H-Bridge Motor Driver with Current Mirror

1 Features

- 4.5V to 40V Operating Supply Voltage Range
- Output Current Capability: 6A Peak and 4A Continuous
- Low $R_{DS(ON)}$ Integrated MOSFET:
  - RDS(on) (HS+LS): 200mΩ
- Separate Logic and Motor Power Supply Pins
- Standard PWM Interface (IN1/IN2)
- Low Power Sleep Mode, Maximum Sleep Current 1μA
- Small Package and Footprint
  - 8 pin SOP (With Thermal Pad)
- Protection Features
  - Over Current Protection (OCP)
  - Thermal Shutdown (TSD)
  - Under Voltage Lock-Out (UVLO)
  - MOSFET Shoot-Through Prevention

2 Applications

- Home Appliances
- DC Brush Motors
- Printers
- Industrial Automation
- Sweeping Robot

3 Description

The GD30DR3003 is an H-bridge driver, and is designed to drive one DC brush motor or other inductive loads. The H-bridge is composed of four high voltage N-Channel MOSFETs that can control motors bidirectionally with up to 6A peak current. Two logic inputs are provided to control the H-bridge driver, and therefore control the speed and direction of the DC motor with externally applied PWM control signals. Setting both inputs low enters a low power sleep mode.

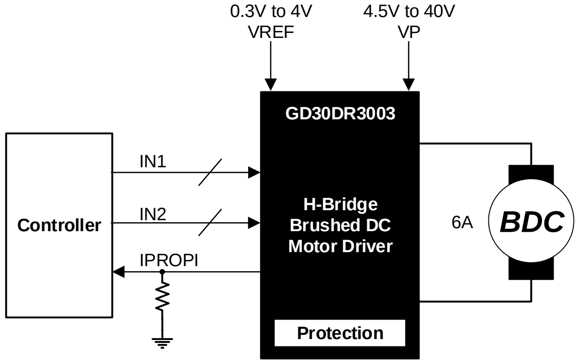
The GD30DR3003 internal current mirror structure on the IPROPI pin enables current sensing and regulation. This avoids the need for a large power shunt resistor, saving PCB board area and reducing system cost. The microcontroller can detect motor stall or load changes through the IPROPI pin. The external voltage reference pin, VREF, determines the threshold of current regulation during start-up and stall events without interaction from a microcontroller.

The device internal protection includes undervoltage (UVLO), overcurrent(OCP), and overtemperature(TSD). When the fault condition is removed, the device automatically resumes normal operation.

Device Information[1]

PART NUMBER	PACKAGE	BODY SIZE (NOM)
GD30DR3003	EP-SOP (8)	4.90 mm × 3.90 mm

1. For packaging details, see *Package Information* section.



Simplified Application Schematic

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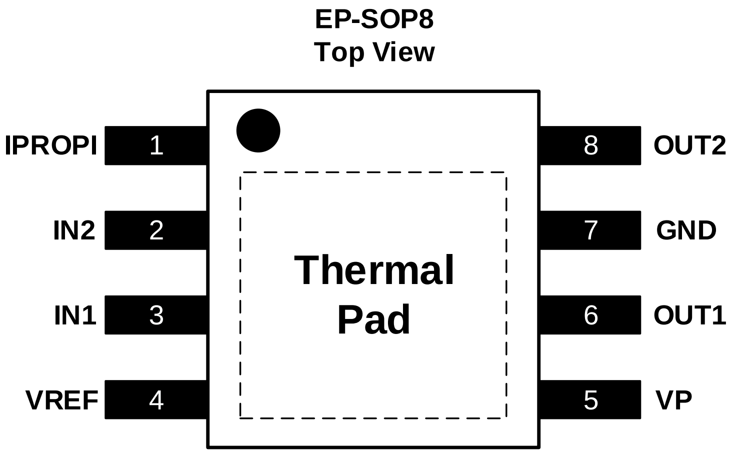
4 Device Overview

4.1 Pinout and Pin Assignment



4.2 Pin Description

PIN		PIN TYPE[1]	FUNCTION
NAME	NUM		
IPROPI	1	O	Proportional output load current. See *Current Sensing*.
IN2	2	I	Logic input, control signal of H-bridge, internal pulldown. See Table 1.
IN1	3	I	Logic input, control signal of H-bridge, internal pulldown. See Table 1.
VREF	4	P	Analog reference voltage for current regulation, apply a voltage between 0.3V to 4V. For information on current regulation, see the *Current Regulation* section.
VP	5	P	Power supply, connect a 0.1μF bypass capacitor to ground, as well as sufficient bulk capacitance, rated for the VP voltage.
OUT1	6	O	H-bridge output, connect to the DC motor or other inductive load.
GND	7	G	Device logic ground, connect to board ground.
OUT2	8	O	H-bridge output, connect to the DC motor or other inductive load.
Thermal pad	Thermal pad	P	Power ground, connect to board ground, use large ground plane for good thermal dissipation, and multiple nearby vias connecting those planes, see *Layout Guidelines and Example*.

1. I = input, O = output, P = power, G = ground.

5 Parameter Information

5.1 Absolute Maximum Ratings

Exceeding the operating temperature range (unless otherwise noted)[1,2]

SYMBOL	PARAMETER	MIN	MAX	UNIT
VP	Motor power supply voltage	−0.3	45	V
VREF	Reference voltage	−0.3	6	V
V_{IPROPI}	IPROPI voltage	−0.3	6	V
V_{INx}	Control input pin voltage	−0.3	6	V
V_{OUTx}	H-bridge output drive	−1.0	VP+0.7	V
I_{LIM}	Internal current limit	0	6	A
T_J	Operating junction temperature	−40	150	°C
T_{stg}	Storage temperature	−65	150	°C

1. Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. All voltage values are with respect to network ground terminal.

5.2 Recommended Operation Conditions

SYMBOL[1,4]	PARAMETER	MIN	TYP	MAX	UNIT
VP	Motor power supply voltage	4.5		40	V
VREF	Reference voltage	0.3		4	V
V_{INx}	Control input pin voltage	0		5.5	V
I_{OUTx}	Continuous motor drive output current, @T_A=25°C	0		4	A
I_{PEAK}	Peak output current[2], @T_A=25°C	0		6	A
f_{pwm}	Externally applied PWM frequency[3]	0		200	kHz
I_{IPROPI}	IPROPI peak output current	0		9	mA
T_A	Operating ambient temperature	−40		125	°C

1. The device is not guaranteed to function outside of its operating conditions.
2. Power dissipation and thermal limits must be observed.
3. At an input frequency of 100KHz/200KHz, the maximum supported duty cycle is 95%/92%.
4. *Application Information* section for further information.

5.3 Electrical Sensitivity

SYMBOL	CONDITIONS	VALUE	UNIT
$V_{ESD(HBM)}$	Human-body model (HBM), ANSI/ESDA/JEDEC JS-001-2017[1]	±4000	V
$V_{ESD(CDM)}$	Charge-device model (CDM), ANSI/ESDA/JEDEC JS-002-2022[2]	±1000	V

1. JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
2. JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

5.4 Thermal Resistance

SYMBOL[1]	CONDITIONS	PACKAGE	VALUE	UNIT
Θ_{JA}	Natural convection, 2S2P PCB	EP-SOP8	39.41	°C/W
Θ_{JB}	Cold plate, 2S2P PCB	EP-SOP8	12.83	°C/W
Θ_{JC}	Cold plate, 2S2P PCB	EP-SOP8	26.81	°C/W
Ψ_{JB}	Natural convection, 2S2P PCB	EP-SOP8	12.45	°C/W
Ψ_{JT}	Natural convection, 2S2P PCB	EP-SOP8	2.65	°C/W

1. Thermal characteristics are based on simulation, and meet JEDEC document JESD51-7.

5.5 Electrical Characteristics

T_A = 25°C (unless otherwise noted).

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
POWER SUPPLY(VP)						
VP	VP operating voltage		4.5		40	V
I_{VP}	VP operating supply current	VP = 24 V		2	4	mA
I_{VPQ}	VP standby mode current	VP = 24 V			1	μA
t_{WAKE}	Turn-on time	VP > V_{UVLO}, IN1 or IN2 high		40	50	μs
t_{SLEEP}	Turn-off delay time	IN1=IN2=0		1		ms
LOGIC-LEVEL INPUTS(IN1, IN2)						
V_{IL}	Input low voltage				0.5	V
V_{IH}	Input high voltage		1.5			V
V_{HYS}	Input logic hysteresis			500		mV
I_{IL}	Input low current	V_{INx} = 0	−1		1	μA
I_{IH}	Input high current	V_{INx} = 3.3V		30	50	μA
R_{PD}	Pulldown resistance			100		kΩ
t_{PD}	Propagation delay	IN1/IN2 transition to OUT1/OUT2 transition		300		ns
MOTOR DRIVER OUTPUTS(OUT1, OUT2)						
$R_{DS(ON)\_HS}$	High side MOSFET R_{DSON}	VP = 24V, I = 1A, T_A = 25°C		100		mΩ
$R_{DS(ON)\_LS}$	Low side MOSFET R_{DSON}	VP = 24V, I = 1A, T_A = 25°C		100		mΩ
V_D	Body diode forward voltage	I_{OUT} = 1A, T_A = 25°C		0.8	1	V
t_{DT}	Output drive dead time			200		ns
t_{RISE}	Output rise time	OUTx rising from 10% to 90%		170		ns
t_{FALL}	Output fall time	OUTx falling from 10% to 90%		170		ns
INTEGRATED CURRENT SENSE AND REGULATION(IPROPI, VREF)						
A_{IPROPI}	Current mirror scaling factor			1500		μA/A
A_{ERR}	Current mirror total error	I_{OUT}=1A, 5.5V⩽V_{VP}⩽37V	−6		6	%
t_{DELAY}	IPROPI delay time			0.7		μs

Electrical Characteristics(continued)

T_A = 25°C (unless otherwise noted).

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
t_{DEG}	Current regulation deglitch time			0.5		μs
t_{OFF}	Fixed PWM off-time			25		μs
t_{BLANK}	Current regulation blanking time			1.5		μs
PROTECTION CIRCUITS						
V_{UVLO}	VP undervoltage lockout	VP falling	4.0	4.2	4.3	V
V_{UVLO_HYS}	VP undervoltage hysteresis	Rising to falling threshold		150		mV
t_{UVLO_DEG}	VP undervoltage deglitch time	VP falling		10		μs
I_{OCP}	Over current protection		6.0	7.0		A
t_{OCP_DEG}	Over current deglitch time			1.5		μs
t_{RETRY}	OCP retry time			3		ms
T_{TSD}	Thermal shutdown temperature[1]			155		°C
T_{HYS}	Thermal shutdown hysteresis[1]			35		°C

5.6 Timing Requirements

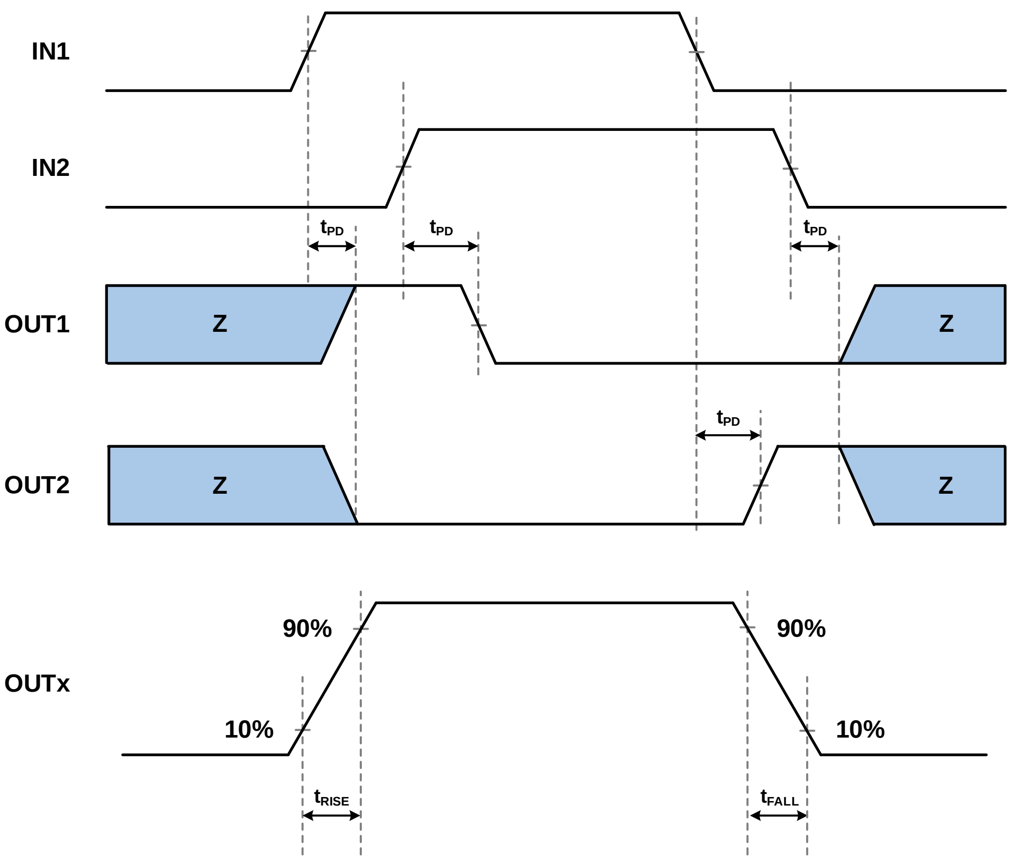


Figure 1. Input and Output Timing for GD30DR3001

5.7 Typical Characteristics

T_A = 25°C, unless otherwise noted.

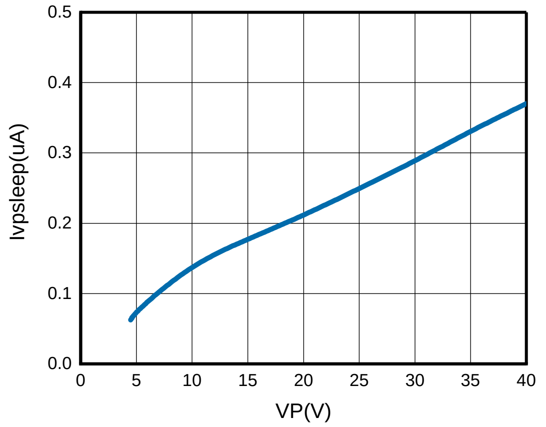


Figure 2. Sleep Current vs. Input Voltage

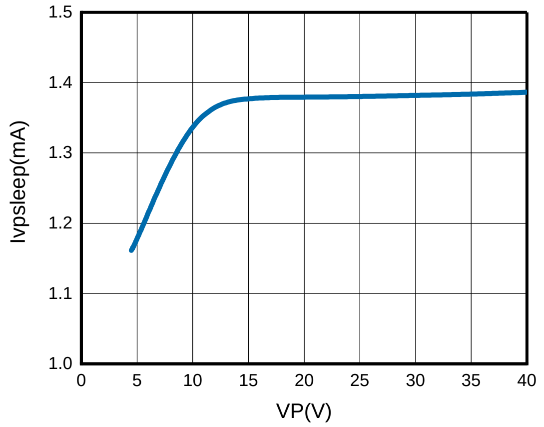


Figure 3. Active Current vs. Input Voltage

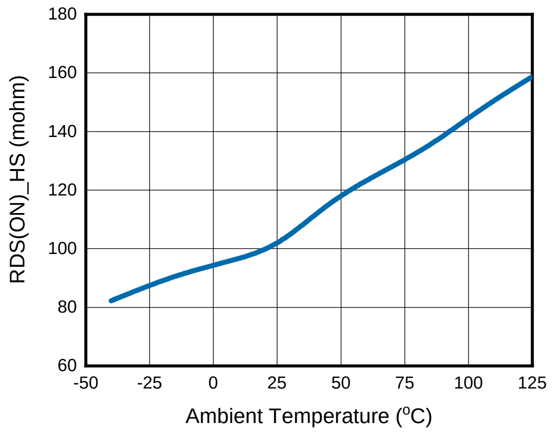


Figure 4. High-Side RDS(ON) vs. Temperature

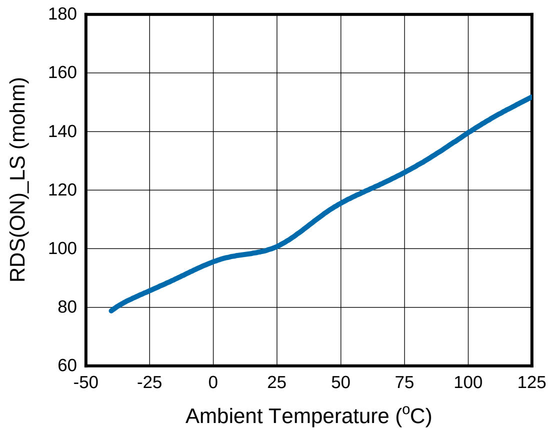


Figure 5. Low-Side RDS(ON) vs. Temperature

6 Functional Description

6.1 Block Diagram

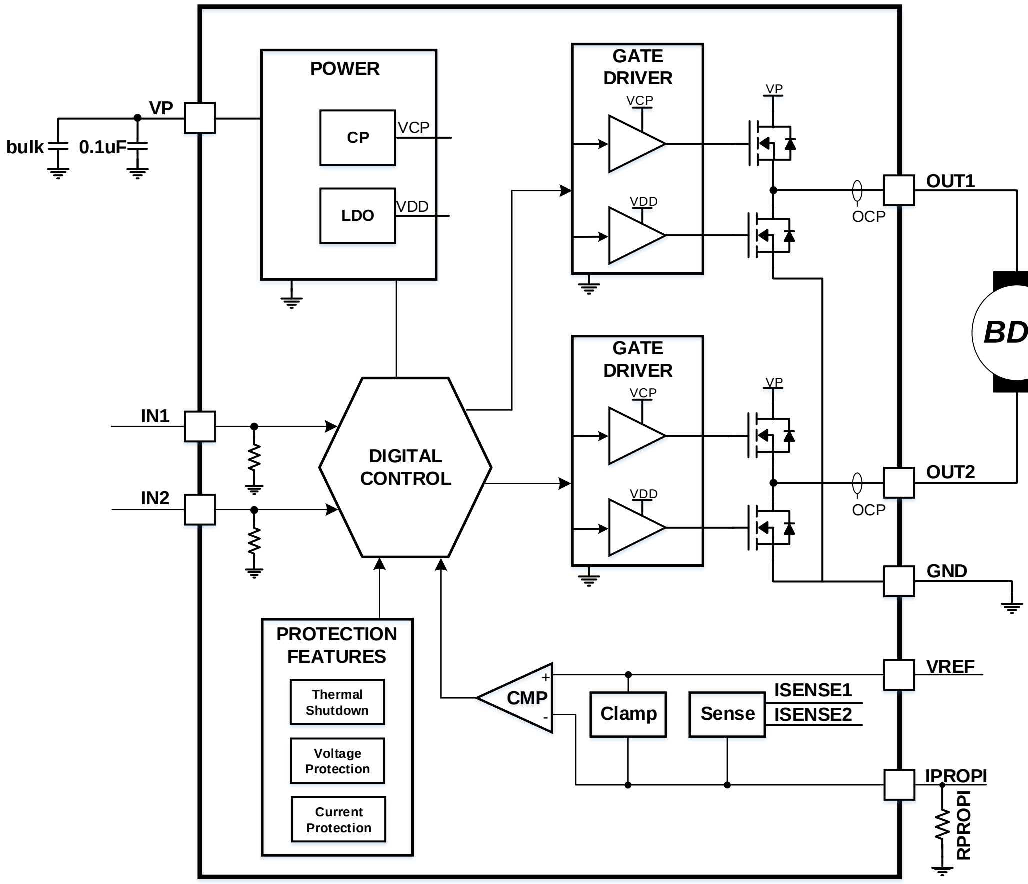


Figure 6. GD30DR3003 Functional Block Diagram

6.2 Operation

The GD30DR3003 serves as an H-bridge driver capable of powering a single DC motor or other devices, such as solenoids. It regulates its outputs through a PWM interface (IN1/IN2) up to 200kHz. When both logic inputs are low for a 1ms period, the device will be set into standby mode and consume less power. The device integrates a current mirror structure to achieve equal proportional output of load current and limit the current. Protection features such as OCP, OTSD and UVLO are implemented to prevent the device and system from fault and damage.

6.2.1 PWM Mode

In GD30DR3003, the device operates in PWM mode. H-bridge in PWM mode supports four output states: coast (Hi-Z), forward, reverse and brake. They are controlled by IN1/IN2 according to Table 1. The inputs can be set to static voltage for 100% duty cycle drive, or PWM for variable motor speed. When using PWM, it typically works best to switch between driving and braking.

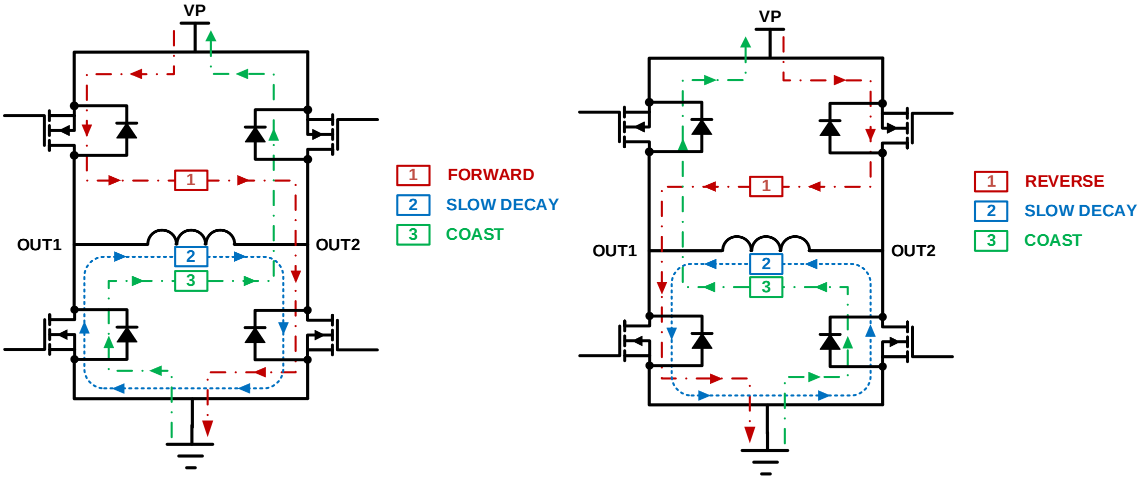


Figure 7. The Driver Outputs and Current Path

Table 1 shows the logic for the GD30DR3003 device.

Table 1. H-Bridge Control

IN1	IN2	OUT1	OUT2	FUNCTION (DC MOTOR)
0	0	Z	Z	Coast; H-bridge disabled to High-Z
0	1	L	H	Reverse
1	0	H	L	Forward
1	1	L	L	Brake; Low-side slow decay

6.2.2 Sleep Mode

When IN1 and IN2 are both low for time t_{SLEEP} (typically 1ms), the GD30DR3003 enters a low-power sleep mode, where the outputs remain High-Z and the device uses I_{VPQ} of current. If the device is powered up while both inputs are low, sleep mode is immediately entered. After IN1 or IN2 are high for at least 5µs, the device will be operational 50µs (t_{ON}) later.

6.2.3 Dead Time

An internal handshaking scheme is used to prevent shoot-through between the high side and low side MOSFETs. A typical dead time of 200ns is inserted when transitioning between MOSFETs in each half-bridge.

6.2.4 Current Sensing

The GD30DR3003 integrates the functions of current regulation, current monitoring, and current feedback. These functions can obtain the current load current without the need for external sampling resistors, greatly reducing material consumption. When the motor is started and locked, the current will become very large. Through these functions combined with the VREF voltage, excessive current can be limited. Figure 8 shows the IPROPI timings specified in the *Electrical Characteristics* table.

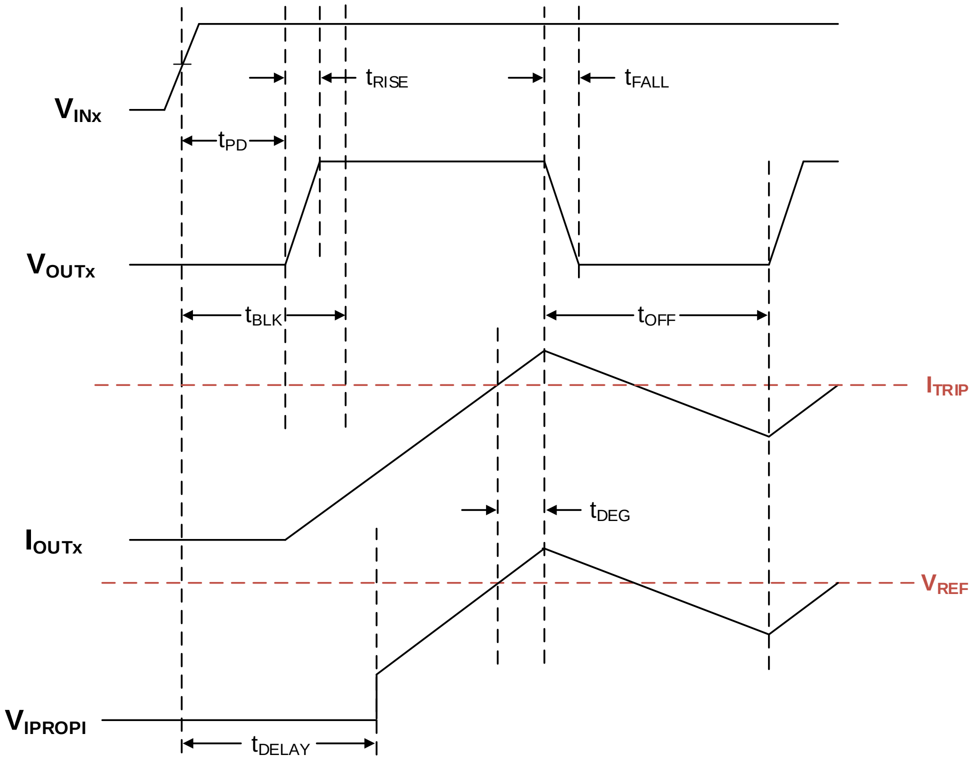


Figure 8. IPROPI Timing Diagram

The IPROPI pin will scale the current of the low-side FETs in the H-bridge according to the ratio of A_{IPROPI}, and then output the analog current. The output current of IPROPI is calculated through Equation(1). I_{LSx} is only effective when the FET is turned on and current flows from the drain to the source of the FET. Therefore, in the slow decay state, IPROPI is only proportional to the current flowing through a FET on the low side.

$$I_{IPROPI}(uA) = (I_{LS1} + I_{LS2})(A) \times A_{IPROPI}(uA / A) \tag{1}$$

The A_{ERR} parameter in the Electrical Characteristics table is the error associated with the A_{IPROPI} gain. It indicates the combined effect of offset error added to the I_{OUT} current and gain error.

The integrated current sensing IPROPI pin should be connected to GND through a power sense resistor, through which the analog current is converted into a voltage signal. This allows the voltage to be monitored through the MCU to infer the current load current. The size of this resistor should be set according to the expected maximum current of the system to prevent damage to the MCU. Additionally, the IPROPI voltage passes through the clamp current, limiting the IPROPI voltage based on the VREF voltage. Prevent excessive current from causing damage to the device.

The IPROPI voltage to the output current can be calculated by Equation(2).

$$V_{IPROPI}(V) = I_{IPROPI}(A) \times R_{IPROPI}(\Omega) \tag{2}$$

The IPROPI output bandwidth is limited by the detection delay time (t_{DELAY}) of the internal current detection circuit. This time is the delay time from the rising edge of INx to when IPROPI outputs. If the device is in PWM+H(drive and slow-decay) mode, then a low-side FET will continue to conduct, and the detection delay time will not affect the IPROPI output. If the input signals are all low, then the IPROPI output will be disabled.

6.2.5 Current Regulation

The output current is regulated at a limit set by an analog input VREF and the resistor R_{IPROPI} connected from IPROPI to ground, according to the Equation(3).

$$I_{TRIP}(A) = \frac{V_{REF}(V)}{A_{IRPOPI}(uA/A) \times R_{IPROPI}(\Omega)} \quad (3)$$

For example, if V_{VREF}=3.3V, A_{IPROPI}=1500μA/A and R_{IPROPI}=1.2kΩ, the GD30DR3003 will limit motor current limit to 1.8A no matter how much load torque is applied.

The current chopping scheme with fixed off-time can support 100% duty cycle, and the H-bridge will automatically restart according to the status of INx after a fixed t_{OFF} period. Once the current exceeds the set threshold, it will enter the current chopping state. During t_{OFF}, the H-bridge adopts slow decay mode. If the current is less than the set threshold after a cycle, the H-bridge will operate normally according to the input status, otherwise it will enter the next braking cycle. If the state of the INx control pin changes within the t_{OFF} time, the remaining toff time is ignored and the output will again follow the input.

The I_{TRIP} comparator has a blanking time (t_{BLANK}) and a deglitch time (t_{DEG}). The blanking time can prevent sudden changes in current and voltage at the switching moment from affecting current chopping. The deglitch time ensures that current regulation is not triggered during transient high current conditions. Placing a 10nF capacitor close to the IPROPI pin of the device will help filter transients on the IPROPI output, but excessive capacitance will slow down the response time of the current regulation circuit. Internal current regulation can be disabled when the IPROPI pin is tied to ground and setting the voltage of V_{REF} higher than GND. When only the current feedback function needs to be retained, you can achieve it by setting V_{REF} and R_{IPROPI}, ensuring that the IPROPI voltage does not reach the VREF threshold.

6.2.6 Slow decay

The GD30DR3003 device integrates current regulation using a fixed off-time current scheme. When current regulation is triggered, the device will enter a fixed time PWM off cycle to re-circulate the current. By default, the device enforces slow current decay by enabling both low-side MOSFETs for the fixed off time ($t_{OFF,}$ 25μs typical). Slow current decay are explained in Figure 9.

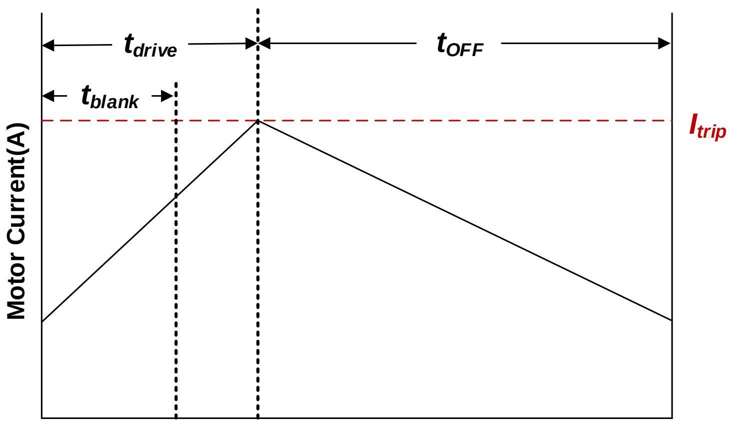


Figure 9. Slow Decay

6.2.7 Protection Circuits

6.2.7.1 Power Supply undervoltage lockout(UVLO)

At any time if the voltage on the power supply VP falls below the UVLO threshold, all the internal MOSFETs in the H-bridge will be disabled. Normal operation will resume when VP rises above UVLO threshold.

6.2.7.2 Overcurrent protection (OCP)

The individual currents go through the MOSFETs (high-side and low-side) are monitored cycle by cycle. In case any current is over the over-current limit, all the MOSFETs are disabled and the internal power supply will be shutdown. The recycle of the PWM control will be retried after a delay time of 3ms and normal operation will be resumed if the OCP events are cleared

6.2.7.3 Thermal shutdown (TSD)

If the die temperature exceeds the trip point of the thermal shutdown limit (T_{OTSD}, typical 150°C), all the MOSFETs are disabled, the internal power supplies are shut down. Normal operation starts again when the temperature falls below the hysteresis and the over temperature condition clears.

6.2.7.4 Fault Conditions Summary

Table 2. Fault Conditions Summary

FAULT	CONDITION	H-BRIDGE	INTERNAL CIRCUIT	RECOVERY
VP undervoltage(UVLO)	VP < 4.2V	Disabled	Disabled	VP > 4.2V
Overcurrent(OCP)	I_{OUT} > 6A (MIN)	Disabled	Operating	t_{OCP_RST}
Thermal Shutdown(TSD)	T_J > 150°C (MIN)	Disabled	Operating	$T_J < T_{OTSD} - T_{HYS}$

7 Application Information

The GD30DR3003 is typically used to drive one brushed DC motor.

7.1 Typical Application Circuit

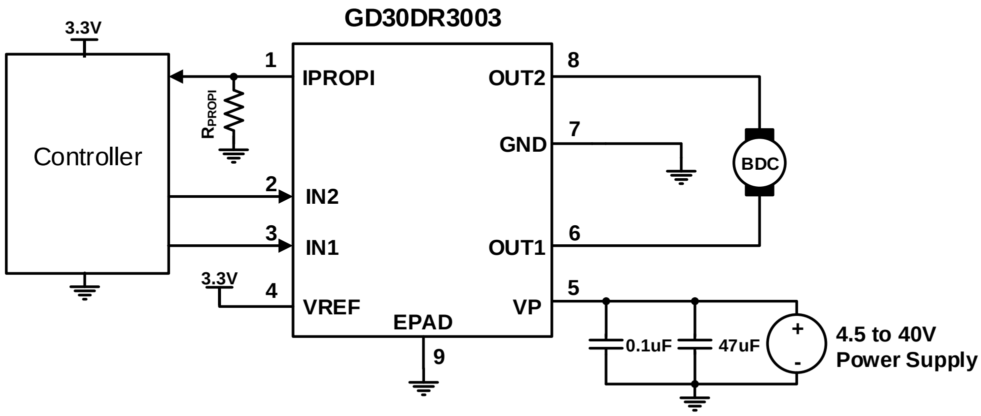


Figure 10. Schematic of GD30DR3003 Application

7.2 Design Example

For this design example, use the parameters in Table 3.

Table 3. Design Parameters

DESIGN PARAMETER	REFERENCE	EXAMPLE VALUE
Motor voltage	VP	24 V
Motor RMS current	IRMS	0.5 A
Motor inrush startup current	ISTART_INRUSH	5 A
Motor current trip point	ITRIP	2 A
VREF voltage	VREF	1.53V
IPROPI resistance	RIPROPI	510 Ω
PWM frequency	fPWM	5 kHz

7.3 Detailed Design Description

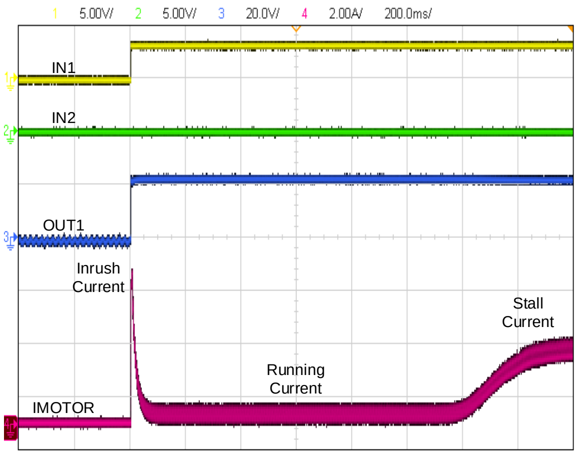
7.3.1 Motor Voltage

The motor voltage to use will depend on the ratings of the motor selected and the desired RPM. A higher voltage spins a brushed DC motor faster with the same PWM duty cycle applied to the power FETs. A higher voltage also increases the rate of current change through the inductive motor windings.

7.3.2 Motor Current

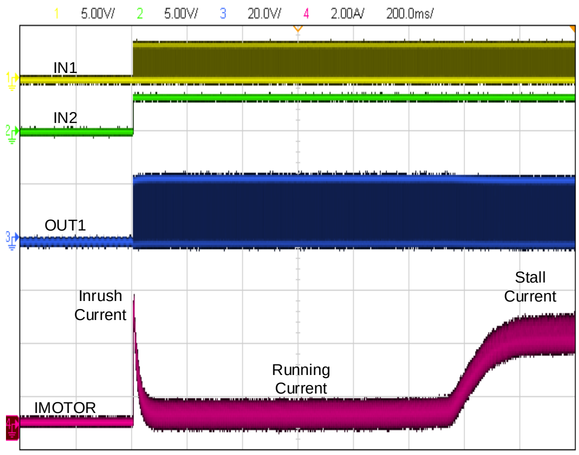
Motors experience large currents at low speed, initial startup, and stalled rotor conditions. The large current at motor startup is sometimes called inrush current. The current regulation feature in the GD30DR3003 can help to limit these large currents.

7.3.3 Typical Application Curves



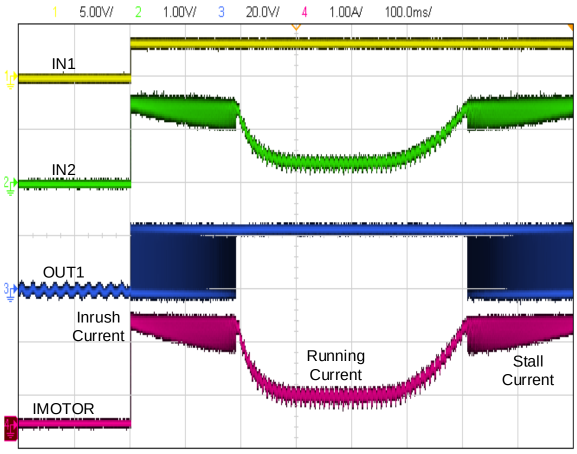
f_{PWM} = 5KHz, D = 100%

Figure 11. Motor Startup at 100% Duty Cycle



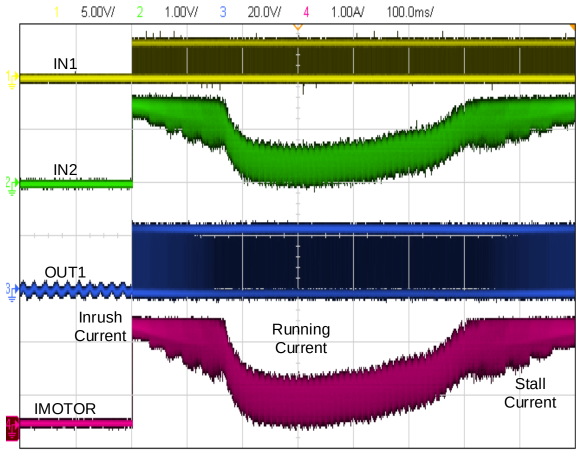
f_{PWM} = 5KHz, D = 20%

Figure 12. Motor Startup at 20% Duty Cycle



f_{PWM} = 5KHz, D = 100%, R_{IPROPI} = 510Ω

Figure 13. Motor Startup at 100% Duty Cycle with Current Regulation



f_{PWM} = 5KHz, D = 20%, R_{IPROPI} = 510Ω

Figure 14. Motor Startup at 20% Duty Cycle with Current Regulation

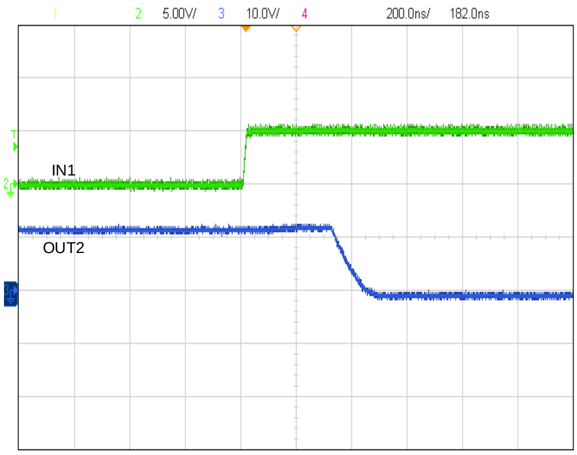


Figure 15. t_{PD}

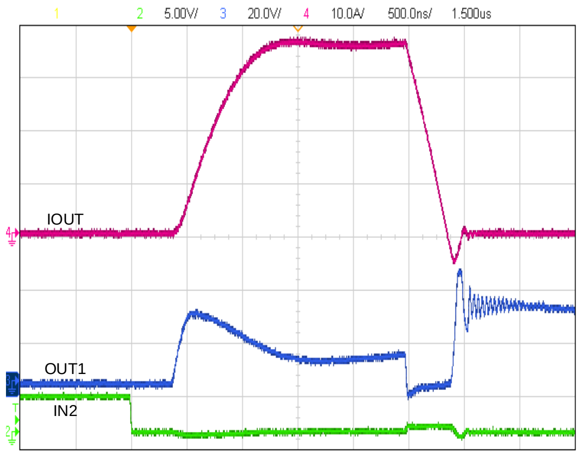


Figure 16. SCP

7.4 Stall Monitoring

When a stall occurs in some applications, this information needs to be passed to the microcontroller. For example, the motor is accidentally mechanically blocked, causing the motor to stall, and even causing damage to the system in severe cases. By using the IPROPI analog current monitoring feedback function integrated in GD30DR3003, combined with a microcontroller, a simple stall monitoring scheme can be implemented.

As shown in Figure 17, stall monitoring mainly relies on the fact that the current rises sharply during the stall period.

When the motor starts working, the microcontroller monitors the voltage on the IPROPI pin through the ADC and compares it with the set threshold.

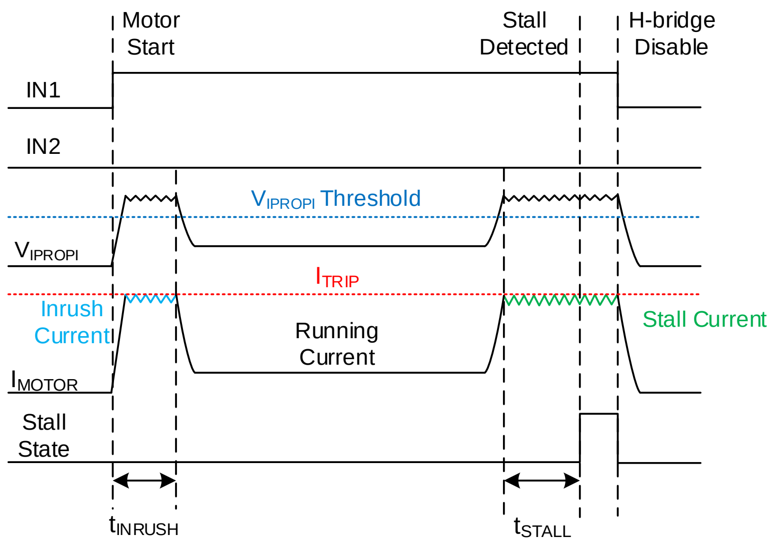
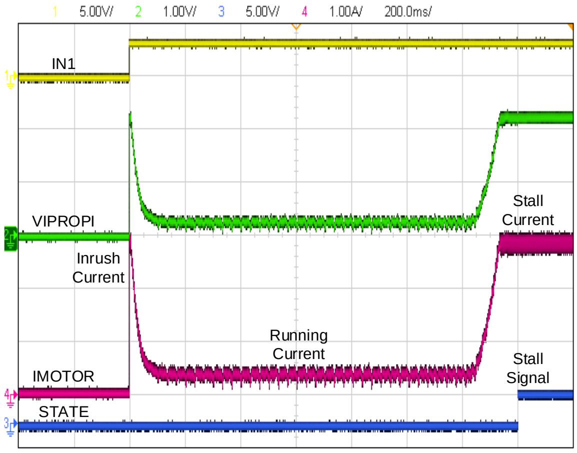


Figure 17. Stall Signal Indication

The microcontroller needs to determine whether it has entered the stalled state based on the IPROPI signal. The motor has a large inrush current when it first starts running. After starting inrush current drops to the normal operating current because as the motor speed increases, the back electromotive force(EMF) also increases, inrush current should not be mistaken for stall current. The microcontroller should ignore the IPROPI signal during the occurrence of inrush current, t_{INRUSH}, to avoid giving false response signal. The determination of t_{INRUSH} should be comprehensively considered based on factors such as motor parameters, power supply, mechanical load response time, input signal delay time, etc.

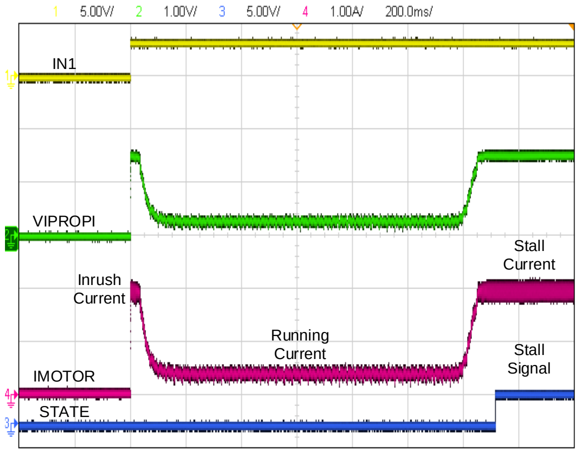
When a stall occurs, the motor rotor stops and the back electromotive force(EMF) is 0V, and the motor current will rise from the operating. Some systems are allowed to operate at stalled current for a period of time under certain application conditions and then recover on their own. For example, a large load is suddenly applied and quickly removed. When the system does not want to be stalled for a long time, it needs to turn off the drive function within a certain period of time, t_{STALL}, to avoid damage to the system. The determination of t_{STALL} should be comprehensively considered factors such as the expected self-recovery time of the system, protection response time, and motor stall current.

The voltage comparison threshold set in the microcontroller should be adjusted according to the actual situation. For example, when the integrated current adjustment function of GD30DR3003 is used, I_{TRIP} will be triggered after the motor is stalled, and the IPROPI voltage at this time can be used as the voltage comparison threshold. After t_{STALL}, the control system begins to respond and disables the H-bridge.



f_{PWM} = 5KHz, D = 100%, R_{IPROPI} = 510Ω

Figure 18. Motor Startup at 100% Duty Cycle with Current Regulation



f_{PWM} = 5KHz, D = 20%, R_{IPROPI} = 510Ω

Figure 19. Motor Startup at 20% Duty Cycle with Current Regulation

7.5 Power Dissipation

Power dissipation in the GD30DR3003 is dominated by the power dissipated in the output FET resistance, or $R_{DS(on)}$. There is additional power due to PWM switching losses, which are dependent on PWM frequency, rise and fall time, and VP supply voltages. These switching losses are typically on the order of 10% to 30% of DC power dissipation.

The power dissipation of the GD30DR3003 device is on function of RMS motor current and FET ON-resistance of each output.

$$P_D \approx I_{RMS}^2 \times \left(R_{HS\_DS(ON)} + R_{LS\_DS(ON)}\right) \tag{4}$$

where

- P_D is the device power dissipation
- $R_{HS\_DS(ON)}$ is the resistance of the high-side FET
- $R_{LS\_DS(ON)}$ is the resistance of the low-side FET
- I_{RMS} is the RMS or DC output current being supplied to the load

$R_{DS(ON)}$ increases with temperature, so as the device heats, the power dissipation increases. This must be taken into consideration when sizing the heatsink.

8 Layout Guidelines and Example

8.1 Layout Guidelines

Low ESR ceramic capacitors should be utilized for the VP to GND bypass capacitors. 0.1uF X5R or X7R types are recommended. These capacitors should be placed as close to the VP pin as possible with a thick trace or ground plane connection to the device GND pin.

In addition, bulk capacitor is required on the VP pin. This bulk capacitor can be ceramic or electrolytic type, but should also be placed as close as possible to the VP pin to minimize the loop inductance.

The high-current device outputs should use wide metal trace, and numerous vias should be used when connecting PCB layers.

8.2 Layout Example

Recommended layout and placement is shown in the following diagram.

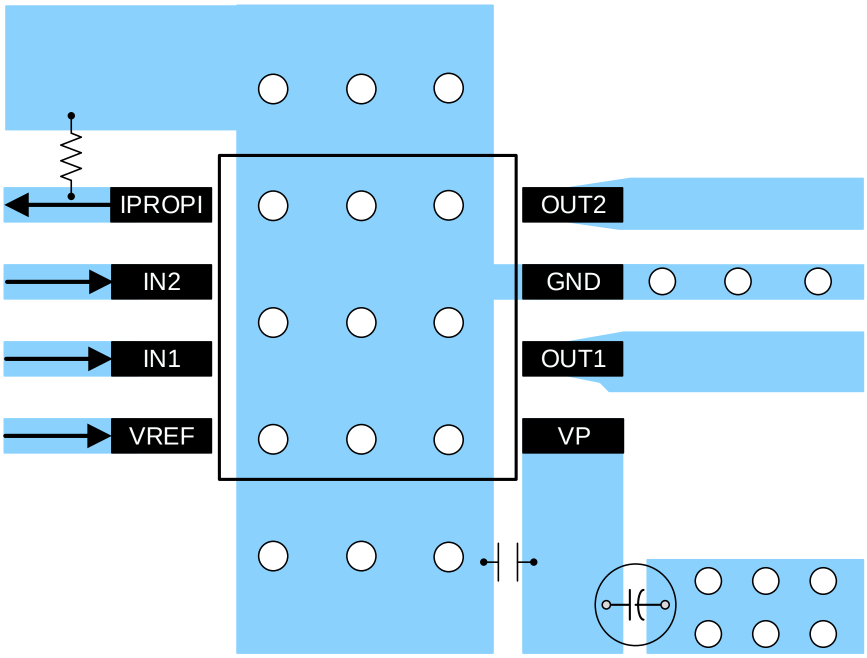
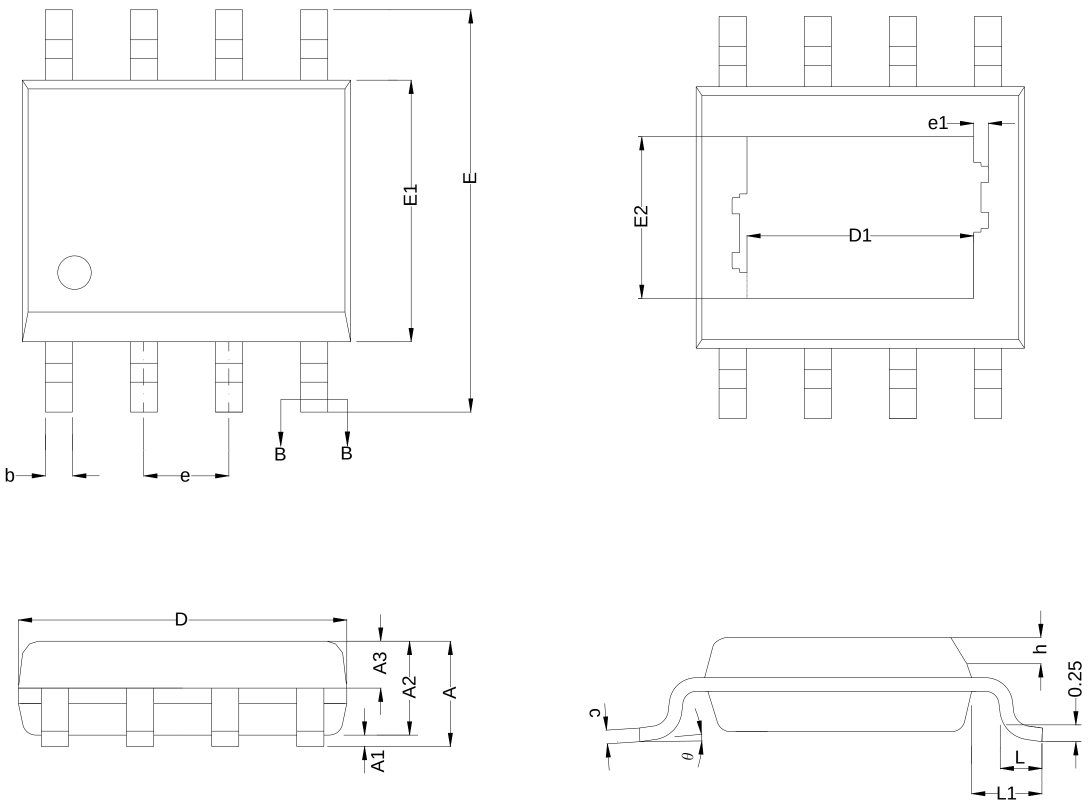


Figure 20. Simplified Layout Example

9 Package Information

9.1 Outline Dimensions

EP-SOP8 Package Outline



NOTES:

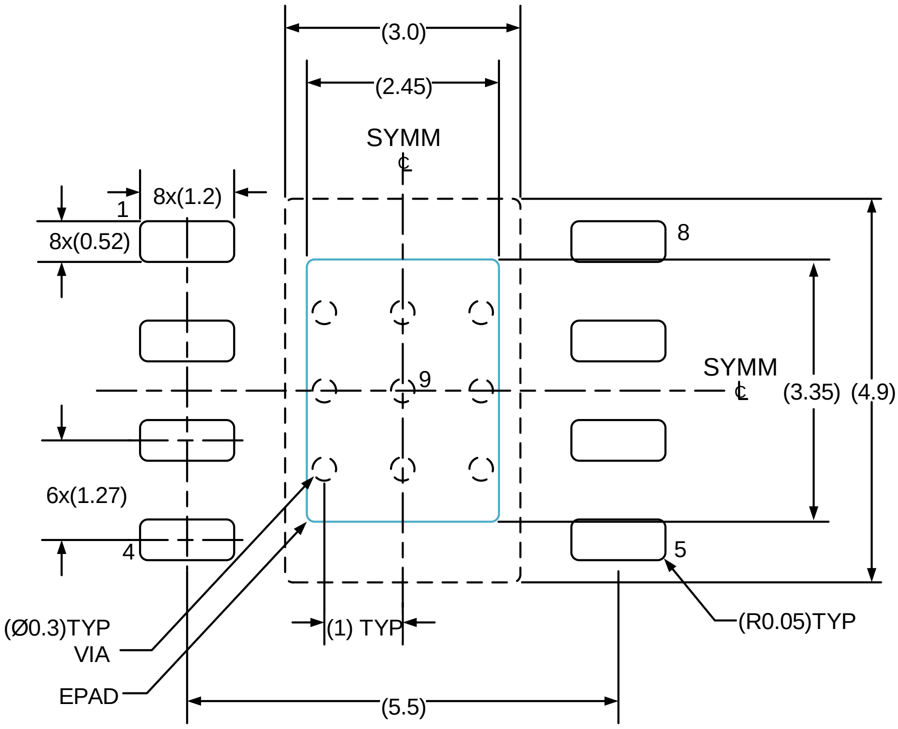
1. All dimensions are in millimeters.
2. Package dimensions does not include mold flash, protrusions, or gate burrs.
3. Refer to the Table 4 *EP-SOP8 dimensions(mm)*.

Table 4. EP-SOP8 dimensions(mm)

SYMBOL	MIN	NOM	MAX
A			1.65
A1	0.05		0.15
A2		1.30	
A3	0.60	0.65	0.70
b	0.39		0.47
c	0.20		0.24
D	4.80	4.90	5.00
D1		3.10	
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
E2		2.21	
e		1.27	
e1		0.10	
L	0.50	0.60	0.80
L1		1.05	
h	0.25		0.50
θ	0°		8°

9.2 Recommended Land Pattern

EP-SOP8 Land Pattern Example



NOTES: (continued)

1. Refer to the IPC-7351 can also help you complete the designs.
2. Exposed metal shown.
3. Drawing is 10X scale.

10 Ordering Information

Ordering Code	Package Type	ECO Plan	Packing Type	MOQ	OP Temp(°C)
GD30DR3003WGTR-K	EP-SOP8	Green	Tape & Reel	4000	−40°C to +125°C

11 Revision History

REVISION NUMBER	DESCRIPTION	DATE
1.0	Initial release and device details	2023
1.1	Modify Input low voltage V_{IL} value	2023

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