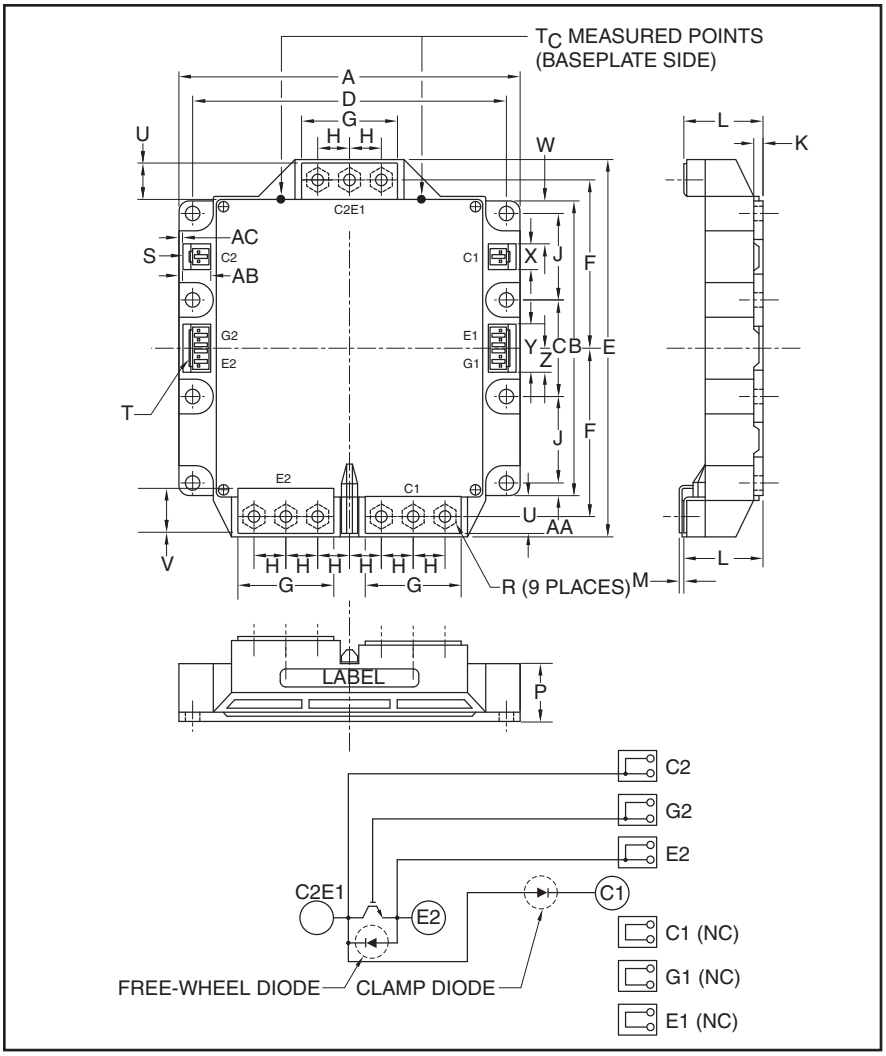
Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272

Mega Power Chopper IGBTMOD™
1000 Amperes/1700 Volts

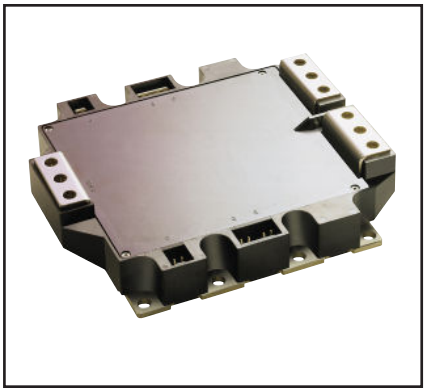


Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	5.91	150.0
B	5.10	129.5
C	1.67±0.01	42.5±0.25
D	5.41±0.01	137.5±0.25
E	6.54	166.0
F	2.91±0.01	74.0±0.25
G	1.65	42.0
H	0.55	14.0
J	1.50±0.01	38.0±0.25
K	0.16	4.0
L	1.36 +0.04/-0.02	34.6 +1.0/-0.5

Housing Type (J.S.T. MFG. CO. LTD)
S = VHR-2N
T = VHR-5N

Dimensions	Inches	Millimeters
M	0.075±0.008	1.9±0.2
P	1.0	25.1
R	M6 Metric	M6
U	0.62	15.7
V	0.71	18.0
W	0.75	19.0
X	0.43	11.0
Y	0.83	21.0
Z	0.41	10.5
AA	0.22	5.5
AB	0.47	12.0
AC	0.08	2.0



Description:
Powerex Chopper IGBTMOD™ Modules are designed for use in switching applications. Each module consists of one IGBT Transistor having a reverse-connected super-fast recovery free-wheel diode and an anode-collector 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 $V_{CE(sat)}$
- ☐ Discrete Super-Fast Recovery Free-Wheel Diode
- ☐ Isolated Baseplate for Easy Heat Sinking

Applications:
- ☐ High Power DC Power Supply
- ☐ Large DC Motor Drives
- ☐ Utility Interface Inverters

Ordering Information:
Example: Select the complete module number you desire from the table - i.e. CM1000E3U-34NF is a 1000V (V_{CES}), 1700 Ampere Chopper IGBTMOD Power Module.

Type	Current Rating Amperes	V_{CES} Volts (x 50)
CM	1000	34

CM1000E3U-34NF
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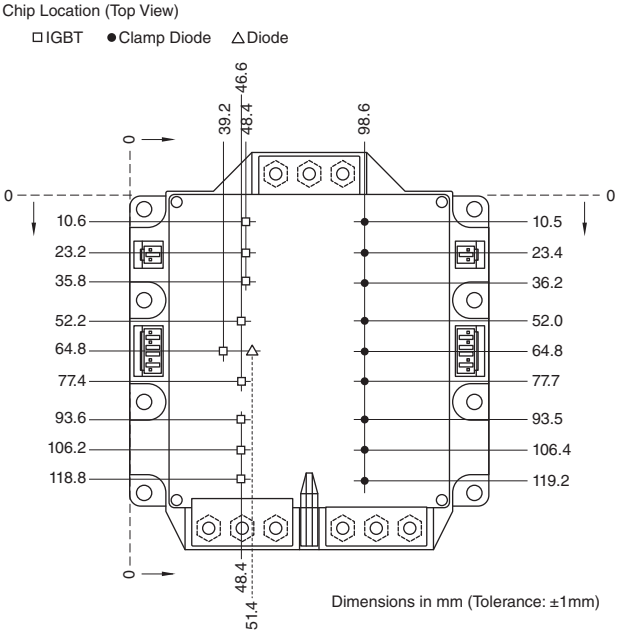
Absolute Maximum Ratings, T_j = 25°C unless otherwise specified

Ratings	Symbol	CM1000E3U-34NF	Units
Junction Temperature	T_j	-40 to 150	°C
Storage Temperature*7	T_{stg}	-40 to 125	°C
Collector-Emitter Voltage (G-E SHORT)	V_{CES}	1700	Volts
Gate-Emitter Voltage (C-E SHORT)	V_{GES}	±20	Volts
Collector Current DC (T_C = 104°C)*6	I_C	1000	Amperes
Peak Collector Current (Pulse)*2	I_{CM}	2000	Amperes
Emitter Current (T_C = 25°C)*4	I_E*1	75	Amperes
Peak Emitter Current (Pulse)*2	I_{EM}*1	150	Amperes
Maximum Collector Dissipation (T_C = 25°C)*2*4	P_C	3900	Watts
Mounting Torque, M6 Mounting Screws (Max.)	–	40	in-lb
Mounting Torque, M6 Main Terminal Screw (Max.)	–	40	in-lb
Weight (Typical)	–	1400	Grams
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	V_{iso}	3500	V_{rms}

Clamp Diode Part, T_j = 25°C unless otherwise specified

Repetitive Peak Reverae Voltage	V_{RRM}	1700	Volts
Forward Current (T_C = 25°C)*4	I_F	1000	Amperes
Peak Forward Current (Pulse)*2	I_{FM}	2000	Amperes

*1 I_E, I_{EM}, and V_{EC} represent ratings and characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
*2 Pulse width and repetition rate should be such that device junction temperature (T_j) does not exceed $T_{j(max)}$ rating.
*4 Case temperature (T_C) is baseplate side.
*6 Case temperature (T_C') and heatsink temperature (T_f') measured point is just under the chips.
*7 The operation temperature is restrained by the permission temperature of female connector housing.



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	–	–	1	mA
Gate Leakage Current	I_{GES}	$V_{GE} = V_{GES}$, V_{CE} = 0V	–	–	0.5	μA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C = 100mA, V_{CE} = 10V	5.5	7	8.5	Volts
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 1000A, V_{GE} = 15V, T_j = 25°C*3	–	2.2	2.8	Volts
(Without Lead Resistance)	(Chip)	I_C = 1000A, V_{GE} = 15V, T_j = 125°C*3	–	2.45	–	Volts
Module Lead Resistance	$R_{(lead)}$	I_C = 1000A, Terminal-Chip	–	0.286	–	mΩ
Input Capacitance	C_{ies}	V_{CE} = 10V, V_{GE} = 0V	–	–	220	nF
Output Capacitance	C_{oes}		–	–	25	nF
Reverse Transfer Capacitance	C_{res}		–	–	4.7	nF
Total Gate Charge	Q_G	V_{CC} = 1000V, I_C = 1000A, V_{GE} = 15V	–	6000	–	nC
Turn-on Delay Time	$t_{d(on)}$	V_{CC} = 1000V, I_C = 1000A,	–	–	600	ns
Turn-on Rise Time	t_r	V_{GE} = ±15V,	–	–	150	ns
Turn-off Delay Time	$t_{d(off)}$	R_G = 0.47Ω,	–	–	900	ns
Turn-off Fall Time	t_f	Inductive Load	–	–	200	ns
Emitter-Collector Voltage*1	V_{EC}	I_E = 75A, V_{GE} = 0V*3	–	–	2.8	Volts
External Gate Resistance	R_G		0.47	–	4.7	Ω

Clamp Diode Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Repetitive Peak Reverse Current	I_{RRM}	$V_R = V_{RRM}$	–	–	1	mA
Forward Voltage	V_{FM}	I_F =1000A*3	–	–	3.0	Volts
Reverse Recovery Time	t_{rr}	I_F =1000A	–	–	450	ns
Reverse Recovery Charge	Q_{rr}	I_F =1000A	–	90	–	μC

Thermal and Mechanical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Junction to Case*4	$R_{th(j-c)}Q$	IGBT	–	–	0.032	°C/W
Thermal Resistance, Junction to Case*4	$R_{th(j-c)}D$	Clamp	–	–	0.053	°C/W
Thermal Resistance, Junction to Case*6	$R_{th(j-c')}Q$	IGBT	–	–	0.014	°C/W
Thermal Resistance, Junction to Case*6	$R_{th(j-c')}D$	Clamp	–	–	0.023	°C/W
Thermal Resistance, Junction to Case*4	$R_{th(c-f)}D$	Thermal Grease Applied per 1/2 Module*5	–	0.016	–	°C/W
Contact Thermal Resistance*6	$R_{th(c-f)}$	Thermal Grease Applied per 1/2 Module*5	–	0.012	–	°C/W

*1 I_E, I_{EM}, and V_{EC} represent ratings and characteristics of the anti-parallel, emitter-to-collector free-wheel diode (FWDi).
*3 Pulse width and repetition rate should be such as to cause negligible temperature rise.
*4 Case temperature (T_C) is baseplate side.
*5 Typical value is measured by using thermally conductive grease of λ = 0.9 [W/(m • K)].
*6 Case temperature (T_C') and heatsink temperature (T_f') measured point is just under the chips.

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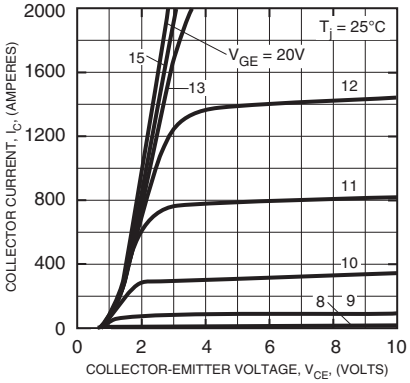
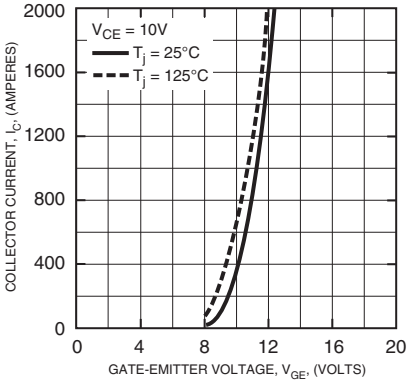
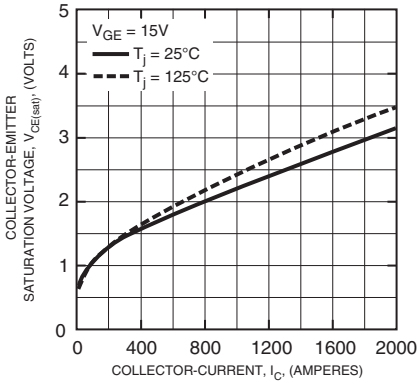
OUTPUT CHARACTERISTICS (TYPICAL)



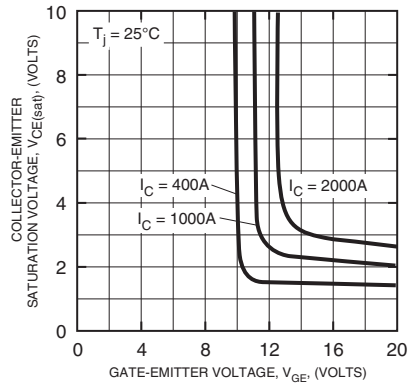
TRANSFER CHARACTERISTICS (TYPICAL)



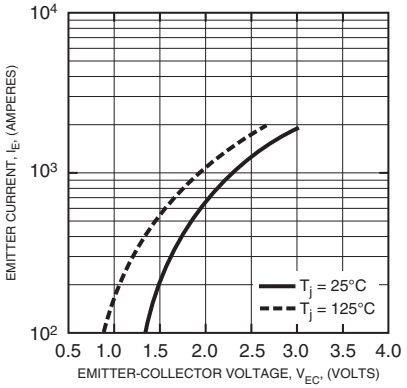
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



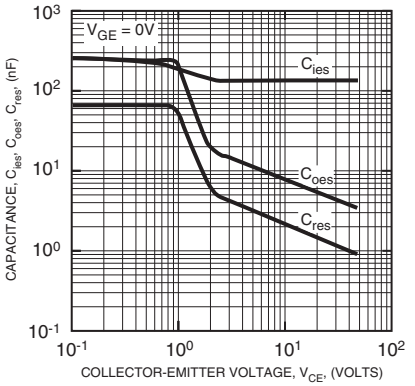
COLLECTOR-EMITTER SATURATION VOLTAGE CHARACTERISTICS (TYPICAL)



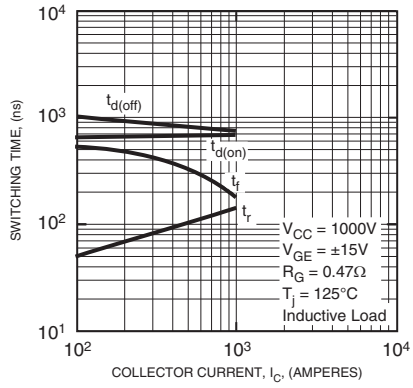
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



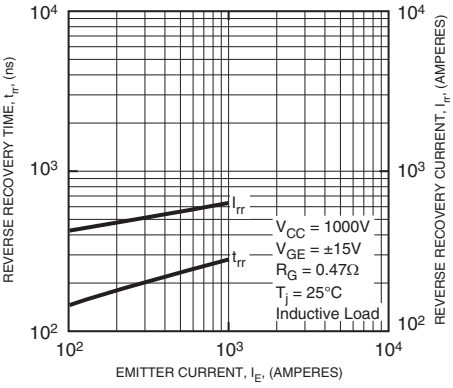
CAPACITANCE VS. V_{CE} (TYPICAL)



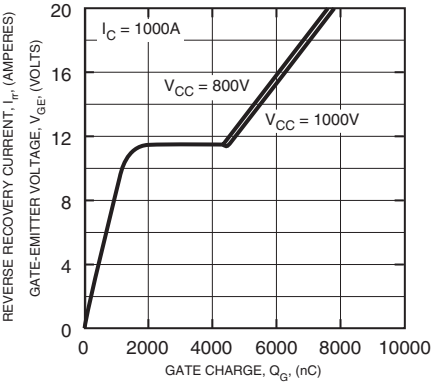
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



GATE CHARGE, V_{GE}



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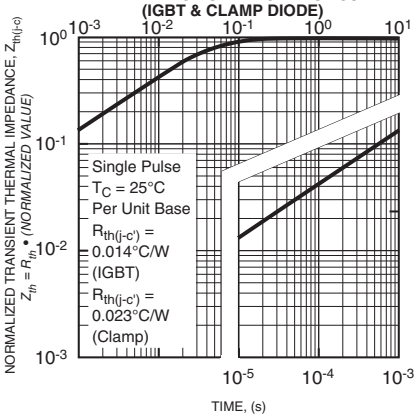
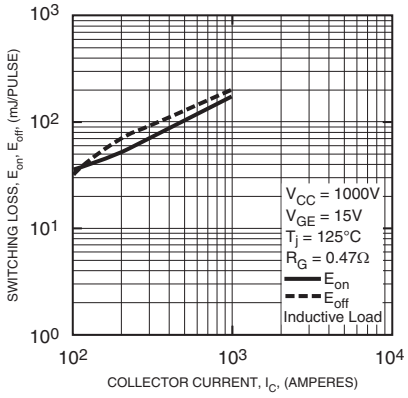
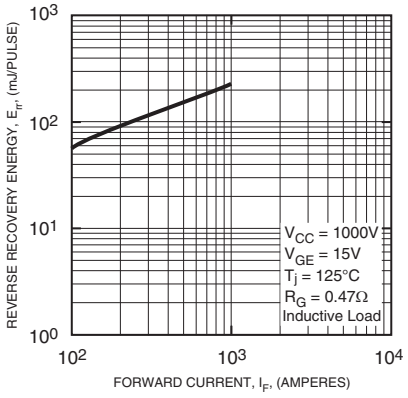
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (IGBT & CLAMP DIODE)



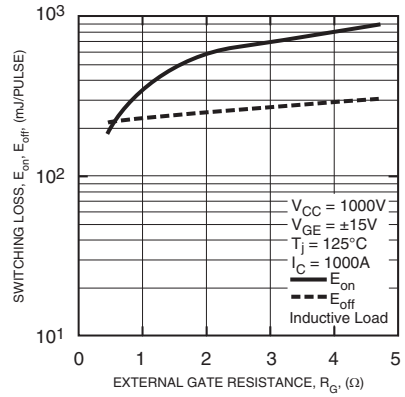
SWITCHING LOSS VS. COLLECTOR CURRENT (TYPICAL)



REVERSE RECOVERY ENERGY VS. FORWARD CURRENT (TYPICAL)



SWITCHING ENERGY VS. EXTERNAL GATE RESISTANCE (TYPICAL)



REVERSE RECOVERY ENERGY VS. EXTERNAL GATE RESISTANCE (TYPICAL)