International
IOR Rectifier

PD-97013A

HiRel™ INT-A-Pak 2, PLASTIC HALF-BRIDGE IGBT MODULE

G450HHBK06P2

Product Summary

Part Number	V_{CE}	I_C	$V_{CE(SAT)}$
G450HHBK06P2	600V	450A	1.8

HiRel™ INT-A-Pak 2

The 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 Vce(sat) IGBT's packaged for ultra low thermal resistance junction to case. The G450HHBK06P2 power module consists of six IGBT's and six FRED's in a Phase- Leg or Half-Bridge configuration.

Features:

- Rugged, Lightweight near Hermetic Package with Integrated Power Terminal Cap
- Gen IV IGBT Technology
- Soft Recovery Rectifiers
- 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
- 2.0 Ohms Series Gate Resistor
- High Altitude Operation, 85,000 Feet Above Sea Level at Rated Voltage

Absolute Maximum Ratings @ Tj=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 @ Tc = 25°C	I_C	600	A
Continuous Collector Current @ Tc = 70°C		450	
Isolation Voltage	V_{ISOL}	2500	V_{RMS}

Electrical Characteristics @ Tj = 25°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} = ±15V, V_{CE} = 0V	-	-	10	µA
On Characteristics						
Gate Threshold Voltage	$V_{GE(TH)}$	V_{CE} = V_{GE}, I_C = 45mA	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	Qg	V_{CE} = 300V, I_C = 450A, V_{GE} = 15V	-	2,600	-	nC
Input Capacitance	C_{IES}	V_{GE} = 0V, V_{CE} = 25V, f = 1.0MHz	-	48	-	nF
Output Capacitance	C_{OES}		-	3.0	-	
Reverse Transfer Capacitance	C_{RES}		-	0.3	-	
Switching Inductive Load Characteristics						
Turn-On Delay Time	td(on)	V_{CC} = 300V, I_C = 450A, V_{GE} =15V $R_{G(on)}$ = 20Ω, $R_{G(off)}$ =10Ω, L=100µH	-	800	900	ns
Rise Time	tr			460	700	
Turn-On Losses	E_{on}		-	45	-	mJ
Turn-Off Delay Time	td(off)			2800	3400	ns
Fall Time	tf		-	400	500	
Turn-Off Losses	E_{off}		-	60	-	mJ
Diode Characteristics						
Forward Voltage	V_F	I_F = 450A	-	1.2	1.8	V
Reverse Recovery Charge	Qrr	V_R =300V, I_C =450A, di/dt =-1100A/µs	-	9.5	12	µC
Peak Reverse Recovery Current	Irr		-	105	-	A
Reverse Recovery Time	trr		-	160	170	ns

Electrical Characteristics @ Tj = 125°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} = ±15V, V_{CE} = 0V	-	-	10	µA
On Characteristics						
Gate Threshold Voltage	$V_{GE(TH)}$	V_{CE} = V_{GE}, I_C = 45mA	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

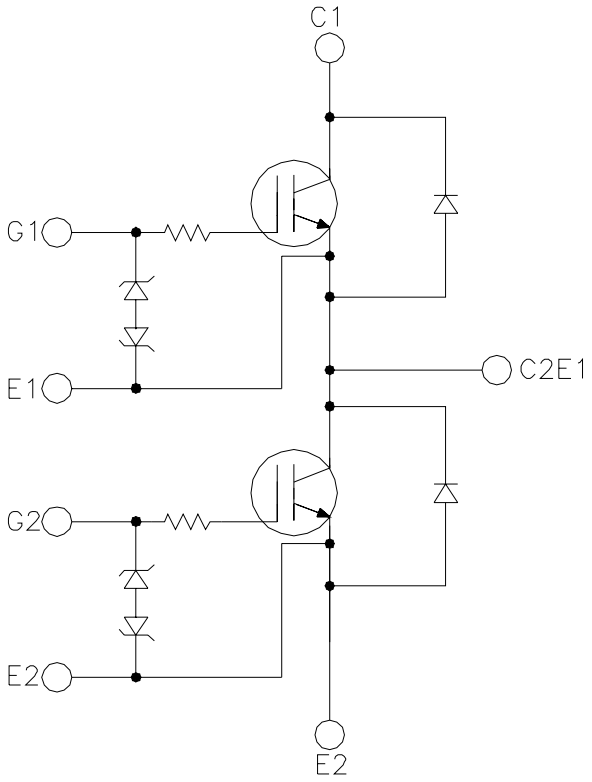
Thermal-Mechanical Specifications

Parameter	Symbol	Min	Max	Units
IGBT Thermal Resistance, Junction to Case, per Switch	R_{thJC}	-	0.07	°C/W
Diode Thermal Resistance, Junction to Case, per Switch		-	0.12	
Operating Junction Temperature Range	T_J	-55	150	°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-STD-883		Comments
	Method	Condition	
Internal Visual	2017		
Temperature Cycle	1010	B	10 Cycles, -55°C to +125°C
Mechanical Shock	2002	B	1500G, 0.5ms, 5 Times (Y1 direction only)
Burn-in	1015	A	160 Hrs @ +125°C
Final Electrical Test			Group A, -55°C, +25°C, +125°C
External Visual	2009		

Schematic



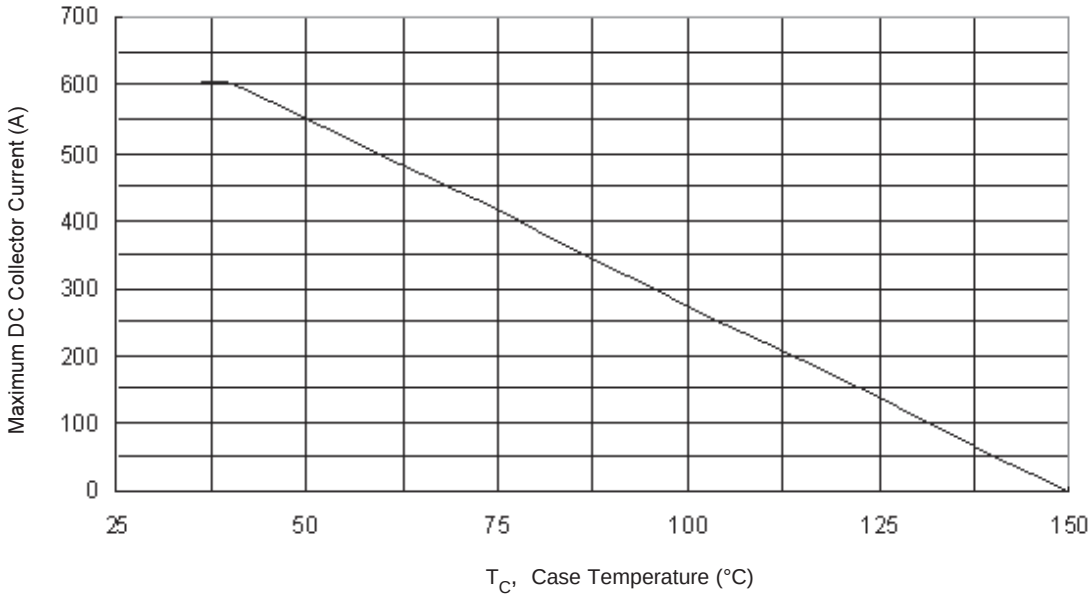


Fig 1: Maximum Collector Current Vs Case Temperature

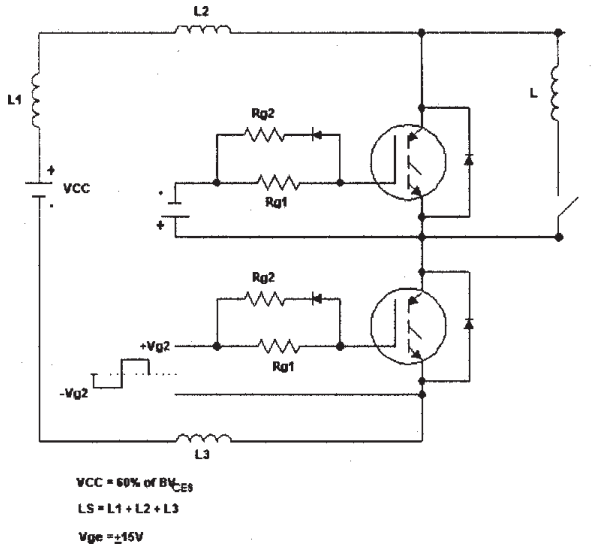


Fig. 2 - Test Circuit for Measurement of E_{on}, E_{off}, t_{rr}, Q_{rr}, I_{rr}, $t_{d(on)}$, t_r, $t_{d(off)}$, t_f

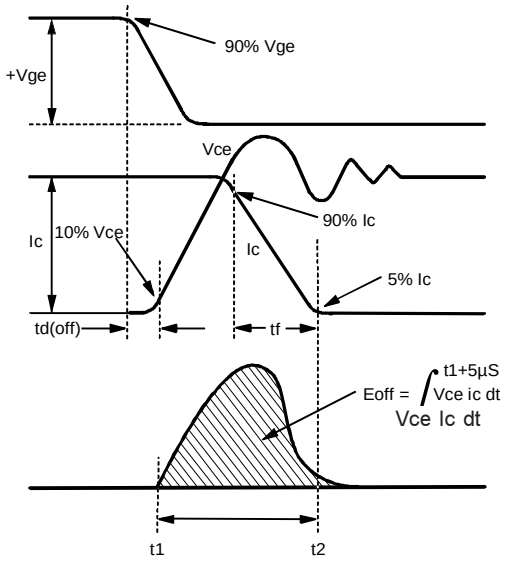


Fig. 3 - Test Waveforms for Circuit of Fig. 2, Defining E_{off}, $t_{d(off)}$, t_f

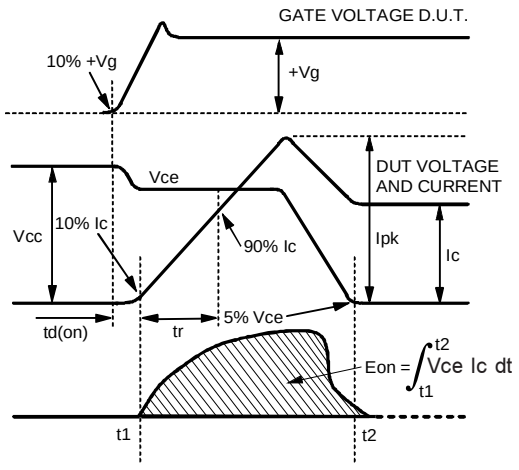


Fig. 3 - Test Waveforms for Circuit of Fig. 2, Defining E_{on}, $t_{d(on)}$, t_r

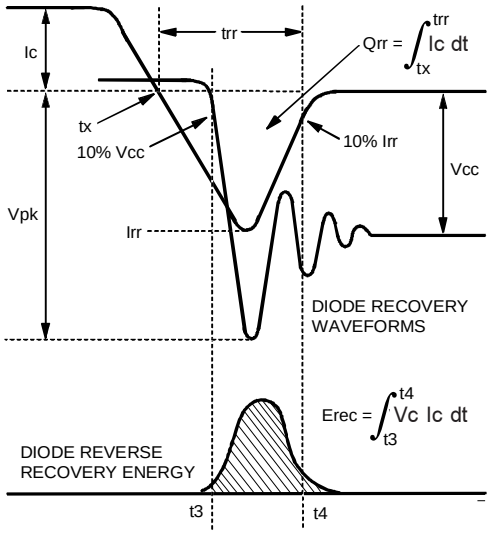
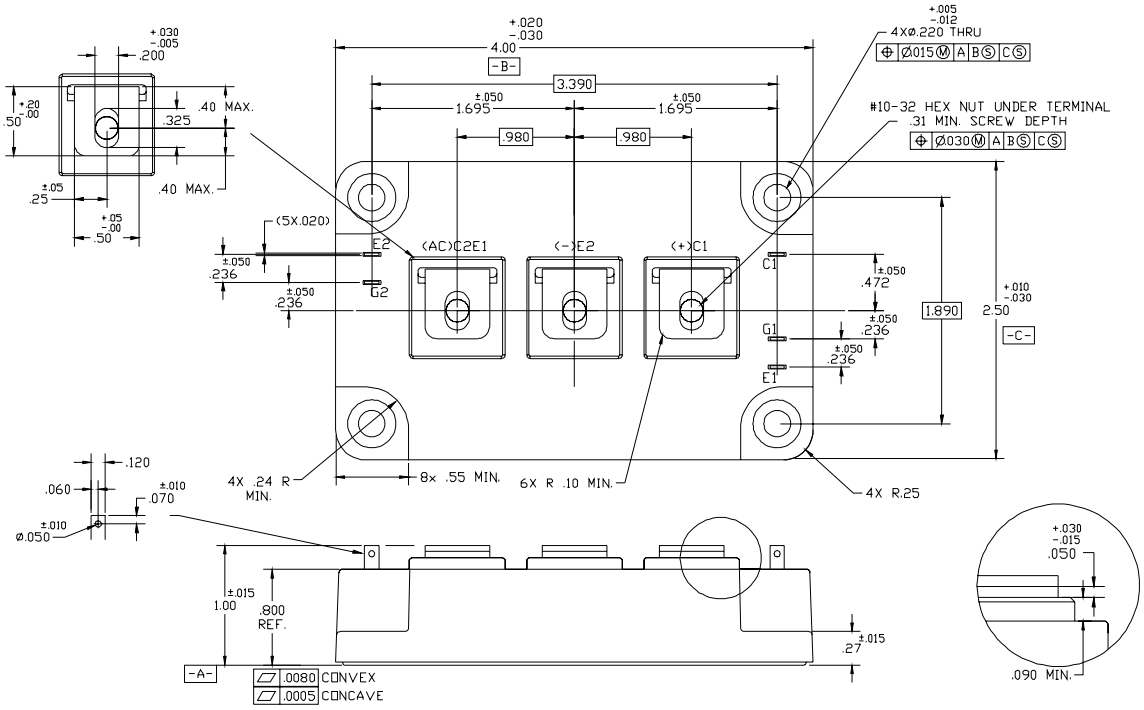


Fig. 4 - Test Waveforms for Circuit of Fig. 2, Defining E_{rec}, t_{rr}, Q_{rr}, I_{rr}

Case Outline and Dimensions - HiRel™ INT-A-Pak 2



Notes: 1) All dimensions are in inches
2) Unless otherwise specified,
Tolerances .XX = ±0.01, .XXX = ±0.005

Part numbering Nomenclature

G 450 HH B K 06 P2 H

IGBT Module - Hirel

Current Capability
450 = 450 Amps

Circuit Configuration
HH = Half Bridge

Generation
IGBT / FWD Configuration
B = GEN 4 / GEN 3

Screening Level
P = Unscreened, 25°C Electrical Test
(Not intended for Qualification)
H = Screened per MIL-PRF-38534

Package Type
P2 = HiRel™ INT-A-Pak 2,
2.5" X 4.0" X 1.0"

Voltage
06 = 600V

IGBT Speed / SC Capability
K = Fast, SC Capable

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Data and specifications subject to change without notice. 11/05