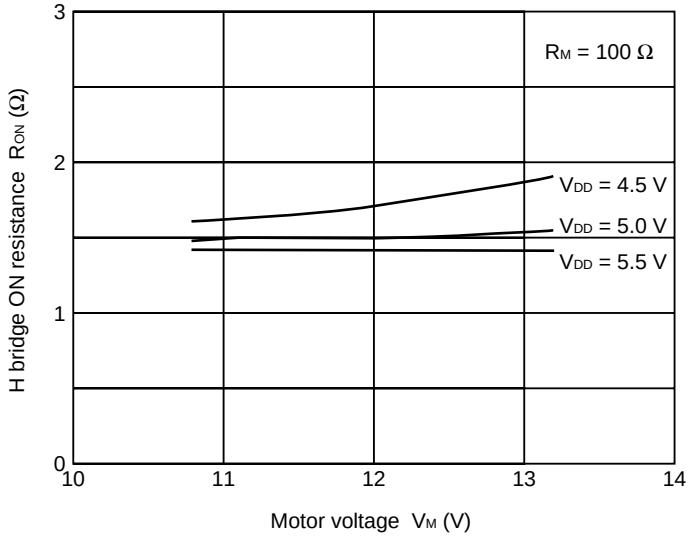
Notes 1. Control pins (IN_1, IN_2, IN_3, IN_4): low
2. Control pins (IN_1, IN_2, IN_3, IN_4): high
3. Sum of ON resistances of top and bottom transistors
4. For the excitation direction, refer to **FUNCTION TABLE**.

CHARACTERISTIC CURVES

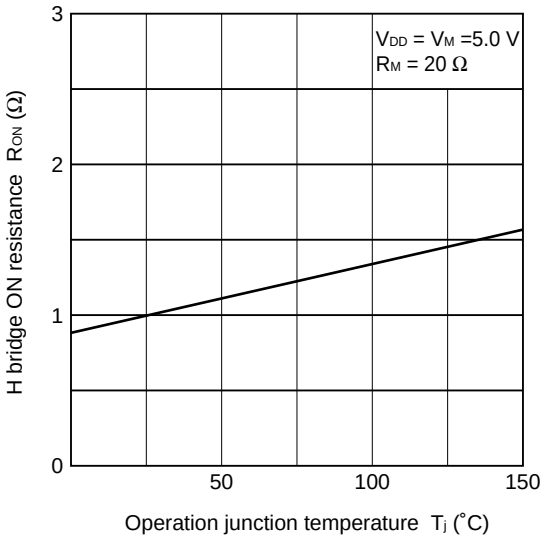
R_{ON} vs. V_{DD} (= V_M) Characteristics



R_{ON} vs. V_M Characteristics

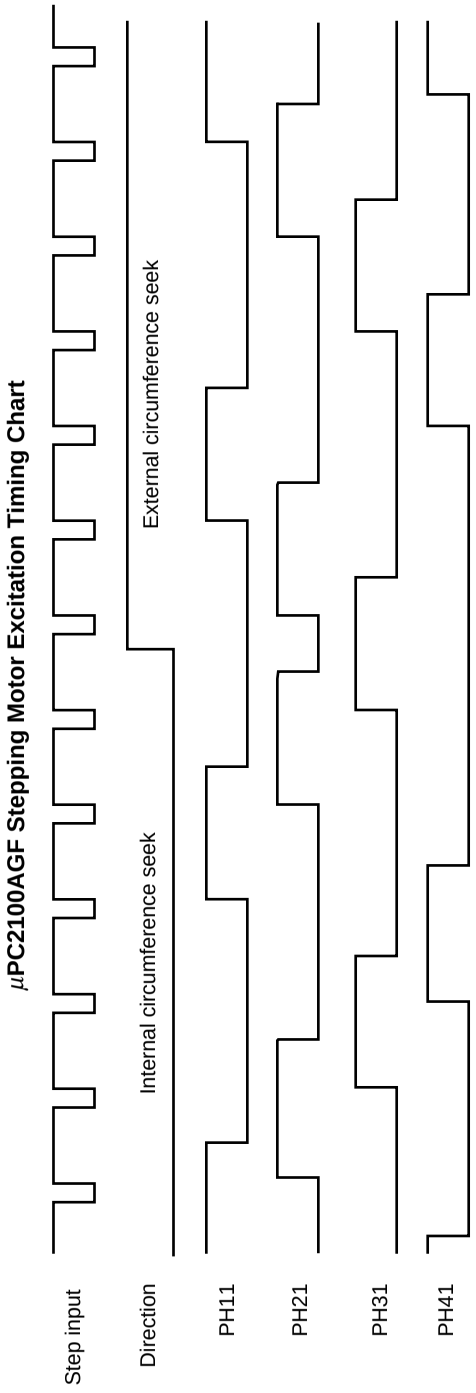


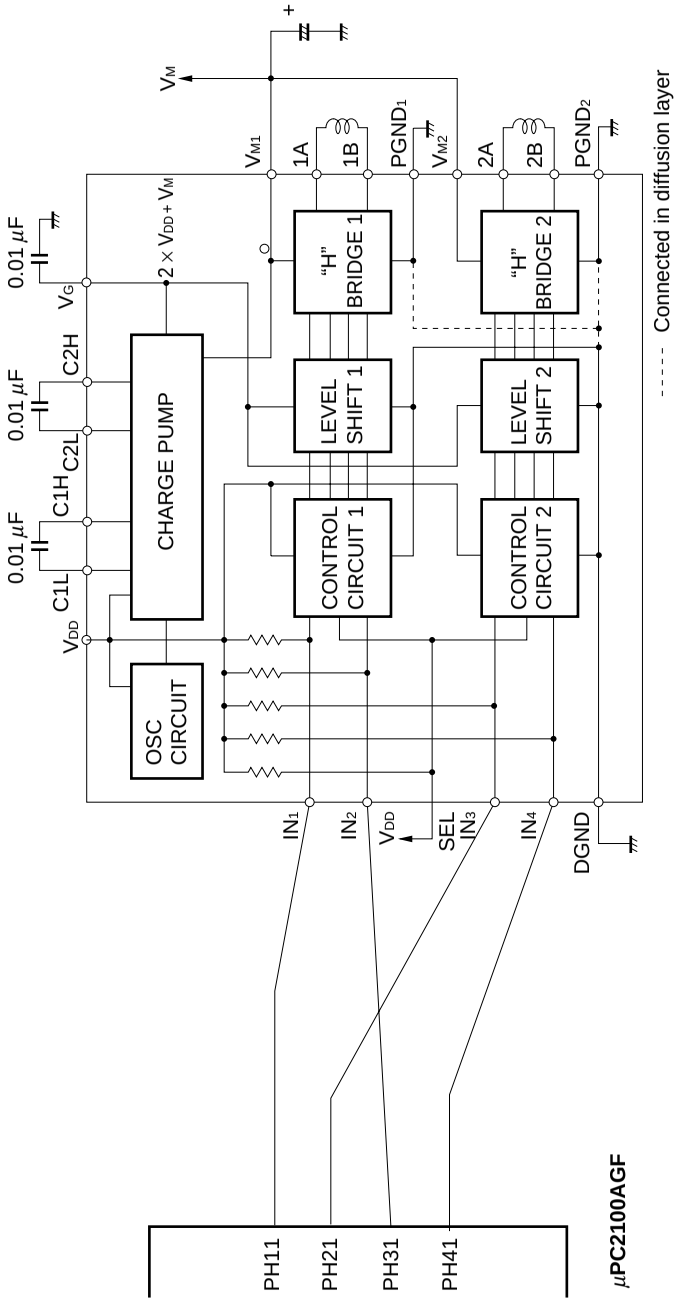
R_{ON} vs. T_j Characteristics



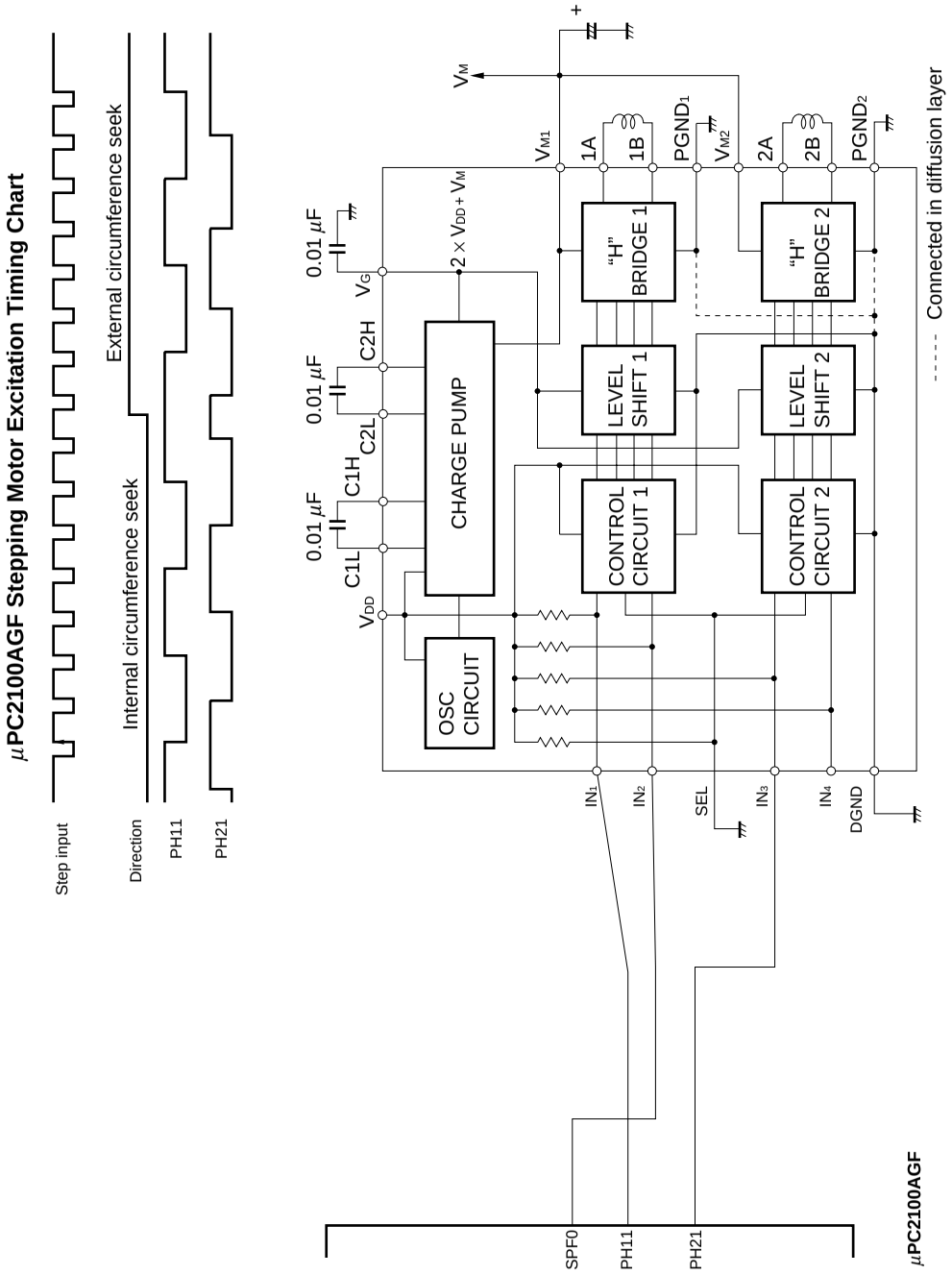
APPLICATION CIRCUIT EXAMPLE

- **Connection with 1-chip FDD LSI μPC2100AGF (With 1- to 2-phase excitation selected)**



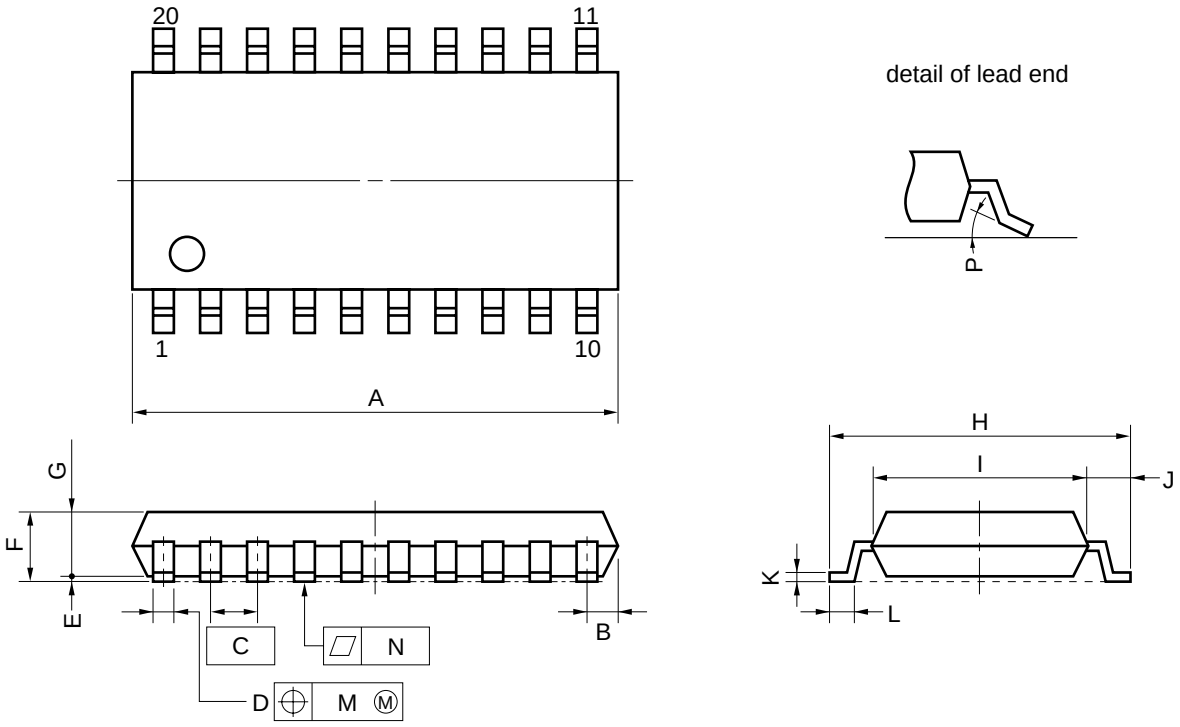


- **Connection with 1-chip FDD LSI μPC2100AGF (With 2-phase exication selected)**



The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

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	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$	$3^{\circ}{}^{+7^{\circ}}_{-3^{\circ}}$

P20GM-50-300B, C-4

RECOMMENDED SOLDERING CONDITIONS

It is recommended to solder this product under the conditions described below.
For soldering methods and conditions other than those listed below, consult NEC.

Surface mount type

For the details of the recommended soldering conditions of this type, refer to **Semiconductor Device Mounting Technology Manual (C10535E)**.

Soldering Method	Soldering Conditions	Symbol of Recommended Soldering
Infrared reflow	Peak package temperature: 230 °C, Time: 30 seconds MAX. (210 °C MIN.), Number of times: 1, Number of days: None[Note]	IR30-00
VPS	Peak package temperature: 215 °C, Time: 40 seconds MAX. (200 °C MIN.), Number of times: 1, Number of days: None[Note]	VP15-00
Wave soldering	Solder bath temperature: 260 °C MAX., Time: 10 seconds MAX., Number of times: 1, Number of days: None[Note]	WS60-00
Partial heating	Pin temperature: 300 °C MAX., Time: 10 seconds MAX., Number of days: None[Note]	–

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

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

[MEMO]

[MEMO]

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