

Product Preview
Hybrid Power Module
Integrated Power Stage
for 230 VAC Motor Drives

This module integrates a 3-phase inverter and 3-phase rectifier in a single convenient package. It is designed for 2.0 hp motor drive applications at frequencies up to 15 kHz. The inverter incorporates advanced EM-Series insulated gate bipolar transistors (IGBT) matched with ultrafast soft (UFS) free-wheeling diodes to give optimum performance. The input bridge uses rugged, efficient diodes with high surge capability. The top connector pins are designed for easy interfacing to the user's control board. It is pin-compatible with MHPM6B15E60D3 series modules for scalability.

- Short Circuit Rated 10 μ s @ 125°C, 400 V
- Pin-to-Baseplate Isolation Exceeds 2500 Vac (rms)
- Compact Package Outline
- Access to Positive and Negative DC Bus
- Gate-Emitter Clamp Diodes for ESD Protection
- UL Recognition Pending

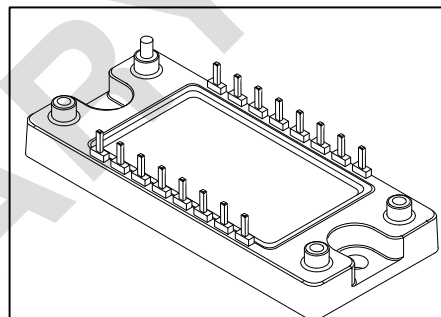
ORDERING INFORMATION

Device	Voltage Rating	Current Rating	Equivalent Horsepower
PHPM6B20E60D3	600	20	2.0

MHPM6B20E60D3

Motorola Preferred Device

**20 AMP, 600 VOLT
HYBRID POWER MODULES**



**CASE 464-03
ISSUE B**

MAXIMUM DEVICE RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Repetitive Peak Input Rectifier Reverse Voltage ($T_J = 25^\circ\text{C}$ to 150°C)	V_{RRM}	900	V
IGBT Reverse Voltage	V_{CES}	600	V
Gate-Emitter Voltage	V_{GES}	± 20	V
Continuous IGBT Collector Current ($T_C = 25^\circ\text{C}$)	I_{Cmax}	20	A
Continuous IGBT Collector Current ($T_C = 80^\circ\text{C}$)	I_{C80}	15	A
Repetitive Peak IGBT Collector Current ⁽¹⁾	$I_{C(pk)}$	40	A
Continuous Free-Wheeling Diode Current ($T_C = 25^\circ\text{C}$)	I_{Fmax}	20	A
Continuous Free-Wheeling Diode Current ($T_C = 80^\circ\text{C}$)	I_{F80}	14	A
Repetitive Peak Free-Wheeling Diode Current ⁽¹⁾	$I_{F(pk)}$	40	A
Average Converter Output Current (Peak-to-Average ratio of 10, $T_C = 95^\circ\text{C}$)	I_{Omax}	20	A
Continuous Input Rectifier Current ($T_C = 25^\circ\text{C}$)	I_{DC}	20	A
Non-Repetitive Peak Input Rectifier Forward Surge Current ⁽²⁾ ($T_J = 95^\circ\text{C}$ prior to start of surge)	I_{FSM}	475	A
IGBT Power Dissipation per die ($T_C = 95^\circ\text{C}$)	P_D	25	W
Free-Wheeling Diode Power Dissipation per die ($T_C = 95^\circ\text{C}$)	P_D	17	W
Input Rectifier Power Dissipation per die ($T_C = 95^\circ\text{C}$)	P_D	13	W

(1) 1.0 ms = 1.0% duty cycle

(2) 1.0 ms = 10% pulse width (t_w 10%)

Preferred devices are Motorola recommended choices for future use and best overall value.

This document contains information on a product under development. Motorola reserves the right to change or discontinue this product without notice.

MHPM6B20E60D3

MAXIMUM DEVICE RATINGS (T_J = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Junction Temperature Range	T _J	-40 to +150	°C
Short Circuit Duration (V _{CE} = 400 V, T _J = 125°C)	t _{sc}	10	μs
Isolation Voltage, pin to baseplate	V _{ISO}	2500	Vac
Operating Case Temperature Range	T _C	-40 to +95	°C
Storage Temperature Range	T _{stg}	-40 to +150	°C
Mounting Torque — Heat Sink Mounting Holes	—	12	lb-in

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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DC AND SMALL SIGNAL CHARACTERISTICS

Input Rectifier Forward Voltage (I = 20 A) T _J = 125°C	V _F	— —	1.0 0.92	1.25 —	V
Maximum Instantaneous Reverse Current (V = 900 V) T _J = 150°C	I _R	— —	50 3000	— —	μA
Gate-Emitter Leakage Current (V _{CE} = 0 V, V _{GE} = ±20 V)	I _{GES}	—	—	±50	μA
Collector-Emitter Leakage Current (V _{CE} = 600 V, V _{GE} = 0 V)	I _{CES}	—	5.0	100	μA
Gate-Emitter Threshold Voltage (V _{CE} = V _{GE} , I _C = 1.0 mA)	V _{GE(th)}	4.0	6.0	8.0	V
Collector-Emitter Breakdown Voltage (I _C = 10 mA, V _{GE} = 0 V)	V _{(BR)CES}	600	—	—	V
Collector-Emitter Saturation Voltage (I _C = I _{Cmax} , V _{GE} = 15 V) T _J = 125°C	V _{CE(SAT)}	— —	2.2 2.5	2.6 —	V
Free-Wheeling Diode Forward Voltage (I _F = I _{Fmax} , V _{GE} = 0 V) T _J = 125°C	V _F	— —	2.0 1.8	2.3 —	V
Input Capacitance (V _{GE} = 0 V, V _{CE} = 10 V, f = 1.0 MHz)	C _{ies}	—	TBD	—	pF

THERMAL CHARACTERISTICS (EACH DIE)

Thermal Resistance — IGBT	R _{θJC}	—	1.8	2.2	°C/W
Thermal Resistance — Free-Wheeling Diode	R _{θJC}	—	2.6	3.3	°C/W
Thermal Resistance — Input Rectifier	R _{θJC}	—	3.4	4.2	°C/W

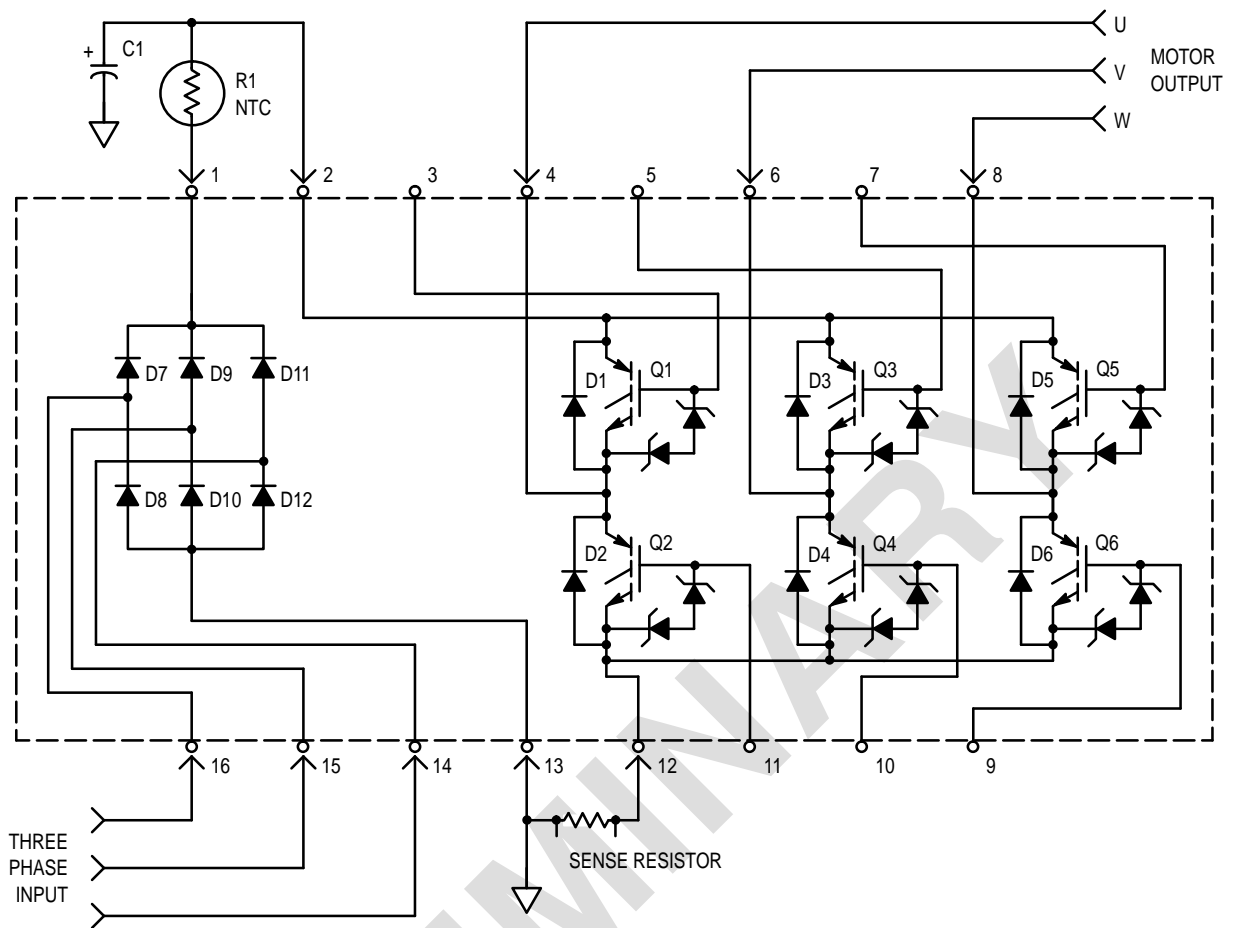


Figure 1. Schematic of Module, Showing Pin-Out and External Connections

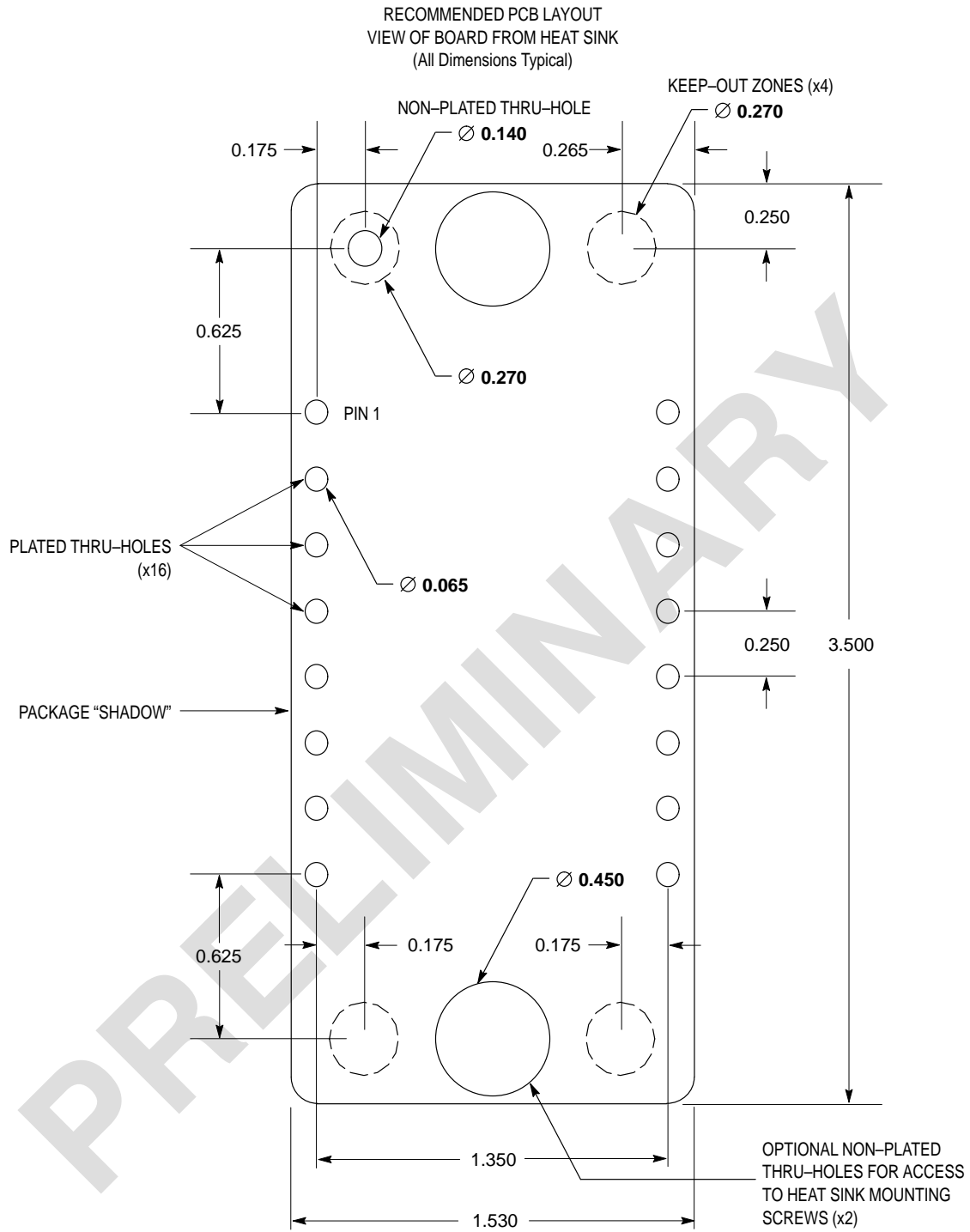
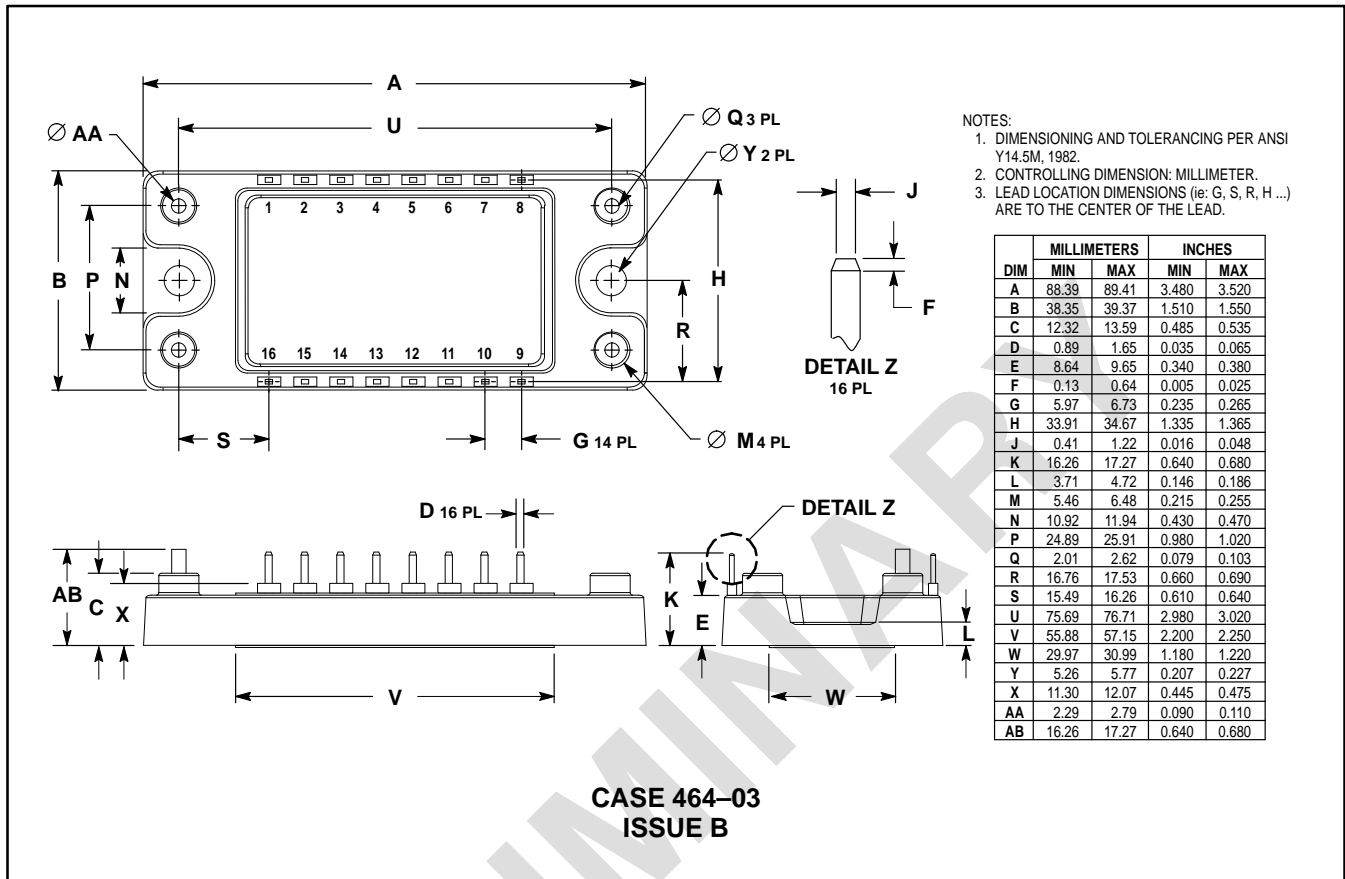


Figure 2. Package Footprint

NOTE:

1. Package is symmetrical, except for a polarizing plastic post near pin 1, indicated by a non-plated thru-hole in the footprint.
2. Dimension of plated thru-holes indicates net size after plating.
3. Access holes for mounting screws may or may not be necessary depending on assembly plan for finished product.

PACKAGE DIMENSIONS



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