

**HALF-BRIDGE
IGBT MODULE**

600V, 450A

Product Summary

Part Number	V _{CE}	I _C	V _{CE(SAT)}
GHP500HHBK06P2	600V	450A	1.8V



Description

The IR HiRel INT-A-Pak Series are isolated near hermetic power modules which combine the latest IGBT and Soft Recovery Rectifier Technology. The module uses both high-speed and low V_{CE(SAT)} IGBT's of ultra low thermal resistance junction to case. The G450HHBK06P2 power module consists of six IGBTs and six FREDs in a Phase-Leg or Half-Bridge configuration.

Features

- Rugged, Lightweight near Hermetic Package with Integrated Power Terminal Cap
- Gen 4 IGBT Technology
- Soft Recovery Rectifiers
- AISiC Baseplate and AlN Substrate
- Ultra Low Thermal Resistance
- Zener Gate Protection
- Very Low Conduction and Switching Loss
- -55°C to +125°C Operating Temperature
- Screening to meet the intent of MIL-PRF-38534 Class H
- Short Circuit Capability
- 2 Ohms Series Gate Resistance
- High Altitude Operation, 85,000 Feet above Sea Level at Rated Voltage

Absolute Maximum Ratings @ T_J = 25°C (unless otherwise specified)

Parameter	Symbol	Value	Units
Collector-to-Emitter Voltage	V _{CES}	600	V
Gate-to-Emitter Voltage	V _{GE}	±20	
Continuous Collector Current @ T _C = 25°C	I _C	600	A
Continuous Collector Current @ T _C = 70°C		450	
Isolation Voltage	V _{ISOL}	2500	V _{RMS}

Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
Collector Emitter Breakdown Voltage	V_{CES}	$V_{GE} = 0V$	600	—	—	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{GE} = 0V, V_{CE} = 600V$	—	—	2.0	mA
Gate Emitter Leakage Current	I_{GES}	$V_{GE} = \pm 15V, V_{CE} = 0V$	—	—	10	μA
On Characteristics						
Gate Threshold Voltage	$V_{GE(TH)}$	$V_{CE} = V_{GE}, I_C = 45\text{mA}$	4.0	—	7.5	V
Collector Emitter Saturation Voltage	$V_{CE(SAT)}$	$V_{GE} = 15V, I_C = 450A$	—	1.8	2.6	
Dynamic Characteristics						
Total Gate Charge	Q_G	$V_{CE} = 300V, I_C = 450A, V_{GE} = 15V$	—	2600	—	nC
Input Capacitance	C_{IES}	$V_{GE} = 0V, V_{CE} = 25V, f = 1.0\text{MHz}$	—	48	—	nF
Output Capacitance	C_{OES}		—	3.0	—	
Reverse Transfer Capacitance	C_{RES}		—	0.3	—	
Switching Inductive Load Characteristics						
Turn-On Delay Time	$t_{d(on)}$	$V_{CC} = 300V, I_C = 450A, V_{GE} = +15V$ $R_{G(on)} = 5\Omega, R_{G(off)} = 10\Omega, L = 200\mu\text{H}$	—	500	900	ns
Rise Time	t_r		—	280	700	
Turn-On Losses	E_{on}		—	20	—	mJ
Turn-Off Delay Time	$t_{d(off)}$		—	2600	3400	ns
Fall Time	t_f		—	500	650	
Turn-Off Losses	E_{off}		—	60	—	mJ
Diode Characteristics						
Forward Voltage	V_F	$I_F = 450A$	—	1.2	1.8	V
Reverse Recovery Charge	Q_{rr}	$V_R = 300V, I_F = 450A, di/dt = -1800A/\mu\text{s}$	—	15	36	μC
Peak Reverse Recovery Current	I_{rr}		—	160	—	A
Reverse Recovery Time	t_{rr}		—	180	260	ns

Electrical Characteristics @ $T_J = 125^\circ\text{C}$ (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
Collector Emitter Breakdown Voltage	V_{CES}	$V_{GE} = 0V$	600	—	—	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{GE} = 0V, V_{CE} = 600V$	—	—	18	mA
Gate Emitter Leakage Current	I_{GES}	$V_{GE} = \pm 15V, V_{CE} = 0V$	—	—	10	μA
On Characteristics						
Gate Threshold Voltage	$V_{GE(TH)}$	$V_{CE} = V_{GE}, I_C = 45\text{mA}$	4.0	—	7.5	V
Collector Emitter Saturation Voltage	$V_{CE(SAT)}$	$V_{GE} = 15V, I_C = 450A$	—	1.8	2.6	
Diode Characteristics						
Forward Voltage	V_F	$I_F = 450A$	—	1.2	1.8	V

Thermal-Mechanical Specifications

Parameter	Symbol	Min.	Typ.	Max.	Units
IGBT Thermal Resistance, Junction-to-Case, per Switch	R_{thJC}	—	0.05	0.07	$^\circ\text{C/W}$
Diode Thermal Resistance, Junction-to-Case, per Switch		—	0.10	0.13	
Operating Junction Temperature Range	T_J	-55	—	150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55	—	125	
Screw Torque - Mounting	T	—	—	26	in-lbs
Screw Torque - Terminals					
Module Weight		—	—	270	g

Module Screening

Test or Inspection	MIL-PRF-883		Comments
	Method	Condition	
Internal Visual	2017		
Temperature Cycle	1010	B	10 Cycles, -55°C to $+125^\circ\text{C}$
Mechanical Shock	2002	B	1500G, 0.5ms, 5 Times (Y1 direction only)
Burn-in	1015	A	160 Hrs @ $+125^\circ\text{C}$
Final Electrical Test			Group A, -55°C , $+25^\circ\text{C}$, $+125^\circ\text{C}$
External Visual	2009		

Schematic

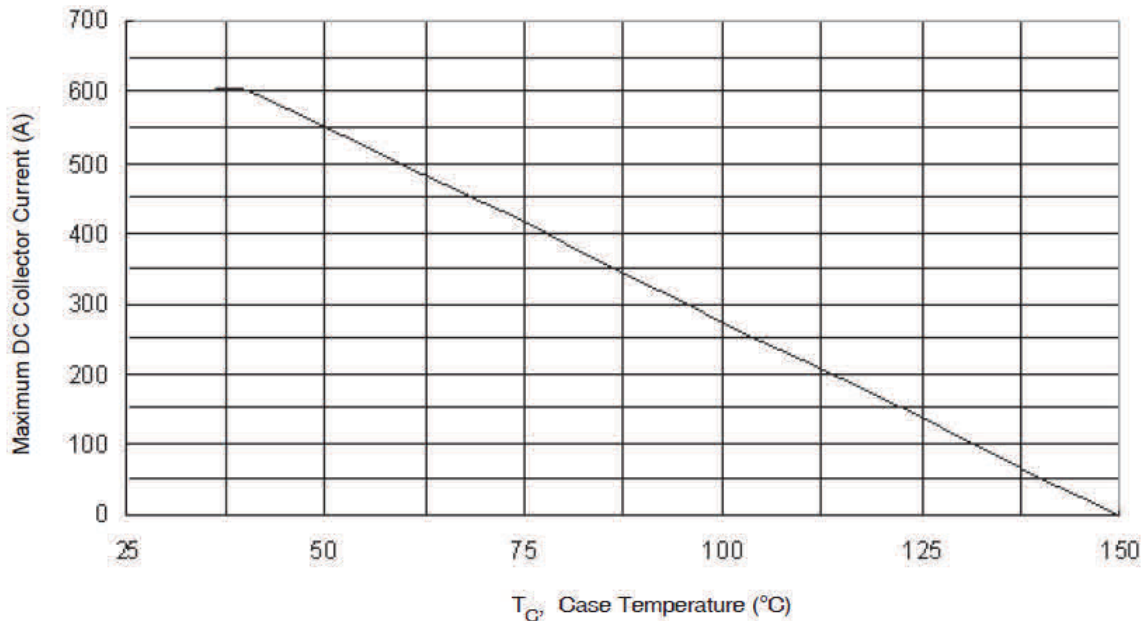
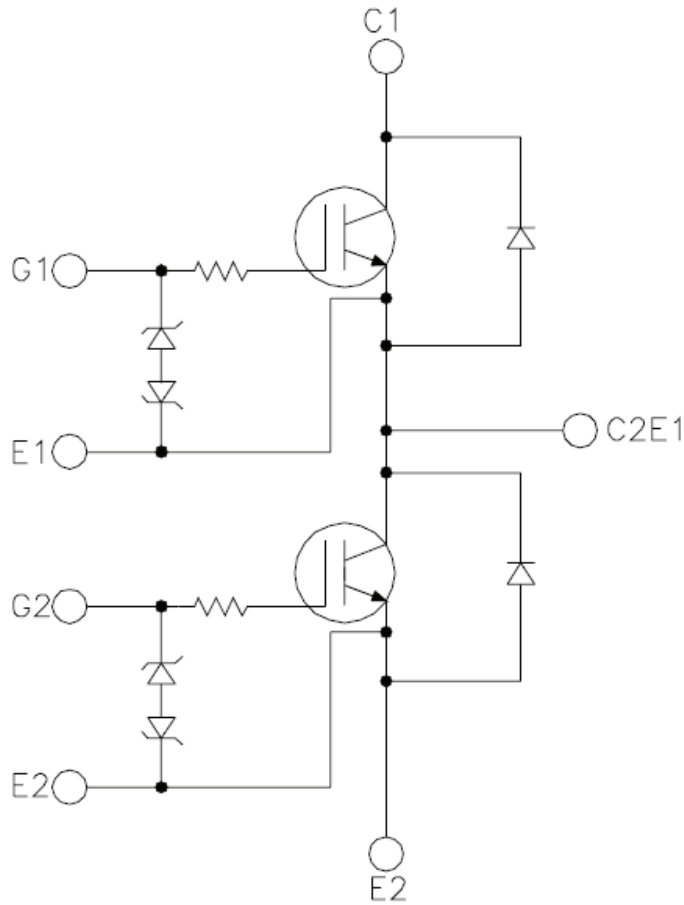


Fig 1. Maximum Collector Current Vs Case Temperature

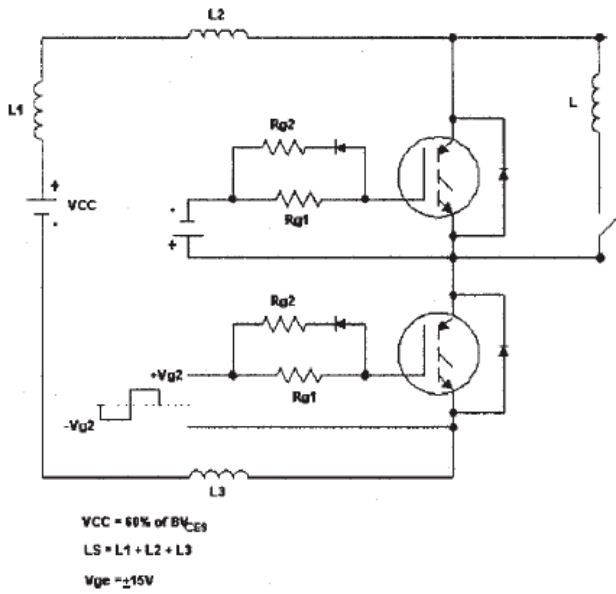


Fig 2. Test Circuit for Measurement of E_{on} , E_{off} , t_{rr} , Q_{rr} , I_{rr} , $t_d(on)$, t_r , $t_d(off)$, t_f

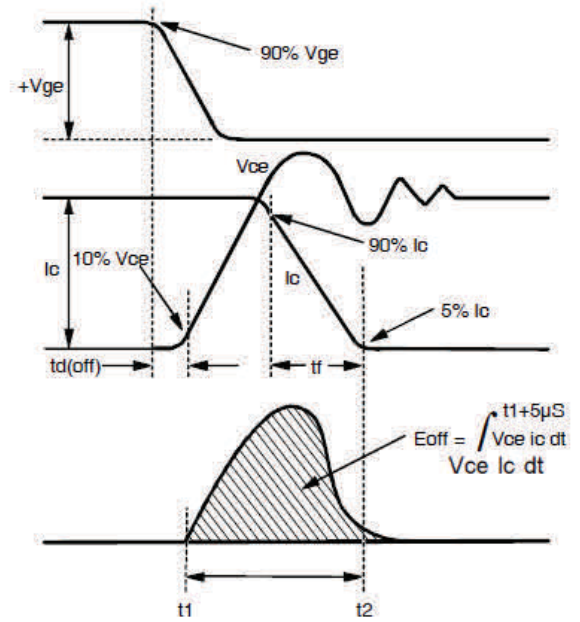


Fig 3. Test Waveforms for Circuit of Fig 2 Defining E_{off} , $t_d(off)$, t_f

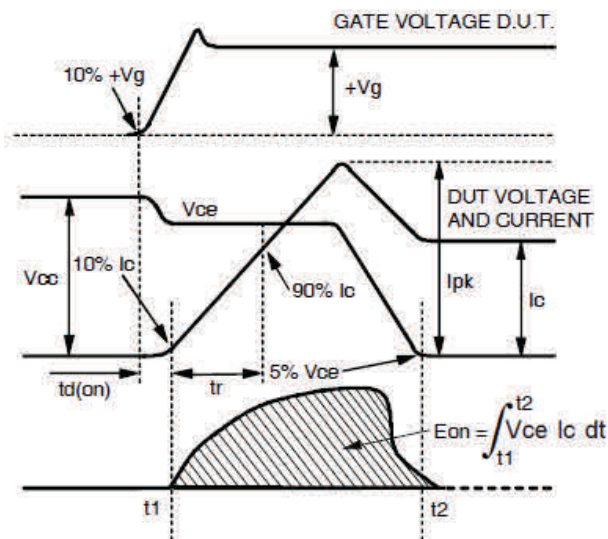


Fig 4. Test Waveforms for Circuit of Fig 2 Defining E_{on} , $t_d(on)$, t_r

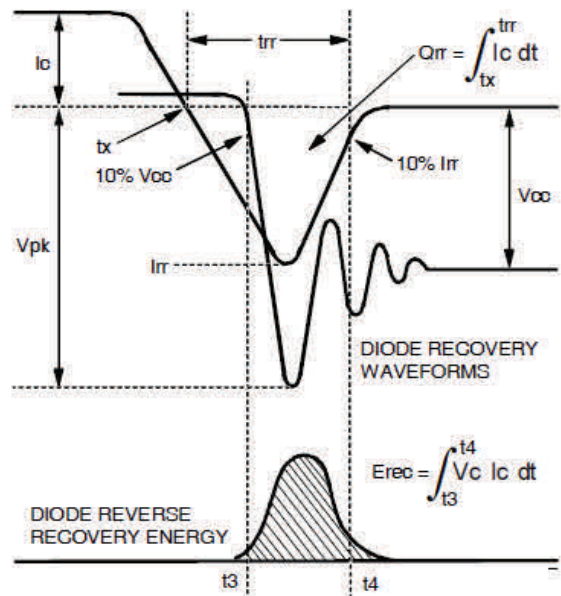
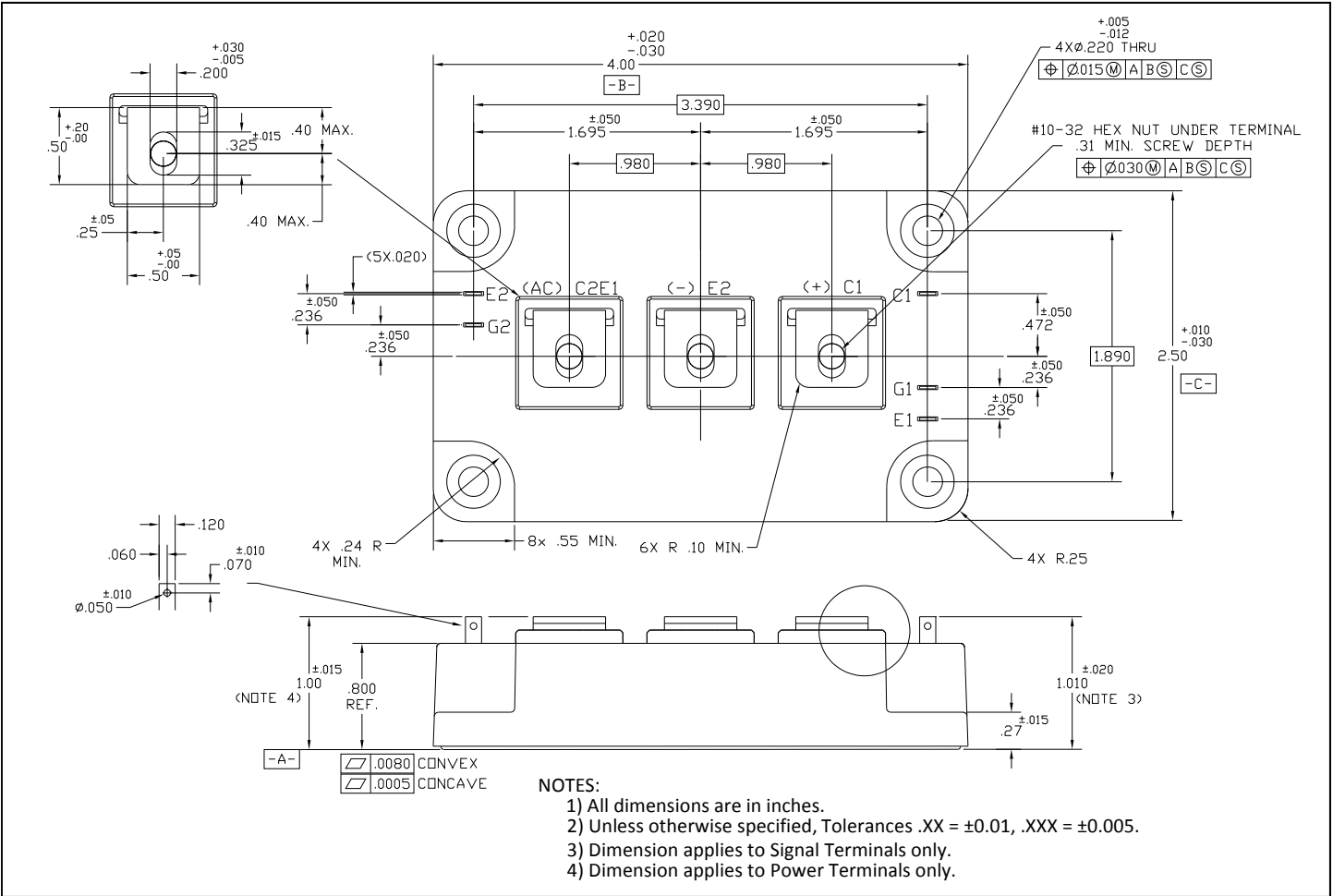
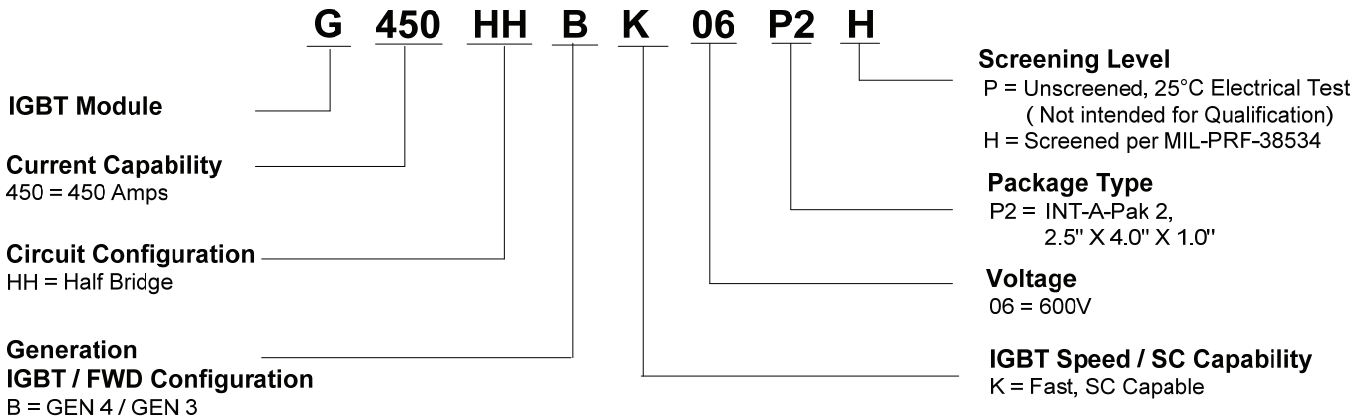


Fig 5. Test Waveforms for Circuit of Fig 2 Defining E_{rec} , t_{rr} , Q_{rr} , I_{rr}

Case Outline and Dimensions - INT-A-Pak 2



Part Numbering Nomenclature



IMPORTANT NOTICE

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