

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

These modules integrate a 3-phase inverter and 3-phase rectifier in a single convenient package. They are designed for 0.5, 1.0, and 1.5 hp motor drive applications at frequencies up to 15 kHz. The inverter incorporates advanced E-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.

- 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

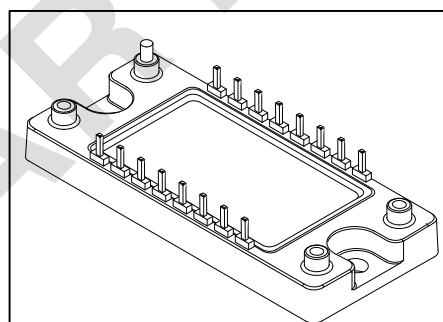
ORDERING INFORMATION

Device	Voltage Rating	Current Rating	Equivalent Horsepower
PHPM6B7E60D3	600	7.0	0.5
PHPM6B10E60D3	600	10	1.0
PHPM6B15E60D3	600	15	1.5

MHPM6B15E60D3
MHPM6B10E60D3
MHPM6B7E60D3

Motorola Preferred Devices

7.0, 10, 15 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}	7E60 10E60 15E60	A	
Continuous IGBT Collector Current ($T_C = 80^\circ\text{C}$)		I_{C80}	7E60 10E60 15E60	A
Repetitive Peak IGBT Collector Current ⁽¹⁾			$I_{C(pk)}$	7E60 10E60 15E60
Continuous Free-Wheeling Diode Current ($T_C = 25^\circ\text{C}$)	I_{Fmax}			7E60 10E60 15E60
Continuous Free-Wheeling Diode Current ($T_C = 80^\circ\text{C}$)		I_{F80}		7E60 10E60 15E60
Repetitive Peak Free-Wheeling Diode Current ⁽¹⁾			$I_{F(pk)}$	7E60 10E60 15E60

(1) 1.0 ms = 1.0% duty cycle

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

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

MHPM6B15E60D3 MHPM6B10E60D3 MHPM6B7E60D3

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

Rating		Symbol	Value	Unit
Average Converter Output Current (Peak-to-Average ratio of 10, T _C = 95°C)		I _{Omax}	20	A
Continuous Input Rectifier Current (T _C = 25°C)		I _{DC}	20	A
Non-Repetitive Peak Input Rectifier Forward Surge Current (2) (T _J = 95°C prior to start of surge)		I _{FSM}	475	A
IGBT Power Dissipation per die (T _C = 95°C)	7E60	P _D	14	W
	10E60		17	
	15E60		23	
Free-Wheeling Diode Power Dissipation per die (T _C = 95°C)	7E60	P _D	7.4	W
	10E60		9.0	
	15E60		13	
Input Rectifier Power Dissipation per die (T _C = 95°C)		P _D	13	W
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 = 15 A) T _J = 125°C	V _F	— —	0.97 0.88	1.2 —	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)}	— —	2.0 1.8	2.4 —	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}	— — —	780 1020 1605	— — —	pF

THERMAL CHARACTERISTICS (EACH DIE)

Thermal Resistance — IGBT	7E60 10E60 15E60	R _{θJC}	— — —	3.1 2.6 1.9	3.8 3.2 2.4	°C/W
Thermal Resistance — Free-Wheeling Diode	7E60 10E60 15E60	R _{θJC}	— — —	6.0 4.8 3.4	7.5 6.1 4.2	°C/W
Thermal Resistance — Input Rectifier		R _{θJC}	—	3.4	4.2	°C/W

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

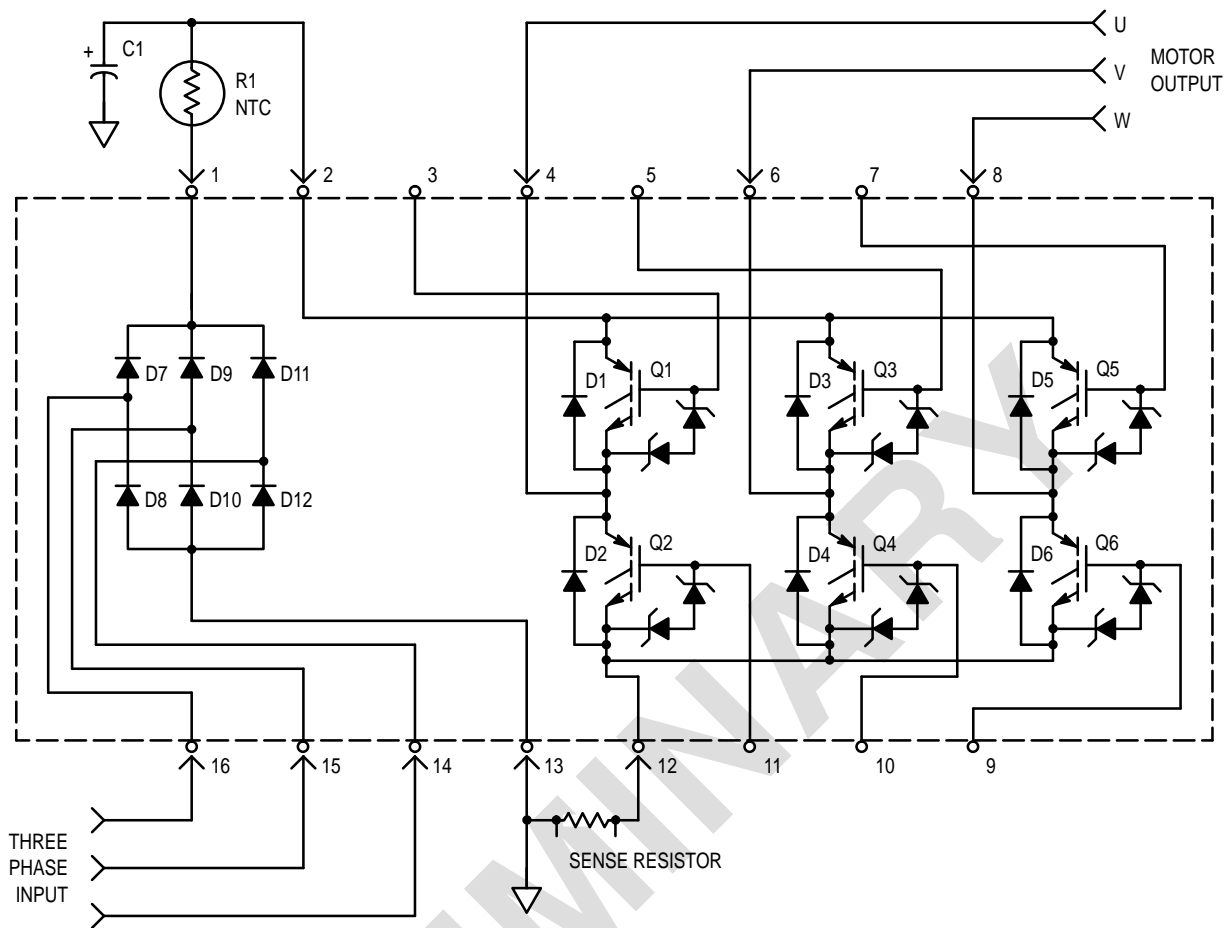


Figure 1. Schematic of Module, Showing Pin-Out and External Connections

MHPM6B15E60D3 MHPM6B10E60D3 MHPM6B7E60D3

RECOMMENDED PCB LAYOUT
VIEW OF BOARD FROM HEAT SINK
(All Dimensions Typical)

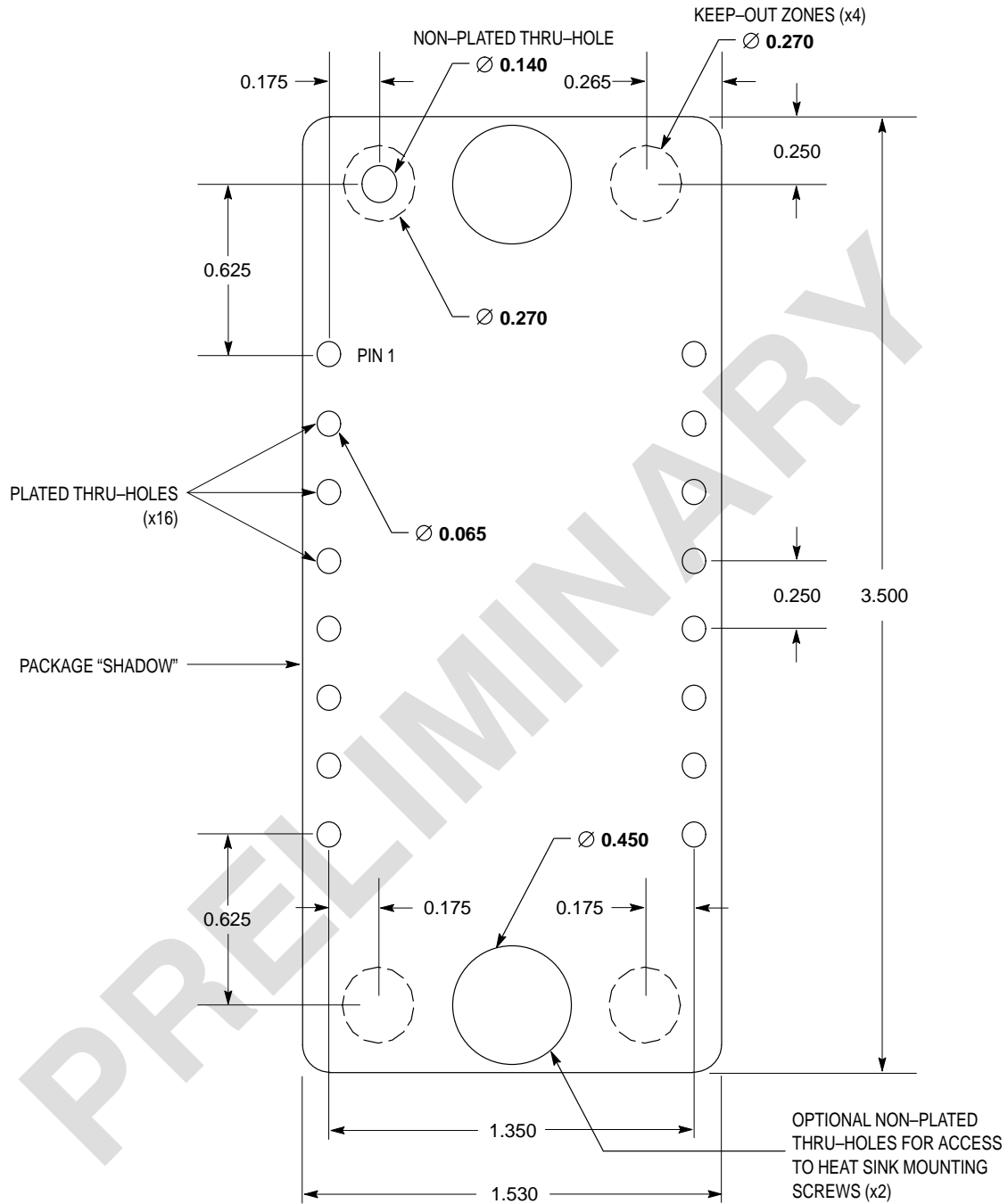


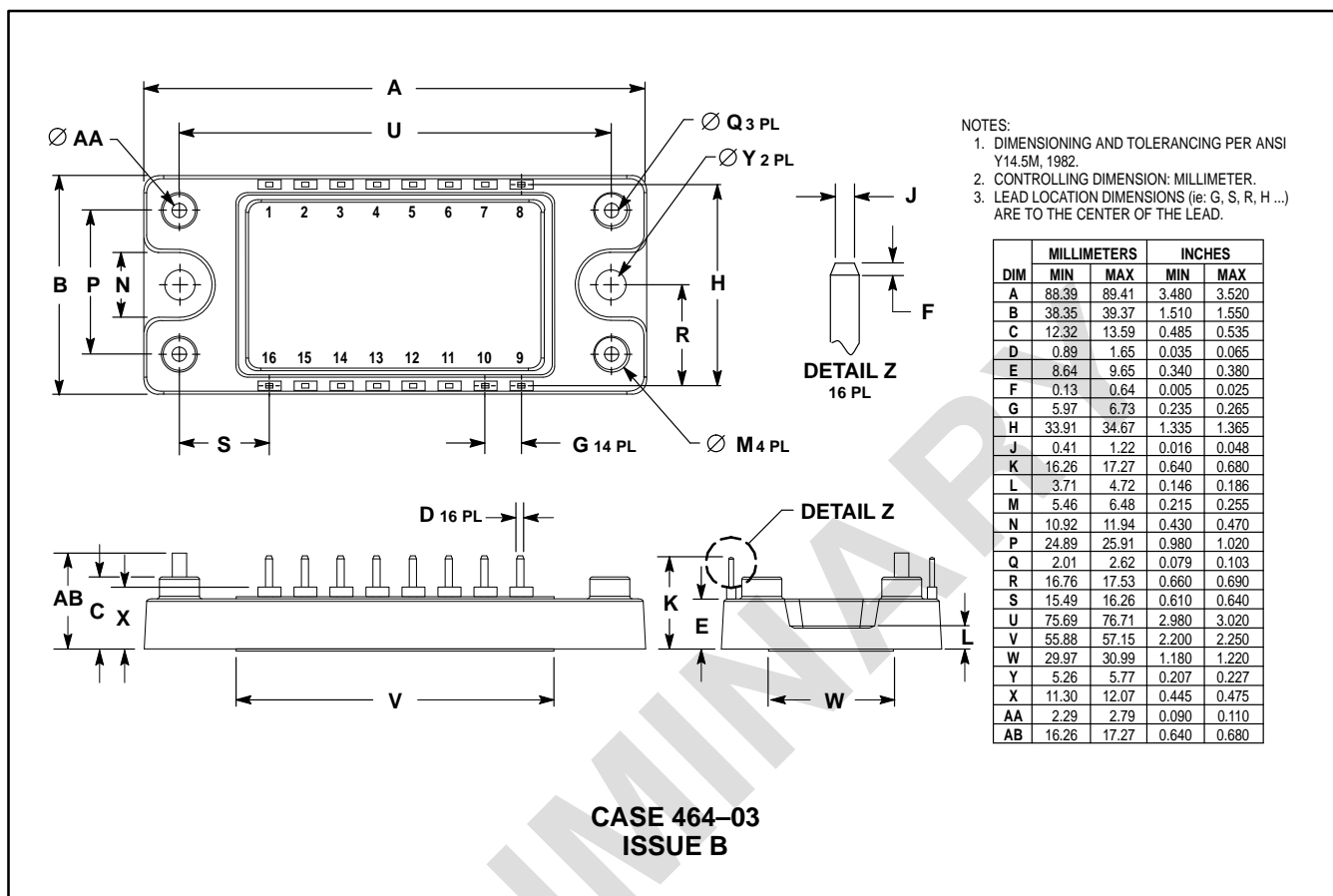
Figure 2. Package Footprint

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.

MHPM6B15E60D3 MHPM6B10E60D3 MHPM6B7E60D3

PACKAGE DIMENSIONS



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