

### General Description

The MDP11N60 uses advanced MagnaChip's MOSFET Technology, which provides low on-state resistance, high switching performance and excellent quality.

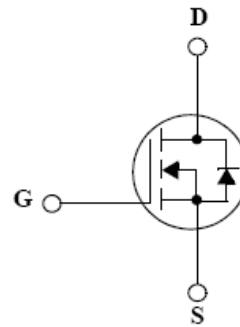
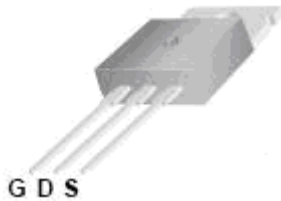
MDP11N60 is suitable device for SMPS, high Speed switching and general purpose applications.

### Features

- $V_{DS} = 600V$
- $V_{DS} = 660V$
- $I_D = 11A$  @  $V_{GS} = 10V$
- $R_{DS(ON)} \leq 0.55\Omega$  @  $V_{GS} = 10V$

### Applications

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



### Absolute Maximum Ratings (Ta = 25°C)

| Characteristics                              |                    | Symbol               | Rating  | 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 (※)                 | $T_C=25^\circ C$   | $I_D$                | 11      | A    |
|  | $T_C=100^\circ C$  |                      | 6.9     | A    |
| Pulsed Drain Current <sup>(1)</sup>          |                    | $I_{DM}$             | 44      | A    |
| Power Dissipation                            | $T_C=25^\circ C$   | $P_D$                | 182     | W    |
|  | Derate above 25 °C |                      | 1.45    | W/°C |
| Peak Diode Recovery $dv/dt^{(3)}$            |                    | $Dv/dt$              | 4.5     | V/ns |
| Single Pulse Avalanche Energy <sup>(4)</sup> |                    | $E_{AS}$             | 720     | mJ   |
| Junction and Storage Temperature Range       |                    | $T_J, T_{stg}$       | -55~150 | °C   |

※  $I_D$  limited by maximum junction temperature

### Thermal Characteristics

| Characteristics  | Symbol          | Rating | Unit |
|--|-----------------|--------|------|
| Thermal Resistance, Junction-to-Ambient <sup>(1)</sup> | $R_{\theta JA}$ | 62.5   | °C/W |
| Thermal Resistance, Junction-to-Case <sup>(1)</sup>    | $R_{\theta JC}$ | 0.69   |      |

## Ordering Information

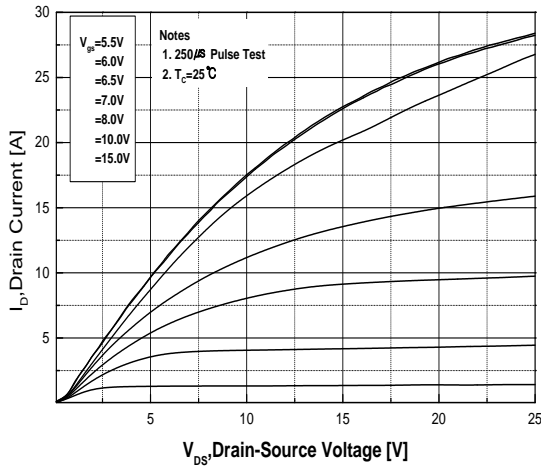
| Part Number | Temp. Range | Package | Packing | RoHS Status  |
|-------------|-------------|---------|---------|--------------|
| MDP11N60TH  | -55~150°C   | TO-220  | Tube    | Halogen Free |

## Electrical Characteristics (Ta =25°C)

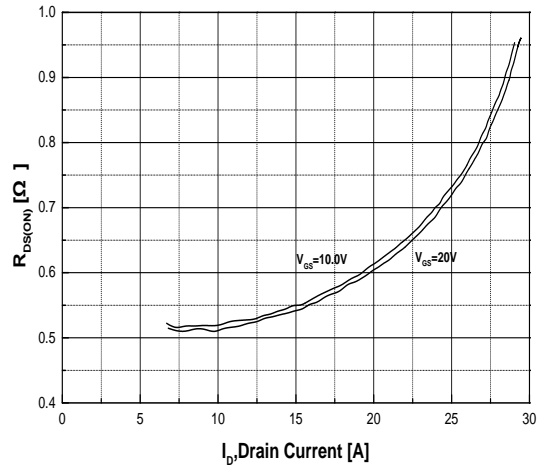
| Characteristics  | Symbol       | Test Condition   | Min | Typ  | Max  | Unit     |
|--|--------------|--|-----|------|------|----------|
| <b>Static Characteristics</b>                            |              |  |     |      |      |          |
| Drain-Source Breakdown Voltage                           | $BV_{DSS}$   | $I_D = 250\mu A, V_{GS} = 0V$                                  | 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                               | $R_{DS(ON)}$ | $V_{GS} = 10V, I_D = 5.5A$                                     |     | 0.45 | 0.55 | $\Omega$ |
| Forward Transconductance                                 | $g_{fs}$     | $V_{DS} = 30V, I_D = 5.5A$                                     | -   | 13   | -    | S        |
| <b>Dynamic Characteristics</b>                           |              |  |     |      |      |          |
| Total Gate Charge  | $Q_g$        | $V_{DS} = 480V, I_D = 11A, V_{GS} = 10V^{(3)}$                 | -   | 38.4 | -    | nC       |
| Gate-Source Charge                                       | $Q_{gs}$     |  | -   | 11.2 | -    |          |
| Gate-Drain Charge  | $Q_{gd}$     |  | -   | 14   | -    |          |
| Input Capacitance  | $C_{iss}$    | $V_{DS} = 25V, V_{GS} = 0V, f = 1.0MHz$                        | -   | 1700 |      | pF       |
| Reverse Transfer Capacitance                             | $C_{rss}$    |  | -   | 6.2  |      |          |
| Output Capacitance                                       | $C_{oss}$    |  | -   | 184  |      |          |
| Turn-On Delay Time                                       | $t_{d(on)}$  | $V_{GS} = 10V, V_{DS} = 300V, I_D = 11A, R_G = 25\Omega^{(3)}$ | -   | 38   |      | ns       |
| Rise Time  | $t_r$        |  | -   | 50   |      |          |
| Turn-Off Delay Time                                      | $t_{d(off)}$ |  | -   | 76   |      |          |
| Fall Time  | $t_f$        |  | -   | 33   |      |          |
| <b>Drain-Source Body Diode Characteristics</b>           |              |  |     |      |      |          |
| Maximum Continuous Drain to Source Diode Forward Current | $I_S$        |  | -   | 11   | -    | A        |
| Source-Drain Diode Forward Voltage                       | $V_{SD}$     | $I_S = 11A, V_{GS} = 0V$                                       | -   |      | 1.4  | V        |
| Body Diode Reverse Recovery Time                         | $t_{rr}$     | $I_F = 11A, di/dt = 100A/\mu s^{(3)}$                          | -   | 430  |      | ns       |
| Body Diode Reverse Recovery Charge                       | $Q_{rr}$     |  | -   | 4.0  |      | $\mu C$  |

Note :

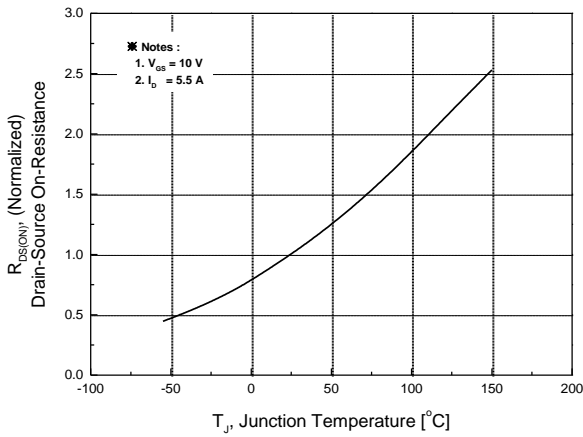
1. Pulse width is based on  $R_{\theta JC}$  &  $R_{\theta JA}$  and the maximum allowed junction temperature of 150°C.
2. Pulse test: pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ , pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ C$ .
3.  $I_{SD} \leq 11.0A$ ,  $di/dt \leq 200A/\mu s$ ,  $V_{DD} = 50V$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$
4.  $L = 10.9mH$ ,  $I_{AS} = 11A$ ,  $V_{DD} = 50V$ ,  $R_G = 25\Omega$ , Starting  $T_J = 25^\circ C$



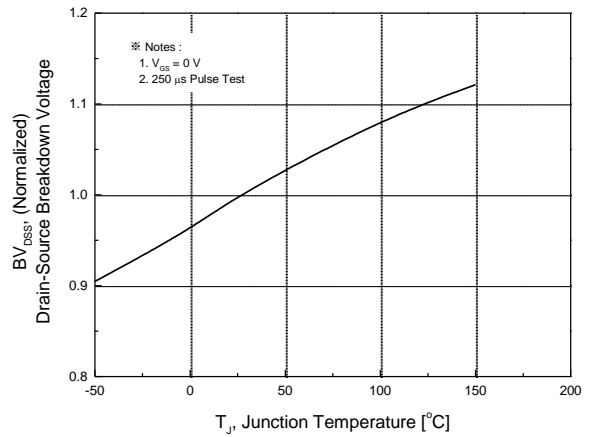
**Fig.1 On-Region Characteristics**



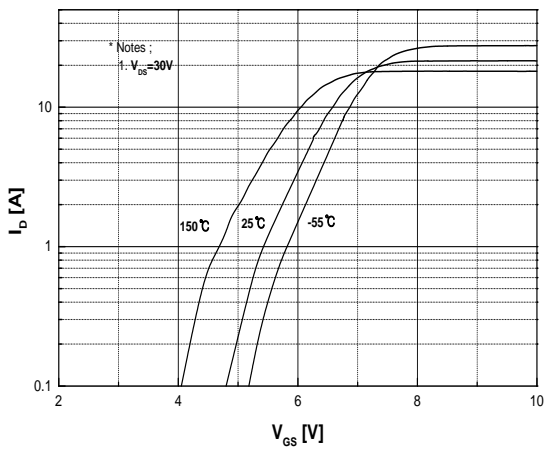
**Fig.2 On-Resistance Variation with Drain Current and Gate Voltage**



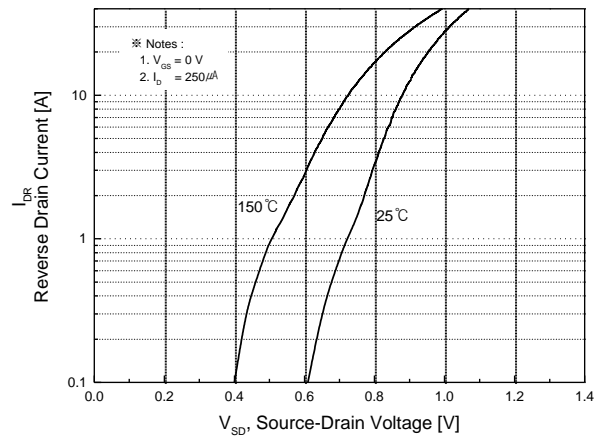
**Fig.3 On-Resistance Variation with Temperature**



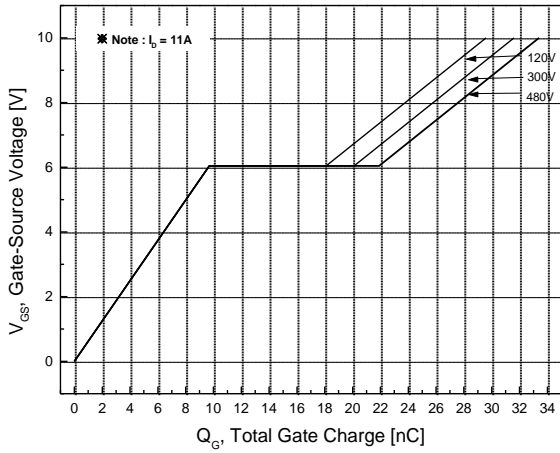
**Fig.4 Breakdown Voltage Variation vs. Temperature**



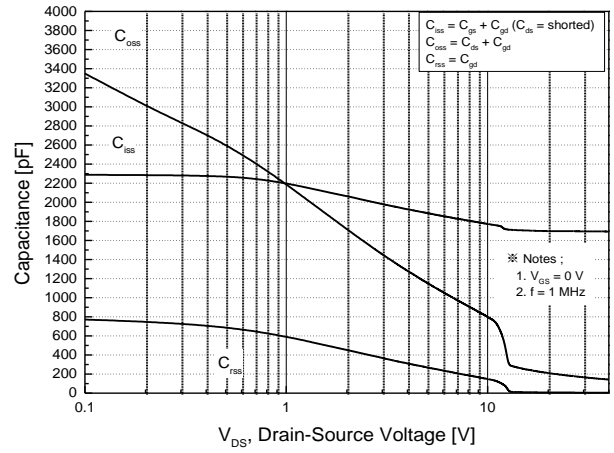
**Fig.5 Transfer Characteristics**



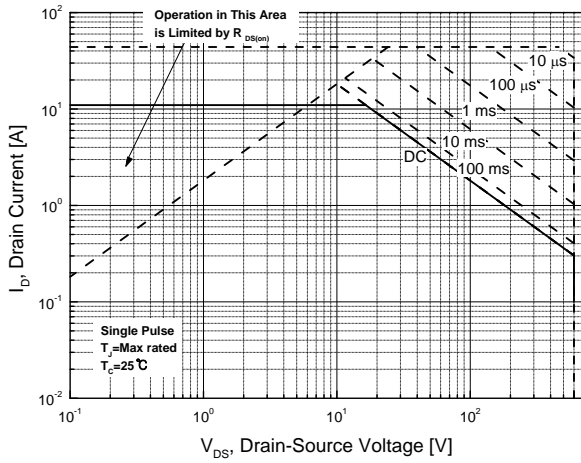
**Fig.6 Body Diode Forward Voltage Variation with Source Current and Temperature**



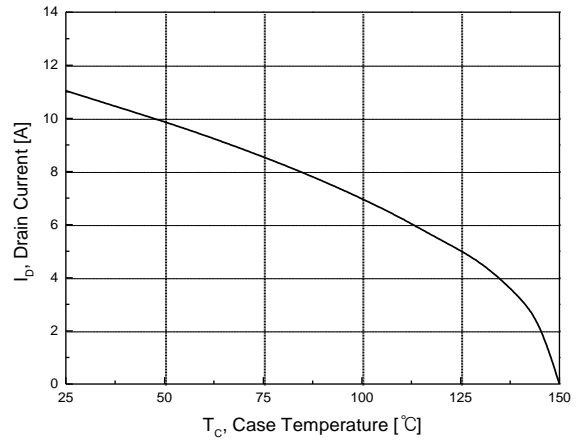
**Fig.7 Gate Charge Characteristics**



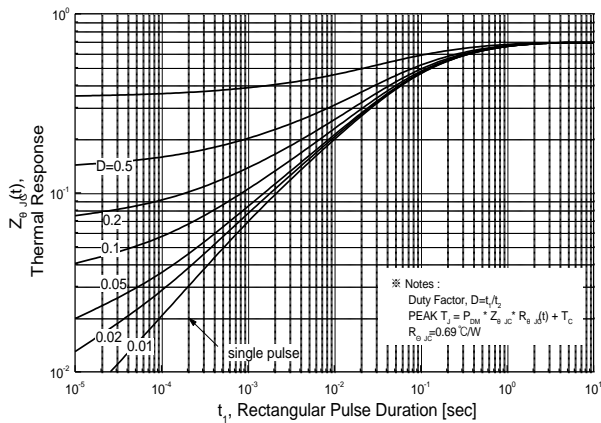
**Fig.8 Capacitance Characteristics**



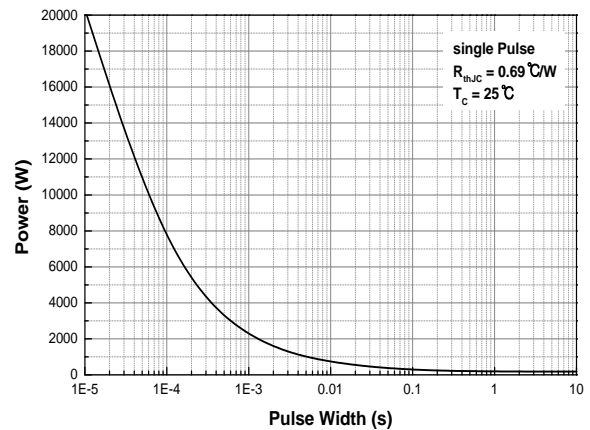
**Fig.9 Maximum Safe Operating Area**



**Fig.10 Maximum Drain Current vs. Case Temperature**



**Fig.11 Transient Thermal Response Curve**

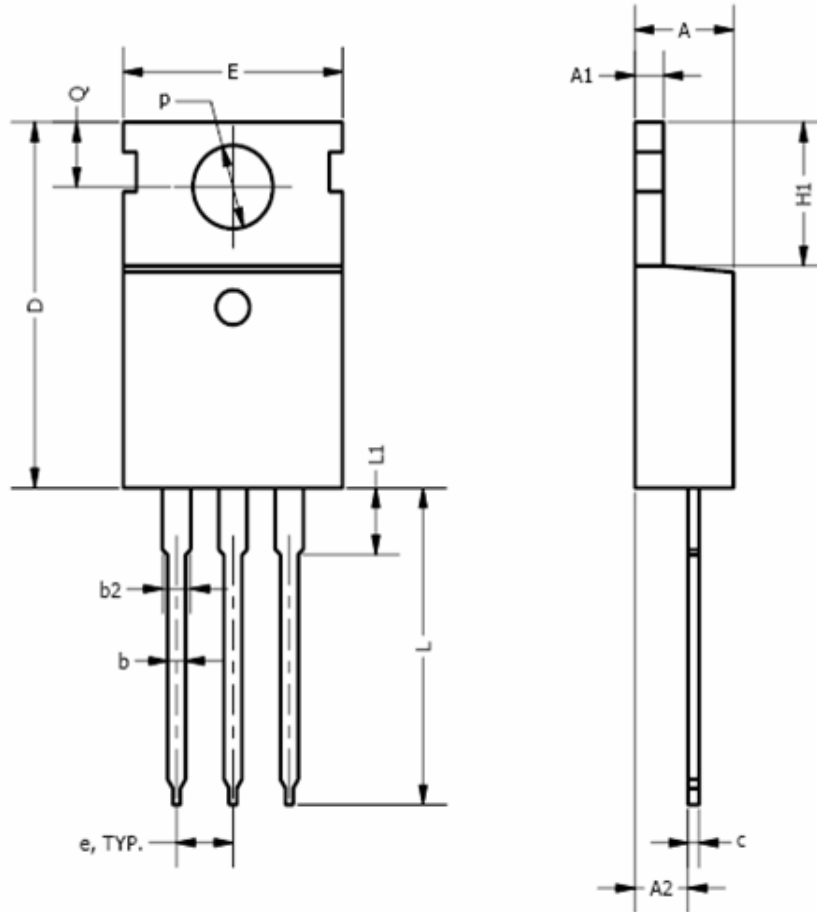


**Fig.12 Single Pulse Maximum Power Dissipation**

■ Physical Dimension

3 Leads, TO-220


Dimensions are in millimeters unless otherwise specified



| Symbol   | Min      | Nom  | Max   |
|----------|----------|------|-------|
| A        | 3.56     |      | 4.83  |
| A1       | 0.50     |      | 1.40  |
| A2       | 2.03     |      | 2.92  |
| b        | 0.38     | 0.69 | 1.02  |
| b2       | 1.14     | 1.45 | 1.78  |
| c        | 0.36     |      | 0.61  |
| D        | 14.22    |      | 16.51 |
| e        | 2.54 TYP |      |       |
| E        | 9.65     |      | 10.67 |
| H1       | 5.84     |      | 6.86  |
| L        | 12.70    |      | 14.73 |
| L1       |          |      | 6.35  |
| $\phi P$ | 3.53     |      | 4.09  |
| Q        | 2.54     |      | 3.43  |

**DISCLAIMER:**

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