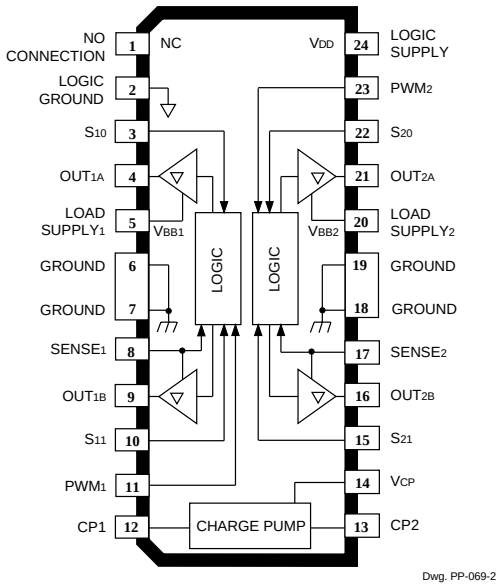
3971

Data Sheet
29319.32

ADVANCE INFORMATION
(Subject to change without notice)
October 1, 1999

DUAL DMOS FULL-BRIDGE DRIVER



Dwg. PP-069-2

ABSOLUTE MAXIMUM RATINGS

at T_A = +25°C

Load Supply Voltage, V_{BB} ..... **50 V**
Output Current, I_{OUT}
Continuous ..... **±2.5 A**
Transient (<500 ns) ..... **±5 A**
Logic Supply Voltage,
V_{DD} ..... **7.0 V**
Sense Voltage, V_{SENSE} ..... **0.5 V**
Logic Input Voltage Range,
V_{IN} ..... **-0.3 V to V_{DD} + 0.3 V**
High-Side Gate Voltage ..... **V_{BB} + 8 V**
Package Power Dissipation,
P_D ..... **2.2 W**
Operating Temperature Range,
T_A ..... **-20°C to +85°C**
Junction Temperature, T_J ..... **+150°C**
Storage Temperature Range,
T_S ..... **-55°C to +150°C**

Output duty cycle, ambient temperature, and heat sinking may limit current rating. Under any set of conditions, do not exceed the specified current rating or a junction temperature of 150 °C.

Designed to interface between external PWM control logic and inductive loads such as relays, solenoids, dc motors or stepper motors, the A3971SLB can operate with continuous output currents to ±2.5 A and operating voltages to 50 V.

Low $r_{DS(on)}$ DMOS output drivers provide low power dissipation during PWM operation. Internal charge pump circuitry is used to create a boosted voltage to fully enhance the high-side DMOS switches.

Three TTL-compatible logic-input terminals per bridge allow flexibility in configuring PWM control.

Internal circuit protection includes thermal shutdown with hysteresis, and crossover-current protection. Special power up sequencing is not required.

The A3971SLB is supplied in a 24-lead plastic SOIC with a copper batwing tab. The power tab is at ground potential and needs no electrical isolation.

FEATURES

- ±2.5 A, Continuous Load Current
- Low $r_{DS(on)}$ Outputs
  Typically 325 mΩ source, 175 mΩ sink
- Synchronous Rectification via Control Logic
- Parallel Outputs for 5 A Load-Current Capability
- Internal Undervoltage Monitor
- Crossover-Current Protection
- Source Connections for External Current Sensing
- Thermal Shutdown Circuitry

Always order by complete part number: **A3971SLB**.

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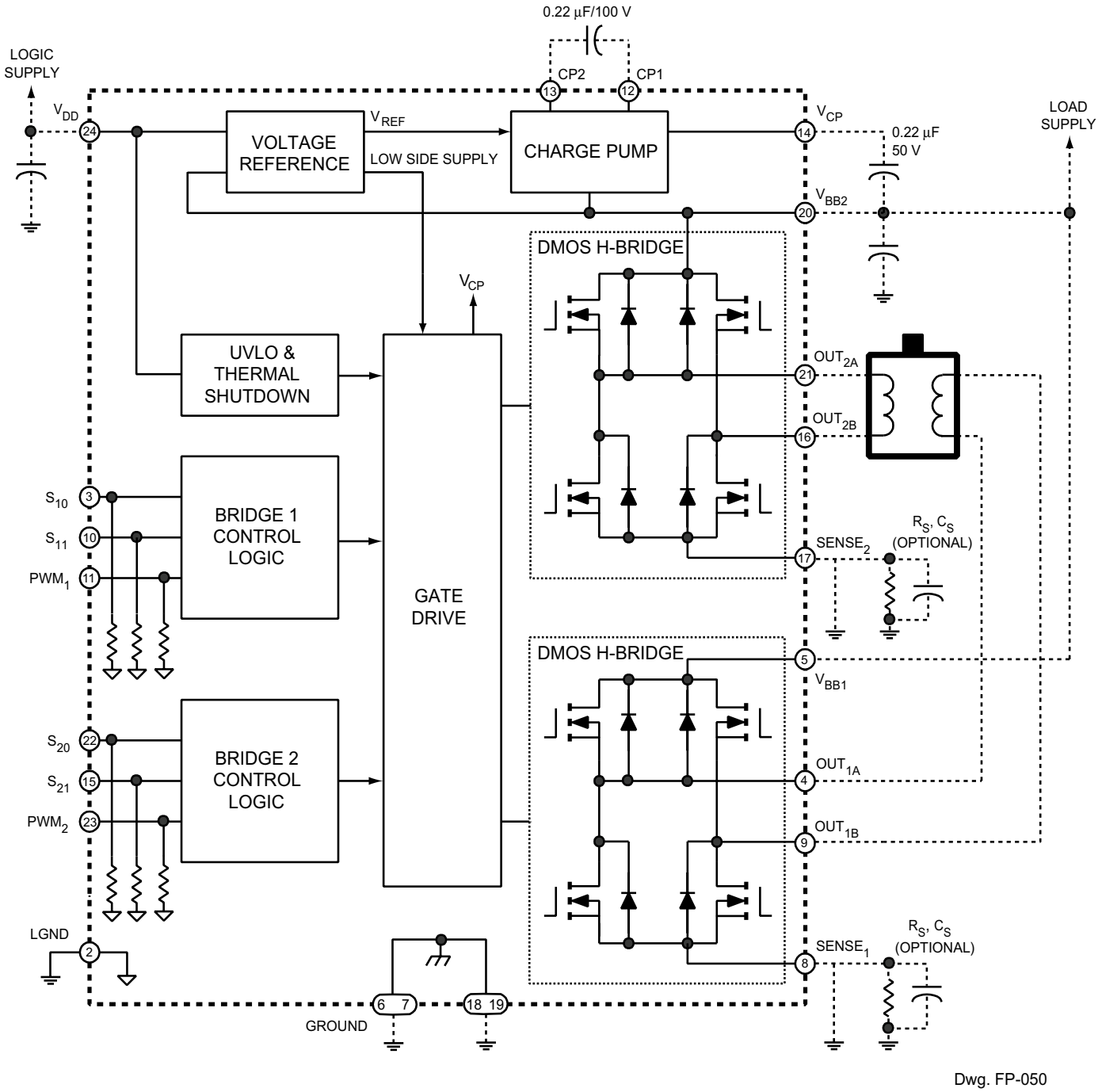
FUNCTIONAL BLOCK DIAGRAM



Dwg. FP-050

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ELECTRICAL CHARACTERISTICS at T_A = +25°C, V_{BB} = 50 V, V_{DD} = 5.0 V (unless otherwise noted).

Characteristic	Symbol	Test Conditions	Limits			
			Min.	Typ.	Max.	Units
Load Supply Voltage Range	V_{BB}	Operating	10	—	50	V
Logic Supply Voltage Range	V_{DD}	Operating	4.5	5.0	5.5	V
Load Supply Current	I_{BB}	Operating, each supply, no load	—	—	3.0	mA
Logic Supply Current	I_{DD}	Operating	—	—	5.0	mA
Output Drivers						
Output Leakage Current	I_{DSS}	$V_{OUT} = V_{BB}$	—	<1.0	20	µA
		V_{OUT} = 0 V	—	<-1.0	-20	mA
Output On Resistance	$r_{DS(on)}$	High-side switch	—	325	375	mΩ
		Low-side switch	—	175	200	mΩ
Body Diode Forward Voltage	V_F	Source diode, I_F = 2.5 A	—	1.2	—	V
		Sink diode, I_F = 2.5 A	—	1.0	—	V
High-Side Gate Voltage	V_{CP}	C = 0.22 µF, reference V_{BB}	6.0	6.5	7.0	V
Control Logic						
Logic Input Voltage	$V_{IN(0)}$		—	—	0.8	V
	$V_{IN(1)}$		2.0	—	—	V
Logic Input Current	$I_{IN(0)}$	V_{IN} = 0 V	—	<1.0	-5.0	µA
	$I_{IN(1)}$	V_{IN} = 5.0 V	—	20	50	µA
Propagation Delay Time	t_{PD}	I_{OUT} = ±2.5 A, 50% to 90%				
		PWM change to source OFF	—	50	—	ns
		PWM change to sink OFF	—	60	—	ns
		PWM change to source ON	—	565	—	ns
		PWM change to sink ON	—	665	—	ns
		Disable to source ON	—	150	—	ns
		Disable to sink ON	—	250	—	ns
Thermal Shutdown Temperature	T_J		—	165	—	°C
Thermal Shutdown Hysteresis	ΔT_J		—	15	—	°C
UVLO Threshold	V_{UVLO}	Increasing V_{DD}	3.9	4.15	4.4	V
UVLO Hysteresis	ΔV_{UVLO}		—	0.15	—	V

NOTES: 1. Typical Data is for design information only.
2. Negative current is defined as coming out of (sourcing) the specified device terminal.

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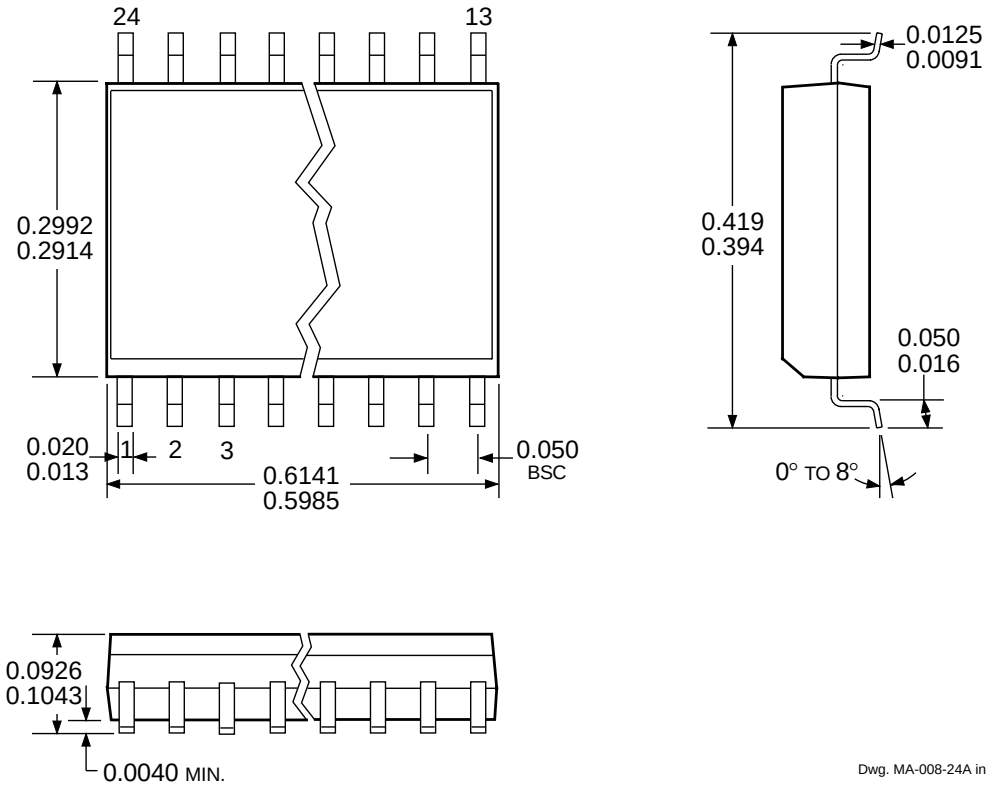
Logic Truth Table

PWM_x	S_{x0}	S_{x1}	OUT_{xA}	OUT_{xB}	Function
X	0	0	Z	Z	Disable
0	0	1	L	H	Forward
0	1	0	H	L	Reverse
0	1	1	L	L	Synchronous
1	0	1	L	L	Rectification/
1	1	1	L	L	Slow Decay
1	1	0	L	L	Chop

Terminal List

Terminal	Name	Description
1	NC	No (Internal) connection
2	LGND	Logic ground
3	S_{10}	Control input, bridge 1
4	OUT_{1A}	Output A, bridge 1
5	V_{BB1}	Load supply voltage, bridge 1
6, 7	GND	Ground
8	$SENSE_1$	Sense resistor, bridge 1
9	OUT_{1B}	Output B, bridge 1
10	S_{11}	Control input, bridge 1
11	PWM_1	Control input, bridge 1
12	CP1	Charge-pump capacitor
13	CP2	Charge-pump capacitor
14	V_{CP}	Reservoir capacitor
15	S_{21}	Control input, bridge 2
16	OUT_{2B}	Output B, bridge 2
17	$SENSE_2$	Sense resistor, bridge 2
18, 19	GND	Ground
20	V_{BB2}	Load supply voltage, bridge 2
21	OUT_{2A}	Output A, bridge 2
22	S_{20}	Control input, bridge 2
23	PWM_2	Control input, bridge 2
24	V_{DD}	Logic supply voltage

Dimensions in Inches
(for reference only)



Dwg. MA-008-24A in

NOTES: 1. Exact body and lead configuration at vendor's option within limits shown.
2. Lead spacing tolerance is non-cumulative
3. Webbed lead frame. Leads 6, 7, 18, and 19 are internally one piece.

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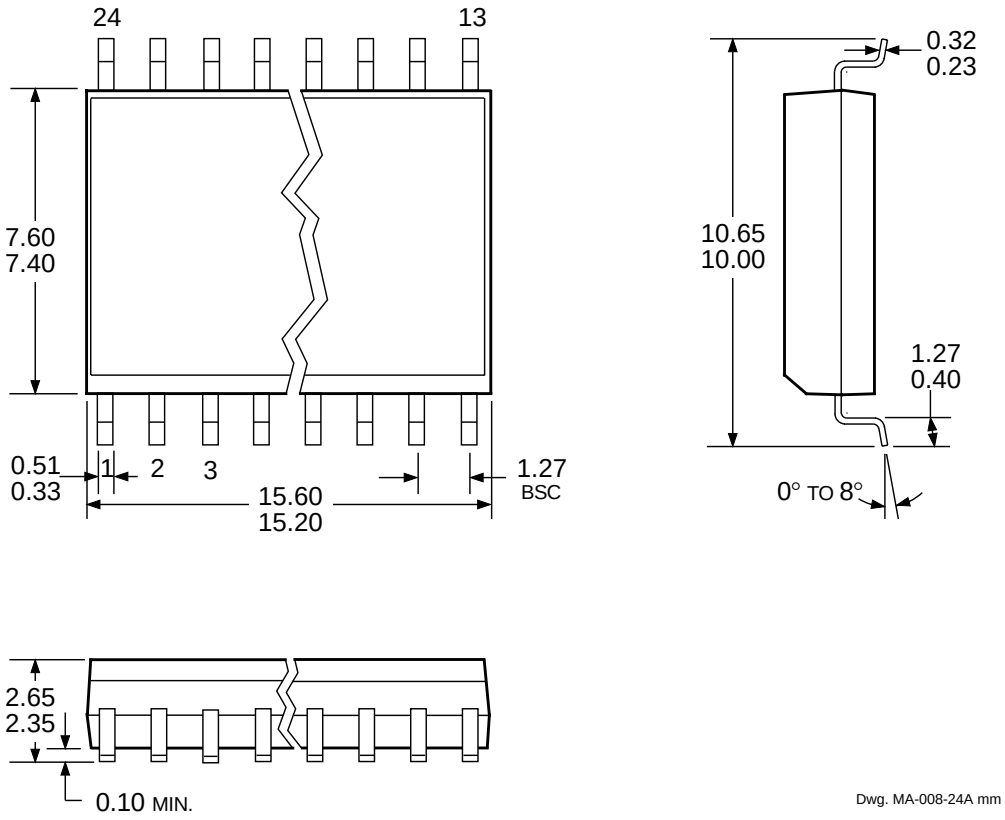
Dimensions in Millimeters
(controlling dimensions)



Dwg. MA-008-24A mm

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MOTOR DRIVERS SELECTION GUIDE

Function	Output Ratings *		Part Number †
INTEGRATED CIRCUITS FOR BRUSHLESS DC MOTORS			
3-Phase Controller/Drivers	±2.0 A	45 V	2936 & 2936-120
Hall-Effect Latched Sensors	10 mA	24 V	3175 & 3177
2-Phase Hall-Effect Sensor/Controller	20 mA	25 V	3235
Hall-Effect Complementary-Output Sensor	20 mA	25 V	3275
2-Phase Hall-Effect Sensor/Driver	900 mA	14 V	3625
2-Phase Hall-Effect Sensor/Driver	400 mA	26 V	3626
3-Phase Power MOSFET Controller	—	28 V	3933
Hall-Effect Complementary-Output Sensor/Driver	300 mA	60 V	5275
3-Phase Back-EMF Controller/Driver	±900 mA	14 V	8902–A
INTEGRATED BRIDGE DRIVERS FOR DC AND BIPOLAR STEPPER MOTORS			
PWM Current-Controlled Dual Full Bridge	±750 mA	45 V	2916
PWM Current-Controlled Dual Full Bridge	±1.5 A	45 V	2917
PWM Current-Controlled Dual Full Bridge	±1.5 A	45 V	2918
PWM Current-Controlled Dual Full Bridge	±750 mA	45 V	2919
Dual Full-Bridge Driver	±2.0 A	50 V	2998
PWM Current-Controlled Full Bridge	±2.0 A	50 V	3952
PWM Current-Controlled Full Bridge	±1.3 A	50 V	3953
PWM Current-Controlled Microstepping Full Bridge	±1.5 A	50 V	3955
PWM Current-Controlled Microstepping Full Bridge	±1.5 A	50 V	3957
DMOS Full Bridge PWM Driver	±2.0 A	50 V	3958
PWM Current-Controlled Dual Full Bridge	±800 mA	33 V	3964
PWM Current-Controlled Dual Full Bridge	±650 mA	30 V	3966
PWM Current-Controlled Dual Full Bridge	±650 mA	30 V	3968
PWM Current-Controlled Dual Full Bridge	±750 mA	45 V	6219
OTHER INTEGRATED CIRCUIT & PMCM MOTOR DRIVERS			
Unipolar Stepper-Motor Quad Driver	1.8 A	50 V	2544
Unipolar Stepper-Motor Translator/Driver	1.25 A	50 V	5804
Unipolar Stepper-Motor Quad Drivers	1 A	46 V	7024 & 7029
Unipolar Stepper-Motor Quad Drivers	3 A	46 V	7026
Unipolar Microstepper-Motor Quad Driver	1.2 A	46 V	7042
Unipolar Microstepper-Motor Quad Driver	3 A	46 V	7044
Voice-Coil Motor Driver	±500 mA	6 V	8932–A
Voice-Coil Motor Driver	±800 mA	16 V	8958

* Current is maximum specified test condition, voltage is maximum rating. See specification for sustaining voltage limits or over-current protection voltage limits. Negative current is defined as coming out of (sourcing) the output.

† Complete part number includes additional characters to indicate operating temperature range and package style.

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