MIL-PRF-38534 CERTIFIED

75 VOLT 20 AMP MOSFET H-BRIDGE WITH GATE DRIVE

4226

M.S.KENNEDY CORP.

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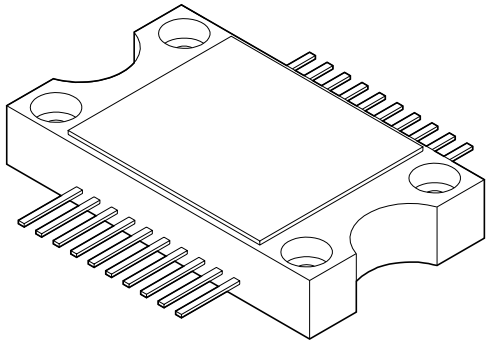


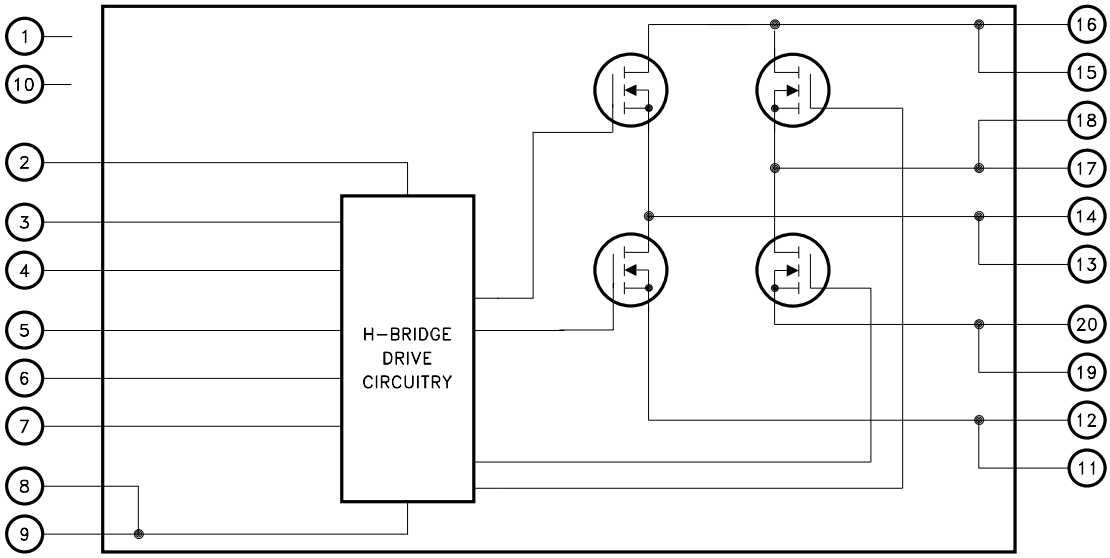
FEATURES:

- Low RDS(ON) 0.013Ω Typical
- Low Cost Complete H-Bridge
- 20 Amp Capability, 75 Volt Maximum Rating
- Self-contained Smart Lowside/Highside Drive Circuitry
- Shoot-through Protection
- Isolated Case Allows Direct Heatsinking
- Logic Level Disable Input
- Individual Logic Level Gate Drive Inputs for Various Modulation Schemes

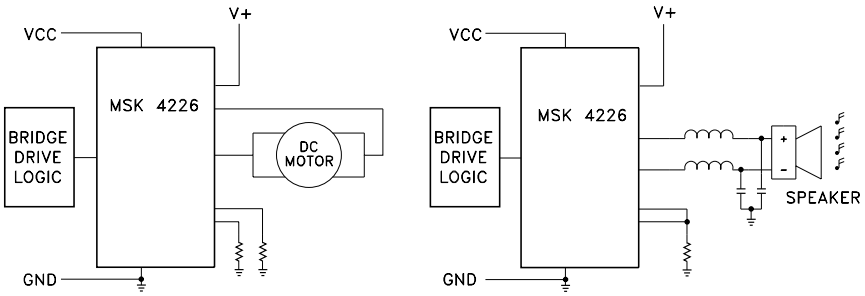
DESCRIPTION:

The MSK 4226 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. Logic level inputs are provided for controlling each MOSFET independently, allowing every possible switch combination except those that would cause a simultaneous conduction or shoot-through condition for each half bridge. This gives the user freedom to use various modulation schemes for PWM control. The MSK 4226 is constructed in a space efficient plastic power package that can be directly bolted to a heatsink.

EQUIVALENT SCHEMATIC



TYPICAL APPLICATIONS



PIN-OUT INFORMATION

1	NC	20	RSENSE A
2	VCC	19	RSENSE A
3	BHI	18	OUTPUT A
4	DIS	17	OUTPUT A
5	BLI	16	V+
6	AHI	15	V+
7	ALI	14	OUTPUT B
8	GND	13	OUTPUT B
9	GND	12	RSENSE B
10	NC	11	RSENSE B

ABSOLUTE MAXIMUM RATINGS ⑤

$V+$	High Voltage Supply 75V	T_{ST}	Storage Temperature Range . . -55°C to +125°C
V_{CC}	Logic Supply 16V	T_{LD}	Lead Temperature Range . . . . . 300°C (10 Seconds)
I_{OUT}	Continuous Output Current 20A	T_C	Case Operating Temperature MSK4226 . . . . . -40°C to +85°C
I_{PK}	Peak Output Current 40A	T_J	Junction Temperature . . . . . +150°C
V_{OUT}	Output Voltage Range . . GND -2V min. to V + max.		
θJC	Thermal Resistance . . . . . 3.0°C/W (Output Switches @ 125°C)		

ELECTRICAL SPECIFICATIONS

Tc = +25°C Unless Otherwise Specified

Parameter	Test Conditions ②	MSK 4226 Min.	Typ.	Max.	Units
OUTPUT CHARACTERISTICS					
RDS (ON) ① ④	Each MOSFET I_D = 20A	-	-	0.013	Ω
VDS(ON) Voltage	Each MOSFET I_D = 20A ③	-	0.45	0.52	V
Instantaneous Forward Voltage	Each MOSFET I_S = 20A Intrinsic Diode ③	-	1.0	1.3	V
Reverse Recovery Time ①	Intrinsic Diode	-	-	280	nS
Leakage Current	Each MOSFET V+ = 70V	-	10	250	uA
Vcc SUPPLY CHARACTERISTICS					
Quiescent Bias Current		-	29	50	mA
Vcc Voltage Range ①		10	12	15	V
LOGIC CONTROL INPUTS,ALI,BLI,AHI,BHI and DIS ①					
Input Voltage LO		-	-	0.8	V
Input Voltage HI		2.7	-	-	V
Input Current (V_{IN} = 0V)		-	-	270	uA
SWITCHING CHARACTERISTICS ①	R_L = 100Ω				
Rise Time		-	40	-	nS
Fall Time		-	30	-	nS
Dead Time		-	45	-	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, V+ = 28V, RSENSE A,B = Ground, DIS = 0V unless otherwise specified.
③ Measured 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.
⑤ Continuous operation at or above absolute maximum ratings may adversely effect the device performance and/or life cycle.

MSK 4226 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.

DIS - 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.

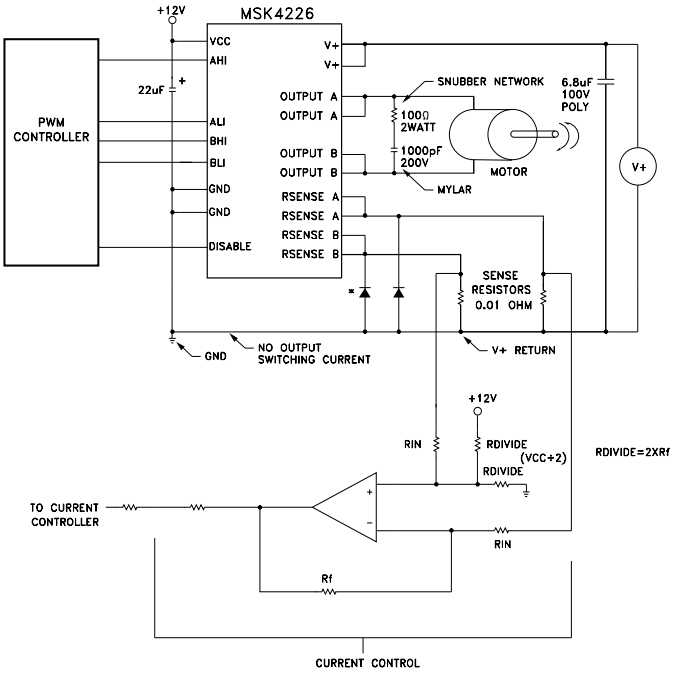
ALI - Is the logic level digital input for controlling the lowside MOSFET in the A half bridge. If AHI is driven high or not connected externally then ALI controls both the lowside and highside MOSFETs, with dead time in between. This is due to the simultaneous conduction lockout feature. DIS will override the ALI input.

AHI - Is the logic level digital input for controlling the highside MOSFET in the A half bridge. ALI high level input will override this input to prevent simultaneous conduction. DIS will override the AHI input.

BLI - Is the logic level digital input for controlling the lowside MOSFET in the B half bridge. If BHI is driven high or not connected externally then BLI controls both the lowside and highside MOSFETs, with dead time in between. This is due to the simultaneous conduction lockout feature. DIS will override the BLI input.

BHI - Is the logic level digital input for controlling the highside MOSFET in the B half bridge. BLI high level input will override this input to prevent simultaneous conduction. DIS will override the BHI input.

TYPICAL SYSTEM OPERATION



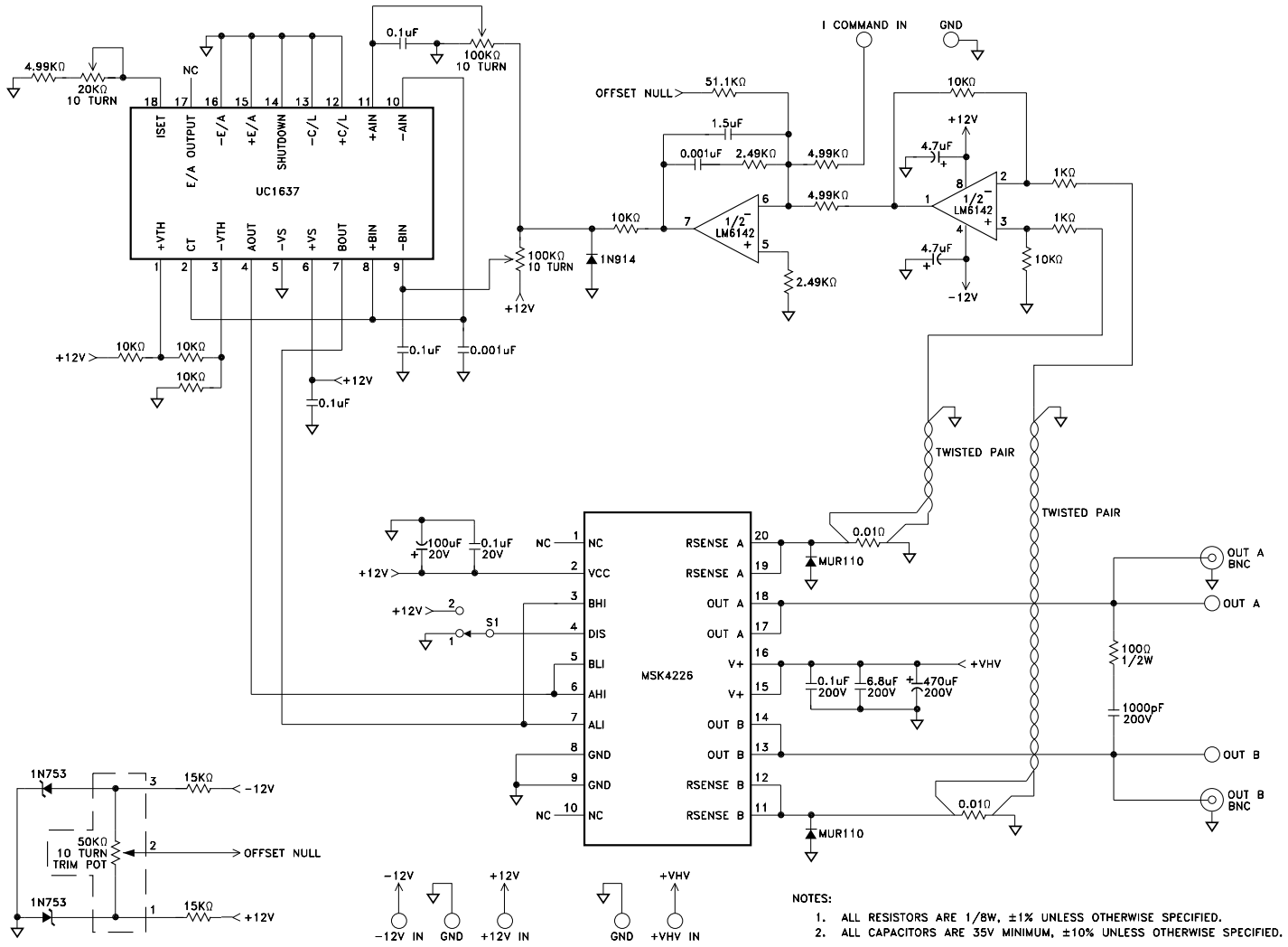
This is a diagram of a typical application of the MSK4226. The design Vcc voltage is + 12 volts and should have a good low ESR bypass capacitor such as a tantalum electrolytic. The digital inputs can come from a microprocessor or any type of PWM controller. The controller will use the current sense signal to either control current through PWM, current limit the bridge, or both.

Current sensing is done in this case by a 0.01 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. Any modulation scheme may be used, however, but the current sensing scheme may have to change.

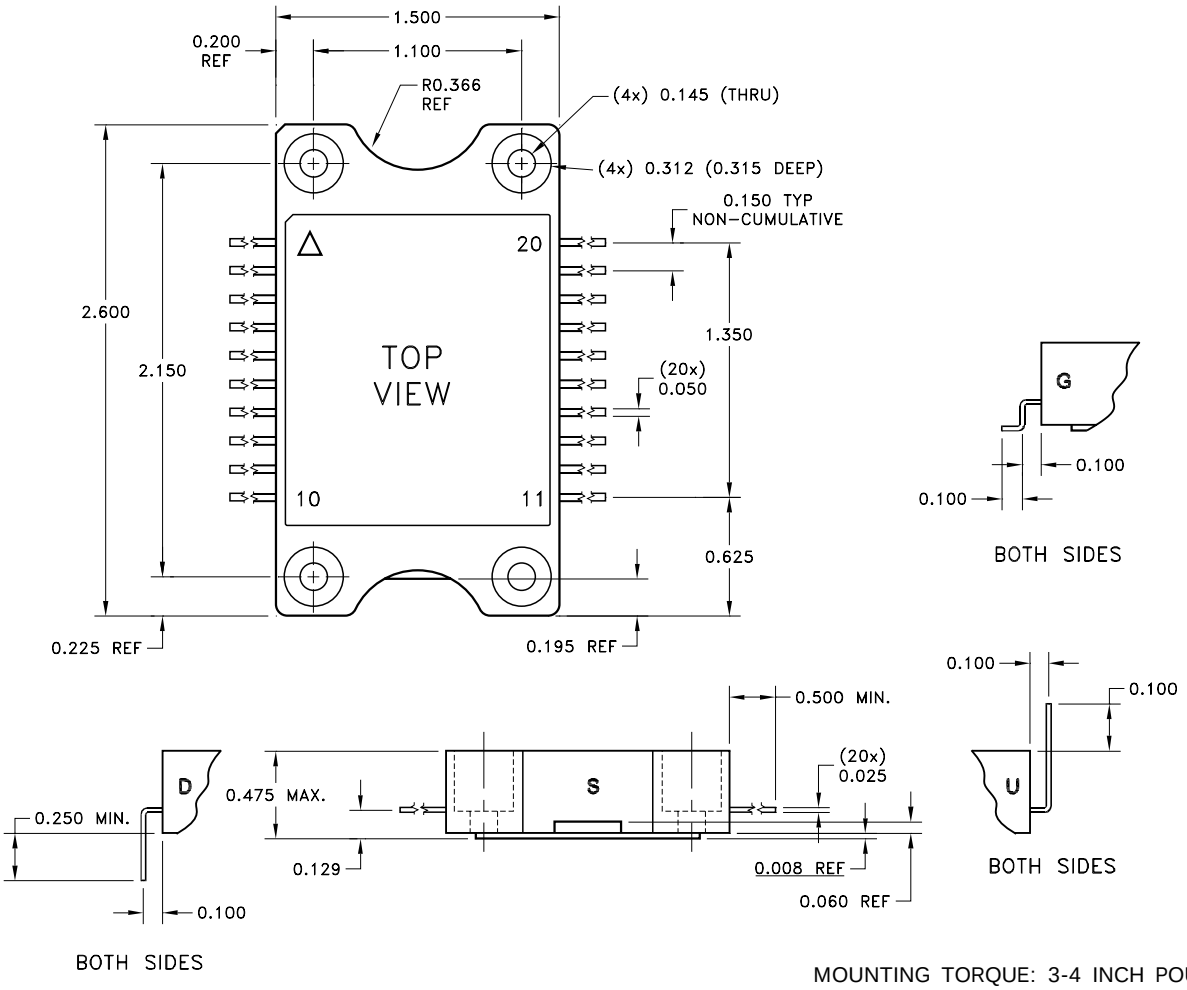
A snubber network is usually required, due to the inductance in the power loop. It is important to design the snubber network to suppress any positive spikes above 70V and negative spikes below -2V with respect to ground.

*There are certain inductive load situations that can possibly cause a momentary shoot-through or cross-conduction condition in the MSK4226. This shoot-through is approximately 100nSec long and can be several amps, depending on the layout and impedence of the bypassing circuit. Most bypassing and current sensing filtering will usually eliminate the effects. However, in the case where it is still present, or the sense resistor trace lengths are long, reverse-biased ultra-fast recovery diodes or power schottky diodes from RSENSE A and RSENSE B to power ground will minimize or eliminate the situation.

MSK4226 EVALUATION SCHEMATIC



MECHANICAL SPECIFICATIONS



NOTE: ALL DIMENSIONS ARE ± 0.010 UNLESS OTHERWISE LABELED.

ORDERING INFORMATION

Part Number	Screening Level	Lead Configuration
MSK4226S	Industrial	Straight
MSK4226D	Industrial	Down
MSK4226U	Industrial	Up
MSK4226G	Industrial	Gull Wing

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