

# MDP10N60G/MDF10N60G

## N-Channel MOSFET 600V, 10A, 0.7Ω

### General Description

These N-channel MOSFET are produced using advanced MagnaChip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality.

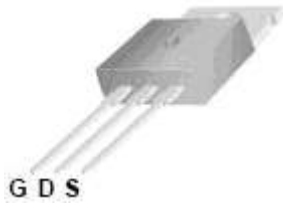
These devices are suitable device for SMPS, high Speed switching and general purpose applications.

### Features

- $V_{DS} = 600V$
- $V_{DS} = 660V$  @  $T_{jmax}$
- $I_D = 10A$  @  $V_{GS} = 10V$
- $R_{DS(ON)} \leq 0.7\Omega$  @  $V_{GS} = 10V$

### Applications

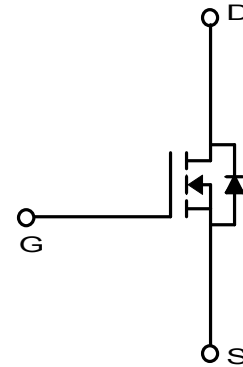
- Power Supply
- PFC
- High Current, High Speed Switching



TO-220  
MDP Series



TO-220F  
MDF Series



### Absolute Maximum Ratings ( $T_a = 25^\circ C$ )

| Characteristics                              |                    | Symbol               | MDP10N60G | MDF10N60G | Unit |
|--|--------------------|----------------------|-----------|-----------|------|
| Drain-Source Voltage                         |                    | $V_{DSS}$            | 600       |           | V    |
| Drain-Source Voltage @ $T_{jmax}$            |                    | $V_{DSS} @ T_{jmax}$ | 660       |           | V    |
| Gate-Source Voltage                          |                    | $V_{GSS}$            | ±30       |           | V    |
| Continuous Drain Current                     | $T_c=25^\circ C$   | $I_D$                | 10        | 10*       | A    |
|  | $T_c=100^\circ C$  |                      | 6.3       | 6.3*      | A    |
| Pulsed Drain Current <sup>(1)</sup>          |                    | $I_{DM}$             | 40        | 40*       | A    |
| Power Dissipation                            | $T_c=25^\circ C$   | $P_D$                | 156       | 48        | W    |
|  | Derate above 25 °C |                      | 1.25      | 0.38      | W/°C |
| Repetitive Avalanche Energy <sup>(1)</sup>   |                    | $E_{AR}$             | 15.6      |           | mJ   |
| Peak Diode Recovery $dv/dt$ <sup>(3)</sup>   |                    | $dv/dt$              | 4.5       |           | V/ns |
| Single Pulse Avalanche Energy <sup>(4)</sup> |                    | $E_{AS}$             | 520       |           | mJ   |
| Junction and Storage Temperature Range       |                    | $T_J, T_{stg}$       | -55~150   |           | °C   |

\*  $I_D$  limited by maximum junction temperature

### Thermal Characteristics

| Characteristics  | Symbol          | MDP10N60G | MDF10N60G | Unit |
|--|-----------------|-----------|-----------|------|
| Thermal Resistance, Junction-to-Ambient <sup>(1)</sup> | $R_{\theta JA}$ | 62.5      | 62.5      | °C/W |
| Thermal Resistance, Junction-to-Case <sup>(1)</sup>    | $R_{\theta JC}$ | 0.8       | 2.6       |      |

## Ordering Information

| Part Number | Temp. Range | Package | Packing | RoHS Status  |
|-------------|-------------|---------|---------|--------------|
| MDP10N60GTH | -55~150°C   | TO-220  | Tube    | Halogen Free |
| MDF10N60GTH | -55~150°C   | TO-220F | Tube    | Halogen Free |

## Electrical Characteristics (Ta =25°C)

| Characteristics  | Symbol       | Test Condition   | Min | Typ  | Max | Unit     |
|--|--------------|--|-----|------|-----|----------|
| <b>Static Characteristics</b>                            |              |  |     |      |     |          |
| Drain-Source Breakdown Voltage                           | $BV_{DSS}$   | $I_D = 250\mu A, V_{GS} = 0V$                                  | 600 | -    | -   | V        |
| Gate Threshold Voltage                                   | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\mu A$                              | 3.0 | -    | 5.0 |          |
| Drain Cut-Off Current                                    | $I_{DSS}$    | $V_{DS} = 600V, V_{GS} = 0V$                                   | -   | -    | 1   | $\mu A$  |
| Gate Leakage Current                                     | $I_{GSS}$    | $V_{GS} = \pm 30V, V_{DS} = 0V$                                | -   | -    | 100 | nA       |
| Drain-Source ON Resistance                               | $R_{DS(ON)}$ | $V_{GS} = 10V, I_D = 5.0A$                                     |     | 0.58 | 0.7 | $\Omega$ |
| Forward Transconductance                                 | $g_{fs}$     | $V_{DS} = 30V, I_D = 5.0A$                                     | -   | 9    | -   | S        |
| <b>Dynamic Characteristics</b>                           |              |  |     |      |     |          |
| Total Gate Charge  | $Q_g$        | $V_{DS} = 480V, I_D = 10A, V_{GS} = 10V^{(3)}$                 | -   | 32   | -   | nC       |
| Gate-Source Charge                                       | $Q_{gs}$     |  | -   | 8.7  | -   |          |
| Gate-Drain Charge  | $Q_{gd}$     |  | -   | 12.2 | -   |          |
| Input Capacitance  | $C_{iss}$    | $V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$                        | -   | 1360 |     | pF       |
| Reverse Transfer Capacitance                             | $C_{rss}$    |  | -   | 7.7  |     |          |
| Output Capacitance                                       | $C_{oss}$    |  | -   | 151  |     |          |
| Turn-On Delay Time                                       | $t_{d(on)}$  | $V_{GS} = 10V, V_{DS} = 300V, I_D = 10A, R_G = 25\Omega^{(3)}$ | -   | 53   |     | ns       |
| Rise Time  | $t_r$        |  | -   | 38   |     |          |
| Turn-Off Delay Time                                      | $t_{d(off)}$ |  | -   | 116  |     |          |
| Fall Time  | $t_f$        |  | -   | 32   |     |          |
| <b>Drain-Source Body Diode Characteristics</b>           |              |  |     |      |     |          |
| Maximum Continuous Drain to Source Diode Forward Current | $I_S$        |  | -   | 10   | -   | A        |
| Source-Drain Diode Forward Voltage                       | $V_{SD}$     | $I_S = 10A, V_{GS} = 0V$                                       | -   |      | 1.4 | V        |
| Body Diode Reverse Recovery Time                         | $t_{rr}$     | $I_F = 10A, di/dt = 100A/\mu s^{(3)}$                          | -   | 340  |     | ns       |
| Body Diode Reverse Recovery Charge                       | $Q_{rr}$     |  | -   | 3.3  |     | $\mu C$  |

Note :

- Pulse width is based on  $R_{\theta JC}$  &  $R_{\theta JA}$  and the maximum allowed junction temperature of 150°C.
- Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ , pulse width limited by junction temperature  $T_{J(MAX)}=150^\circ C$ .
- $I_{SD} \leq 10A, di/dt \leq 200A/\mu s, V_{DD}=50V, R_G = 25\Omega$ , Starting  $T_J=25^\circ C$
- $L=9.6mH, I_{AS}=10.0A, V_{DD}=50V, R_G = 25\Omega$ , Starting  $T_J=25^\circ C$ ,

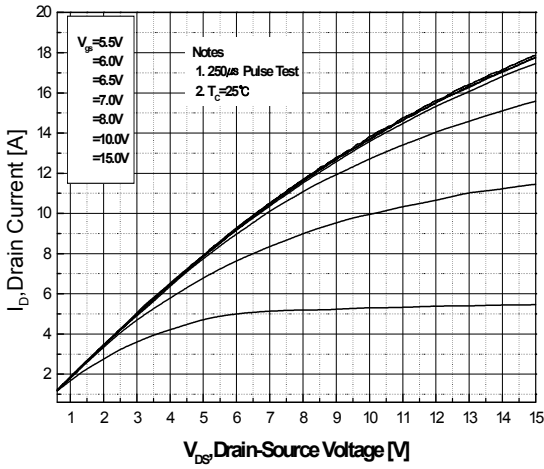


Fig.1 On-Region Characteristics

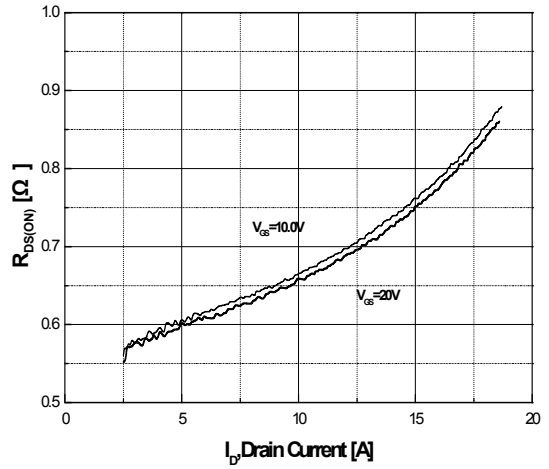


Fig.2 On-Resistance Variation with Drain Current and Gate Voltage

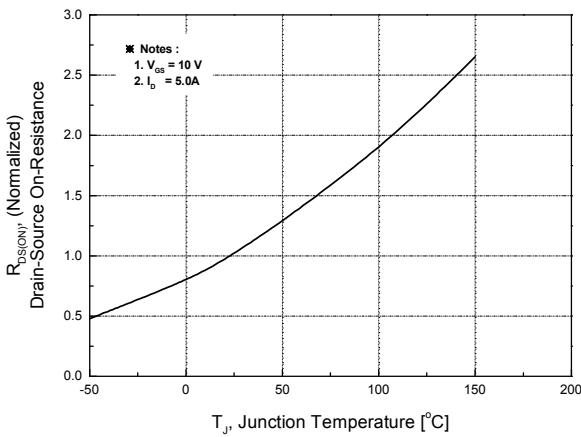


Fig.3 On-Resistance Variation with Temperature

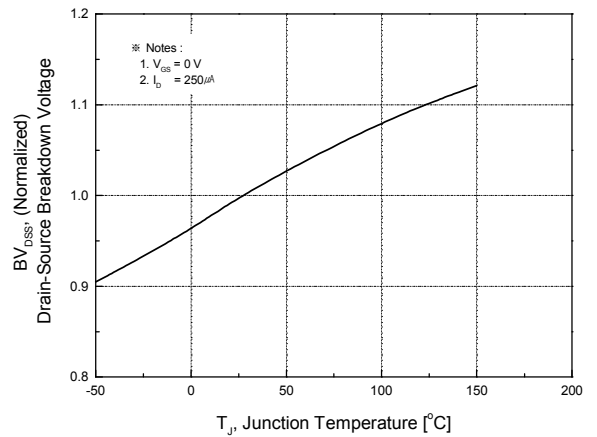


Fig.4 Breakdown Voltage Variation vs. Temperature

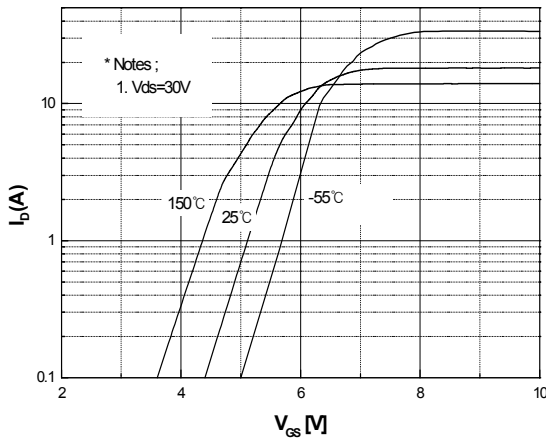


Fig.5 Transfer Characteristics

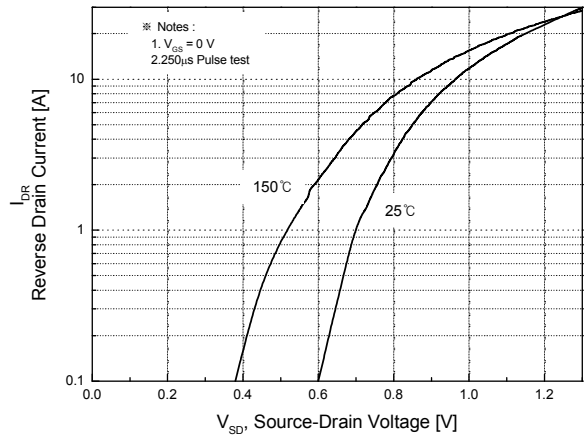


Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature

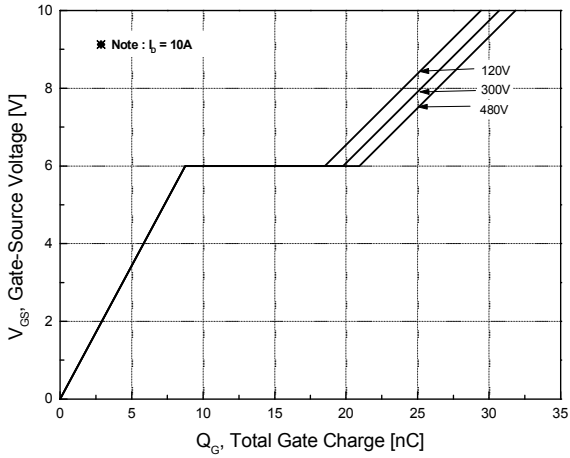


Fig.7 Gate Charge Characteristics

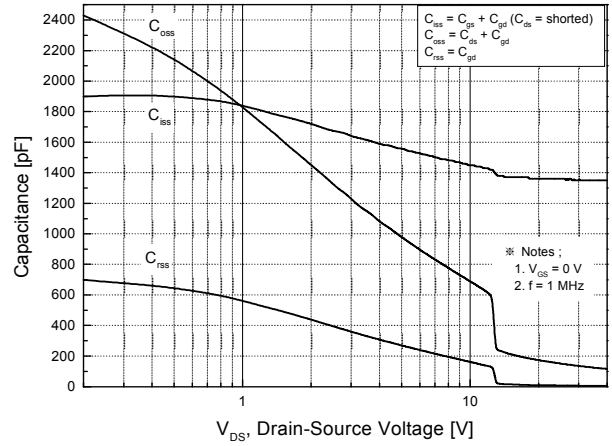


Fig.8 Capacitance Characteristics

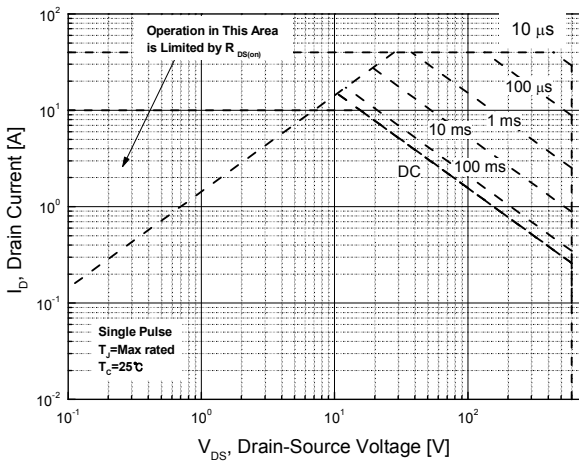


Fig.9 Maximum Safe Operating Area MDP10N60G(TO-220)

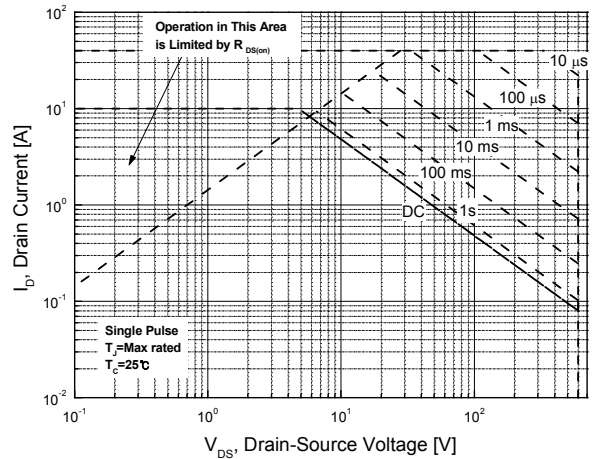


Fig.10 Maximum Safe Operating Area MDF10N60G(TO-220F)

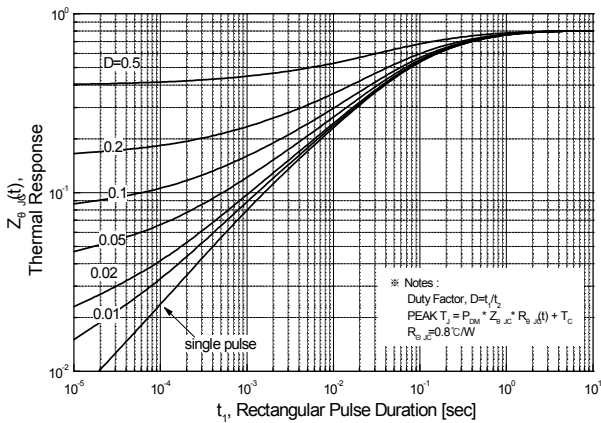


Fig.11 Transient Thermal Response Curve MDP10N60G(TO-220)

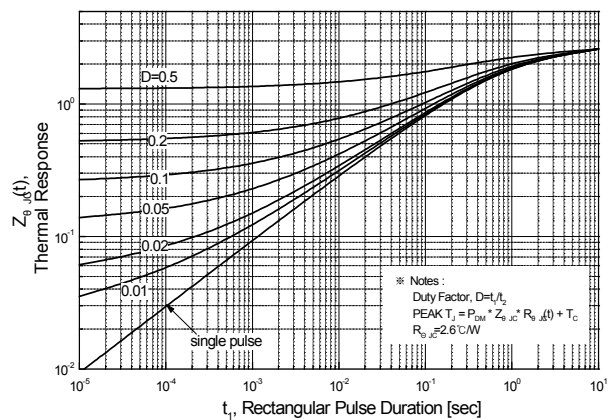
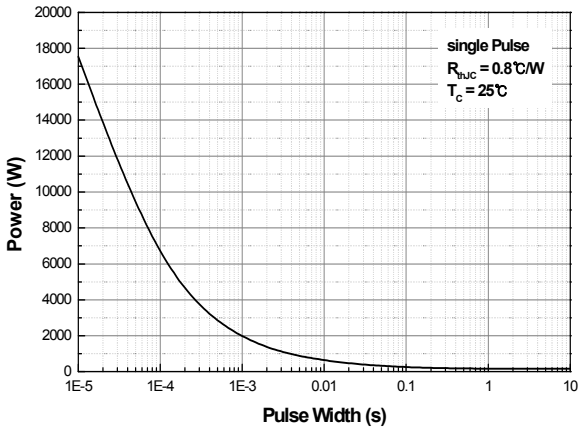
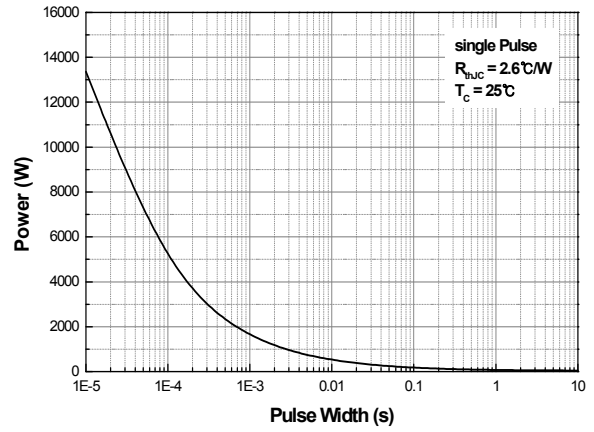


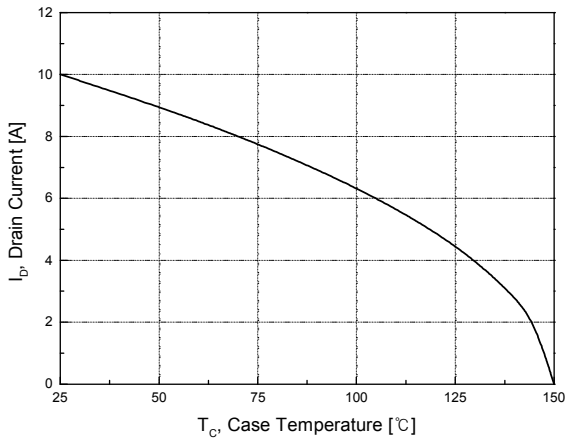
Fig.12 Transient Thermal Response Curve MDF10N60G(TO-220F)



**Fig.13 Single Pulse Maximum Power Dissipation MDP10N60G(TO-220)**



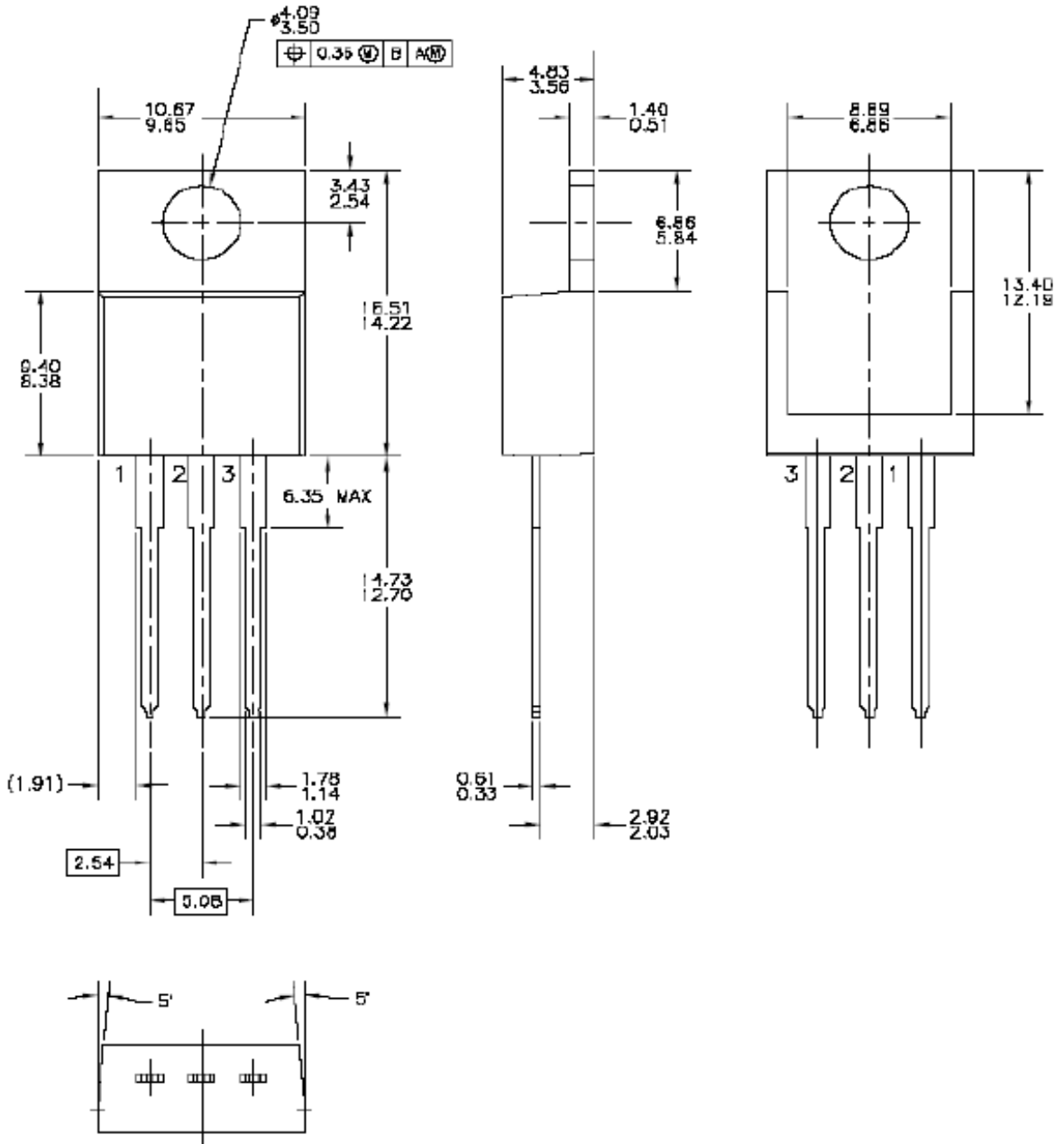
**Fig.14 Single Pulse Maximum Power Dissipation MDF10N60G(TO-220F)**



**Fig.15 Maximum Drain Current vs. Case Temperature**

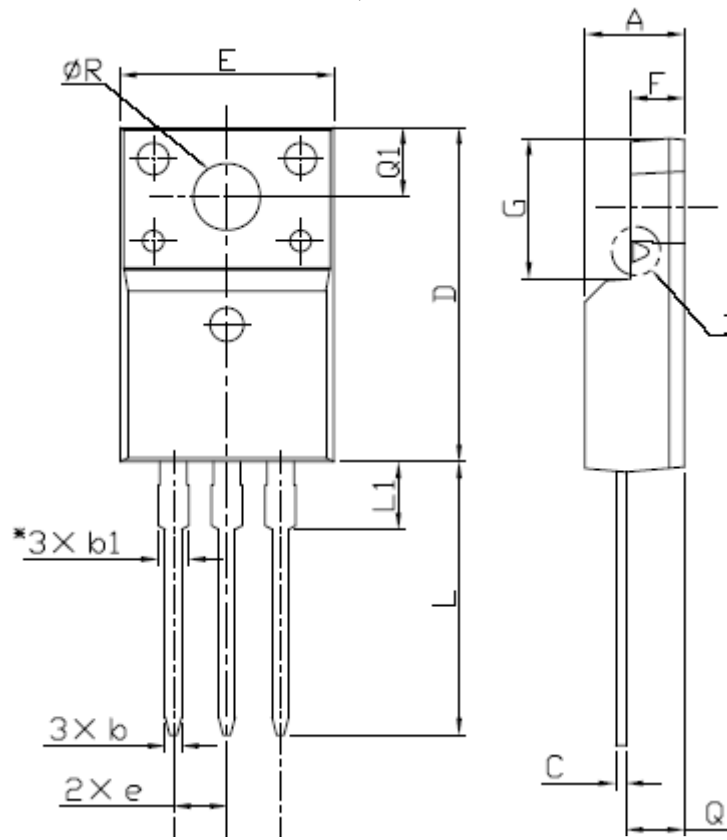
Physical Dimensions

TO-220



Physical Dimensions

3 Leads, TO-220F



Dimensions are in millimeters unless otherwise specified

| Symbol          | Min   | Nom  | Max   |
|-----------------|-------|------|-------|
| A               | 4.50  |      | 4.93  |
| b               | 0.63  |      | 0.91  |
| b1              | 1.15  |      | 1.47  |
| C               | 0.33  |      | 0.63  |
| D               | 15.47 |      | 16.13 |
| E               | 9.60  |      | 10.71 |
| e               |       | 2.54 |       |
| F               | 2.34  |      | 2.84  |
| G               | 6.48  |      | 6.90  |
| L               | 12.24 |      | 13.72 |
| L1              | 2.79  |      | 3.67  |
| Q               | 2.52  |      | 2.96  |
| Q1              | 3.10  |      | 3.50  |
| $\varnothing R$ | 3.00  |      | 3.55  |

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