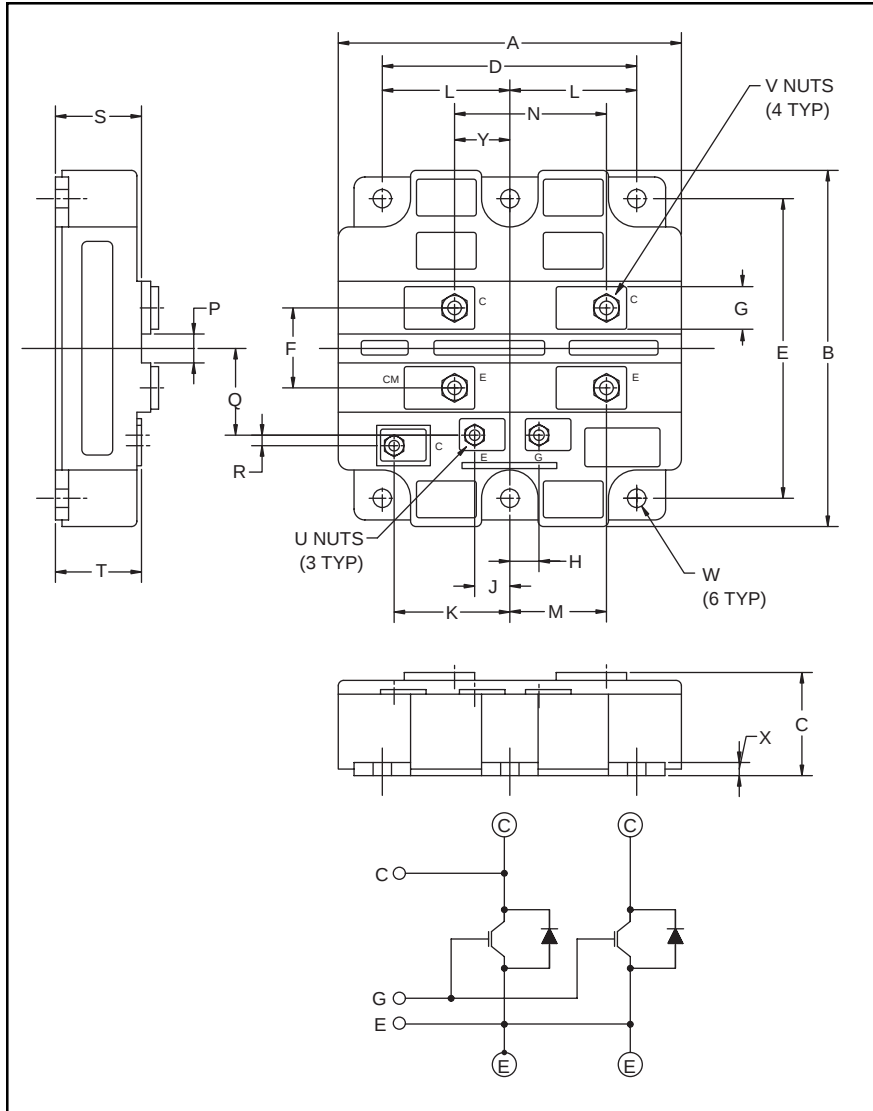


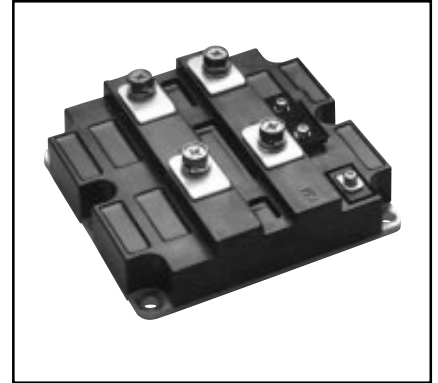
Single IGBTMOD™ HVIGBT 400 Amperes/4500 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.12	130.0
B	5.51	140.0
C	1.50	38.0
D	4.48	114.0
E	4.88±0.01	124.0±0.25
F	1.57	40.0
G	0.79	20.0
H	0.41	10.35
J	0.42	10.65
K	1.92	48.8
L	2.24±0.01	57.0±0.25
M	1.71	43.5

Dimensions	Inches	Millimeters
N	2.42	61.5
P	0.59	15.0
Q	1.57	40.0
R	0.20	5.2
S	1.16	29.5
T	1.10	28.0
U	M4 Metric	M4
V	M8 Metric	M8
W	0.28 Dia.	Dia.7.0
X	0.20	5.0
Y	0.71	18.0



Description:

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of one IGBT Transistor with a reverse-connected super-fast recovery free-wheel diode. All components and interconnects are isolated from the heat sinking baseplate, offering simplified system assembly and thermal management.

Features:

- ☐ Low Drive Power
- ☐ Low $V_{CE(sat)}$
- ☐ Super-Fast Recovery Free-Wheel Diode
- ☐ Isolated Baseplate for Easy Heat Sinking

Applications:

- ☐ Traction
- ☐ Medium Voltage Drive
- ☐ High Voltage Power Supplies

Ordering Information:

Example: Select the complete part module number you desire from the table below -i.e. CM400HB-90H is a 4500V (V_{CES}), 400 Ampere Single IGBTMOD™ Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	400	90



Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

CM400HB-90H
Single IGBTMOD™ HVIGBT
400 Amperes/4500 Volts

Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Ratings	Symbol	CM400HB-90H	Units
Junction Temperature	T_j	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Collector-Emitter Voltage ($V_{\text{GE}} = 0\text{V}$)	V_{CES}	4500	Volts
Gate-Emitter Voltage ($V_{\text{CE}} = 0\text{V}$)	V_{GES}	± 20	Volts
Collector Current ($T_c = 25^\circ\text{C}$)	I_c	400	Amperes
Peak Collector Current (Pulse)	I_{CM}	800*	Amperes
Diode Forward Current** ($T_c = 25^\circ\text{C}$)	I_E	400	Amperes
Diode Forward Surge Current** (Pulse)	I_{EM}	800*	Amperes
Maximum Collector Dissipation ($T_c = 25^\circ\text{C}$, IGBT Part, $T_j \leq 125^\circ\text{C}$)	P_C	4300	Watts
Max. Mounting Torque M8 Terminal Screws	—	115	in-lb
Max. Mounting Torque M6 Mounting Screws	—	53	in-lb
Max. Mounting Torque M4 Auxiliary Terminal Screws	—	17	in-lb
Module Weight (Typical)	—	1.5	kg
Isolation Voltage (Charged Part to Baseplate, AC 60Hz 1 min.)	V_{iso}	6000	Volts

* Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(\text{max})}$ rating.

**Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDI).

Static Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	I_{CES}	$V_{\text{CE}} = V_{\text{CES}}, V_{\text{GE}} = 0\text{V}$	—	—	8.0	mA
Gate Leakage Current	I_{GES}	$V_{\text{GE}} = V_{\text{GES}}, V_{\text{CE}} = 0\text{V}$	—	—	0.5	μA
Gate-Emitter Threshold Voltage	$V_{\text{GE(th)}}$	$I_c = 40\text{mA}, V_{\text{CE}} = 10\text{V}$	4.5	6.0	7.5	Volts
Collector-Emitter Saturation Voltage	$V_{\text{CE(sat)}}$	$I_c = 400\text{A}, V_{\text{GE}} = 15\text{V}, T_j = 25^\circ\text{C}$	—	3.0	3.9*	Volts
		$I_c = 400\text{A}, V_{\text{GE}} = 15\text{V}, T_j = 125^\circ\text{C}$	—	3.3	—	Volts
Total Gate Charge	Q_G	$V_{\text{CC}} = 2250\text{V}, I_c = 400\text{A}, V_{\text{GE}} = 15\text{V}$	—	3.6	—	μC
Emitter-Collector Voltage**	V_{EC}	$I_E = 400\text{A}, V_{\text{GE}} = 0\text{V}$	—	4.0	5.2	Volts

* Pulse width and repetition rate should be such that device junction temperature rise is negligible.

**Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDI).



Powerex, Inc., 200 Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

CM400HB-90H
Single IGBTMOD™ HVIGBT
 400 Amperes/4500 Volts

Dynamic Electrical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Input Capacitance	C_{ies}		–	72	–	nF
Output Capacitance	C_{oes}	$V_{GE} = 0V, V_{CE} = 10V$	–	5.3	–	nF
Reverse Transfer Capacitance	C_{res}		–	1.6	–	nF
Resistive	Turn-on Delay Time	$t_{d(on)}$	$V_{CC} = 2250V, I_C = 400A,$	–	–	2.4 μs
Load	Rise Time	t_r	$V_{GE1} = V_{GE2} = 15V,$	–	–	2.4 μs
Switching	Turn-off Delay Time	$t_{d(off)}$	$R_G = 22.5\Omega$	–	–	6.0 μs
Times	Fall Time	t_f	Resistive Load Switching Operation	–	–	1.2 μs
Diode Reverse Recovery Time**		t_{rr}	$I_E = 400A, di_E/dt = -800A/\mu s$	–	–	1.8 μs
Diode Reverse Recovery Charge**		Q_{rr}	$I_E = 400A, di_E/dt = -800A/\mu s$	–	160*	μC

* Pulse width and repetition rate should be such that device junction temperature rise is negligible.

**Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

Thermal and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ unless otherwise specified

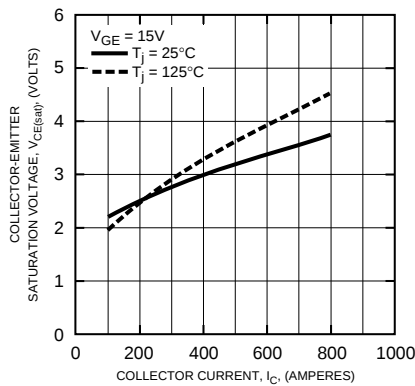
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}$ Q	Per IGBT	–	–	0.023	K/W
Thermal Resistance, Junction to Case	$R_{th(j-c)}$ D	Per FWDi	–	–	0.045	K/W
Contact Thermal Resistance, Case to Fin	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	–	0.015	–	K/W

CM400HB-90H

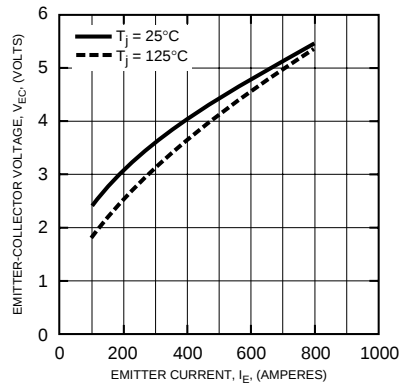
Single IGBTMOD™ HVIGBT

400 Amperes/4500 Volts

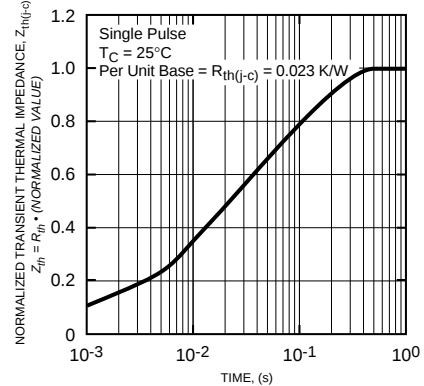
COLLECTOR-EMITTER
SATURATION VOLTAGE CHARACTERISTICS
(TYPICAL)



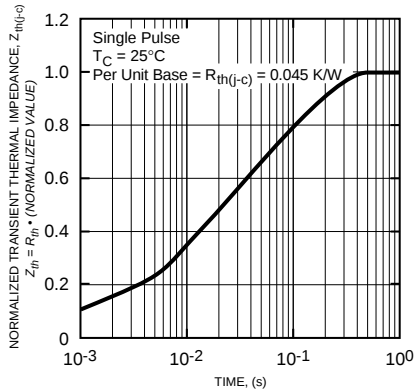
FREE-WHEEL DIODE
FORWARD CHARACTERISTICS
(TYPICAL)



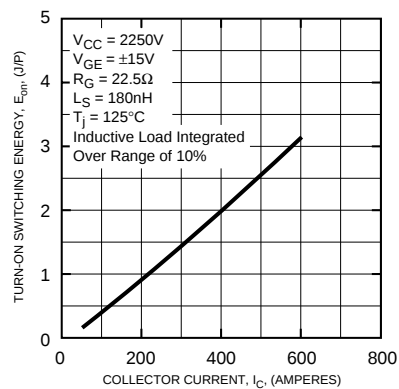
TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(IGBT)



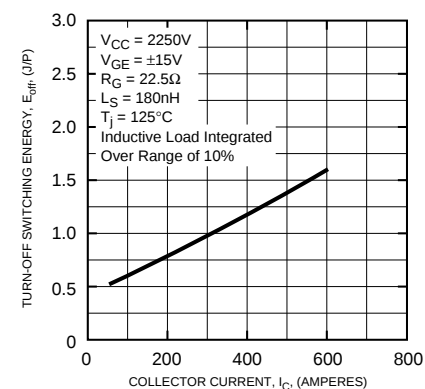
TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS
(FWD)



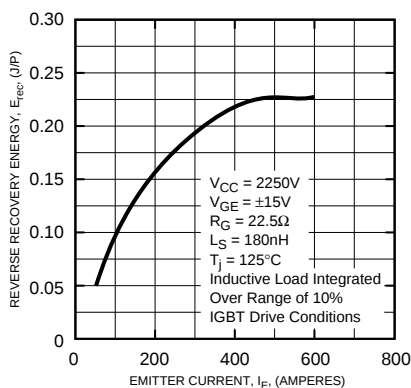
HALF-BRIDGE TURN-ON SWITCHING
ENERGY CHARACTERISTICS
(TYPICAL)



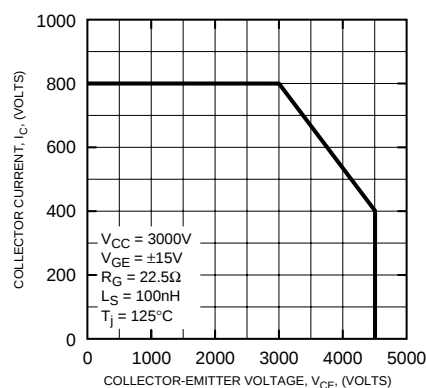
HALF-BRIDGE TURN-OFF SWITCHING
ENERGY CHARACTERISTICS
(TYPICAL)



FREE-WHEEL DIODE
REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)



TURN-ON SWITCHING
SAFE OPERATING AREA (RBSOA)
(TYPICAL)



DIODE REVERSE RECOVERY
SAFE OPERATING AREA
(TYPICAL)

