

# HiPerFETs

The HiPerFET family of Power MOSFETs is designed to provide superior  $dv/dt$  performance while eliminating the need for discrete, fast recovery "free wheeling" rectifiers in a broad range of power switching applications.

This new class of Power MOSFETs uses IXYS' HDMOS II process which improves the ruggedness of the FET while reducing the reverse recovery time of the intrinsic rectifier to less than 250 ns at elevated (150°C) junction temperature. The performance of the intrinsic rectifier is comparable to discrete high voltage rectifiers and is tailored to minimize power dissipation and stress in the MOSFET

## HiPerFETs Offer Extended $dv/dt$ Ruggedness

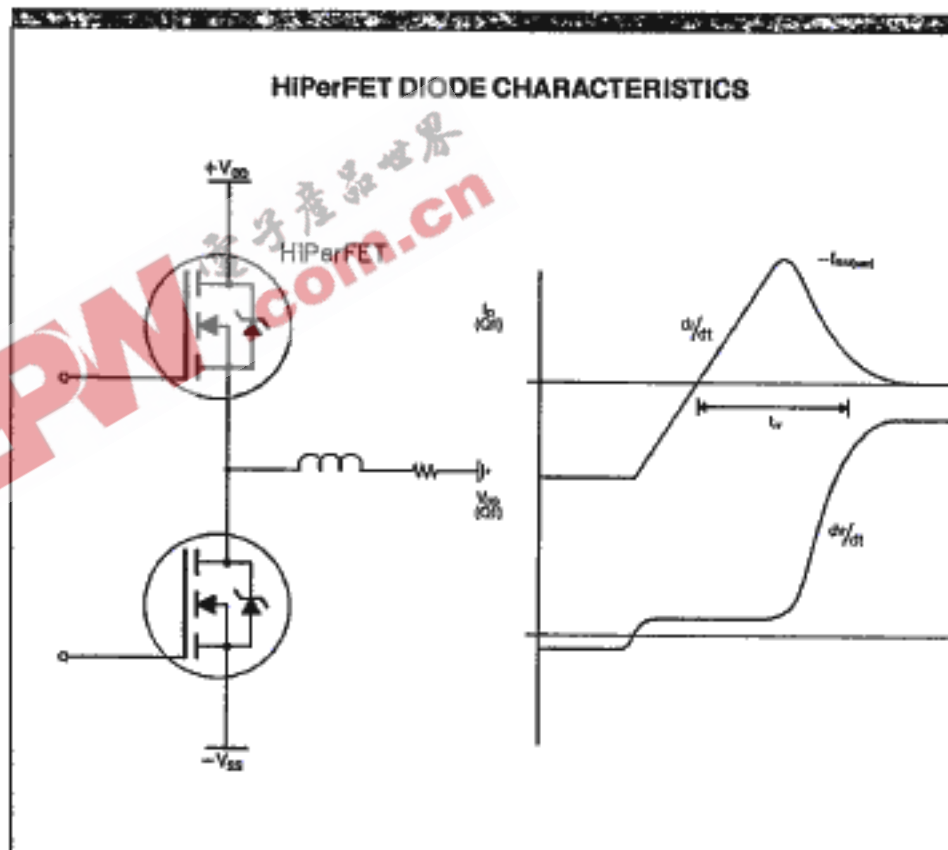
The HiPerFET series of Power MOSFETs have an extended stress capability in applications where the intrinsic "free-wheeling" diode is used. Both static and commutating  $dv/dt$  withstand capability have been improved tenfold to typically 50V/ns and 15V/ns respectively. These devices offer a significant margin of safety in high stress conditions found in many types of inductive power switching applications.

## HDMOS II Eliminates Tradeoffs

HDMOS II is a fifth generation power MOS technology developed by IXYS which incorporates the advantages of the original HDMOS process to achieve ultra low  $R_{DS(ON)}$ , high unclamped energy, and high transconductance. Additionally, HDMOS II includes proprietary lifetime control process to reduce the recovery time ( $t_{rr}$ ) of the intrinsic rectifier without increasing the on-resistance of the MOSFET. Also contained are enhancements to the MOSFET cell design which significantly improves  $dv/dt$  ruggedness.

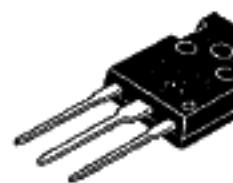
## HiPerFETs Range From 450 to 1000 Volts

IXYS offers the broadest range of MOSFETs with high  $dv/dt$  rugged and usable diode characteristics. They are available in ratings of 20 amps at 500 volts and 12 amps at 1000 volts. Even if the application does not require use of the intrinsic rectifier, HiPerFETs offer an extra measure of reliability in harsh industrial circuit environments such as DC motor controls, welders, sonar amplifier and other Hi-Rel/military power conversion systems.

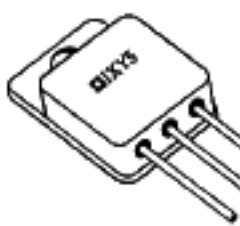



## HiPerFET Power MOSFETs

| Part Number | Drain-Source Voltage<br>$V_{DS(ROSS)}$<br>(Volts) | Drain Current<br>$I_{D(Cont)}$<br>(Amps) | On Resistance<br>$R_{DS(on)}$<br>(Ohms) | HiPerFET Characteristics           |                                     |                                  | Power Diss.<br>$P_D$ Max<br>(Watts) | Notes | Case Style |
|-------------|---|--|---|------------------------------------|-------------------------------------|----------------------------------|-------------------------------------|-------|------------|
|             |   |  |   | Diode Rec Time<br>$t_{rr}$<br>(nS) | Avalanche Current<br>loss<br>(Amps) | Commutating<br>$dv/dt$<br>(V/nS) |                                     |       |            |
| IXFH12N100  | 1000  | 12                                       | 1.0                                     | 250                                | 12                                  | 10                               | 300                                 |       | TO-247     |
| IXFH11N100  | 1000  | 11                                       | 1.15                                    | 250                                | 11                                  | 10                               | 300                                 |       |            |
| IXFH10N100  | 1000  | 10                                       | 1.2                                     | 250                                | 10                                  | 10                               | 250                                 |       |            |
| IXFH9N100   | 1000  | 9  | 1.4                                     | 250                                | 9                                   | 10                               | 250                                 |       |            |
| IXFH6N100   | 1000  | 6  | 2.0                                     | 250                                | 6                                   | 10                               | 150                                 |       |            |
| IXFH5N100   | 1000  | 5  | 2.6                                     | 250                                | 5                                   | 10                               | 150                                 |       |            |
| IXFH13N90   | 900   | 13                                       | 0.8                                     | 250                                | 13                                  | 10                               | 300                                 |       |            |
| IXFH12N90   | 900   | 12                                       | 0.9                                     | 250                                | 12                                  | 10                               | 300                                 |       |            |
| IXFH11N90   | 900   | 11                                       | 0.95                                    | 250                                | 11                                  | 10                               | 250                                 |       |            |
| IXFH10N90   | 900   | 10                                       | 1.1                                     | 250                                | 10                                  | 10                               | 250                                 |       |            |
| IXFH7N90    | 900   | 7  | 1.5                                     | 250                                | 7                                   | 10                               | 150                                 |       |            |
| IXFH6N90    | 900   | 6  | 2.2                                     | 250                                | 6                                   | 10                               | 150                                 |       |            |
| IXFH18N65   | 650   | 18                                       | 0.4                                     | 250                                | 18                                  | 10                               | 300                                 |       |            |
| IXFH17N65   | 650   | 17                                       | 0.45                                    | 250                                | 17                                  | 10                               | 300                                 |       |            |
| IXFH15N65   | 650   | 15                                       | 0.5                                     | 250                                | 15                                  | 10                               | 250                                 |       |            |
| IXFH13N65   | 650   | 13                                       | 0.65                                    | 250                                | 13                                  | 10                               | 250                                 |       |            |
| IXFH10N65   | 650   | 10                                       | 0.7                                     | 250                                | 10                                  | 10                               | 150                                 |       |            |
| IXFH8N65    | 650   | 8  | 0.95                                    | 250                                | 8                                   | 10                               | 150                                 |       |            |
| IXFH21N60   | 600   | 21                                       | 0.3                                     | 250                                | 21                                  | 10                               | 300                                 |       |            |
| IXFH20N60   | 600   | 20                                       | 0.35                                    | 250                                | 20                                  | 10                               | 300                                 |       |            |
| IXFH17N60   | 600   | 17                                       | 0.4                                     | 250                                | 17                                  | 10                               | 250                                 |       |            |
| IXFH15N60   | 600   | 15                                       | 0.5                                     | 250                                | 15                                  | 10                               | 250                                 |       |            |
| IXFH11N60   | 600   | 11                                       | 0.55                                    | 250                                | 11                                  | 10                               | 150                                 |       |            |
| IXFH10N60   | 600   | 10                                       | 0.75                                    | 250                                | 10                                  | 10                               | 150                                 |       |            |
| IXFH26N50   | 500   | 26                                       | 0.2                                     | 250                                | 26                                  | 10                               | 300                                 |       |            |
| IXFH24N50   | 500   | 24                                       | 0.23                                    | 250                                | 24                                  | 10                               | 300                                 |       |            |
| IXFH21N50   | 500   | 21                                       | 0.25                                    | 250                                | 21                                  | 10                               | 250                                 |       |            |
| IXFH19N50   | 500   | 19                                       | 0.3                                     | 250                                | 19                                  | 10                               | 250                                 |       |            |
| IXFH13N50   | 500   | 13                                       | 0.4                                     | 250                                | 13                                  | 10                               | 150                                 |       |            |
| IXFH12N50   | 500   | 12                                       | 0.5                                     | 250                                | 12                                  | 10                               | 150                                 |       |            |
| IXFH40N30   | 300   | 40                                       | 0.08                                    | 250                                | 40                                  | 10                               | 250                                 |       |            |
| IXFH35N30   | 300   | 35                                       | 0.1                                     | 250                                | 35                                  | 10                               | 250                                 |       |            |
| IXFH50N20   | 200   | 50                                       | 0.045                                   | 200                                | 50                                  | 10                               | 250                                 |       |            |
| IXFH42N20   | 200   | 42                                       | 0.065                                   | 200                                | 42                                  | 10                               | 250                                 |       |            |
| IXFH75N10   | 100   | 75                                       | 0.02                                    | 200                                | 75                                  | 10                               | 250                                 |       |            |
| IXFH67N10   | 100   | 67                                       | 0.025                                   | 200                                | 67                                  | 10                               | 250                                 |       |            |


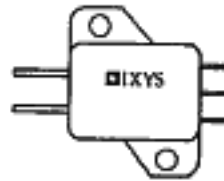


# HIPerFET Power MOSFETs

| Part Number | Drain-Source Voltage $V_{DS(oss)}$ (Volts) | Drain Current $I_D(Cont)$ (Amps) | On Resistance $R_{DS(on)}$ (Ohms) | HIPerFET Characteristics     |                                   |                            | Power Diss. $P_D$ Max (Watts) | Notes   | Case Style  |
|-------------|--|----------------------------------|-----------------------------------|------------------------------|-----------------------------------|----------------------------|-------------------------------|---|---|
|             |  |                                  |                                   | Diode Rec Time $t_{rr}$ (nS) | Avalanche Current $I_{AS}$ (Amps) | Commutating $dv/dt$ (V/nS) |                               |   |   |
| IXFL13N65   | 650  | 13                               | 0.5                               | 250                          | 13                                | 10                         | 175                           |  |   |
| IXFL9N65    | 650  | 9                                | 0.7                               | 250                          | 9                                 | 10                         | 125                           |   |   |
| IXFL14N60   | 600  | 14                               | 0.4                               | 250                          | 14                                | 10                         | 175                           |   |   |
| IXFL10N60   | 600  | 10                               | 0.55                              | 250                          | 10                                | 10                         | 125                           |   |   |
| IXFL18N50   | 500  | 18                               | 0.25                              | 250                          | 18                                | 10                         | 175                           |   |   |
| IXFL450     | 500  | 12                               | 0.4                               | 250                          | 12                                | 10                         | 125                           |   |   |
| IXFL24N40   | 400  | 24                               | 0.2                               | 250                          | 24                                | 10                         | 175                           |   |   |
| IXFL350     | 400  | 14                               | 0.3                               | 250                          | 14                                | 10                         | 125                           |   |   |
| IXFL25N20   | 200  | 25                               | 0.065                             | 200                          | 25                                | 10                         | 175                           |   |   |
| IXFL250     | 200  | 25                               | 0.1                               | 200                          | 25                                | 10                         | 125                           |   |   |
| IXFL25N10   | 100  | 25                               | 0.030                             | 200                          | 25                                | 10                         | 175                           |   |   |
| IXFL150     | 100  | 25                               | 0.065                             | 200                          | 25                                | 10                         | 125                           |   |   |
| IXFM12N100  | 1000                                       | 12                               | 1.0                               | 250                          | 12                                | 10                         | 300                           |   |  |
| IXFM11N100  | 1000                                       | 11                               | 1.15                              | 250                          | 11                                | 10                         | 300                           |   |   |
| IXFM10N100  | 1000                                       | 10                               | 1.2                               | 250                          | 10                                | 10                         | 250                           |   |   |
| IXFM9N100   | 1000                                       | 9                                | 1.4                               | 250                          | 9                                 | 10                         | 250                           |   |   |
| IXFM8N100   | 1000                                       | 6                                | 2.0                               | 250                          | 6                                 | 10                         | 150                           |   |   |
| IXFM5N100   | 1000                                       | 5                                | 2.6                               | 250                          | 5                                 | 10                         | 150                           |   |   |
| IXFM13N90   | 900  | 13                               | 0.8                               | 250                          | 13                                | 10                         | 300                           |   |   |
| IXFM12N90   | 900  | 12                               | 0.9                               | 250                          | 12                                | 10                         | 300                           |   |   |
| IXFM11N90   | 900  | 11                               | 0.95                              | 250                          | 11                                | 10                         | 250                           |   |   |
| IXFM10N90   | 900  | 10                               | 1.1                               | 250                          | 10                                | 10                         | 250                           |   |   |
| IXFM7N90    | 900  | 7                                | 1.5                               | 250                          | 7                                 | 10                         | 150                           |   |   |
| IXFM6N90    | 900  | 6                                | 2.2                               | 250                          | 6                                 | 10                         | 150                           |   |   |
| IXFM18N65   | 650  | 18                               | 0.4                               | 250                          | 18                                | 10                         | 300                           |   |   |
| IXFM17N65   | 650  | 17                               | 0.45                              | 250                          | 17                                | 10                         | 300                           |   |   |
| IXFM15N65   | 650  | 15                               | 0.5                               | 250                          | 15                                | 10                         | 250                           |   |   |
| IXFM13N65   | 650  | 13                               | 0.65                              | 250                          | 13                                | 10                         | 250                           |   |   |
| IXFM10N65   | 650  | 10                               | 0.7                               | 250                          | 10                                | 10                         | 150                           |   |   |
| IXFM9N65    | 650  | 8                                | 0.95                              | 250                          | 8                                 | 10                         | 150                           |   |   |
| IXFM21N60   | 600  | 21                               | 0.3                               | 250                          | 21                                | 10                         | 300                           |   |   |
| IXFM20N60   | 600  | 20                               | 0.35                              | 250                          | 20                                | 10                         | 300                           |   |   |
| IXFM17N60   | 600  | 17                               | 0.4                               | 250                          | 17                                | 10                         | 250                           |   |   |
| IXFM15N60   | 600  | 15                               | 0.5                               | 250                          | 15                                | 10                         | 250                           |   |   |
| IXFM11N60   | 600  | 11                               | 0.55                              | 250                          | 11                                | 10                         | 150                           |   |   |
| IXFM10N60   | 600  | 10                               | 0.75                              | 250                          | 10                                | 10                         | 150                           |   |   |
| IXFM26N50   | 500  | 26                               | 0.2                               | 250                          | 26                                | 10                         | 300                           |   |   |



**HIPerFET Power MOSFETs**

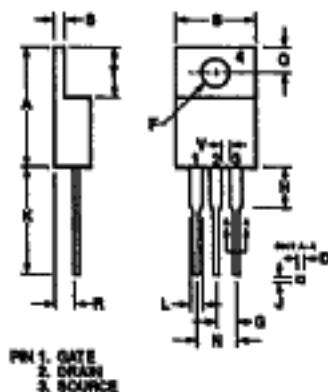
| Part Number | Drain-Source Voltage $V_{DS(ON)}$ (Volts) | Drain Current $I_{D(ON)}$ (Amps) | On Resistance $R_{DS(ON)}$ (Ohms) | HIPerFET Characteristics  |                                   |                            | Power Diss. $P_D$ Max (Watts) | Notes   | Case Style |
|-------------|---|----------------------------------|-----------------------------------|---------------------------|-----------------------------------|----------------------------|-------------------------------|---|------------|
|             |   |                                  |                                   | Diode Rec Time $t_r$ (nS) | Avalanche Current $I_{AS}$ (Amps) | Commutating $dv/dt$ (V/nS) |                               |   |            |
| IXFM24N50   | 500                                       | 24                               | 0.23                              | 250                       | 24                                | 10                         | 300                           |    |            |
| IXFM21N50   | 500                                       | 21                               | 0.25                              | 250                       | 21                                | 10                         | 250                           |   |            |
| IXFM19N50   | 500                                       | 19                               | 0.3                               | 250                       | 19                                | 10                         | 250                           |   |            |
| IXFM13N50   | 500                                       | 13                               | 0.4                               | 250                       | 13                                | 10                         | 150                           |   |            |
| IXFM12N50   | 500                                       | 12                               | 0.5                               | 250                       | 12                                | 10                         | 150                           |   |            |
| IXFM40N30   | 300                                       | 40                               | 0.08                              | 250                       | 40                                | 10                         | 250                           |   |            |
| IXFM35N30   | 300                                       | 35                               | 0.1                               | 250                       | 35                                | 10                         | 250                           |   |            |
| IXFM50N20   | 200                                       | 50                               | 0.045                             | 200                       | 50                                | 10                         | 250                           |   |            |
| IXFM42N20   | 200                                       | 42                               | 0.065                             | 200                       | 42                                | 10                         | 250                           |   |            |
| IXFM75N10   | 100                                       | 75                               | 0.02                              | 200                       | 75                                | 10                         | 250                           |   |            |
| IXFM67N10   | 100                                       | 67                               | 0.025                             | 200                       | 67                                | 10                         | 250                           |  |            |
| IXFZ11N100  | 1000                                      | 11                               | 1.15                              | 250                       | 11                                | 10                         | 300                           |   |            |
| IXFZ12N90   | 900                                       | 12                               | 0.9                               | 250                       | 12                                | 10                         | 300                           |   |            |
| IXFZ18N65   | 650                                       | 18                               | 0.4                               | 250                       | 18                                | 10                         | 300                           |   |            |
| IXFZ21N60   | 600                                       | 21                               | 0.3                               | 250                       | 21                                | 10                         | 300                           |   |            |
| IXFZ24N50   | 500                                       | 24                               | 0.23                              | 250                       | 24                                | 10                         | 300                           |   |            |
| IXFZ35N30   | 300                                       | 35                               | 0.1                               | 250                       | 35                                | 10                         | 250                           |   |            |
| IXFZ42N20   | 200                                       | 42                               | 0.065                             | 200                       | 42                                | 10                         | 250                           |   |            |
| IXFZ67N10   | 100                                       | 67                               | 0.025                             | 200                       | 67                                | 10                         | 250                           |   |            |
| IXFN15N100  | 1000                                      | 15                               | 0.6                               | 250                       | ---                               | 10                         | 325                           |   | 1          |
| IXFN17N80   | 800                                       | 17                               | 0.5                               | 250                       | ---                               | 10                         | 325                           | 1   |            |
| IXFN35N50   | 500                                       | 35                               | 0.12                              | 250                       | 35                                | 10                         | 325                           | 1   |            |
| IXFN50N25   | 250                                       | 50                               | 0.05                              | 250                       | 50                                | 10                         | 300                           | 1   |            |
| IXFN64N20   | 200                                       | 64                               | 0.033                             | 250                       | 64                                | 10                         | 300                           |   |            |
| IXFN100N10  | 100                                       | 100                              | 0.013                             | 250                       | 100                               | 10                         | 300                           |   |            |

Notes: 1. Available 4Q89

# DETAILED PACKAGE OUTLINES

T-91-20

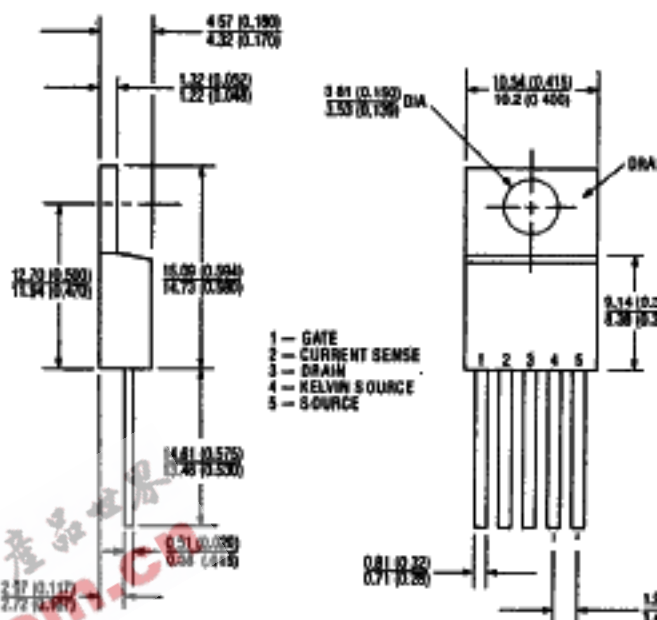
TO-220 AB



PIN 1. GATE  
2. DRAIN  
3. SOURCE

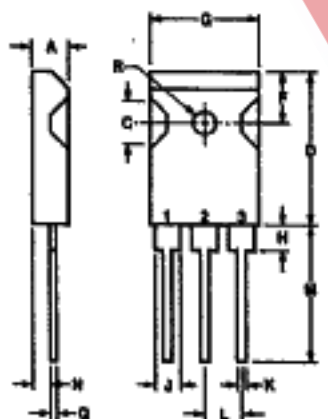
| Dim. | Millimeter |       | Inches |      |
|------|------------|-------|--------|------|
|      | Min.       | Max.  | Min.   | Max. |
| A    | 14.23      | 16.51 | .560   | .650 |
| B    | 9.65       | 10.65 | .380   | .420 |
| C    | 3.56       | 4.82  | .140   | .190 |
| D    | 0.64       | 0.89  | .025   | .035 |
| F    | 3.54       | 4.00  | .139   | .161 |
| G    | 2.29       | 2.79  | .090   | .110 |
| H    | -          | 6.35  | -      | .250 |
| J    | 0.51       | .76   | .020   | .030 |
| K    | 12.79      | 14.73 | .500   | .580 |
| L    | 1.15       | 1.77  | .045   | .070 |
| N    | 4.83       | 5.33  | .190   | .210 |
| Q    | 2.54       | 3.42  | .100   | .135 |
| R    | 2.64       | 2.49  | .060   | .115 |
| S    | 0.64       | 1.39  | .025   | .055 |
| T    | 5.85       | 6.85  | .230   | .270 |
| V    | 1.15       | -     | .045   | -    |

CONFORMS TO OUTLINE TO-220 (IR H-7)  
Dimensions in Millimeters (Inches)



1 - GATE  
2 - CURRENT SENSE  
3 - DRAIN  
4 - KELVIN SOURCE  
5 - SOURCE

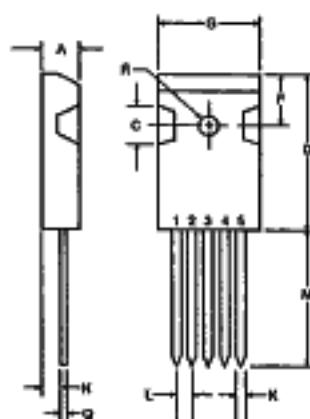
TO-247 (3 LEADED)



PIN 1. GATE  
2. DRAIN  
3. SOURCE

| Dim.           | Millimeter |      | Inches |      |
|----------------|------------|------|--------|------|
|                | Min.       | Max. | Min.   | Max. |
| A              | 4.7        | 5.3  | .185   | .209 |
| C              | 4.5        | 6.0  | .178   | .236 |
| D              | 19.7       | 21.4 | .776   | .843 |
| F              | 5.3        | 6.1  | .209   | .240 |
| G              | 15.3       | 15.9 | .602   | .625 |
| H              | 3.7        | 4.3  | .146   | .169 |
| J              | 1.95       | 2.4  | .077   | .094 |
| J <sub>1</sub> | 2.97       | 3.4  | .117   | .134 |
| K              | 1.0        | 1.4  | .040   | .055 |
| L              | 5.4        | 5.5  | .213   | .217 |
| M              | 19.9       | 20.2 | .783   | .795 |
| N              | 2.2        | 2.6  | .087   | .102 |
| Q              | 0.4        | 0.8  | .016   | .031 |
| R              | 2.9        | 3.3  | .114   | .129 |

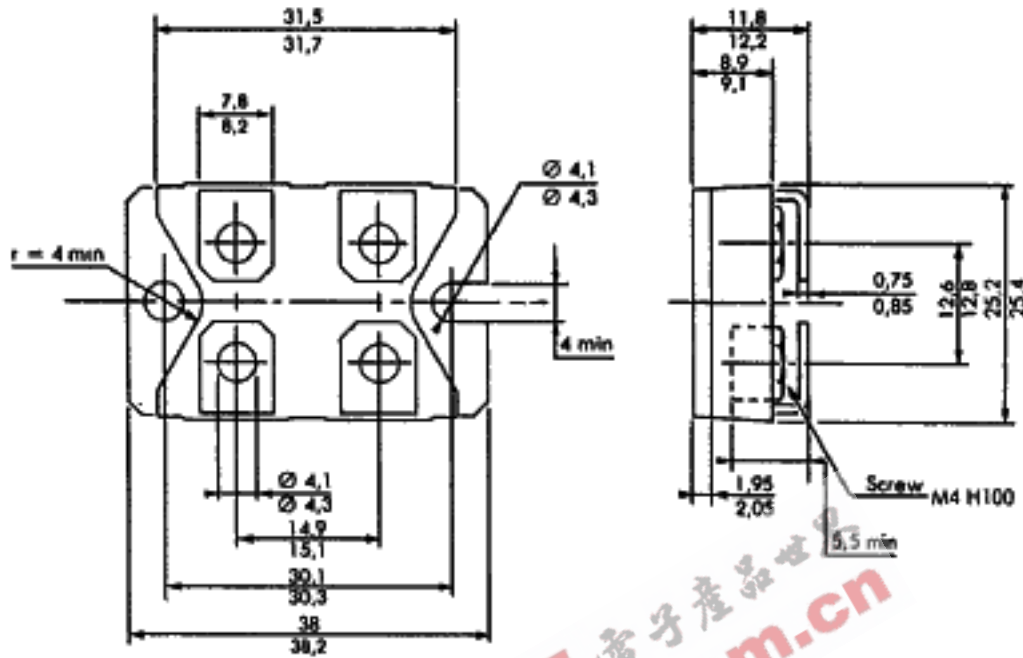
TO-247 (5 LEADED)



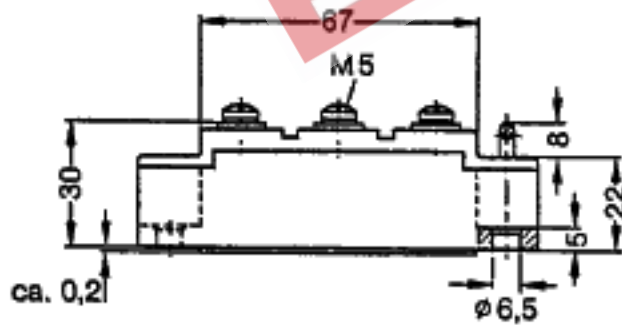
PIN 1. GATE  
2. MIRROR  
3. DRAIN  
4. KELVIN  
5. SOURCE

| Dim. | Millimeter |      | Inches |      |
|------|------------|------|--------|------|
|      | Min.       | Max. | Min.   | Max. |
| A    | 4.7        | 5.3  | .185   | .209 |
| C    | 4.5        | 6.0  | .178   | .236 |
| D    | 19.7       | 21.4 | .776   | .843 |
| F    | 5.3        | 6.1  | .209   | .240 |
| G    | 15.3       | 15.9 | .602   | .625 |
| K    | 1.1        | 1.3  | .043   | .051 |
| L    | 2.61       | 2.58 | .099   | .101 |
| M    | 19.9       | 20.2 | .783   | .795 |
| N    | 2.2        | 2.6  | .087   | .102 |
| Q    | 0.4        | 0.8  | .016   | .031 |
| R    | 2.9        | 3.3  | .114   | .129 |

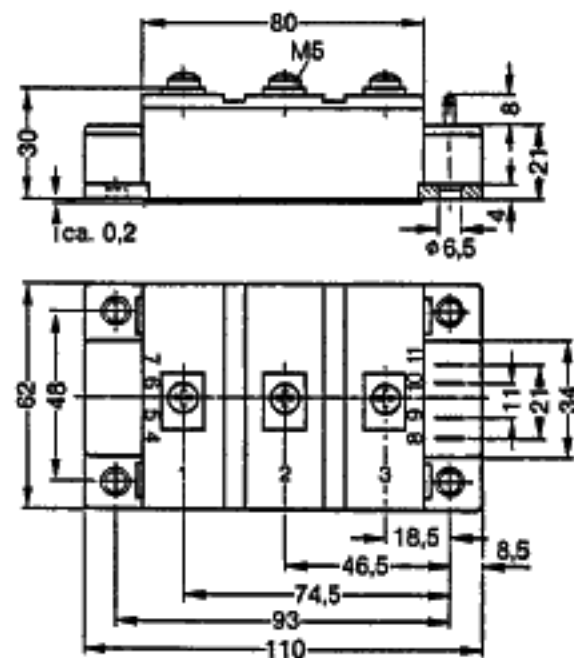
**TO-238**  
Dimensions in Millimeters



**Y-4**  
Dimensions in Millimeters

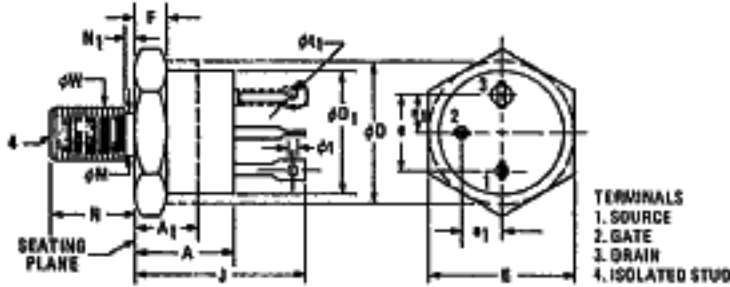


**Y-3**  
Dimensions in Millimeters





**CONFORMS TO JEDEC OUTLINE TO-210AC (TO-61)**  
 Dimensions in Millimeters (Inches)



**TERMINALS**  
 1. SOURCE  
 2. GATE  
 3. DRAIN  
 4. ISOLATED STUD

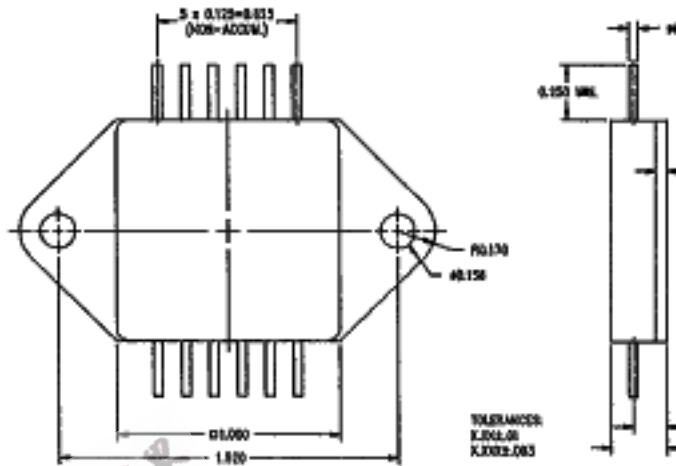
| Symbol             | Inches |       | Millimeters |       | Notes |
|--------------------|--------|-------|-------------|-------|-------|
|                    | Min.   | Max.  | Min.        | Max.  |       |
| A                  | 0.325  | 0.450 | 8.26        | 11.68 |       |
| A <sub>1</sub>     | 0.270  | 0.400 | 6.86        | 10.16 | 2     |
| phi D              | 0.670  | 0.687 | 16.99       | 17.45 | 2     |
| phi D <sub>1</sub> | 0.570  | 0.610 | 14.48       | 15.40 |       |
| e                  | 0.060  | 0.087 | 1.52        | 2.21  |       |
| phi                | 0.340  | 0.435 | 8.64        | 11.04 | 5     |
| phi 1              | 0.170  | 0.213 | 4.32        | 5.41  | 5     |
| F                  | 0.050  | 0.150 | 1.27        | 3.81  | 1     |

| Symbol         | Inches |        | Millimeters |       | Notes |
|----------------|--------|--------|-------------|-------|-------|
|                | Min.   | Max.   | Min.        | Max.  |       |
| J              | 0.540  | 0.675  | 13.76       | 17.16 |       |
| phi M          | 0.720  | 0.748  | 18.29       | 19.01 |       |
| N              | 0.422  | 0.456  | 10.72       | 11.56 |       |
| N <sub>1</sub> | 0.055  | 0.070  | 1.39        | 1.78  |       |
| phi 11         | 0.046  | 0.077  | 1.17        | 1.96  | 4     |
| phi W          | 0.2225 | 0.2764 | 5.661       | 7.001 | 3     |

**NOTES**

1. DIMENSION DOES NOT INCLUDE SEALING FLANGES.
2. PACKAGE CONTOUR OPTIONAL WITHIN DIMENSIONS SPECIFIED.
3. PITCH DIAMETER - THREAD 1/4-28 UNF 2A COATED. REFERENCE ISCREM THREAD STANDARDS FOR FEDERAL SERVICES - HANDBOOK H-201.
4. THIS TERMINAL CAN BE FLATTENED AND PIERCED OR HOOK TYPE.
5. POSITION OF LEADS IN RELATION TO THE HEXAGON IS NOT CONTROLLED.

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