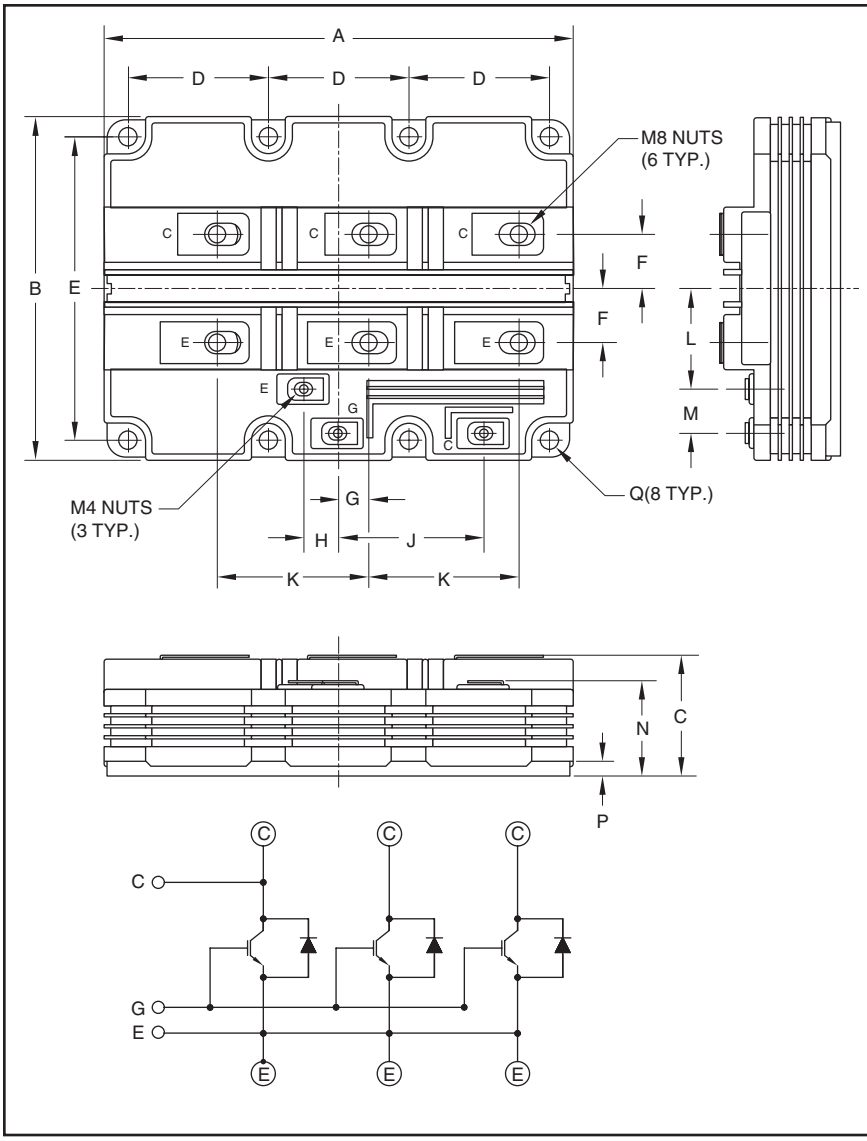
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272

CM600HG-130H

Single IGBTMOD™ HVIGBT Module
600 Amperes/6500 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	7.48	190.0
B	5.51	140.0
C	1.89	48.0
D	2.24	57.0
E	4.88	124.0
F	0.87	22.0
G	0.47	12.0
H	0.55	14.0

Dimensions	Inches	Millimeters
J	2.33	59.2
K	2.41	61.2
L	1.61	41.0
M	0.71	18.0
N	1.50	38.0
P	0.20	5.0
Q	0.28 Dia.	7.0 Dia.

Description:

Powerex IGBTMOD™ Modules are designed for use in switching applications. Each module consists of one IGBT Transistor in 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 Drives
- ☐ High Voltage Power Supplies

Ordering Information:

Example: Select the complete part module number you desire from the table below -i.e. CM600HG-130H is a 6500V (V_{CES}), 600 Ampere Single IGBTMOD™ Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	600	130

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Absolute Maximum Ratings, T_j = 25 °C unless otherwise specified

Ratings	Symbol	CM600HG-130H	Units
Junction Temperature	T_j	-40 to 150	°C
Storage Temperature	T_{stg}	-40 to 125	°C
Operating Temperature	T_{opr}	-40 to +125	°C
Collector-Emitter Voltage (V_{GE} = 0V)	V_{CES}	6500	Volts
Gate-Emitter Voltage (V_{CE} = 0V)	V_{GES}	±20	Volts
Collector Current (DC, T_c = 80°C)	I_C	600	Amperes
Peak Collector Current (Pulse)	I_{CM}	1200*	Amperes
Emitter Current** (T_c = 25°C)	I_E	600	Amperes
Emitter Surge Current** (Pulse)	I_{EM}	1200*	Amperes
Maximum Collector Dissipation (T_c = 25°C, IGBT Part, $T_{j(max)} \leq$ 125°C)	P_C	8900	Watts
Partial Discharge (V_1 = 6900 V_{rms}, V_2 = 5100 V_{rms}, 60 Hz (Acc. to IEC 1287))	Q_{pd}	10	pC
Max. Mounting Torque M8 Main Terminal Screws	–	133	in-lb
Max. Mounting Torque M6 Mounting Screws	–	53	in-lb
Max. Mounting Torque M4 Auxiliary Terminal Screws	–	17	in-lb
Module Weight (Typical)	–	1.35	kg
Isolation Voltage (Charged Part to Baseplate, AC 60Hz 1 min.)	V_{iso}	10200	Volts
Maximum Turn-Off Switching Current ($V_{CC} \leq$ 4500V, V_{GE} = ±15V, T_j = 125°C)	–	1200	Amperes
Short Circuit Capability, Maximum Pulse Width ($V_{CC} \leq$ 4500V, V_{GE} = ±15V, T_j = 125°C)	–	10	µs
Maximum Reverse Recovery Instantaneous Power ($V_{CC} \leq$ 4500V, $di_e/dt \leq$ 3000A/µs, T_j = 125°C)	–	3600	kW

* Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(oprmax)}$ rating (125°C).
**Represents characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).

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Static Electrical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Cutoff Current	I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V, T_j = 25°C	–	–	10.0	mA
		$V_{CE} = V_{CES}$, V_{GE} = 0V, T_j = 125°C	–	30	90.0	mA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 60mA, V_{CE} = 10V	5.0	6.0	7.0	Volts
Gate Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	–	–	0.5	µA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 600A, V_{GE} = 15V, T_j = 25°C	–	5.1	–	Volts
		I_C = 600A, V_{GE} = 15V, T_j = 125°C	–	5.0	–	Volts
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V,	–	124	–	nF
Output Capacitance	C_{oes}	f = 100kHz,	–	7.6	–	nF
Reverse Transfer Capacitance	C_{res}	T_j = 25°C	–	2.2	–	nF
Total Gate Charge	Q_G	V_{CC} = 3600V, I_C = 600A, V_{GE} = 15V	–	9.9	–	µC
Emitter-Collector Voltage**	V_{EC}	I_E = 600A, V_{GE} = 0V, T_j = 25°C	–	4.0	–	Volts
		I_E = 600A, V_{GE} = 0V, T_j = 125°C	–	3.6	–	Volts
Turn-On Delay Time	$t_{d(on)}$	V_{CC} = 3600V, I_C = 600A,	–	1.2	–	µs
Turn-On Rise Time	t_r	$V_{GE1} = -V_{GE2}$ = 15V, $R_{G(on)}$ = 10Ω,	–	0.35	–	µs
Turn-On Switching Energy	E_{on}	T_j = 125°C, t_{off} = 60µs	–	4.5	–	J/P
Turn-Off Delay Time	$t_{d(off)}$	V_{CC} = 3600V, I_C = 600A,	–	6.6	–	µs
Turn-Off Fall Time 1	t_{f1}	$V_{GE1} = -V_{GE2}$ = 15V,	–	0.5	–	µs
Turn-Off Fall Time 2	t_{f2}	$R_{G(off)}$ = 24Ω,	–	3.3	–	µs
Turn-Off Switching Energy	E_{off}	T_j = 125°C, t_{off} = 60µs	–	3.5	–	J/P
Reverse Recovery Time 1**	t_{rr1}	V_{CC} = 3600V, I_E = 600A,	–	1.0	–	µs
Reverse Recovery Time 2**	t_{rr2}	di_e/dt = -2000A/µs,	–	2.4	–	µs
Reverse Recovery Charge**	Q_{rr}	T_j = 125°C,	–	1100	–	µC
Reverse Recovery Energy**	E_{rec}	t_{off} = 60µs	–	2.0	–	J/P

* 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 Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case	$R_{th(j-c)}$ Q	Per IGBT	–	–	14.0	K/kW
Thermal Resistance, Junction to Case	$R_{th(j-c)}$ D	Per FWDi	–	–	22.0	K/kW
Contact Thermal Resistance, Case to Fin	$R_{th(c-f)}$	Per Module, Thermal Grease Applied	–	6.0	–	K/kW

Mechanical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Comparative Tracking Index	CTI	–	600	–	–	–
Clearance	–	–	26.0	–	–	mm
Creepage Distance	–	–	56.0	–	–	mm
Internal Inductance	$L_{C-E(int)}$	–	–	18	–	nH
Internal Lead Resistance	$R_{C-E(int)}$	–	–	0.18	–	mΩ

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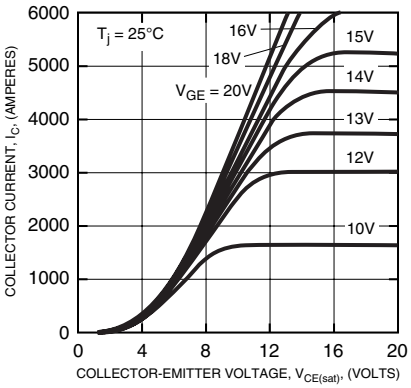
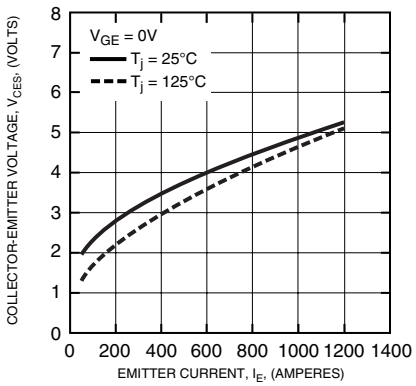
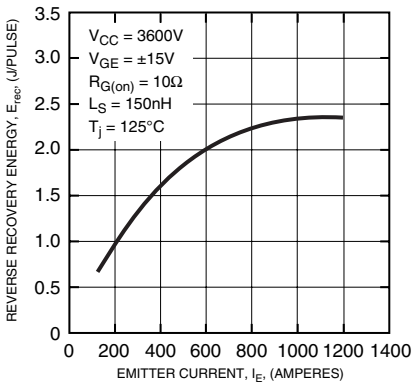
OUTPUT CHARACTERISTICS (TYPICAL)



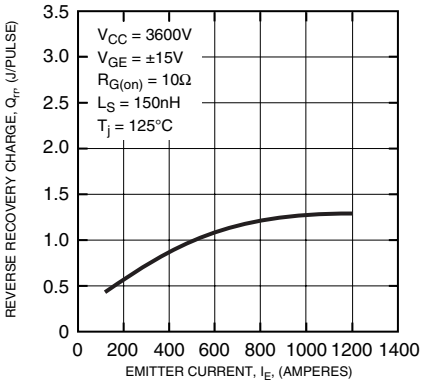
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



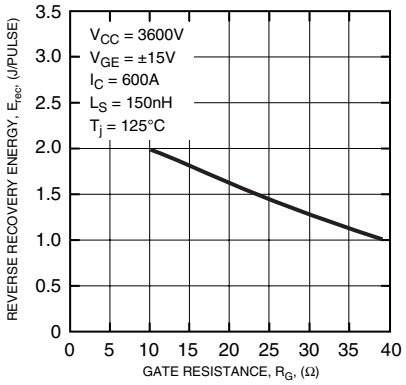
FREE-WHEEL DIODE REVERSE RECOVERY ENERGY CHARACTERISTICS (TYPICAL)



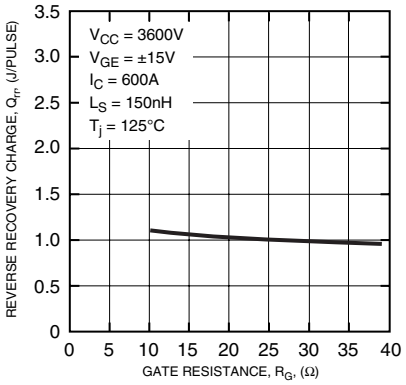
FREE-WHEEL DIODE REVERSE RECOVERY CHARGE CHARACTERISTICS (TYPICAL)



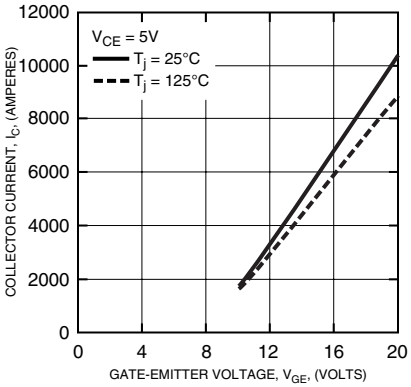
FREE-WHEEL DIODE REVERSE RECOVERY ENERGY CHARACTERISTICS (TYPICAL)



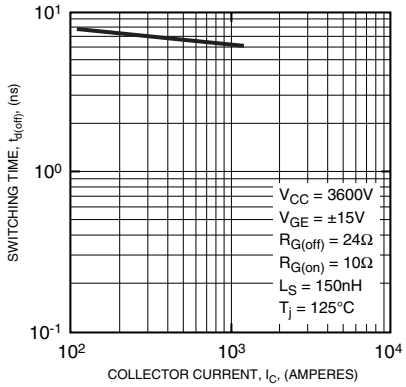
FREE-WHEEL DIODE REVERSE RECOVERY CHARGE CHARACTERISTICS (TYPICAL)



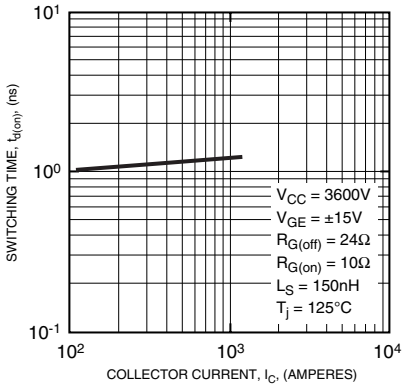
TRANSFER CHARACTERISTICS (TYPICAL)



TURN-OFF DELAY TIME VS. COLLECTOR CURRENT (TYPICAL)



TURN-ON DELAY TIME VS. COLLECTOR CURRENT (TYPICAL)



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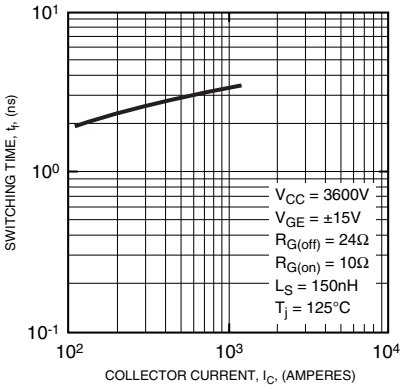
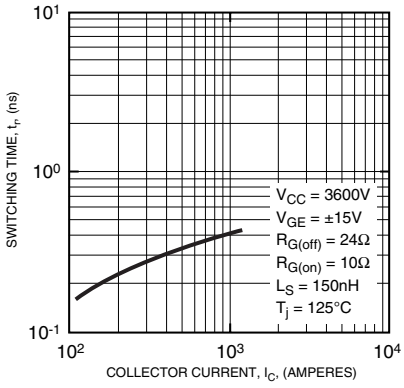
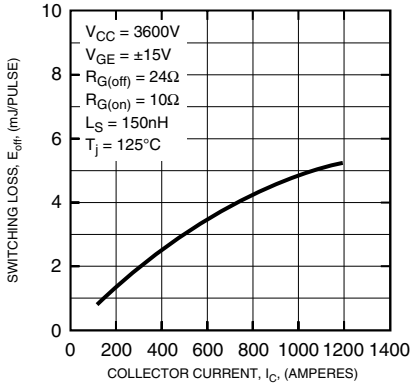
FALL TIME VS. COLLECTOR CURRENT (TYPICAL)



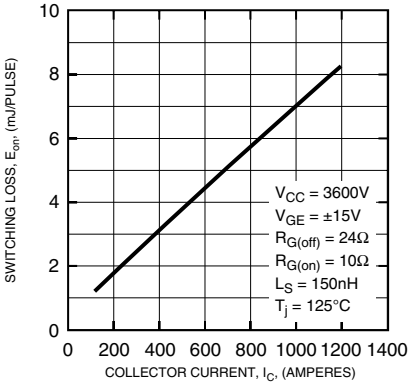
RISE TIME VS. COLLECTOR CURRENT (TYPICAL)



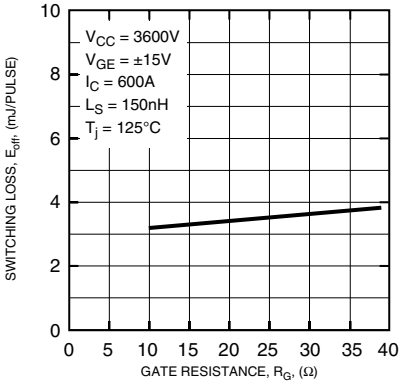
SWITCHING LOSS (OFF) VS. COLLECTOR CURRENT (TYPICAL)



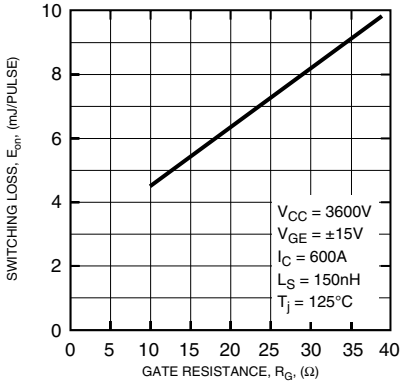
SWITCHING LOSS (ON) VS. COLLECTOR CURRENT (TYPICAL)



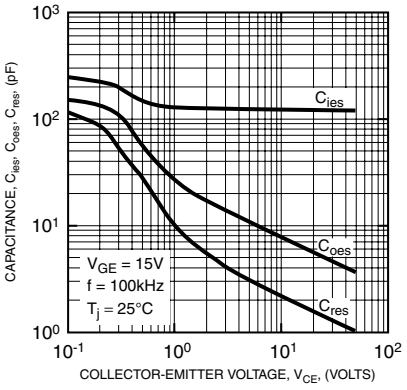
SWITCHING LOSS (OFF) VS. GATE RESISTANCE (TYPICAL)



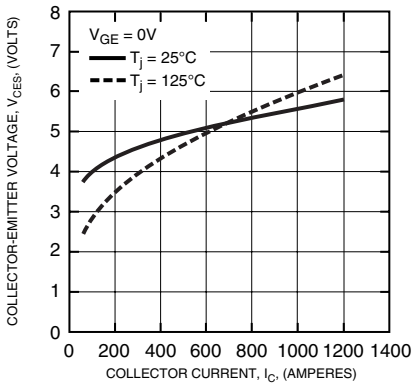
SWITCHING LOSS (ON) VS. GATE RESISTANCE (TYPICAL)



CAPACITANCE VS. COLLECTOR-EMITTER VOLTAGE (TYPICAL)



COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & FWDI)