MIL-PRF-38534 CERTIFIED

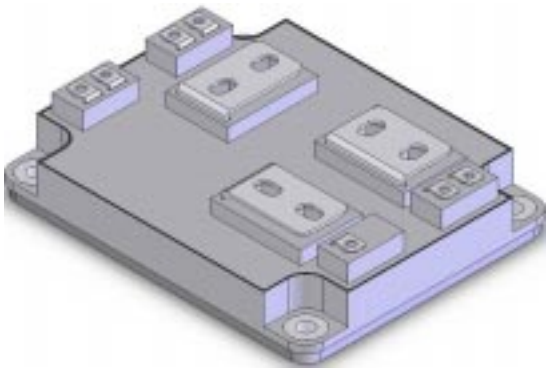
M.S.KENNEDY CORP.

600V/800A HALF BRIDGE PEM 4802

4707 Dey Road Liverpool, N.Y. 13088 (315) 701-6751

FEATURES:

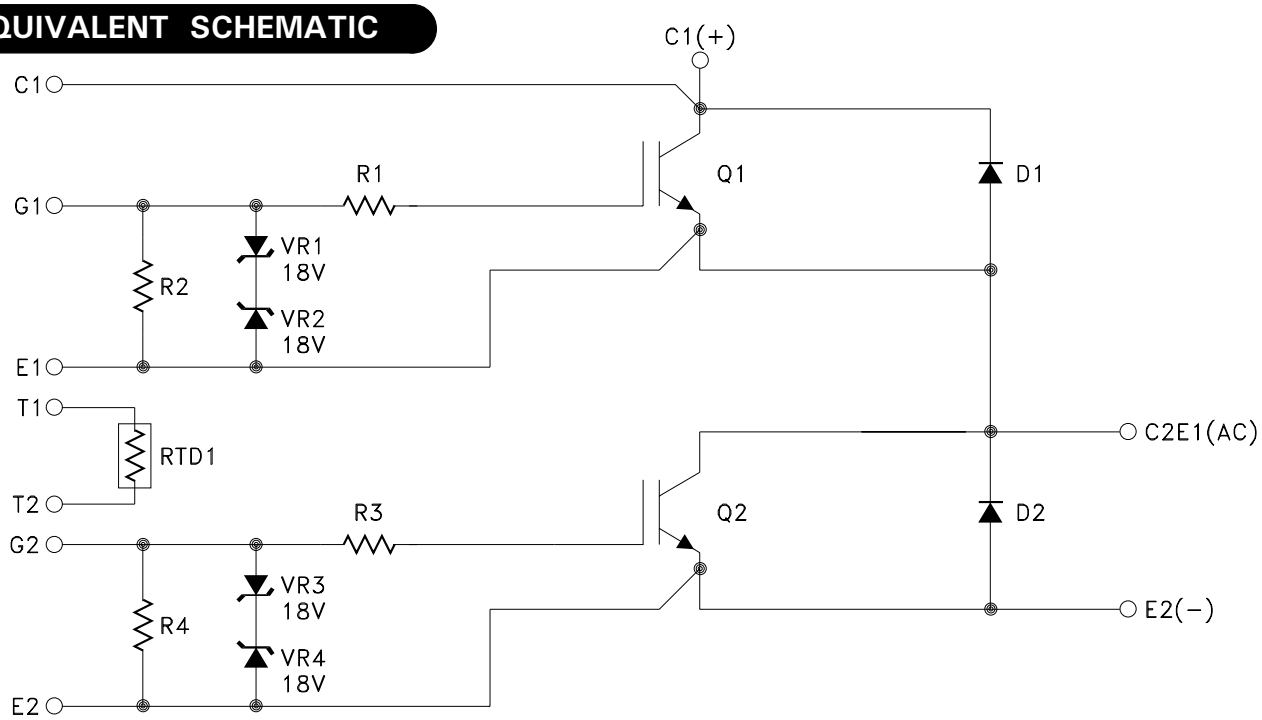
- Half Bridge Configuration
- 600V Rated Voltage
- 800A Continuous Output Current
- Internal Zener Clamps on Gates; Internal RTD
- Proprietary Encapsulation Provides Near Hermetic Performance
- MIL-PRF-38534 Screening Available (Modified)
- Light Weight Domed ALSIC Baseplate
- Robust Mechanical Design for Hi-Rel Applications
- Ultra-Low Inductance Internal Layout
- Withstands 96 Hours HAST and Thermal Cycling (-55°C to +125°C)
- High Side Collector Sense Pin for De-Sat Detection



DESCRIPTION:

The MSK 4802 is one of a family of plastic encapsulated modules (PEM) developed specifically for use in military, aerospace and other severe environment applications. The half bridge configuration and 600 volt/800 amp rating make it ideal for use in high current motor drive and inverter applications. The Aluminum Silicon Carbide (AlSiC) baseplate offers superior flatness and light weight; far better than the copper or copper alloys found in most high power plastic modules. The high thermal conductivity materials used to construct the MSK 4802 allow high power outputs at elevated baseplate temperatures. Our proprietary coating, SEES™ - Severe Environment Encapsulation System - protects the internal circuitry of MSK PEM's from moisture and contamination, allowing them to pass the rugged environmental screening requirements of military and aerospace applications. MSK PEM's are also available with industry standard silicone gel coatings for a lower cost option.

EQUIVALENT SCHEMATIC



TYPICAL APPLICATIONS

- Motor Drives
- Inverters

ABSOLUTE MAXIMUM RATING ⑦

V_{CE}	Collector to Emitter Voltage	600V	
V_{GE}	Gate to Emitter Voltage	±20V	
I_{OUT}	Current (Continuous)	800A	
I_{OUTP}	Current Pulsed (1mS)	1000A	
V_{CASE}	Case Isolation Voltage	2500 V	
T_{ST}	Storage Temperature Range	-55°C to +125°C	
T_J	Junction Temperature	150°C	
T_C	Case Operating Temperature Range		
	MSK 4802H/E	-55°C to +125°C	
	MSK 4802	-40°C to +85°C	

ELECTRICAL SPECIFICATIONS

Parameter ⑥	Test Conditions	Group A Subgroup	MSK 4800 H/E Min.	MSK 4800 H/E Typ.	MSK 4800 H/E Max.	MSK 4800 Min.	MSK 4800 Typ.	MSK 4800 Max.	Units
RTD Resistance	VCE = 0V, VGE = 0V, IC = 0A	1	1094	TBD	1098.5	1094	TBD	1098.5	Ω
		2	1476	TBD	1486	1476	TBD	1486	Ω
		3	785	TBD	791	785	TBD	791	Ω
Collector-Emitter Saturation Voltage	IC = 800A, VGE = 15V	1	-	TBD	2.5	-	TBD	2.6	V
		2	-	TBD	2.7	-	TBD	2.8	V
		3	-	TBD	2.6	-	TBD	2.7	V
	IC = 400A, VGE = 15V	1	-	TBD	1.9	-	TBD	2.0	V
		2	-	TBD	2.1	-	TBD	2.2	V
		3	-	TBD	2.1	-	TBD	2.2	V
Collector-Emitter Leakage Current	VCE = 600V, VGE = 0V	1	-	TBD	2.0	-	TBD	5.0	mA
		2	-	TBD	18	-	TBD	18	mA
		① 3	-	TBD	2.0	-	TBD	5.0	mA
Gate Threshold Voltage	IC = 100mA, VCE = 10V	1	4.0	TBD	7.5	-	TBD	7.9	V
		2	4.0	TBD	7.5	-	TBD	7.9	V
		3	4.0	TBD	8.5	-	TBD	8.9	V
Diode Forward Voltage	IC = 800A	1	-	TBD	2.5	-	TBD	2.6	V
		2	-	TBD	2.1	-	TBD	2.2	V
		3	-	TBD	2.8	-	TBD	2.9	V
	IC = 400A	1	-	TBD	2.0	-	TBD	2.1	V
		2	-	TBD	1.9	-	TBD	2.0	V
		3	-	TBD	2.3	-	TBD	2.4	V
Total Gate Charge ① Low Side Only	VCC = 350V, IC = 800A, VGE + 15V/-7V	4	-	TBD	6500	-	TBD	6500	nC
Eon ① Low Side Only	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 800A	4	-	TBD	40	-	TBD	40	mJ
	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 400A	4	-	TBD	30	-	TBD	30	mJ
	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 800A	5	-	TBD	-	-	TBD	-	mJ
	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 400A	5	-	TBD	-	-	TBD	-	mJ
Eoff ① Low Side Only	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 800A	4	-	TBD	60	-	TBD	60	mJ
	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 400A	4	-	TBD	30	-	TBD	30	mJ
	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 800A	5	-	TBD	-	-	TBD	-	mJ
	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 400A	5	-	TBD	-	-	TBD	-	mJ
Erec ① Low Side Only	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 800A	4	-	TBD	7	-	TBD	7	mJ
	VCC = 350V, RG = 2.5Ω, VGE = +15V/-7V, IC = 400A	4	-	TBD	6	-	TBD	6	mJ
Thermal Resistance ①	IGBT @ TJ = 125°C	4	-	TBD	0.045	-	TBD	0.045	°C/W
	Diode @ TJ = 125°C	4	-	TBD	0.075	-	TBD	0.075	°C/W

NOTES:

① Guaranteed by design but not tested. Typical parameters are representative of actual device performance but are for reference only.
② Industrial grade and "E" suffix devices shall be tested to subgroup 1 unless otherwise specified.
③ Military grade devices ("H" suffix) shall be 100% tested to subgroups 1, 2 and sample tested to subgroup 3.
④ Subgroup 4 testing available upon request.
⑤ Subgroup 1, 4 T_A = +25°C
2, 5 T_A = +125°C
3, 6 T_A = -55°C
⑥ Unless otherwise specified all specifications apply to both the upper and lower sections of the half bridge.
⑦ Continuous operation at or above absolute maximum ratings may adversly effect the device performance and/or life cycle

THERMAL CALCULATIONS

Power dissipation and maximum allowable temperature rise involve many variables working together. Collector current, PWM duty cycle and switching frequency all factor into power dissipation. DC losses or "ON-TIME" losses are simply V_{CE}(SAT) x Collector Current x PWM duty cycle. For the MSK 4802, V_{CE}(SAT) = TBDV max., and at 800 amps and a PWM duty cycle of 30%, DC losses equal TBD watts. Switching losses vary proportionally with switching frequency. The MSK 4802 typical switching losses at V_{CE} = 300V and I_{CE} = 800A are about TBDmJ, which is simply the sum of the turn-on switching loss and the turn-off switching loss. Multiplying the switching frequency times the switching losses will result in a power dissipation number for switching. The MSK 4802, at 5KHz, will exhibit switching power dissipation of TBD watts. The total losses are the sum of DC losses plus switching losses, or in this case, TBD watts total.

TBD watts x TBD°C/W thermal resistance equals TBD degrees of temperature rise between the case and the junction. Subtracting TBD°C from the maximum junction temperature of 150°C equals TBD°C maximum case temperature for this example.

V_{CE}(SAT) x IC x PWM duty cycle = TBDV x 800 amps x 30% = TBD watts DC losses

Turn-on switching loss + Turn-off switching loss = Total switching losses = TBD + TBD = TBDmJ

Total switching loss x PWM frequency = Total switching power dissipation = TBDmJ x 5KHz = TBD watts

Total power dissipation = DC losses + switching losses = TBD + TBD = TBD watts

Junction temperature rise above case = Total power dissipation x thermal resistance

TBD watts x TBD°C/W = TBD°C temperature rise above case

Maximum junction temperature - junction temperature rise = maximum baseplate temperature

150°C - TBD°C = TBD°C

TYPICAL PERFORMANCE CURVES

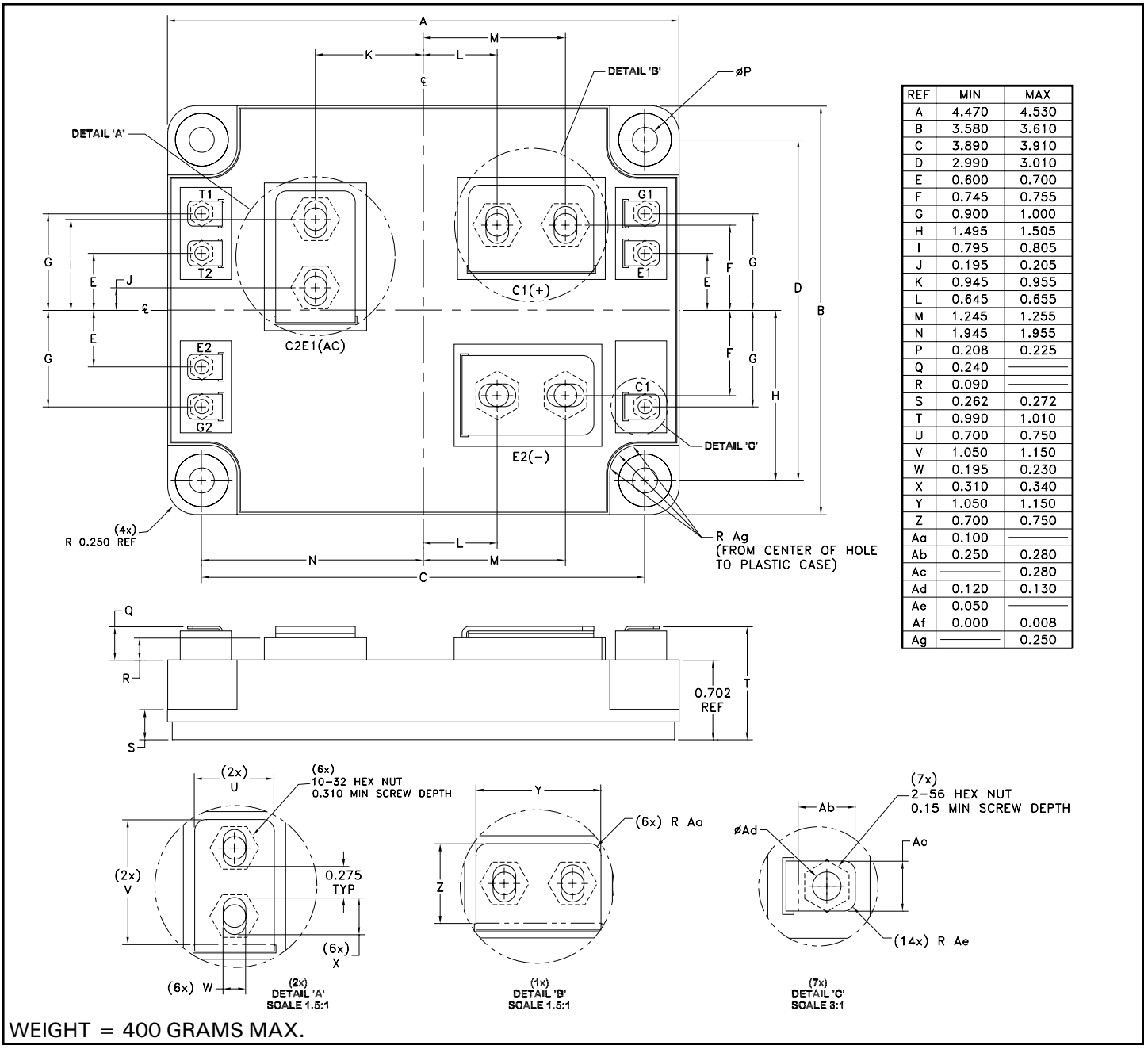
TBD

SCREENING CHART

OPERATION IN ACCORDANCE WITH MIL-PRF-38534	INDUSTRIAL	CLASS E	CLASS H
QUALIFICATION (MODIFIED)	NO	NO	YES
ELEMENT EVALUATION	NO	YES	YES
CLEAN ROOM PROCESSING	YES	YES	YES
NON DESTRUCT BOND PULL SAMPLE	YES	YES	YES
CERTIFIED OPERATORS	NO	YES	YES
MIL LINE PROCESSING	YES	YES	YES
MAX REWORK SPECIFIED	NO	YES	YES
ENCAPSULANT	GEL COAT	SEES™	SEES™
PRE-CAP VISUAL	YES - INDUSTRIAL	YES - CLASS H	YES - CLASS H
TEMP CYCLE (-55°C TO +125°C)	NO	YES	YES
BURN-IN	NO	YES - 96 HOURS	YES - 160 HOURS
ELECTRICAL TESTING	YES - 25°C	YES - 25°C	YES - FULL TEMP
EXTERNAL VISUAL	YES - SAMPLE	YES - SAMPLE	YES
XRAY	NO	NO	NO
PIN FINISH	NI	NI	NI

NOTE: ADDITIONAL SCREENING IS AVAILABLE SUCH AS XRAY, CSAM, MECHANICAL SHOCK, ETC. CONTACT FACTORY FOR QUAL STATUS.

MECHANICAL SPECIFICATIONS



REF	MIN	MAX
A	4.470	4.530
B	3.580	3.610
C	3.890	3.910
D	2.990	3.010
E	0.600	0.700
F	0.745	0.755
G	0.900	1.000
H	1.495	1.505
I	0.795	0.805
J	0.195	0.205
K	0.945	0.955
L	0.645	0.655
M	1.245	1.255
N	1.945	1.955
P	0.208	0.225
Q	0.240	———
R	0.090	———
S	0.262	0.272
T	0.990	1.010
U	0.700	0.750
V	1.050	1.150
W	0.195	0.230
X	0.310	0.340
Y	1.050	1.150
Z	0.700	0.750
Aa	0.100	———
Ab	0.250	0.280
Ac	———	0.280
Ad	0.120	0.130
Ae	0.050	———
Af	0.000	0.008
Ag	———	0.250

WEIGHT = 400 GRAMS MAX.

ORDERING INFORMATION

MSK4802 H

SCREENING

BLANK = INDUSTRIAL; E = EXTENDED RELIABILITY;
H = MIL-PRF-38534 CLASS H (MODIFIED)

GENERAL PART NUMBER

THE ABOVE EXAMPLE IS A MILITARY SCREENED MODULE.

M.S. Kennedy Corp.
4707 Dey Road Liverpool, New York 13088
Phone (315) 701-6751
FAX (315) 701-6752
www.mskennedy.com