NEC

MOS INTEGRATED CIRCUIT
μPD16833

MONOLITHIC QUAD H BRIDGE DRIVER CIRCUIT

DESCRIPTION

The μPD16833 is a monolithic quad H bridge driver IC which uses N-channel power MOS FETs in its driver stage. By using the MOS FETs in the output stage, this driver IC has a substantially improved saturation voltage and power consumption as compared with conventional driver circuits using bipolar transistors.

In addition, a low-voltage malfunction prevention function is provided to prevent the IC from malfunctioning when the supply voltage drops.

As the package, a 30-pin shrink SOP is employed to enable the creation of compact, slim application sets.

This driver IC can drive two stepping motors at the same time, and is ideal for video cameras.

FEATURES

- Four H bridge circuits employing power MOS FETs
- 3-V power supply
  Minimum operating supply voltage: 2.5 V MIN.
- Low current consumption: 2 mA (MAX.)
- Low-voltage malfunctioning prevention circuit
- 30-pin shrink SOP (300 mil) (μPD16833G3)

ORDERING INFORMATION

Part Number	Package
μPD16833G3	30-pin plastic SOP (300 mil)

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Parameter	Symbol	Conditions	Rating	Unit
Supply voltage	V_{DD}		–0.5 to +6.0	V
	V_M		–0.5 to +6.0	V
Input voltage	V_{IN}		–0.5 to V_{DD} + 0.5	V
Gate drive voltage	V_G		–0.5 to 12	V
H bridge drive current**Note 1**	$I_{D\ (DC)}$	DC	±300	mA/phase
Instantaneous H bridge drive current**Note 1**	$I_{D\ (pulse)}$	PW ≤ 10 ms, Duty ≤ 5 %	±700	mA/phase
Power consumption**Note 2**	P_T		1.19	W
Peak junction temperature	$T_{J\ (MAX)}$		150	°C
Storage temperature range	T_{stg}		–55 to +150	°C

Notes 1. Permissible current per phase, when mounted on a printed circuit board

2. When mounted on a glass epoxy board (10 cm × 10 cm × 1 mm)

The information in this document is subject to change without notice.

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RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply voltage	V_{DD}	2.5		5.5	V
	V_M	2.7		5.5	V
Gate drive voltage[Note 1]	V_G	V_M + 4.5		11.5	V
Charge pump capacitance	C_1, C_2, C_3	5		20	nF
H bridge drive current	I_D	–200		200	mA
Logic input frequency[Note 2]	f_{IN}			50	kHz
Operating temperature range	T_A	–10		85	°C
Peak junction temperature	$T_{J\ (MAX)}$			125	°C

Notes 1. When V_G is applied from an external source

2. Common to IN and EN pins

DC Characteristics (Unless otherwise specified, $V_{DD} = V_M = 3.0$ V, $T_A = 25$ °C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
OFF V_M pin current	I_M	with all control pins at low level			2.0	mA
V_{DD} pin current	I_{DD}	with all control pins at low level			10	μA
High-level input current	I_{IH}	$V_{IN} = V_{DD}$			0.06	mA
Low-level input current	I_{IL}	V_{IN} = 0	–1.0			μA
Input pull-down resistor	R_{IND}		50		200	kΩ
High-level input voltage	V_{IH}	V_{DD} = 2.5 V to 5.5 V	$V_{DD} * 0.7$		$V_{DD} + 0.3$	V
Low-level input voltage	V_{IL}	V_{DD} = 2.5 V to 5.5 V	–0.3		$V_{DD} * 0.3$	V
H bridge ON resistance[Note]	R_{ON}	$V_{DD} = V_M$ = 2.7 V to 5.5 V			3.0	Ω
Low-voltage malfunction prevention circuit operating voltage	V_{DDS1}	V_M = 5.0 V –10 °C ≤ T_A ≤ +85 °C	0.8		2.5	V
	V_{DDS2}	V_M = 3.0 V –10 °C ≤ T_A ≤+85 °C	0.65		2.5	V

Note Sum of top and bottom ON resistances (@I_D = 100 mA)

AC Characteristics (Unless otherwise specified, $V_{DD} = V_M = 3.0$ V, $T_A = 25$ °C)

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Charge pump circuit turn ON time	t_{ONG}	$C_1 = C_2 = C_3$ = 10 nF I_D = 150 mA, Figure 1			3.0	ms
Charge pump circuit oscillation frequency	f_G		100		600	kHz
H bridge output circuit turn ON time	t_{ONH}	$C_1 = C_2 = C_3$ = 10 nF I_D = 150 mA, Figure 1			5.0	μs
H bridge output circuit turn OFF time	t_{OFFH}	$C_1 = C_2 = C_3$ = 10 nF I_D = 150 mA, Figure 1			5.0	μs

FUNCTION TABLE

Channel 1

EN_1	IN_1	OUT1A	OUT1B
H	L	H	L
H	H	L	H
L	L	Z	Z
L	H	Z	Z

Channel 2

EN_2	IN_2	OUT2A	OUT2B
H	L	H	L
H	H	L	H
L	L	Z	Z
L	H	Z	Z

Channel 3

EN_3	IN_3	OUT3A	OUT3B
H	L	H	L
H	H	L	H
L	L	Z	Z
L	H	Z	Z

Channel 4

EN_4	IN_4	OUT4A	OUT4B
H	L	H	L
H	H	L	H
L	L	Z	Z
L	H	Z	Z

H: High level, L: Low level, Z: High impedance IN

PIN CONFIGURATION

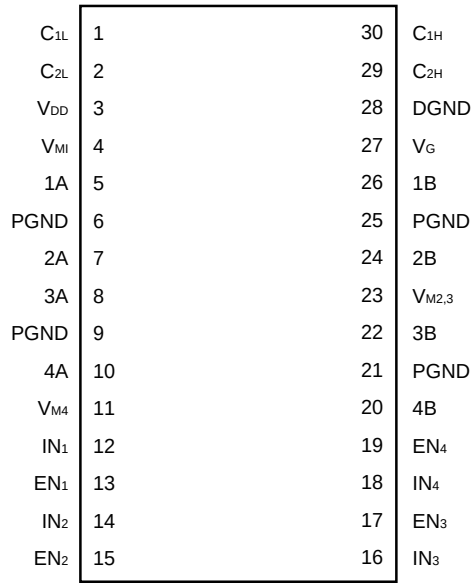
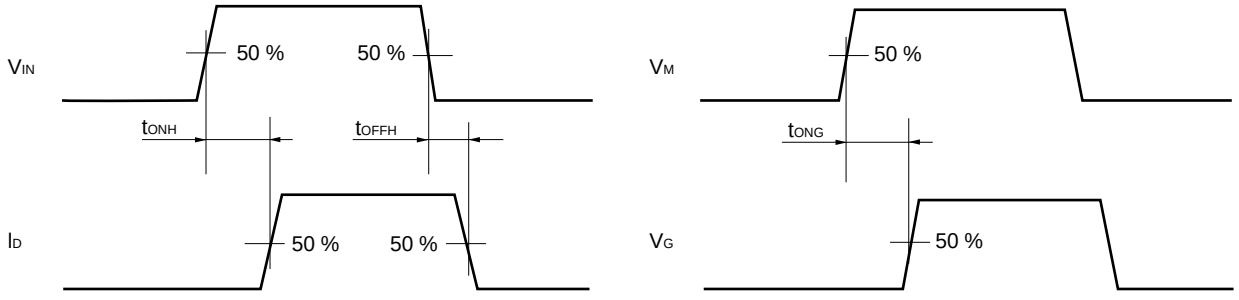
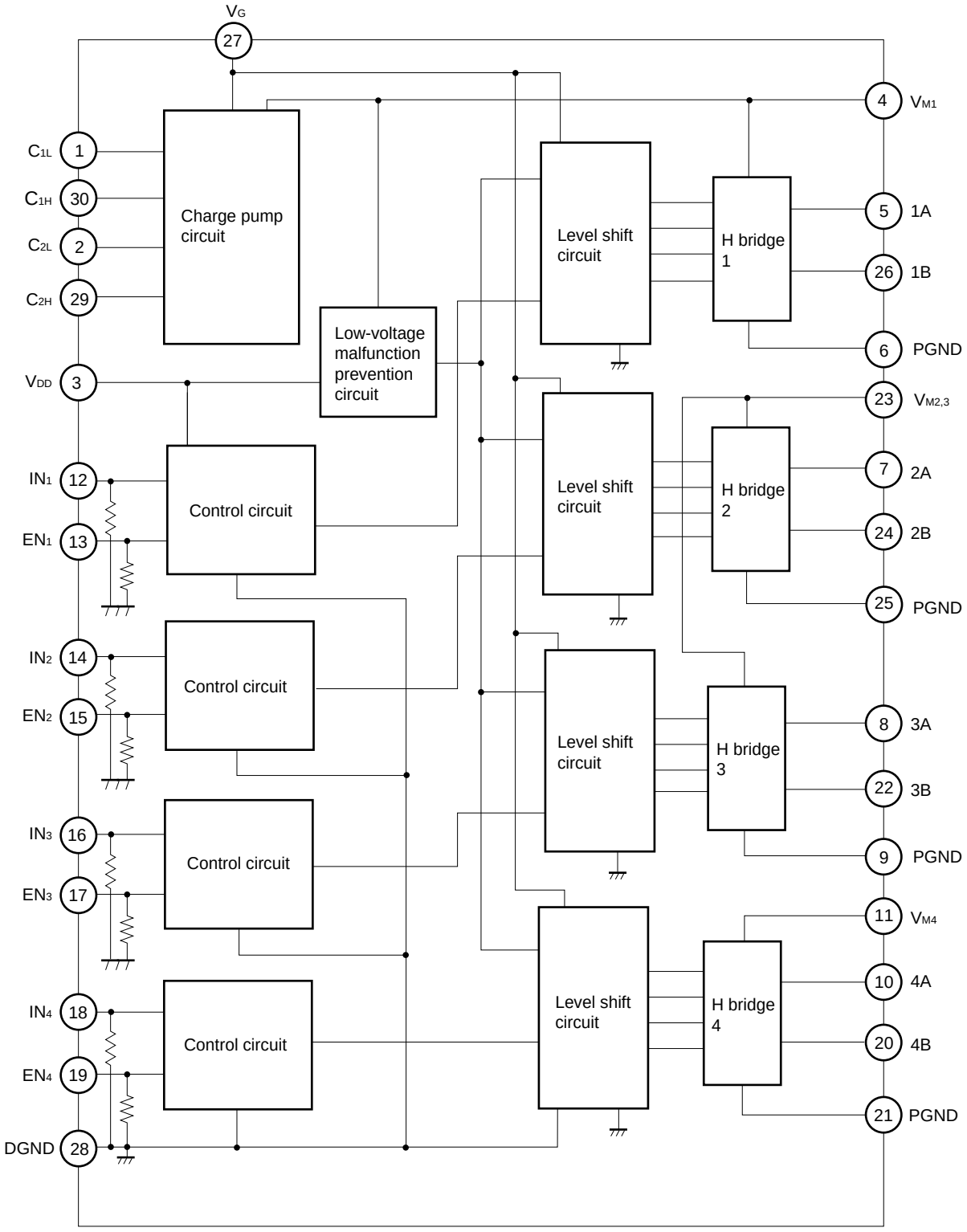


Figure 1. Switching Characteristic Wave

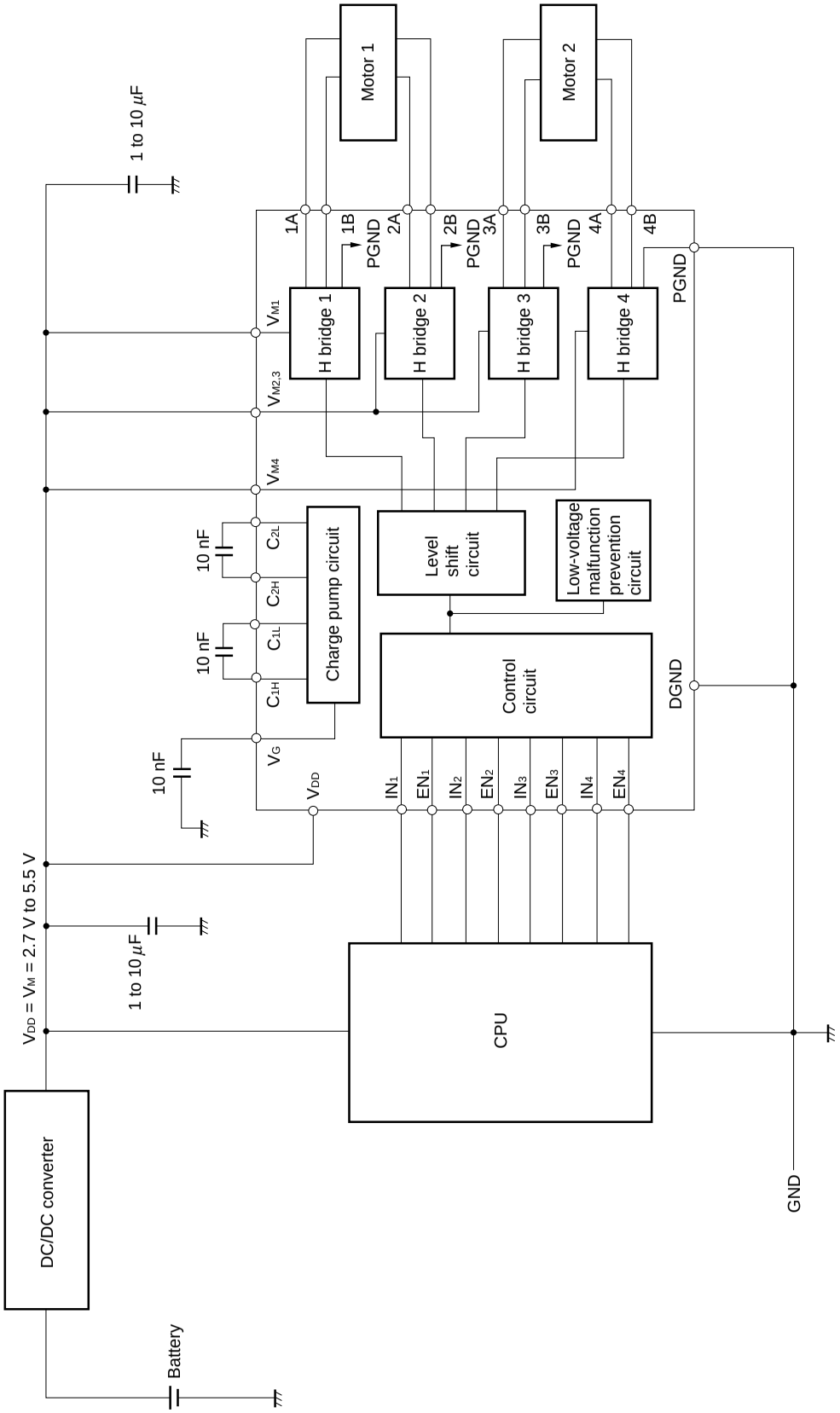


BLOCK DIAGRAM

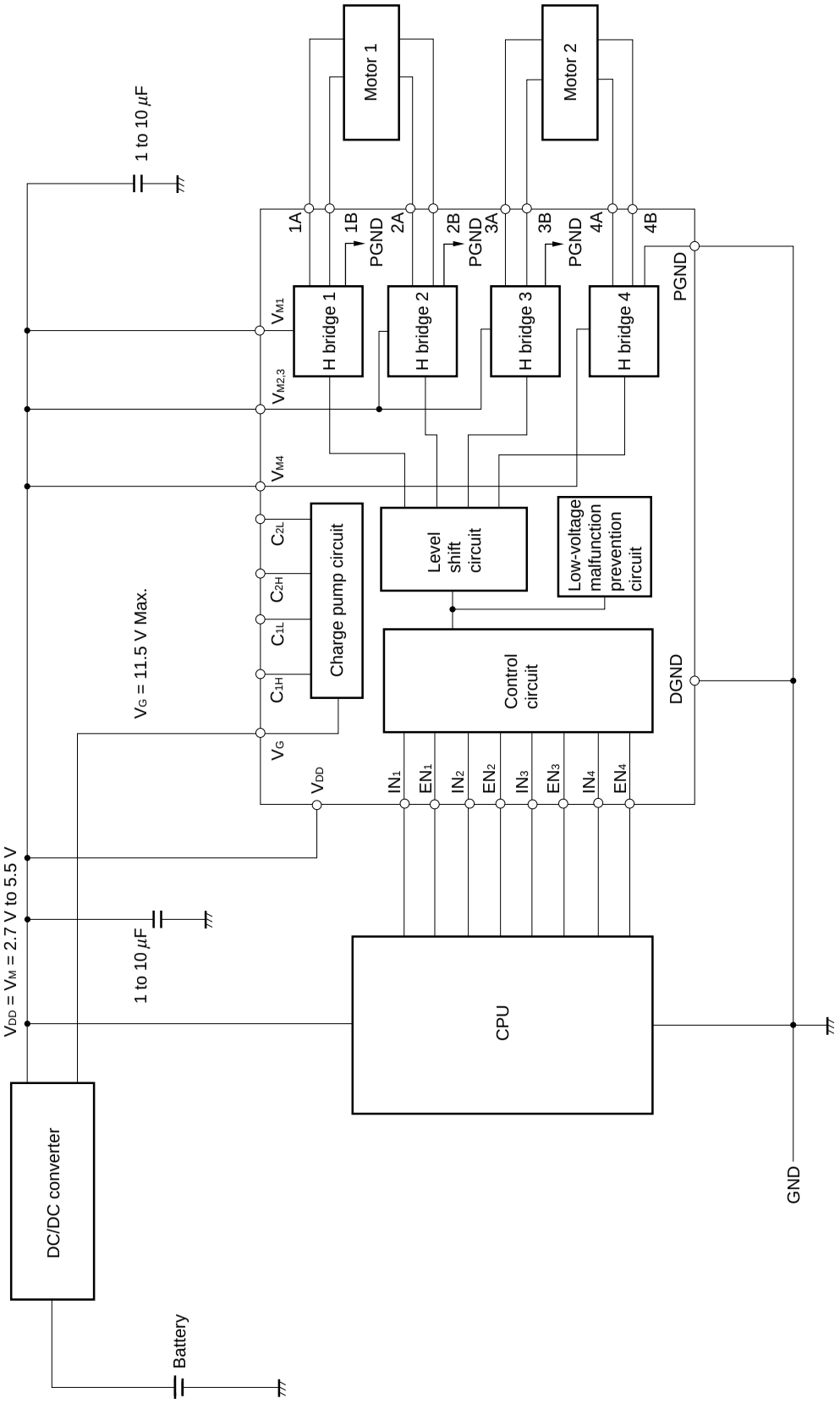


STANDARD CONNECTION EXAMPLE

(1) When charge pump is used

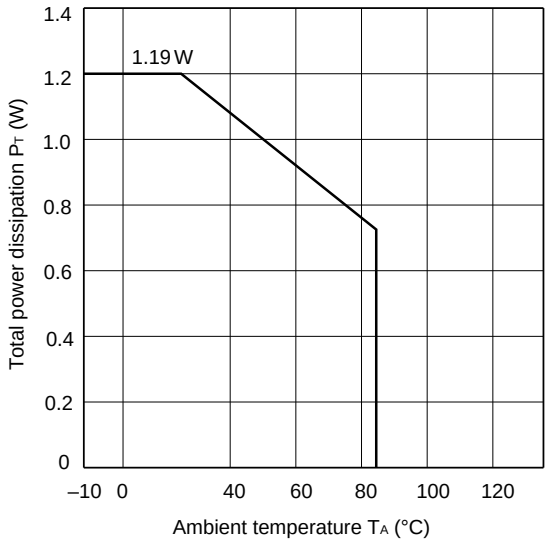


(2) When V_G is applied from external source

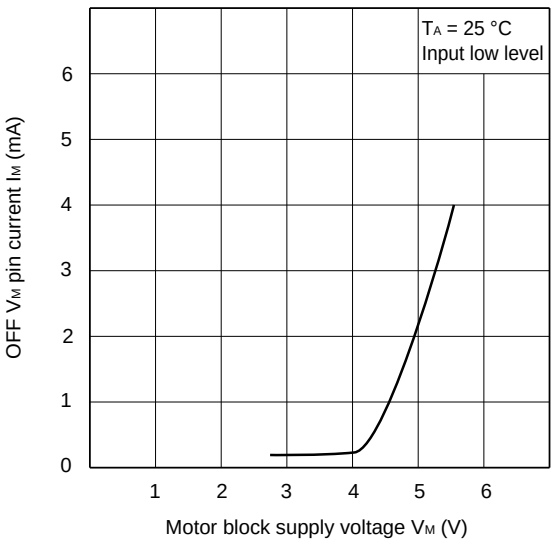


TYPICAL CHARACTERISTICS (T_A = 25 °C)

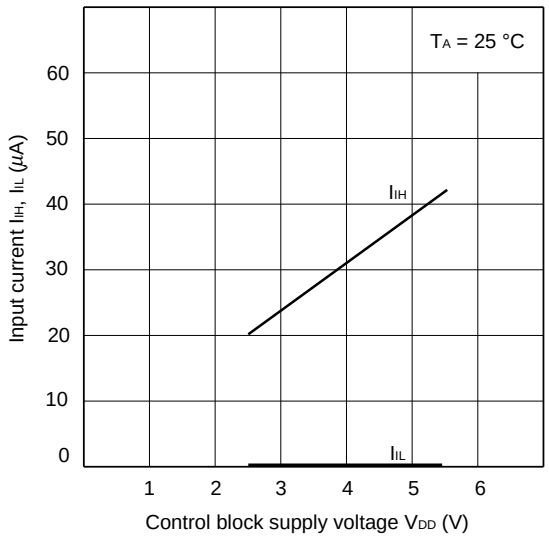
P_T vs. T_A Characteristics



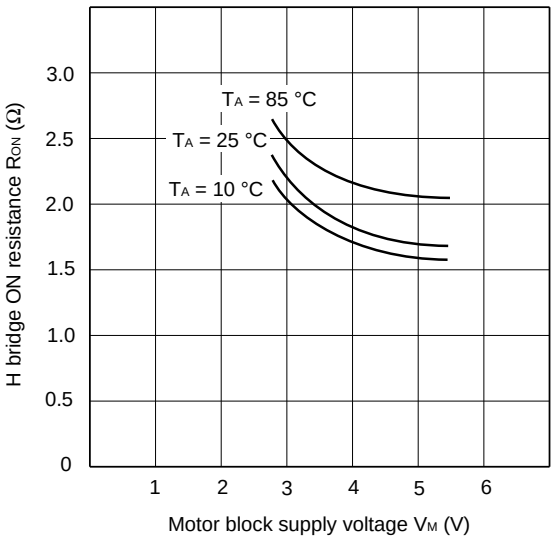
I_M vs. V_M Characteristics



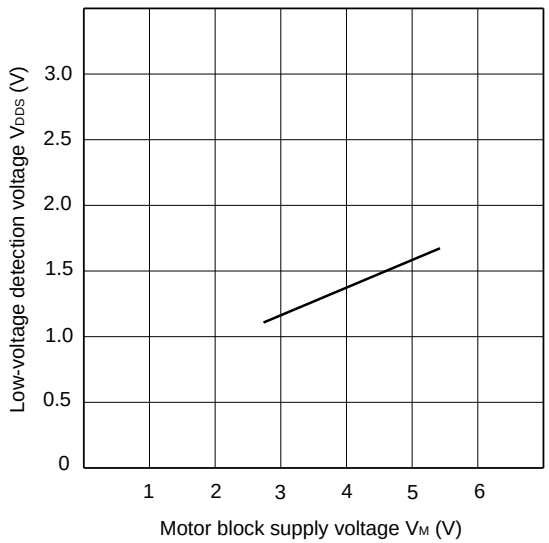
I_{IH}, I_{IL} vs. V_{DD} Characteristics



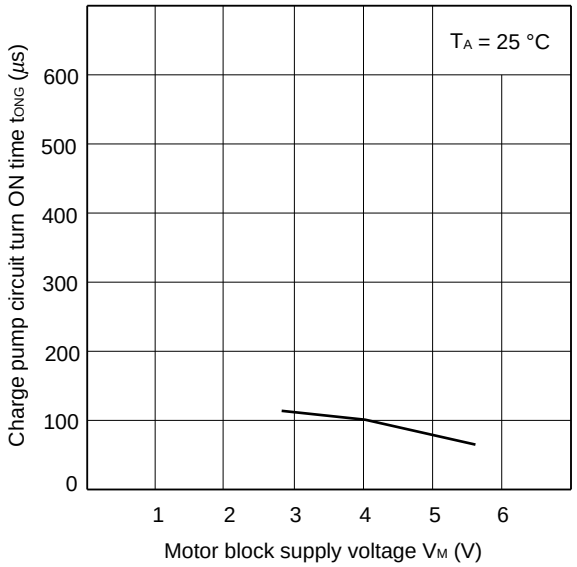
R_{ON} vs. V_M Characteristics



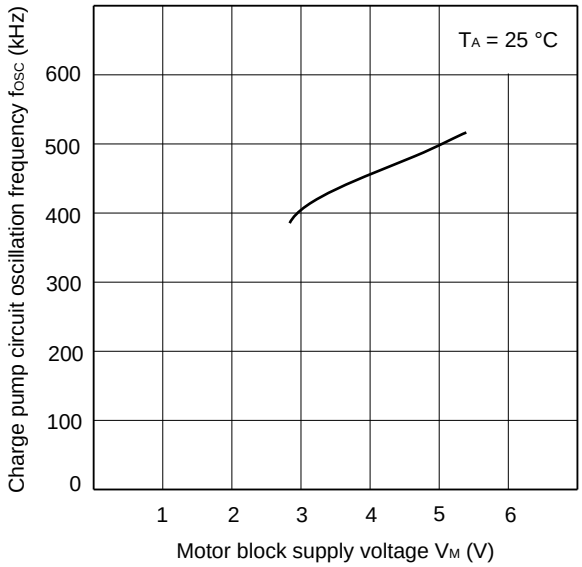
Low-Voltage Malfunction Prevention Circuit Characteristics



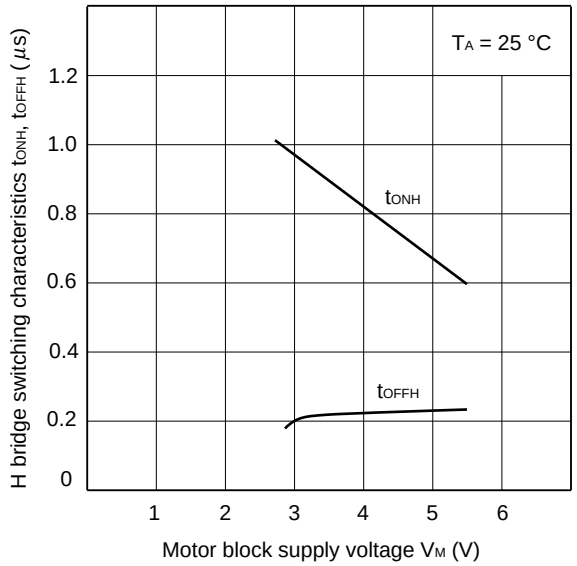
t_{ONG} vs. V_M Characteristics



f_{OSC} vs. V_M Characteristics

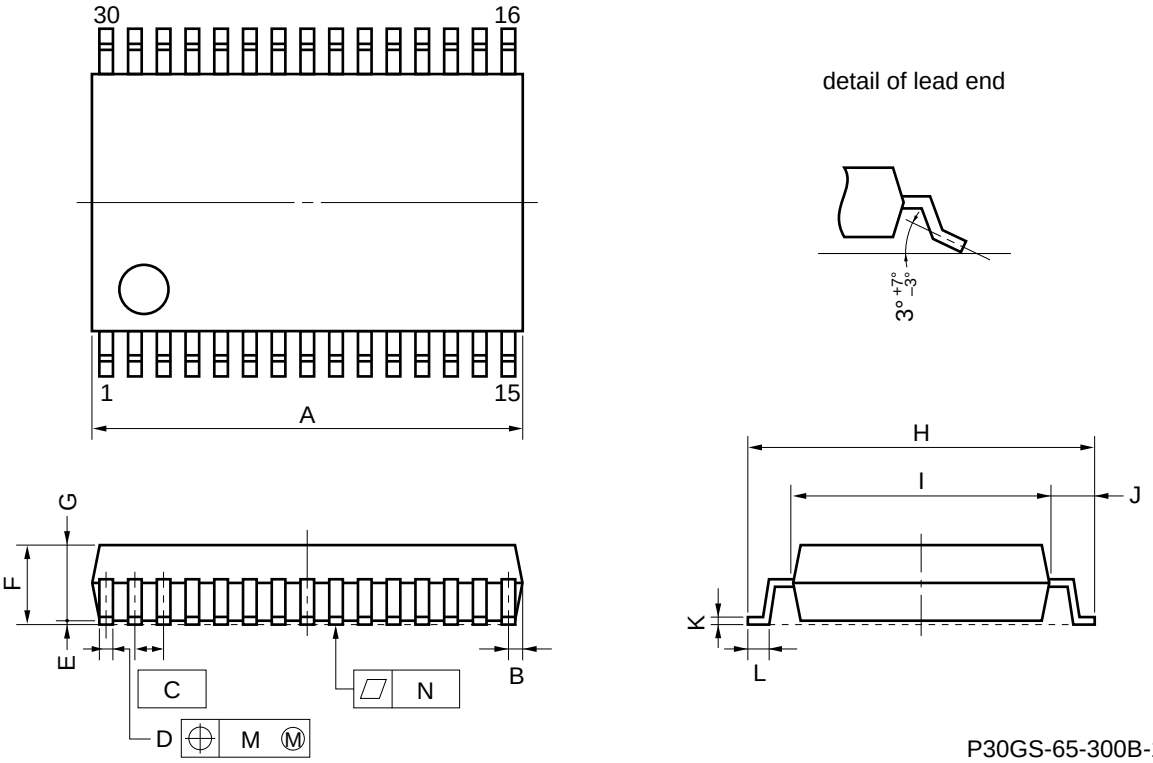


t_{ONH}, t_{OFFH} vs.V_M Characteristics



PACKAGE DIMENSION

30 PIN PLASTIC SHRINK SOP (300 mil)



P30GS-65-300B-1

NOTE

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

ITEM	MILLIMETERS	INCHES
A	10.11 MAX.	0.398 MAX.
B	0.51 MAX.	0.020 MAX.
C	0.65 (T.P.)	0.026 (T.P.)
D	$0.30^{+0.10}_{-0.05}$	$0.012^{+0.004}_{-0.003}$
E	0.125±0.075	0.005±0.003
F	2.0 MAX.	0.079 MAX.
G	1.7±0.1	0.067±0.004
H	8.1±0.2	0.319±0.008
I	6.1±0.2	0.240±0.008
J	1.0 ± 0.2	$0.039^{+0.009}_{-0.008}$
K	$0.15^{+0.10}_{-0.05}$	$0.006^{+0.004}_{-0.002}$
L	0.5±0.2	$0.020^{+0.008}_{-0.009}$
M	0.10	0.004
N	0.10	0.004

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.

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

Soldering Method	Soldering Conditions	Symbol of Recommended Soldering
Infrared reflow	Peak package temperature: 235 °C, Time: 30 seconds MAX. (210 °C MIN.), Number of times: 3 MAX., Number of days: None[Note], Flux: Rosin-based flux with little chlorine content (chlorine: 0.2 Wt% MAX.) is recommended.	IR35-00-3
VPS	Peak package temperature: 215 °C, Time: 40 seconds MAX. (200 °C MIN.), (200 °C MIN.), Number of times: 2 MAX., Number of days: None[Note], Flux: Rosin-based flux with little chlorine content (chlorine: 0.2 Wt% MAX.) is recommended.	VP15-00-2
Wave soldering	Soldering bath temperature: 260 °C MAX., Time: 10 seconds MAX., Preheating temperature: 120 °C MAX., Number of times: 1, Flux: Rosin-based flux with little chlorine content (chlorine: 0.2 Wt% MAX.) is recommended.	WS60-00-1

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 pin partial heating).

[MEMO]

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