



**70 VOLT 10 AMP RAD-HARD
H-BRIDGE PWM MOTOR
DRIVER/AMPLIFIER**

4202RH

M.S.KENNEDY CORP.

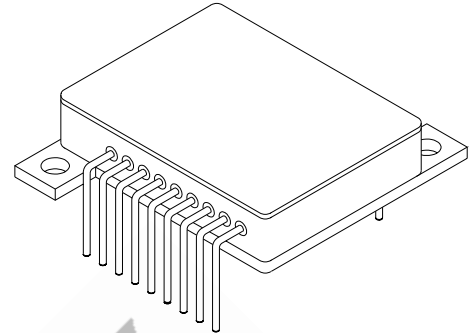
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FEATURES:

- User Adjustable PWM Frequency
- 70 Volt, 10 Amp Capability
- Self-Contained Smart Lowside/Highside Drive Circuitry
- Internal PWM Generation, Shoot-through Protection
- Isolated Case Allows Direct Heatsinking
- On Board 5Volt Rad-Hard Regulator
- Available Fully Screened To MIL-PRF-38534 Class K and Class H
- Total Dose Rated to 100K RAD
- Logic Level High Side Enable Control
- Logic Level Disable Input

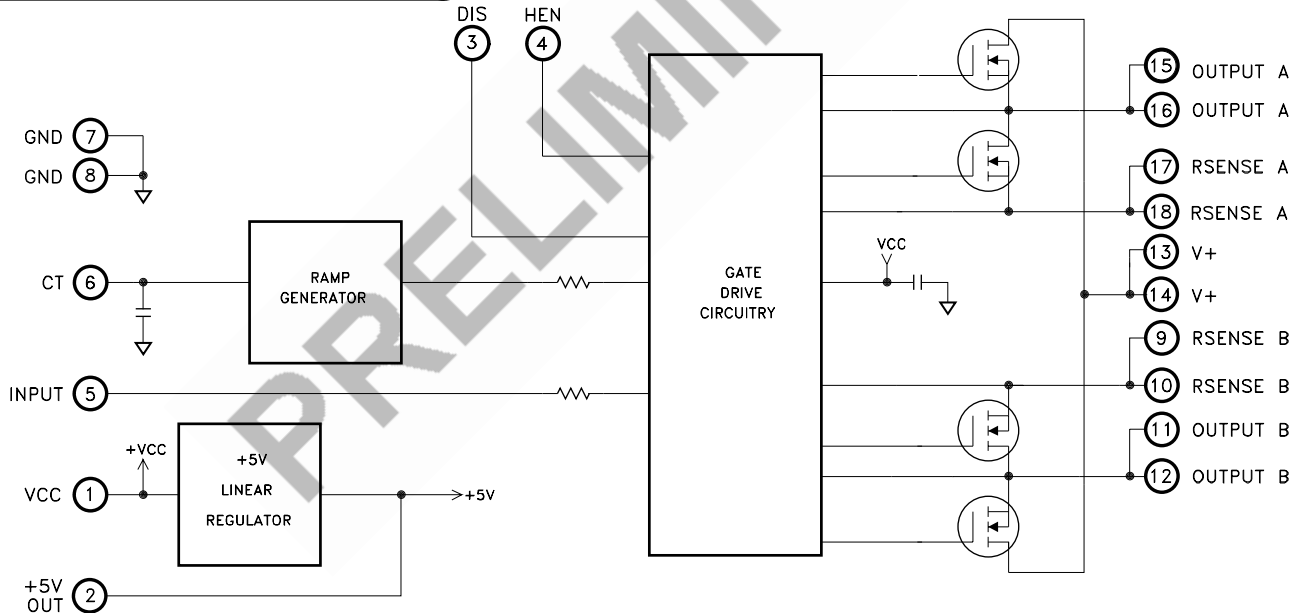
**MIL-PRF-38534 QUALIFIED
CERTIFIED TO CLASS K**



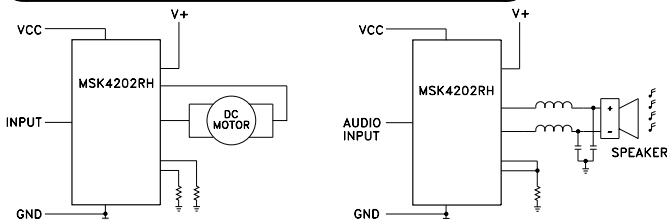
DESCRIPTION:

The MSK 4202RH is a radiation hardened complete H-Bridge hybrid intended for use in DC brushed motor control applications or Class D switchmode amplification in space or other severe operating environments. The design will exhibit high resistance to Single Event Effects (SEE), Single Event Gate Rupture (SEGR), total dose up to 100K RAD and neutron tolerance for military applications. All of the drive/control circuitry for the lowside and highside switches are internal to the hybrid, as well as a +5V linear regulator. The 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 4202RH is packaged in a space efficient isolated 18 pin power package available in three lead form configurations that can be directly connected to a heatsink.

EQUIVALENT SCHEMATIC



TYPICAL APPLICATIONS



ELECTRICAL SPECIFICATIONS

Parameter	Test Conditions ①	Subgroup Group A ④	MSK 4202RH ③			Units
			Min.	Typ.	Max.	
OUTPUT CHARACTERISTICS						
VDS(ON) Voltage (Each MOSFET)	ID = 10A	1	-	0.5	1.0	V
		2	-	1.0	2.0	V
		3	-	0.2	1.0	V
Instantaneous Forward Voltage, Each MOSFET ② (Intrinsic Diode)	IS = 10A	1	-	TBD	1.8	V
		2	-	TBD	1.9	V
		3	-	TBD	1.8	V
RDS (ON) each mosfet ② ⑥	ID = 10A TC = 125°C	-	-	0.075	0.1	Ω
Leakage Current, Each MOSFET ②	V+ = 70V	1	-	25	50	uA
		2	-	100	500	uA
		3	-	25	50	uA
PWM Frequency	CT = N/C	4,5,6	40	45	50	KHz
	CT = 300pF TO GND	4,5,6	TBD	20	TBD	KHz
VCC SUPPLY CHARACTERISTICS						
Quiescent Current	VIN = 2.5V	1,2,3	-	20	TBD	mA
+5V OUT	IOUT = 0mA	1,2,3	4.9	5.0	5.1	V
	IOUT = 100mA	1,2,3	4.75	5.0	5.25	V
OUTPUT DUTY CYCLE						
	VIN = 2.5VDC Both Outputs	4,5,6	40	50	60	%
VIN = 5V	Output A = 100% Duty Cycle High Output B = 0% Duty Cycle Low	7	-	Verify	-	P/F
	Output A = 0% Duty Cycle Low Output B = 100% Duty Cycle High	7	-	Verify	-	P/F
SWITCHING CHARACTERISTICS ②						
Rise-Time	RL = 1K A to B	-	-	75	TBD	nS
Fall-Time	RL = 1K A to B	-	-	350	TBD	nS
Dead-Time	RL = 1K A to B	-	-	100	-	nS
LOGIC CONTROL INPUTS						
DIS Input ②	Input Voltage LO	1,2,3	-	-	0.8	V
	Input Voltage HI	1,2,3	2.0	-	-	V
	Input Current (High or Low)	1,2,3	-	±100	±250	uA
HEN Input ②	Input Voltage LO	1,2,3	-	-	0.8	V
	Input Voltage HI	1,2,3	2.0	-	-	V
	Input Current (High or Low)	1,2,3	-	±100	±250	uA

NOTES:

- ① VCC = 12V, V+ = 28V, RSENSE A,B = Ground, CT = N/C, DIS = 0V, HEN = N/C unless otherwise specified
- ② Guaranteed by design but not tested. Typical parameters are representative of actual device performance but are for reference only.
- ③ Devices shall be 100% tested to subgroups 1,2,3,4, and 7. Subgroup 5 and 6 testing available upon request.
- ④ Subgroup 1,4,7 TA = TC = +25°C
2,5 TA = TC = +125°C
3,6 TA = TC = -55°C
- ⑤ Industrial grade devices shall be 100% tested at 25°C only.
- ⑥ The internal on resistance is for the die only. This should be used for thermal calculations only.

ABSOLUTE MAXIMUM RATINGS

V+	High Voltage Supply	70V
V _{CC}	Logic Supply	16V
I _{OUT}	Continuous Output Current	10A
I _{PK}	Peak Output Current	23A
V _{OUT}	Output Voltage Range	GND-2V min. to V+ max.
I _{OUT}	(+5V Regulator)	500mA
V _{IN}	Input Voltage	5.5V
V _{IN}	Logic Input Voltage	0V to TBD

T _{ST}	Storage Temperature Range	-65°C to +150°C
T _{LD}	Lead Temperature Range (10 Seconds)	300°C
T _C	Case Operating Temperature	-55°C to +125°C
T _J	Junction Temperature	+175°C
θ _{Jc}	Thermal Resistance (Output FETS)	2.0°C/W
	(+5Vout Regulator)	12°C/W

APPLICATION NOTES

MSK 4202RH 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. The +5V regulator also gets its supply voltage from this pin.

V+ - Is the high 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 100 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 on the hybrid as possible.

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

OUTPUT B - Is the output pin for the other half of the bridge. Decreasing 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 higher than 2.5V will produce greater than 50% duty cycle pulses out of OUTPUT A. A voltage lower than 2.5V will produce greater than 50% duty cycle pulses out of OUTPUT B.

DIS - Is the connection for disabling all 4 output switches. DIS high overrides all other inputs. When taken low, everything functions normally. An internal pullup to Vcc will keep DIS high if left unconnected. This pin should be grounded if not used.

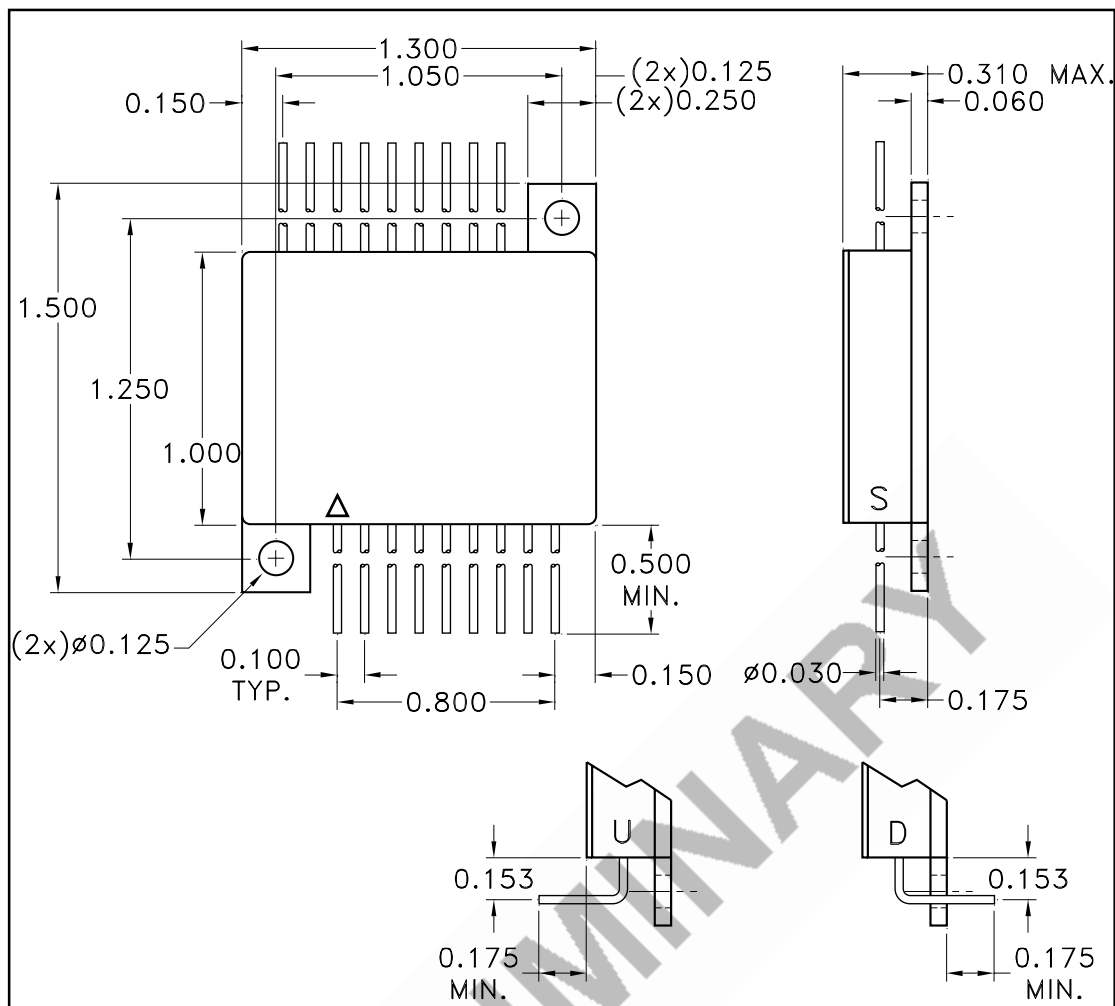
HEN - Is the connection for enabling the high side output switches. When taken low, HEN overrides other inputs and the high side switches remain off. When HEN is high, everything functions normally. An internal pullup to Vcc will keep HEN high if left unconnected.

+5V OUT - Is the output of the internal linear regulator. This pin should be bypassed to GND using a 4.7μF tantalum capacitor and a 0.1μF ceramic capacitor. This pin can supply up to 500mA of output current for powering other external circuitry, depending on case temperature and input voltage.

CT - Is a connection to the internal ramp generator. An external capacitor can be connected from this pin to GND to lower the PWM frequency. The following chart is useful to determine a capacitor for a lower PWM frequency.

CT (pF)	PWM FREQUENCY
TBD	1KHz
TBD	10KHz
TBD	15KHz
TBD	20KHz
TBD	25KHz
TBD	35KHz
TBD	40KHz

MECHANICAL SPECIFICATIONS



ALL DIMENSIONS ARE ± 0.01 INCHES UNLESS OTHERWISE LABELED

ORDERING INFORMATION

MSK4202 H RH U

LEAD CONFIGURATIONS

S = STRAIGHT; U = BENT UP; D = BENT DOWN

RADIATION HARDENED

SCREENING

BLANK = INDUSTRIAL; H = MIL-PRF-38534 CLASS H

K = MIL-PRF-38534 CLASS K

GENERAL PART NUMBER

The above example is a Military grade class H hybrid with leads bent up.

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