



M.S.KENNEDY CORP.

# 600V/300A SCR/REGEN PEM

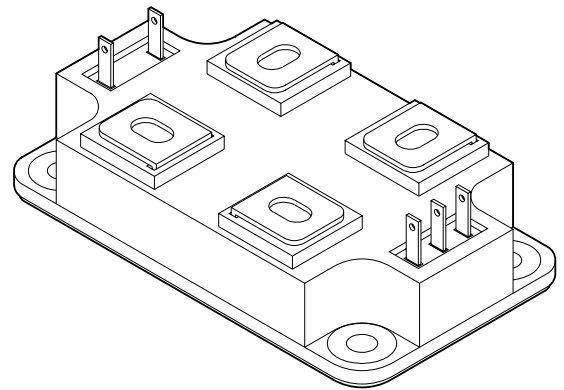
# 4890

4707 Dey Road Liverpool, N.Y. 13088

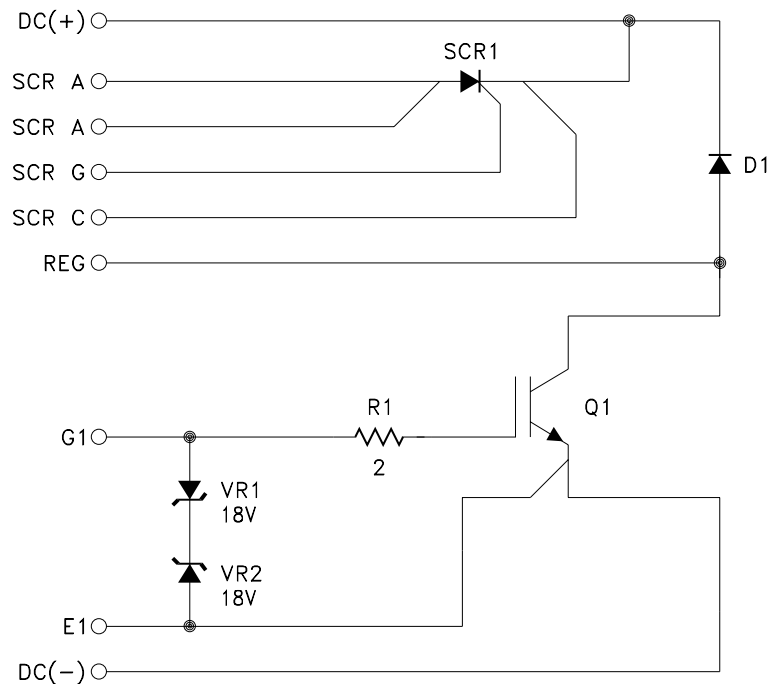
(315) 701-6751

**FEATURES:**

- SCR/REGEN Topology
- 600V Rated Voltage
- 300A Continuous IGBT Current
- Internal Zener Clamps on Gate
- 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)

**MIL-PRF-38534 CERTIFIED****DESCRIPTION:**

The MSK 4890 is one of a family of plastic encapsulated modules (PEM) developed specifically for use in military, aerospace and other severe environment applications. The SCR/REGEN configuration and 600 volt/300 amp rating make it ideal for use in high current motor drive and inverter brake 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 4890 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

VCE	Collector to Emitter Voltage . . . . .	600V
VGE	Gate to Emitter Voltage . . . . .	± 20V
ICC	Collector Current (Continuous) . . . . .	300A
ICC	Collector Current Pulsed (1mS) . . . . .	600A
IT	SCR Forward Current (Continuous) . . . . .	220A
ITSM	SCR Peak Surge Current (1/2 Cycle 60Hz) . . . . .	1100A
IF	REGEN Diode Current (Continuous) . . . . .	50A
IFP	REGEN Diode Current Pulsed (1mS) . . . . .	100A
VCASE	Case Isolation Voltage . . . . .	2500V

TST	Storage Temperature Range . . . . .	-55°C to +125°C
TJ	Junction Temperature . . . . .	150°C
Tc	Case Operating Temperature Range	
	MSK 4890H/E . . . . .	-55°C to +125°C
	MSK 4890 . . . . .	-40°C to +85°C

## ELECTRICAL SPECIFICATIONS

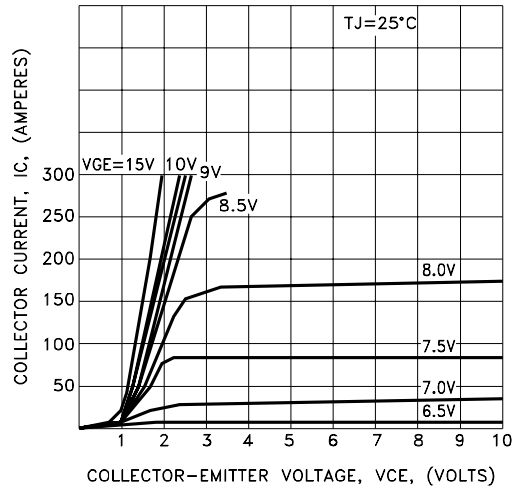
Parameter ⑥	Test Conditions	Group A Subgroup	MSK 4890 H/E			MSK 4890			Units
			Min.	Typ.	Max.	Min.	Typ.	Max.	
Collector-Emitter Saturation Voltage	IC = 300A, VGE = 15V	1	-	2.1	2.6	-	2.1	2.7	V
		2	-	2.1	2.6	-	2.1	2.7	V
		3	-	2.3	2.8	-	2.3	2.9	V
Collector-Emitter Leakage Current	VCE = 600V, VGE = 0V	1	-	0.05	1.0	-	0.05	1.5	mA
		2	-	2.0	7.5	-	2.0	8.0	mA
		① 3	-	0.05	1.5	-	0.05	2.0	mA
Gate Threshold Voltage	IC = 30mA, VCE = VGE	1	4.0	5.5	7.5	4.0	5.5	7.5	V
		2	4.0	4.5	7.5	4.0	4.5	7.5	V
		3	4.0	6.1	7.5	4.0	6.1	7.5	V
Gate Leakage Current	VCE = 0V, VGE = ± 15V	1	-10	0.2	10	-15	0.2	15	uA
		2	-10	0.8	10	-15	0.8	15	uA
		3	-10	0.1	10	-15	0.1	15	uA
Diode Forward Voltage	IF = 50A	1	-	1.4	2.4	-	1.4	2.5	V
		2	-	1.1	2.4	-	1.1	2.5	V
		3	-	1.5	2.6	-	1.5	2.7	V
SCR Leakage Current	VRRM = 600V	1	-	0.01	30	-	0.01	35	mA
		2	-	1.0	30	-	1.0	35	mA
		3	-	0.01	30	-	0.01	35	mA
SCR On Voltage	IF = 220A	1	-	1.0	1.35	-	1.0	1.5	V
		2	-	0.9	1.35	-	0.9	1.5	V
		3	-	1.1	1.5	-	1.1	1.6	V
SCR Holding Current		1	-	110	600	-	110	600	mA
		2	-	100	800	-	100	900	mA
		3	-	170	600	-	170	650	mA
Total Gate Charge ①	V = 300V, IC = 300A	4	-	170	2900	-	170	2900	nC
Turn-On Delay ①	V = 300V, IC = 300A, RG = 20Ω	4	-	630	900	-	630	900	nS
Rise Time ①	V = 300V, IC = 300A, RG = 20Ω	4	-	320	700	-	320	700	nS
Turn-Off Delay ①	V = 300V, IC = 300A, RG = 10Ω	4	-	0.9	2.1	-	0.9	2.1	uS
Fall Time ①	V = 300V, IC = 300A, RG = 10Ω	4	-	90	300	-	90	300	nS
Diode Reverse Recovery Time ①	IE = 50A, di/dt = 25A/uS	4	-	50	170	-	50	170	nS
Diode Reverse Recovery Charge ①	IE = 50A, di/dt = 25A/uS	4	-	0.26	2.5	-	0.26	2.5	uC
Thermal Resistance ①	IGBT @ TJ = 125°C	4	-	0.1	0.12	-	0.1	0.13	°C/W
	DIODE @ TJ = 125°C	4	-	0.6	0.8	-	0.6	0.85	°C/W
	SCR @ TJ = 125°C	4	-	0.12	0.19	-	0.12	0.20	°C/W

### NOTES:

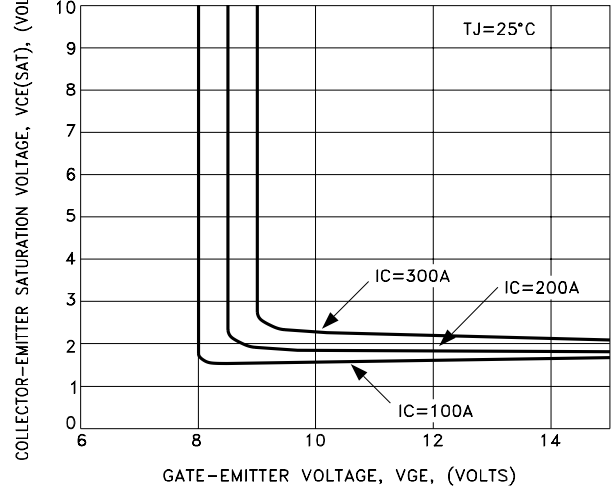
- ① Guaranteed by design but not tested. Typical parameters are representative of actual device performance but are for reference only.
- ② Industrial grade and "E" suffix devices shall be tested to subgroup 1 unless otherwise specified.
- ③ Military grade devices ("H" suffix) shall be 100% tested to subgroups 1, 2 and sample tested to subgroup 3.
- ④ Subgroups 4, 5 and 6 testing available upon request.
- ⑤ Subgroup 1, 4 TA = +25°C  
2, 5 TA = +125°C  
3, 6 TA = -55°C
- ⑥ VGE = 15V unless otherwise specified.
- ⑦ Continuous operation at or above absolute maximum ratings may adversely effect the device performance and/or life cycle.

# TYPICAL PERFORMANCE CURVES

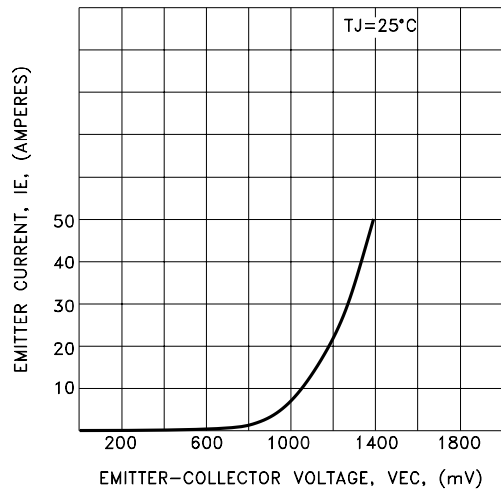
TYPICAL OUTPUT CHARACTERISTICS



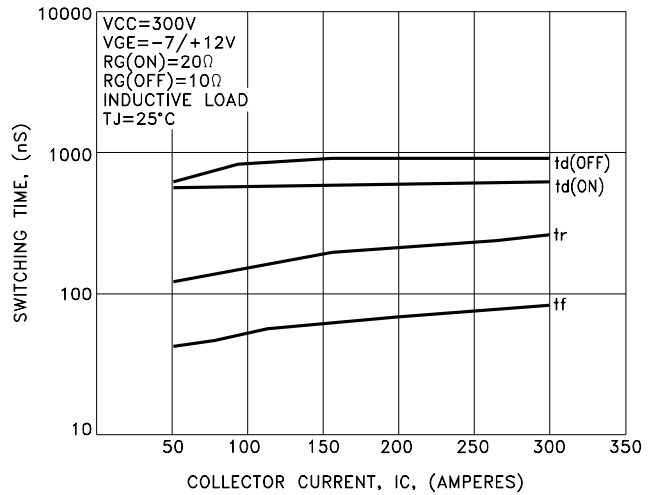
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS



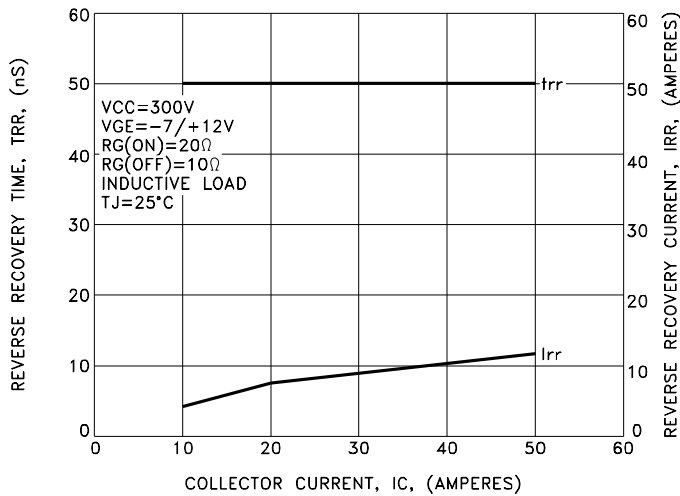
FREE-WHEEL DIODE FORWARD CHARACTERISTICS



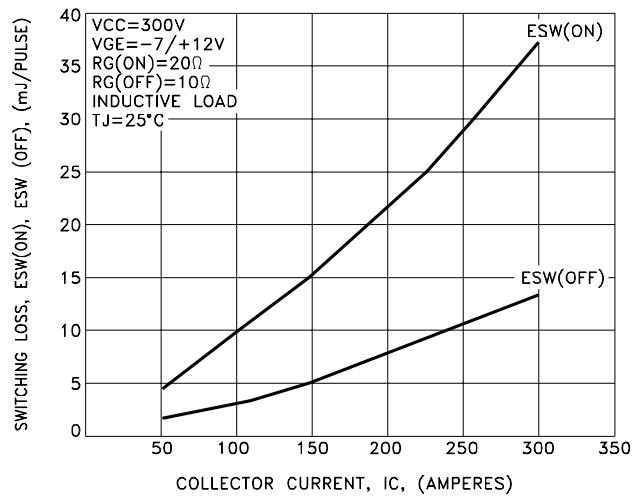
SWITCHING CHARACTERISTICS



REVERSE RECOVERY CHARACTERISTICS



SWITCHING LOSS vs. COLLECTOR CURRENT

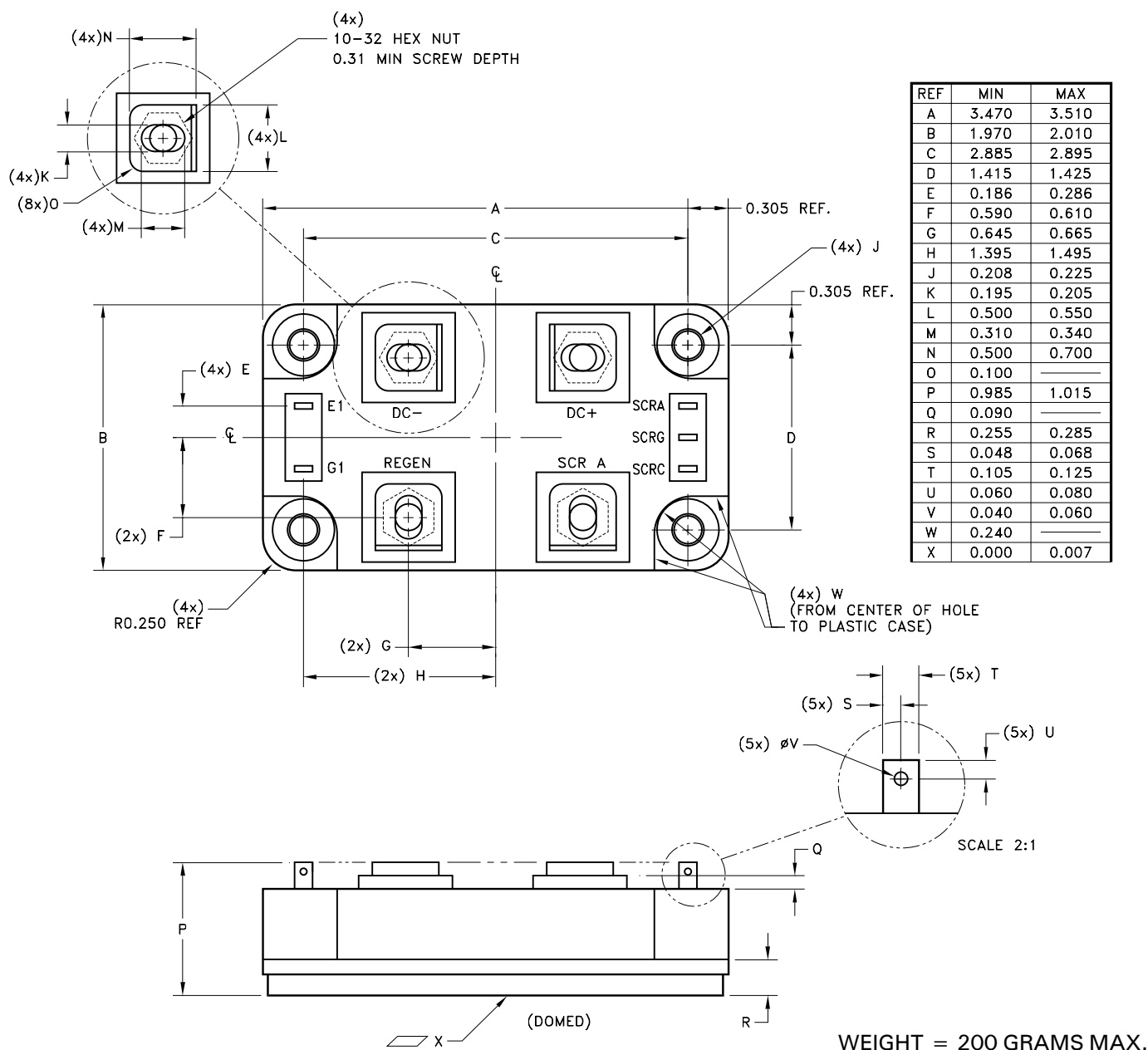


## SCREENING CHART

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



## ORDERING INFORMATION

**MSK4890 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

The information contained herein is believed to be accurate at the time of printing. MSK reserves the right to make changes to its products or specifications without notice, however, and assumes no liability for the use of its products. Please visit our website for the most recent revision of this datasheet.