75 VOLT 10 AMP MOSFET H-BRIDGE PWM MOTOR DRIVER/AMPLIFIER

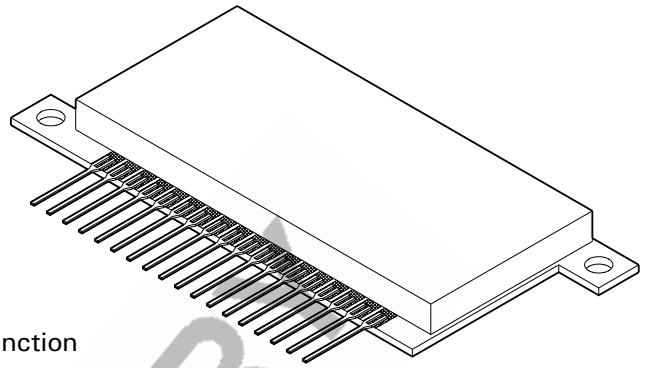
4224

M.S.KENNEDY CORP.

8170 Thompson Road Cicero, N.Y. 13039 (315) 699-9201

FEATURES:

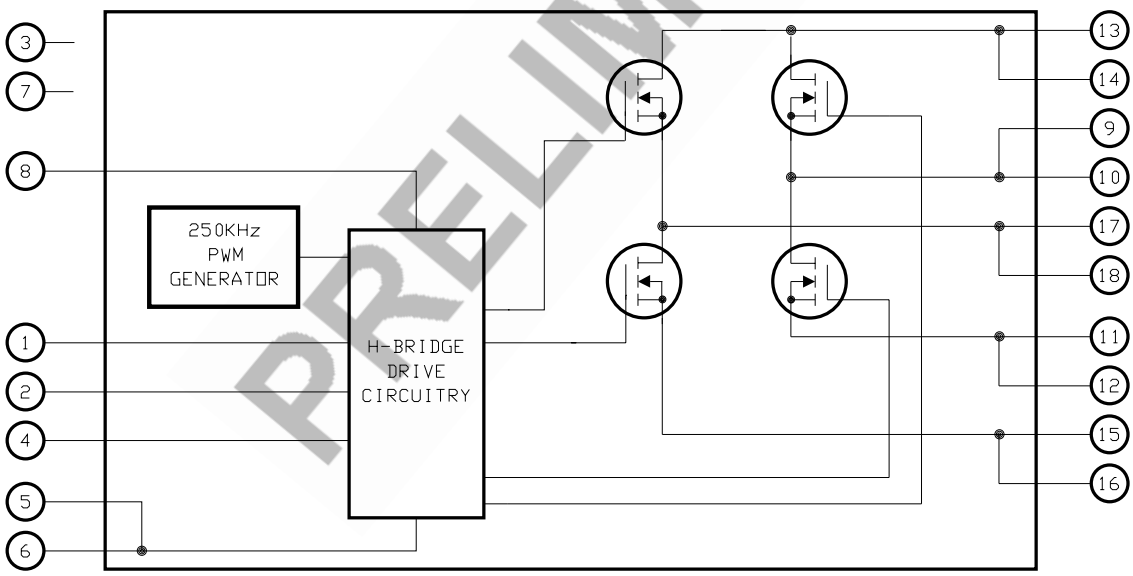
- Low RDS(ON) 0.020Ω Typical
- Low Cost Complete H-Bridge
- 10 Amp Capability, 75 Volt Maximum Rating
- Self-contained Smart Lowside/Highside Drive Circuitry
- Internal 250KHz PWM Generation, Shoot-through Protection
- Isolated Case Allows Direct Heatsinking
- Four Quadrant Operation, Torque Control Capability
- Logic Level Disable Input
- Logic Level High Side Enable Input for Special Modulation or Function



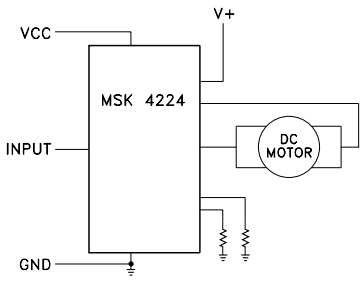
DESCRIPTION:

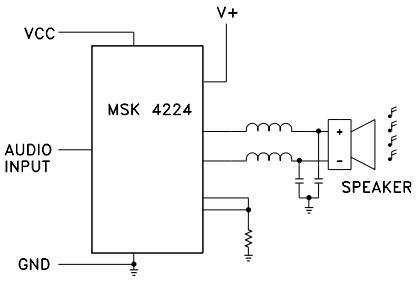
The MSK 4224 is a complete H-Bridge circuit to be used for DC brushed motor control or Class D switchmode amplification. All of the drive/control circuitry for the lowside and highside switches are internal to the circuit. The 250KHz PWM circuitry is internal as well, leaving the user to only provide an analog signal for the motor speed/ direction, or audio signal for switchmode audio amplification. The MSK 4224 is constructed on a space efficient ceramic coated insulated metal substrate that can be directly connected to a heatsink.

EQUIVALENT SCHEMATIC



TYPICAL APPLICATIONS





PIN-OUT INFORMATION

1	HEN	18	Output B
2	Disable	17	Output B
3	N/C	16	Rsense B
4	Input	15	Rsense B
5	Ground	14	V+
6	Ground	13	V+
7	N/C	12	Rsense A
8	Vcc	11	Rsense A
9	Output A	10	Output A

ABSOLUTE MAXIMUM RATINGS

$V+$ High Voltage Supply 75V
V_{CC} Logic Supply 16V
I_{OUT} Continuous Output Current 10A
I_{PK} Peak Output Current 20A
V_{OUT} Output Voltage Range .... GND -2V min. to V + max.
θJC Thermal Resistance ..... .5.3°C/W
(Output Switches)

T_{ST} Storage Temperature Range .... -65C to +150°C
T_{LD} Lead Temperature Range ....300°C
(10 Seconds)
T_C Case Operating Temperature
MSK4224 ....-25°C to +125°C
T_J Junction Temperature ....+150°C

ELECTRICAL SPECIFICATIONS

All Ratings: Tc = +25°C Unless Otherwise Specified

Parameter	Test Conditions 2	MSK 4224 Min.	Typ.	Max.	Units
OUTPUT CHARACTERISTICS					
RDS (ON) ④	Each MOSFET I_D = 10A	-	-	0.013	Ω
VDS(ON) Voltage ①	Each MOSFET I_D = 10A 3	-	TBD	TBD	V
Instantaneous Forward Voltage ①	Each MOSFET I_S = 10A Intrinsic Diode 3	-	TBD	TBD	V
Reverse Recovery Time ①	Intrinsic Diode	-	-	280	nS
Leakage Current ①	Each MOSFET V+ = 70V	-	1.0	25	uA
PWM Frequency		225	250	275	KHz
Vcc SUPPLY CHARACTERISTICS					
Quiescent Bias Current	Analog Input = 6V_{DC}	-	43	TBD	mA
Vcc Voltage Range ①		9	12	16	V
INPUT SIGNAL CHARACTERISTICS ①					
Analog Input Voltage	Output A,B = 50% Duty Cycle	-	6	-	V
Analog Input Voltage	Output A = 100% Duty Cycle High	-	4	-	V
Analog Input Voltage	Output B = 100% Duty Cycle High	-	8	-	V
LOGIC CONTROL INPUTS ①					
Disable Input	Input Voltage LO	-	-	0.8	V
	Input Voltage HI	2.7	-	-	V
	Input Current (DISABLE = 0V)	-	-	-135	uA
HEN Input	Input Voltage LO	-	-	0.8	V
	Input Voltage HI	2.7	-	-	V
	Input Current (HEN = 0V)	-	-	-270	uA
SWITCHING CHARACTERISTICS ①	R_L = 100Ω				
Rise-Time		-	TBD	-	nS
Fall-Time		-	TBD	-	nS
Dead-Time		-	100	-	nS

NOTES:

① Guaranteed by design but not tested. Typical parameters are representative of actual device performance but are for reference only.
② Vcc = +12V unless otherwise specified.
③ Measure using a 300μS pulse with a 2% Duty Cycle.
④ On Resistance is specified for the Internal MOSFET for Thermal Calculations. It does not include the package pin resistance.

MSK 4224 PIN DESCRIPTIONS

VCC - Is the low voltage supply for powering internal logic and drivers for the lowside and highside MOSFETS. The supplies for the highside drivers are derived from this voltage.

V+ - Is the higher voltage H-bridge supply. The MOSFETS obtain the drive current from this supply pin. The voltage on this pin is limited by the drive IC. The MOSFETS are rated at 75 volts. Proper by-passing to GND with sufficient capacitance to suppress any voltage transients, and to ensure removing any drooping during switching, should be done as close to the pins of the module as possible.

OUTPUT A - Is the output pin for one half of the bridge. Decreasing the input voltage causes increasing duty cycles at this output.

OUTPUT B - Is the output pin for the other half of the bridge. Increasing the input voltage causes increasing duty cycles at this output.

RSENSE A - Is the connection for the bottom of the A half bridge. This can have a sense resistor connection to the V+ return ground for current limit sensing, or can be connected directly to ground. The maximum voltage on this pin is ±2 volts with respect to GND.

RSENSE B - Is the connection for the bottom of the B half bridge. This can have a sense resistor connection to the V+ return ground for current limit sensing, or can be connected directly to ground. The maximum voltage on this pin is ±2 volts with respect to GND.

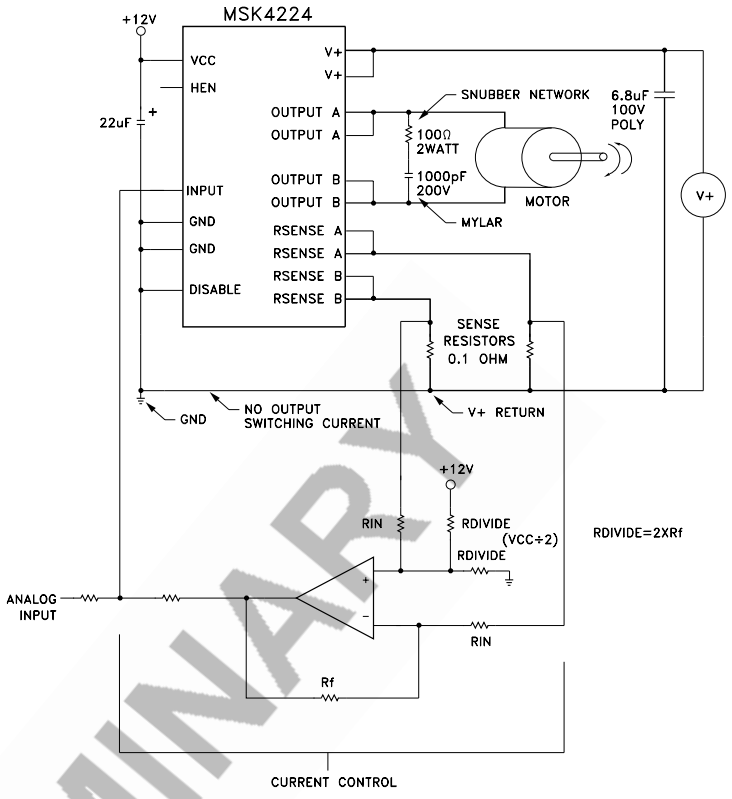
GND - Is the return connection for the input logic and Vcc.

INPUT - Is an analog input for controlling the PWM pulse width of the bridge. A voltage lower than Vcc/2 will produce greater than 50% duty cycle pulses out of OUTPUT A. A voltage higher than Vcc/2 will produce greater than 50% duty cycle pulses out of OUTPUT B.

DISABLE - Is the connection for disabling all 4 output switches. DISABLE high overrides all other inputs. When taken low, everything functions normally. An internal pullup to Vcc will keep DISABLE high if left unconnected.

HEN - Is the connection for enabling the high side output switches. When taken low, HEN overrides other inputs and the high side switches remain off. When HEN is high everything functions normally. An internal pullup to Vcc will keep HEN high if left unconnected.

TYPICAL SYSTEM OPERATION

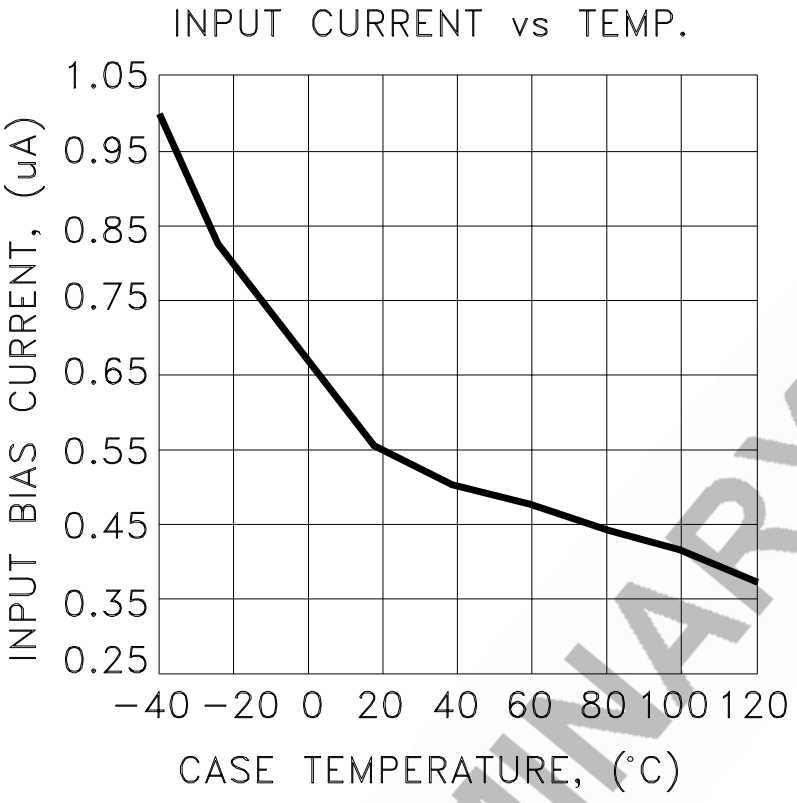


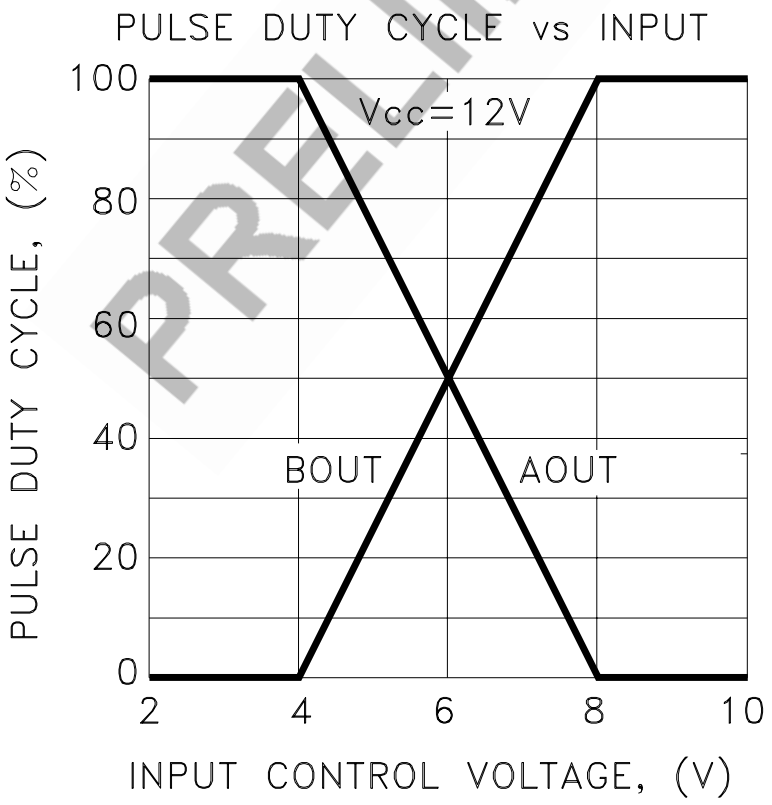
This is a diagram of a typical application of the MSK4224. The design Vcc voltage is +12 volts and should have a good low ESR bypass capacitor such as a tantalum electrolytic. The analog input can be an analog speed control voltage from a potentiometer, other analog circuitry or by microprocessor and a D/A converter. This analog input gets pulled by the current control circuitry in the proper direction to reduce the current flow in the bridge if it gets too high. The gain of the current control amplifier will have to be set to obtain the proper amount of current limiting required by the system.

Current sensing is done in this case by a 0.1 ohm sense resistor to sense current from both legs of the bridge separately. It is important to make the high current traces as big as possible to keep inductance down. The storage capacitor connected to the V+ and the module should be large enough to provide the high energy pulse without the voltage sagging too far. A low ESR ceramic capacitor or large polypropylene capacitor will be required. Mount the capacitor as close to the module as possible. The connection between GND and the V+ return should not be carrying any motor current. The sense resistor signal is common mode filtered as necessary to feed the limiting circuitry for the microprocessor. This application will allow full four quadrant torque control for a closed loop servo system.

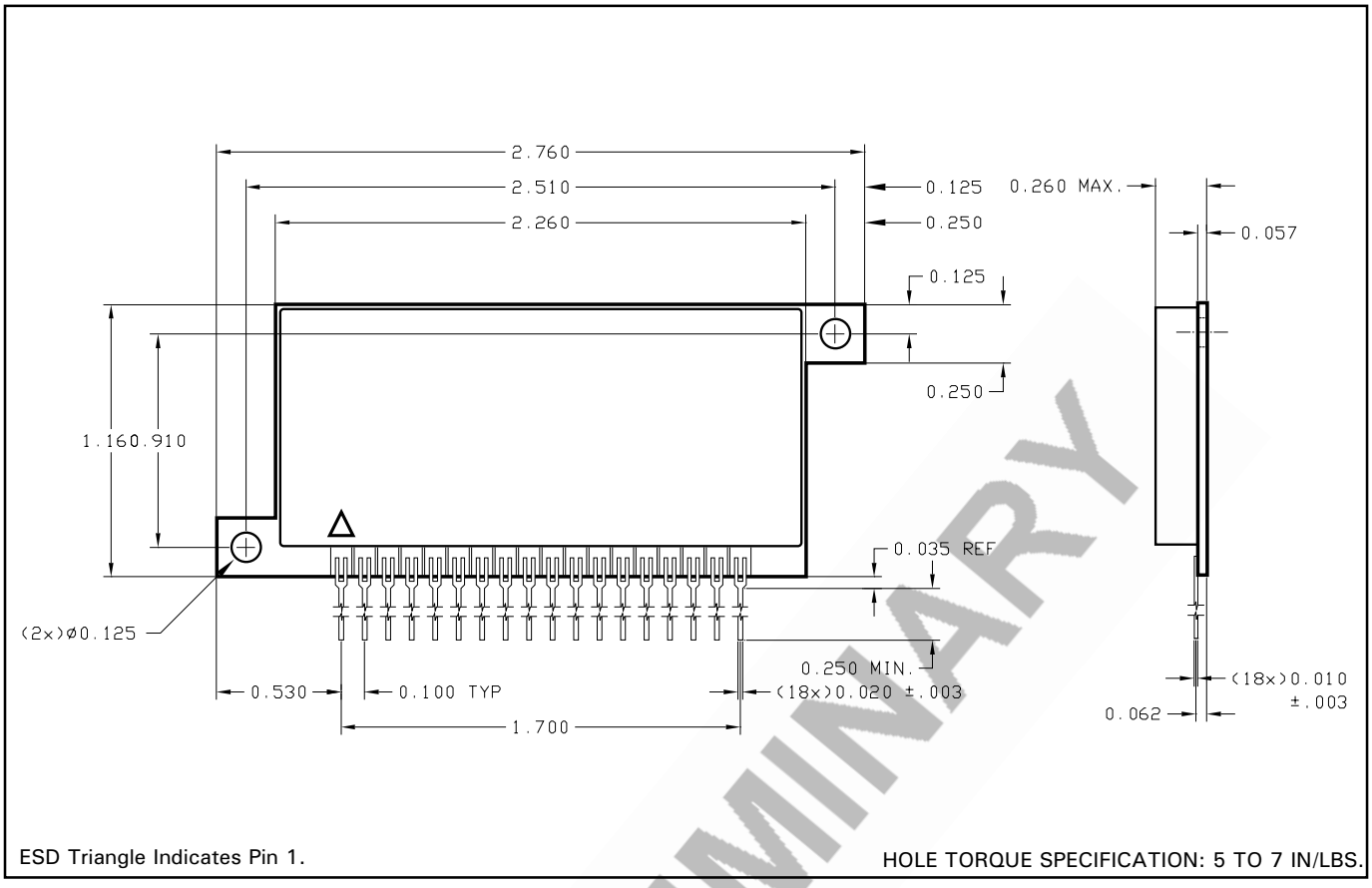
A snubber network is usually required, due to the inductance in the power loop. It is important to design the snubber network to suppress any positive spikes above 70V and negative spikes below -2V with respect to ground.

TYPICAL PERFORMANCE CURVES





MECHANICAL SPECIFICATIONS



NOTE: ALL DIMENSIONS ARE ±0.010 UNLESS OTHERWISE LABELED.

ORDERING INFORMATION

Part Number	Screening Level
MSK4224	Industrial

M.S. Kennedy Corp.
8170 Thompson Rd., Cicero, New York 13039-9393
Tel. (315) 699-9201
FAX (315) 699-8023