

Advance Information

Hybrid Power Module

Integrated Power Stage for 5.0 hp 460 VAC Motor Drive

This VersaPower™ module integrates a 3-phase inverter, 3-phase rectifier, brake, and temperature sense in a single convenient package. It is designed for 5.0 hp general purpose 3-phase induction motor drive applications. The inverter incorporates advanced insulated gate bipolar transistors (IGBT) matched with fast soft free-wheeling diodes to give optimum performance. The solderable top connector pins are designed for easy interfacing to the user's control board.

- Short Circuit Rated 10 μ s @ 125°C, 720 V
- Pin-to-Baseplate Isolation Exceeds 2500 Vac (rms)
- Compact Package Outline
- Access to Positive and Negative DC Bus
- Independent Brake Circuit Connections
- UL Recognition Pending
- Visit our website at <http://www.mot-sps.com/tsg/>

ORDERING INFORMATION

| Device | Voltage Rating | Current Rating | Equivalent Horsepower |
|-----------------|----------------|----------------|-----------------------|
| XHPM7A25S120DC3 | 1200 | 25 | 5.0 |

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

| Rating | Symbol | Value | Unit |
|---|-------------|-----------------|------------------|
| Non-Repetitive Peak Input Rectifier Reverse Voltage ⁽¹⁾ ($T_J = 25^\circ\text{C}$ to 150°C) | V_{RSM} | 1600 | V |
| Repetitive Peak Input Rectifier Reverse Voltage ($T_J = 25^\circ\text{C}$ to 125°C) ($T_J = 25^\circ\text{C}$ to 150°C) | V_{RRM2} | 1600 | V |
| | V_{RRM2} | 900 | V |
| IGBT Reverse Voltage | V_{CES} | 1200 | V |
| Gate-Emitter Voltage | V_{GES} | ± 20 | V |
| Continuous IGBT Collector Current ($T_C = 25^\circ\text{C}$) | I_{Cmax} | 25 | A |
| Repetitive Peak IGBT Collector Current ⁽²⁾ | $I_{C(pk)}$ | 50 | A |
| Continuous Free-Wheeling Diode Current ($T_C = 25^\circ\text{C}$) | I_{Fmax} | 25 | A |
| Continuous Free-Wheeling Diode Current ($T_C = 80^\circ\text{C}$) | I_{F80} | 16.5 | A |
| Repetitive Peak Free-Wheeling Diode Current ⁽²⁾ | $I_{F(pk)}$ | 50 | A |
| Average Converter Output Current (Peak-to-Average ratio of 10, $T_C = 95^\circ\text{C}$) | I_{Omax} | 23.4 | A |
| IGBT Power Dissipation per die ($T_C = 95^\circ\text{C}$) | P_D | 50 | W |
| Free-Wheeling Diode Power Dissipation per die ($T_C = 95^\circ\text{C}$) | P_D | 23 | W |
| Junction Temperature Range | T_J | -40 to $+150$ | $^\circ\text{C}$ |
| Short Circuit Duration ($V_{CE} = 720$ V, $T_J = 125^\circ\text{C}$) | t_{sc} | 10 | μ s |
| Isolation Voltage, pin to baseplate | V_{ISO} | 2500 | Vac |
| Operating Case Temperature Range | T_C | -40 to $+95$ | $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -40 to $+125$ | $^\circ\text{C}$ |
| Mounting Torque — Heat Sink Mounting Holes | — | 12 | lb-in |

(1) Half-Sine 60 Hz, maximum reverse voltage capability decreases by 0.1% per $^\circ\text{C}$ at lower temperature

(2) 1.0 ms = 1.0% duty cycle

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

This document contains information on a new product. Specifications and information herein are subject to change without notice.

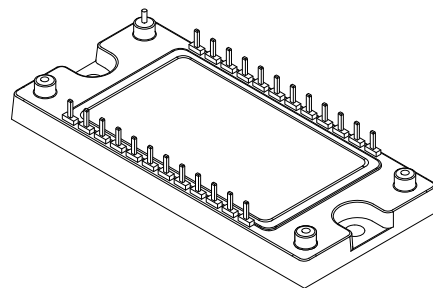
Designer's is a trademark of Motorola, Inc.

REV 2

MHPM7A25S120DC3

Motorola Preferred Device

25 AMP, 1200 VOLT
HYBRID POWER MODULE



CASE 464D-01
ISSUE O

MHPM7A25S120DC3**ELECTRICAL CHARACTERISTICS** ($T_J = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

DC AND SMALL SIGNAL CHARACTERISTICS

| | | | | | |
|---|---------------|------|------|----------|---------------|
| Input Rectifier Forward Voltage ($I_F = 25\text{ A}$) | V_F | — | 1.1 | 1.375 | V |
| Gate–Emitter Leakage Current ($V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$) | I_{GES} | — | — | ± 20 | μA |
| Collector–Emitter Leakage Current ($V_{CE} = 1200\text{ V}$, $V_{GE} = 0\text{ V}$) | I_{CES} | — | 5.0 | 100 | μA |
| Gate–Emitter Threshold Voltage ($V_{CE} = V_{GE}$, $I_C = 1.0\text{ mA}$) | $V_{GE(th)}$ | 4.0 | 6.0 | 8.0 | V |
| Collector–Emitter Breakdown Voltage ($I_C = 10\text{ mA}$, $V_{GE} = 0\text{ V}$) | $V_{(BR)CES}$ | 1200 | — | — | V |
| Collector–Emitter Saturation Voltage ($I_C = I_{Cmax}$, $V_{GE} = 15\text{ V}$) | $V_{CE(sat)}$ | — | 2.5 | 3.5 | V |
| Free–Wheeling Diode Forward Voltage ($I_F = I_{Fmax}$, $V_{GE} = 0\text{ V}$) | V_F | 1.8 | 2.1 | 2.5 | V |
| Input Capacitance ($V_{GE} = 0\text{ V}$, $V_{CE} = 25\text{ V}$, $f = 1.0\text{ MHz}$) | C_{ies} | — | 2700 | — | pF |
| Input Gate Charge ($V_{CE} = 600\text{ V}$, $I_C = I_{Cmax}$, $V_{GE} = 15\text{ V}$) | Q_T | — | 100 | — | nC |

THERMAL CHARACTERISTICS, EACH DIE

| | | | | | |
|--|-----------------|---|-----|-----|--------------------|
| Thermal Resistance — IGBT | $R_{\theta JC}$ | — | 0.8 | 1.1 | $^\circ\text{C/W}$ |
| Thermal Resistance — Free–Wheeling (Fast Soft) Diode | $R_{\theta JC}$ | — | 1.8 | 2.4 | $^\circ\text{C/W}$ |
| Thermal Resistance — Input Rectifier | $R_{\theta JC}$ | — | 2.4 | 3.3 | $^\circ\text{C/W}$ |

TEMPERATURE SENSE DIODE

| | | | | | |
|--|-----------|-------|--------|-------|----------------------------|
| Forward Voltage (@ $I_F = 1.0\text{ mA}$) | V_F | 2.388 | 2.418 | 2.448 | V |
| Forward Voltage Temperature Coefficient (@ $I_F = 1.0\text{ mA}$) | TC_{VF} | — | –7.404 | — | $\text{mV}/^\circ\text{C}$ |

TYPICAL CHARACTERISTICS

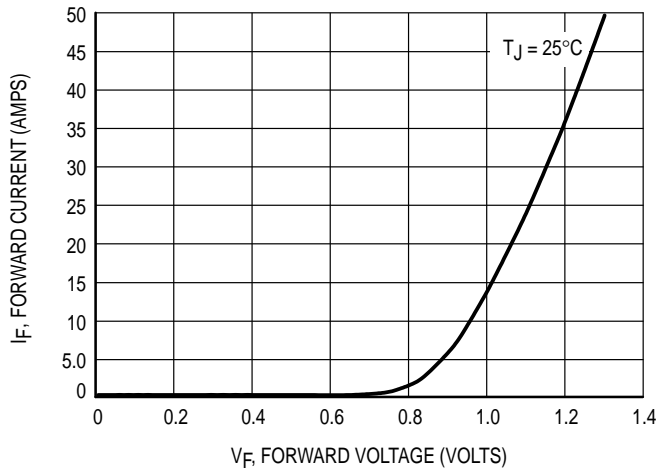


Figure 1. Forward Characteristics — Input Rectifier

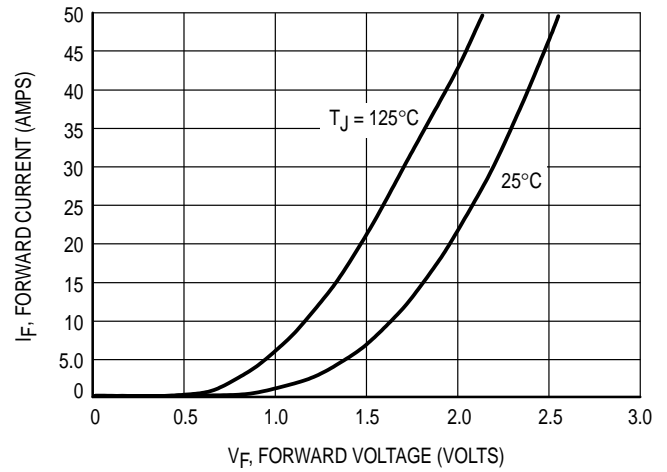


Figure 2. Forward Characteristics — Free-Wheeling Diode

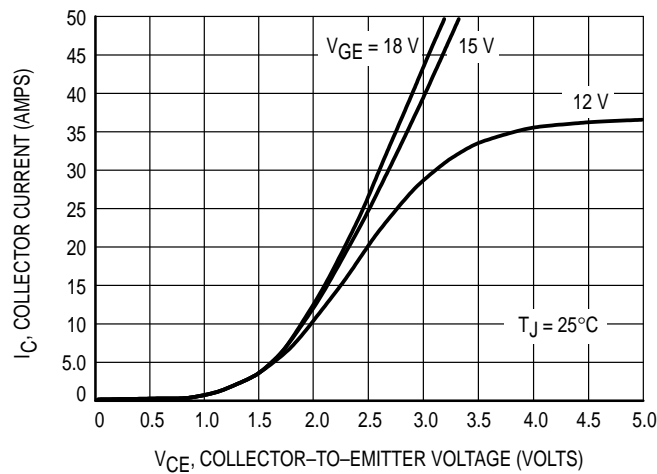


Figure 3. Forward Characteristics, $T_J = 25^\circ\text{C}$

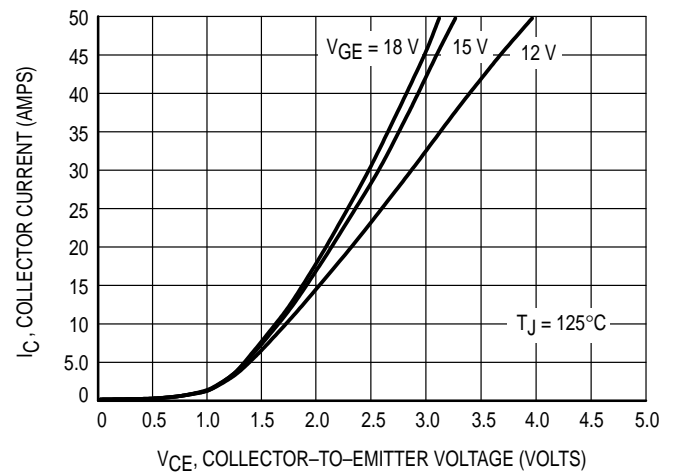


Figure 4. Forward Characteristics, $T_J = 125^\circ\text{C}$

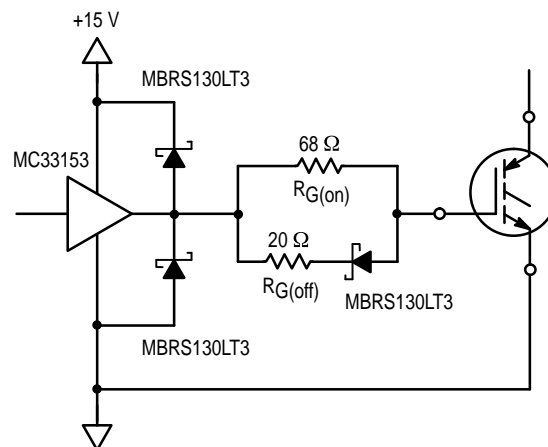


Figure 5. Recommended Gate Drive Circuit

TYPICAL CHARACTERISTICS

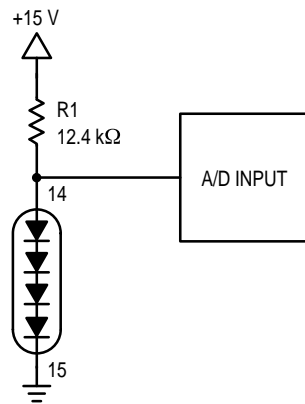


Figure 6. Recommended Temperature Sense Bias Circuit

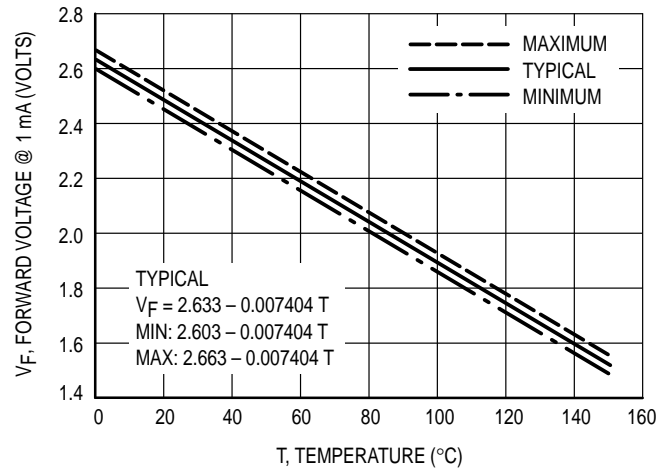


Figure 7. BAV99LT1 Temperature Sense Diode Performance: $V_F = 2.633 - 7.404E-3 T_C$

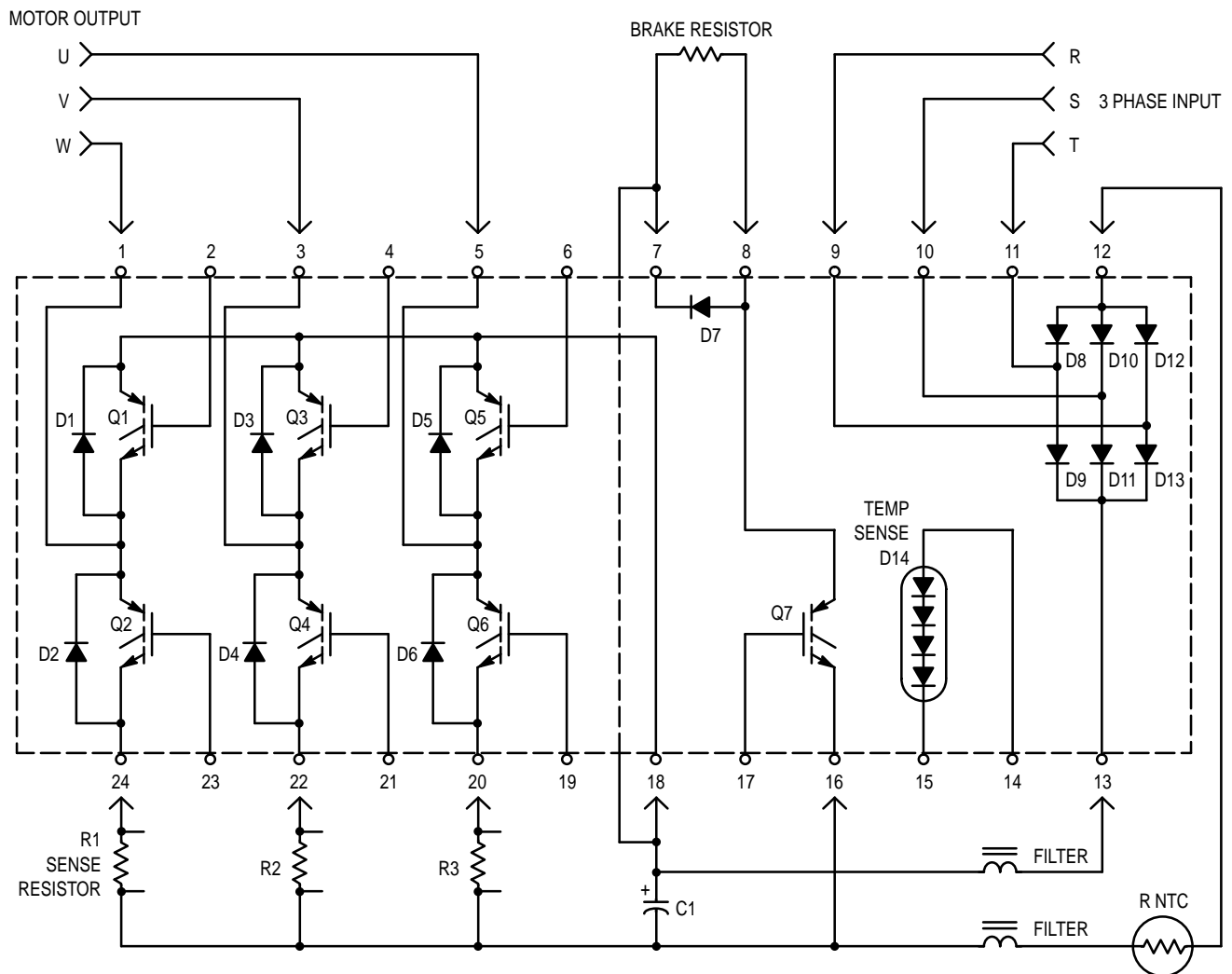
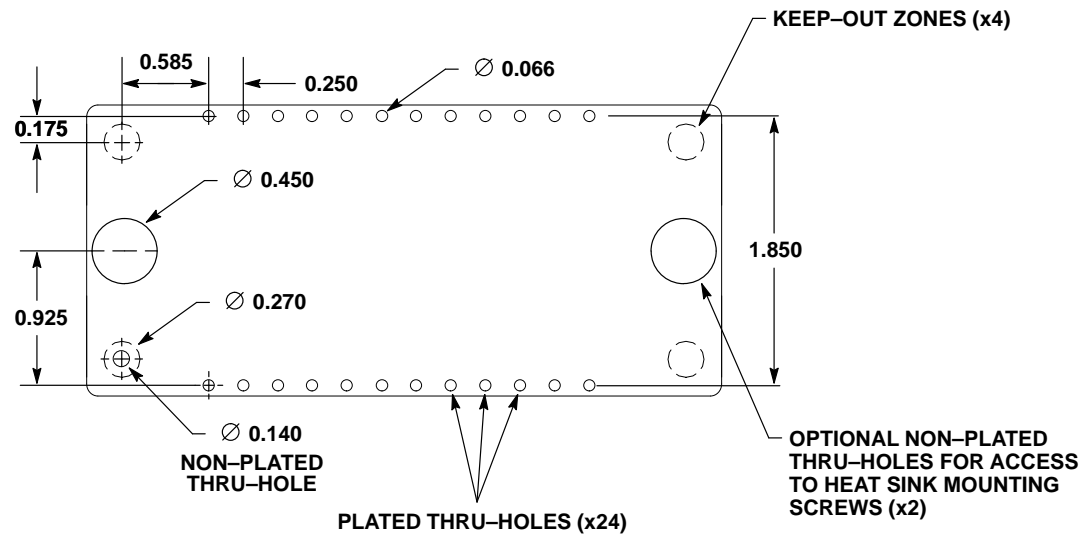


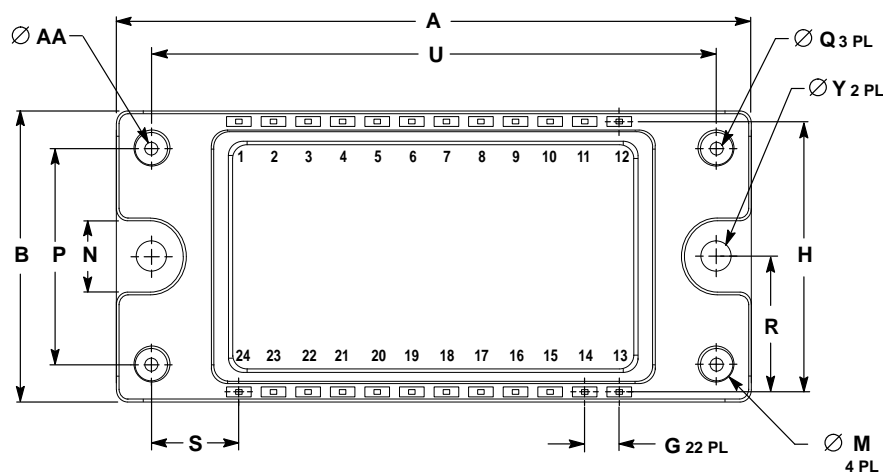
Figure 8. Schematic of Module, Showing Pin-Out and External Connections

MHPM7A25S120DC3**NOTES:**

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 finished hole size after plating.
3. Access holes for mounting screws may or may not be necessary depending on assembly plan for finished product.

Figure 9. Package Footprint (Dimensions in Inches)

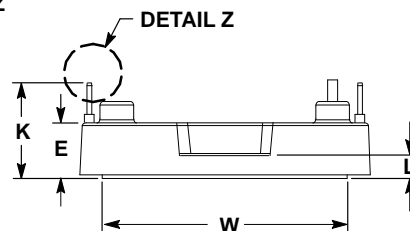
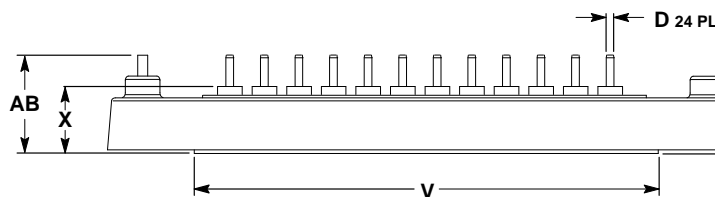
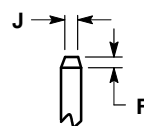
PACKAGE DIMENSIONS




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. LEAD LOCATION DIMENSIONS (ie: P, Q, R, S...) ARE TO THE CENTER OF THE LEAD.

| DIM | MILLIMETERS | | INCHES | |
|-----|-------------|--------|--------|-------|
| | MIN | MAX | MIN | MAX |
| A | 111.51 | 112.52 | 4.390 | 4.430 |
| B | 50.93 | 51.94 | 2.005 | 2.045 |
| C | 12.32 | 13.59 | 0.485 | 0.535 |
| D | 0.89 | 1.65 | 0.035 | 0.065 |
| E | 8.64 | 9.65 | 0.340 | 0.380 |
| F | 0.13 | 0.64 | 0.005 | 0.025 |
| G | 5.97 | 6.73 | 0.235 | 0.265 |
| H | 46.48 | 47.50 | 1.830 | 1.870 |
| J | 0.41 | 1.22 | 0.016 | 0.048 |
| K | 16.26 | 17.27 | 0.640 | 0.680 |
| L | 3.71 | 4.72 | 0.146 | 0.186 |
| M | 5.46 | 6.48 | 0.215 | 0.255 |
| N | 10.92 | 11.94 | 0.430 | 0.470 |
| P | 37.60 | 38.60 | 1.480 | 1.520 |
| Q | 2.01 | 2.62 | 0.079 | 0.103 |
| R | 23.24 | 23.75 | 0.915 | 0.935 |
| S | 14.35 | 15.37 | 0.565 | 0.605 |
| U | 99.10 | 100.08 | 3.900 | 3.940 |
| V | 81.28 | 82.55 | 3.200 | 3.240 |
| W | 42.67 | 43.69 | 1.680 | 1.720 |
| Y | 5.15 | 5.77 | 0.203 | 0.227 |
| X | 11.30 | 12.07 | 0.445 | 0.475 |
| AA | 2.01 | 2.72 | 0.079 | 0.107 |
| AB | 16.26 | 17.27 | 0.640 | 0.680 |



CASE 464D-01
ISSUE O

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution;
P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

JAPAN: Nippon Motorola Ltd.; SPD, Strategic Planning Office, 141,
4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan. 81-3-5487-8488

Customer Focus Center: 1-800-521-6274

Mfax™: RMFAX0@email.sps.mot.com – TOUCHTONE 1-602-244-6609
Motorola Fax Back System – US & Canada ONLY 1-800-774-1848
– http://sps.motorola.com/mfax/

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

HOME PAGE: <http://motorola.com/sps/>



MOTOROLA