## Description

The HM60N10D uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.

## General Features

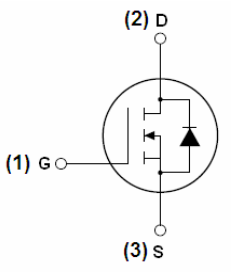
- $V_{DS}$ = 100V,$I_D$ =60A
  $R_{DS(ON)}$ <16mΩ @ $V_{GS}$=12.6V
- Special designed for convertors and power controls
- High density cell design for ultra low Rdson
- Fully characterized Avalanche voltage and current
- Good stability and uniformity with high $E_{AS}$
- Excellent package for good heat dissipation

## Application

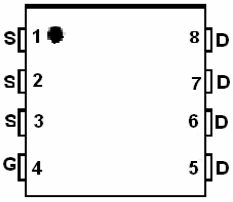
- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply

***100% UIS TESTED!***

***100% ΔVds TESTED!***




**Schematic diagram**




**Marking and pin assignment**


**DFN5X6-8L top view**

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| HM60N10D | HM60N10D | **DFN5X6-8L** | - | - | - |

## Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 100 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 60 | A |
| Drain Current-Continuous($T_C$=70℃) | $I_D$ (70℃) | 50 | A |
| Pulsed Drain Current | $I_{DM}$ | 80 | A |
| Maximum Power Dissipation | $P_D$ | 105 | W |
| Derating factor | | 0.70 | W/℃ |
| Single pulse avalanche energy (Note 5) | $E_{AS}$ | 550 | mJ |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 175 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to- Case (Note 2) | $R_{\theta Jc}$ | 1.43 | ℃/W |

## Electrical Characteristics ($T_C$=25℃unless otherwise noted)

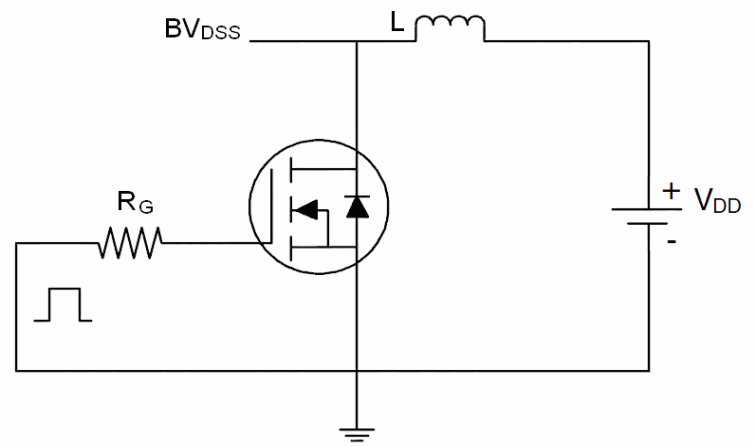
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 100 | 110 | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=100V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 2.5 | 3.7 | 4.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=30A | - | 12.6 | 16 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=15V,$I_D$=10A | - | 30 | - | S |
| **Dynamic Characteristics** (Note4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=50V,$V_{GS}$=0V, F=1.0MHz | - | 2850 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 220 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 90 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=30V,$I_D$=5A,$R_L$=10Ω $V_{GS}$=10V,$R_G$=1Ω | - | 17 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 10 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 26 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 10 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=50V,$I_D$=10A, $V_{GS}$=10V | - | 47 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 13 | -- | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 12.5 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=4A | - | - | 1.2 | V |
| Diode Forward Current (Note 2) | $I_S$ | | - | - | 60 | A |
| Reverse Recovery Time | $t_{rr}$ | TJ = 25°C, IF = 10A di/dt = 100A/μs (Note3) | - | - | 60 | nS |
| Reverse Recovery Charge | Qrr | | - | - | 200 | nC |
| Forward Turn-On Time | $t_{on}$ | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

## Notes:

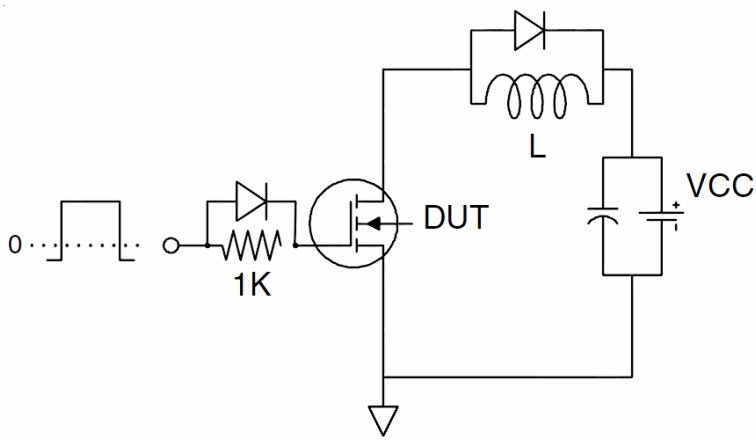
**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** Surface Mounted on FR4 Board, t ≤ 10 sec.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production
**5.** EAS condition：Tj=25℃,$V_{DD}$=50V,$V_G$=10V,L=0.5mH,Rg=25Ω

Test Circuit

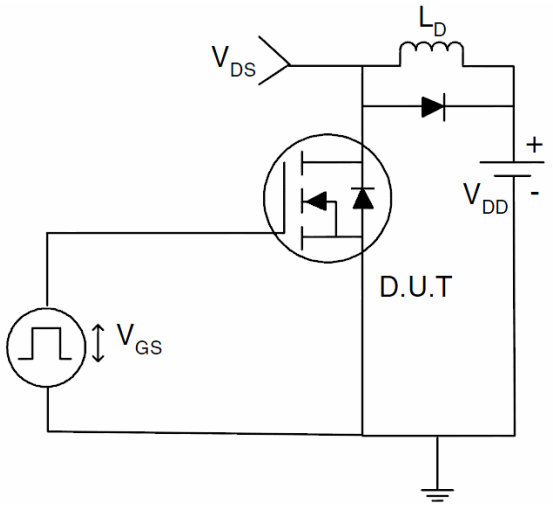
**1）$E_{AS}$ test Circuit**




**2）Gate charge test Circuit**




**3）Switch Time Test Circuit**



## Typical Electrical and Thermal Characteristics (Curves)

**Figure1. Safe operating area**

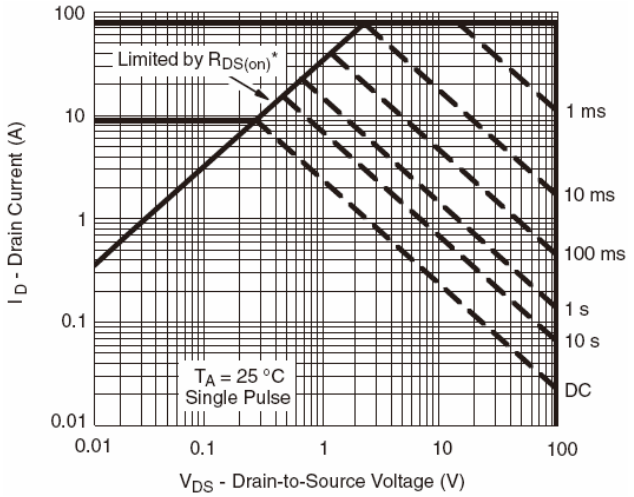



**Figure2. Source-Drain Diode Forward Voltage**

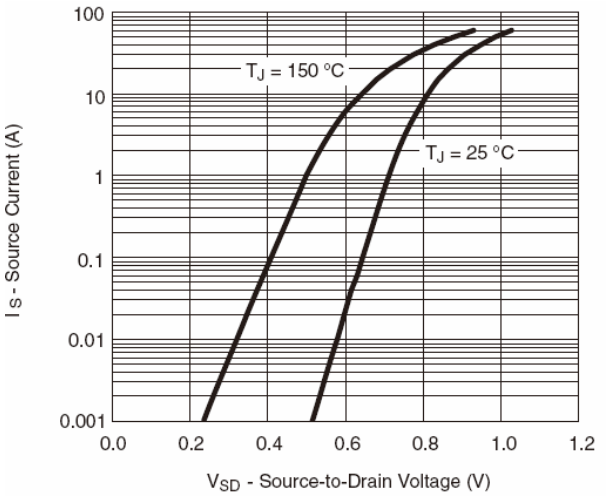



**Figure3. Output characteristics**

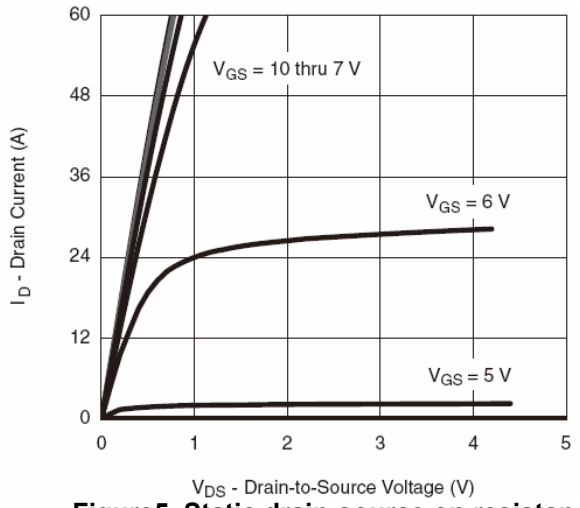



**Figure4. Transfer characteristics**

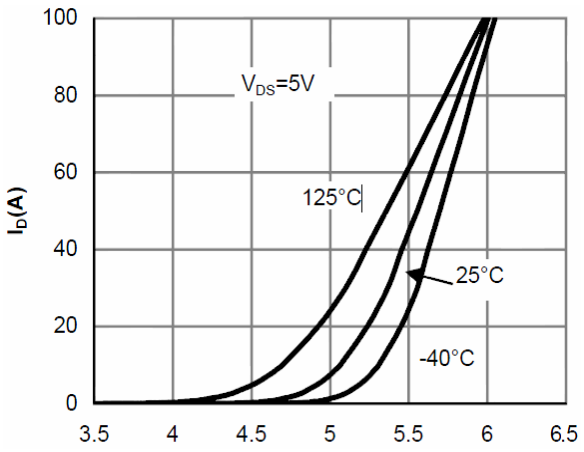



**Figure5. Static drain-source on resistance**

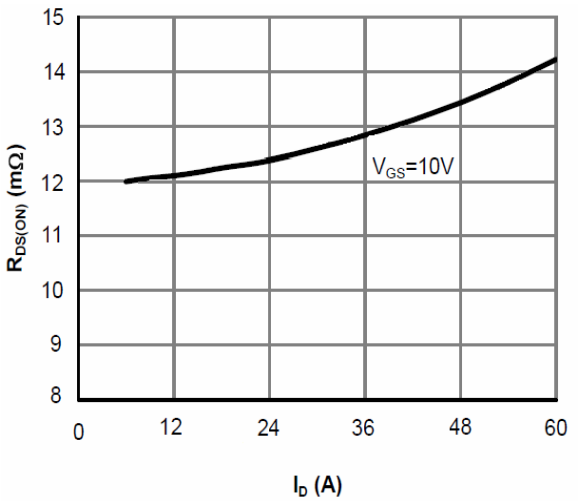



**Figure6. $R_{DS(ON)}$ vs Junction Temperature**

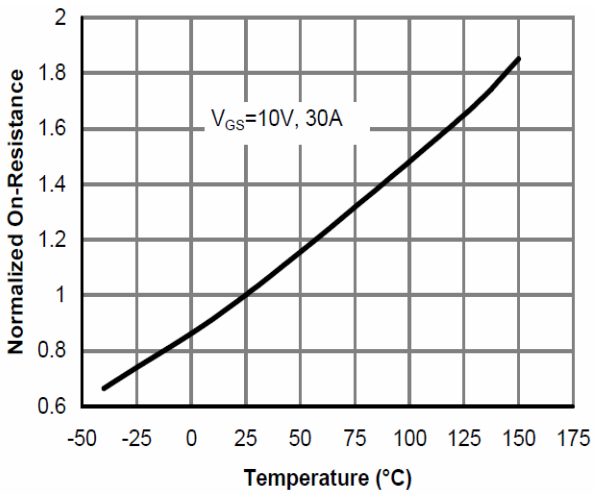


**Figure7. $BV_{DSS}$ vs Junction Temperature**

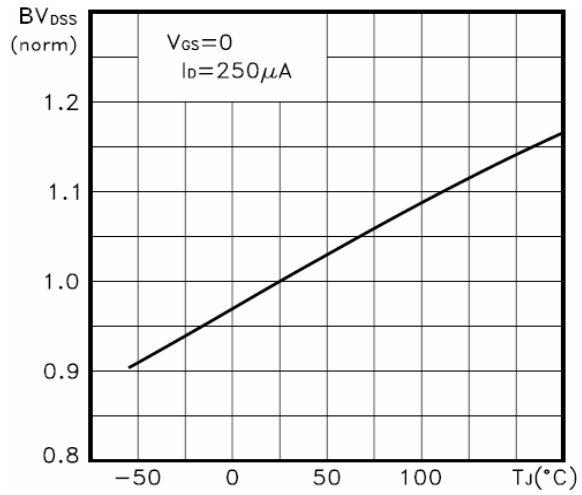



**Figure8. $V_{GS(th)}$ vs Junction Temperature**

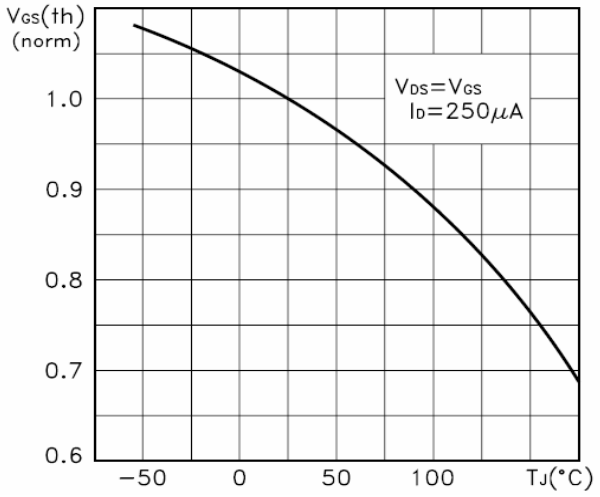



**Figure9. Gate charge waveforms**

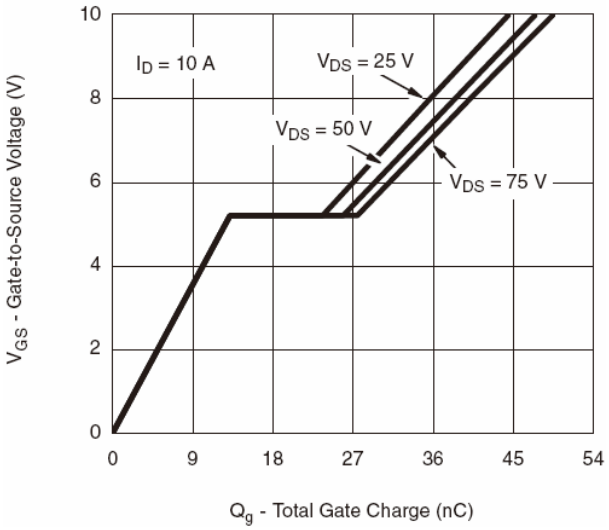



**Figure10. Capacitance**

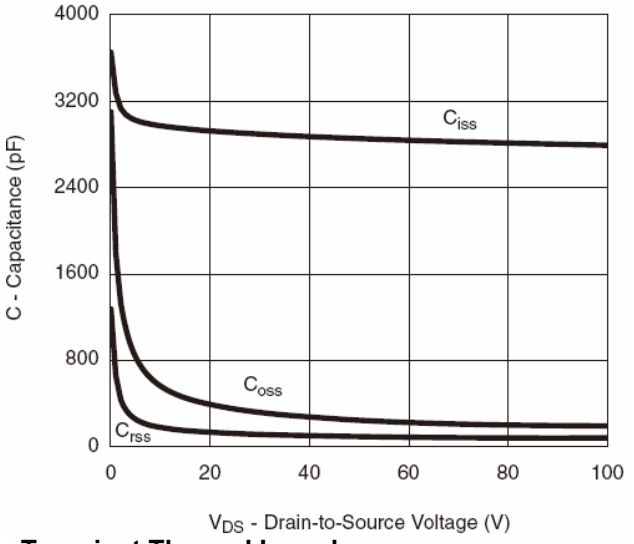
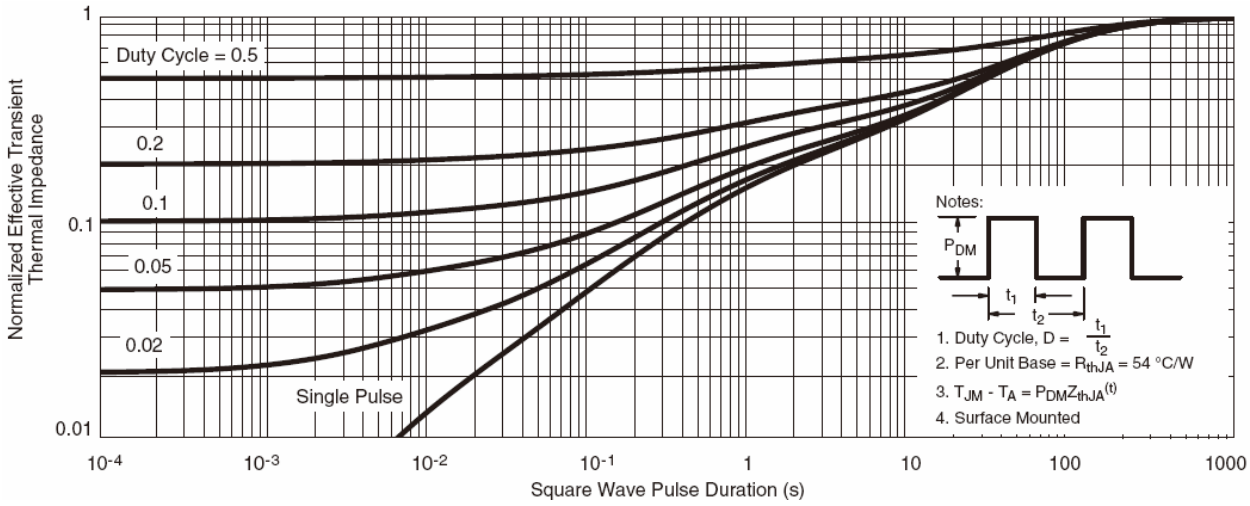
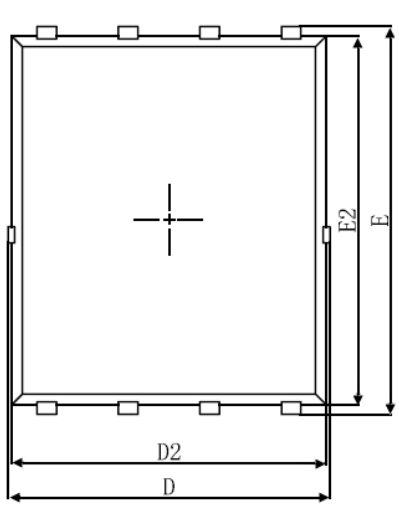


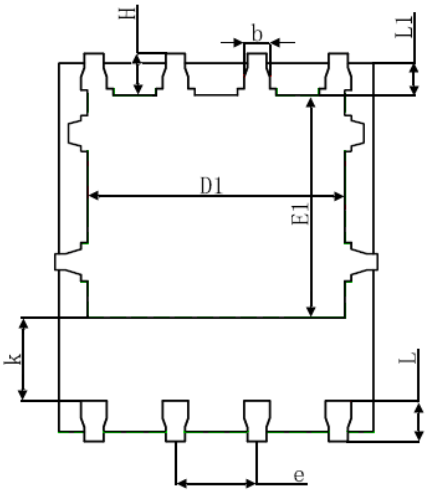

**Figure11. Normalized Maximum Transient Thermal Impedance**



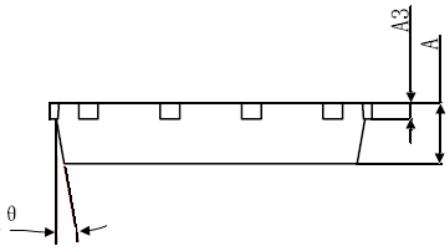
## DFN5X6-8L Package Information




Top View
[顶视图]




Bottom View
[背视图]




Side View
[侧视图]

| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.900 | 1.000 | 0.035 | 0.039 |
| A3 | 0.254REF. | | 0.010REF. | |
| D | 4.944 | 5.096 | 0.195 | 0.201 |
| E | 5.974 | 6.126 | 0.235 | 0.241 |
| D1 | 3.910 | 4.110 | 0.154 | 0.162 |
| E1 | 3.375 | 3.575 | 0.133 | 0.141 |
| D2 | 4.824 | 4.976 | 0.190 | 0.196 |
| E2 | 5.674 | 5.826 | 0.223 | 0.229 |
| K | 1.190 | 1.390 | 0.047 | 0.055 |
| b | 0.035 | 0.450 | 0.014 | 0.018 |
| e | 1.270(TYP.) | | 0.050(TYP.) | |
| L | 0.559 | 0.711 | 0.022 | 0.028 |
| L1 | 0.424 | 0.576 | 0.017 | 0.023 |
| H | 0.574 | 0.726 | 0.023 | 0.029 |
| θ | 8° | 12° | 8° | 12° |