# Product Summary

| V$_{(BR)DSS}$ | R$_{DS(on)TYP}$ | I$_D$ |
|---|---|---|
| 60V | 13mΩ@10V | 8A |
| | 18mΩ@4.5V | |

## Feature

- V$_{DS}$ = 60V,I$_D$ =8A
- R$_{DS(ON)}$ < 18mΩ @ V$_{GS}$=10V (Typ:13mΩ)
  R$_{DS(ON)}$ < 26mΩ @ V$_{GS}$=4.5V (Typ:18mΩ)
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
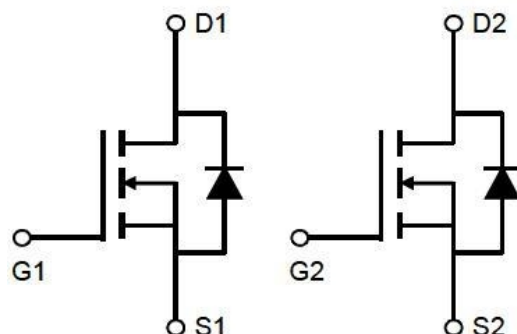- Low gate to drain charge to reduce switching losses

## Applications
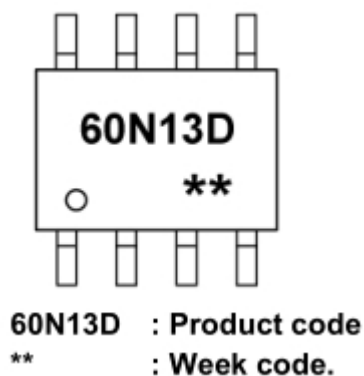
- Power switching application
- Load switch

## Package



SOP-8L

## Circuit diagram



## Marking



60N13D : Product code
** : Week code.

## Absolute maximum ratings

($T_a$=25℃ unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 60 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 8 | A |
| Pulsed Drain Current[1] | $I_{DM}$ | 32 | A |
| Maximum Power Dissipation | $P_D$ | 1.4 | W |
| Thermal Resistance,Junction-to-Case[2] | $R_{\theta JC}$ | 1.3 | °C/W |
| Operating Junction and Storage Temperature Range | $T_{STG}, T_J$ | -55 To 150 | °C |

# Electrical characteristics

(T$_A$=25℃, unless otherwise noted)

| Parameter | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | BV$_{(BR)DSS}$ | V$_{GS}$ = 0V, I$_D$ =250μA | 60 | | | V |
| Zero Gate Voltage Drain Current | I$_{DSS}$ | V$_{DS}$ =60V, V$_{GS}$ = 0V | | | 1 | uA |
| Gate-Body Leakage Current | I$_{GSS}$ | V$_{GS}$ =±20V, V$_{DS}$ = 0V | | | ±100 | uA |
| Gate Threshold Voltage | V$_{GS(th)}$ | V$_{DS}$ =V$_{GS}$, I$_D$ =250μA | 1 | 1.6 | 2.5 | V |
| Drain-Source On-State Resistance | R$_{DS(on)}$ | V$_{GS}$ =10V, I$_D$ =8A | | 12 | 16 | mΩ |
| | | V$_{GS}$ =4.5V, I$_D$ =8A | | 15 | 22 | |
| **Dynamic and Switching Characteristics(4)** | | | | | | |
| Input capacitance | C$_{iss}$ | V$_{DS}$=30V, V$_{GS}$=0V, f=1MHz | | 1600 | | pF |
| Output capacitance | C$_{oss}$ | | | 112 | | |
| Reverse transfer capacitance | C$_{rss}$ | | | 98 | | |
| **Switching Characteristics(4)** | | | | | | |
| Turn-on Delay Time | T$_{d(on)}$ | V$_{DD}$=30V, R$_L$ =1Ω, V$_{GS}$=10V, R$_{GEN}$ =3Ω | | 7 | | nS |
| Turn-on Rise Time | T$_r$ | | | 5.5 | | |
| Turn-Off Delay Time | T$_{d(off)}$ | | | 29 | | |
| Turn-Off Fall Time | t$_f$ | | | 4.5 | | |
| Total Gate Charge | Q$_g$ | V$_{DS}$=30V , I$_D$ =8A, V$_{GS}$=10V | | 38.5 | | pF |
| Gate-Source Charge | Q$_{gs}$ | | | 4.7 | | |
| Gate-Drain Charge | Q$_{gd}$ | | | 10.3 | | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Diode Forward Voltage [3] | V$_{SD}$ | V$_{GS}$=0V ,I$_S$=8A | | | 1.2 | V |

**Note：**

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
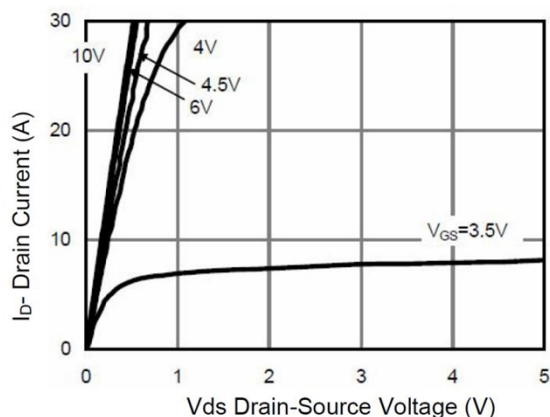
## Typical Characteristics
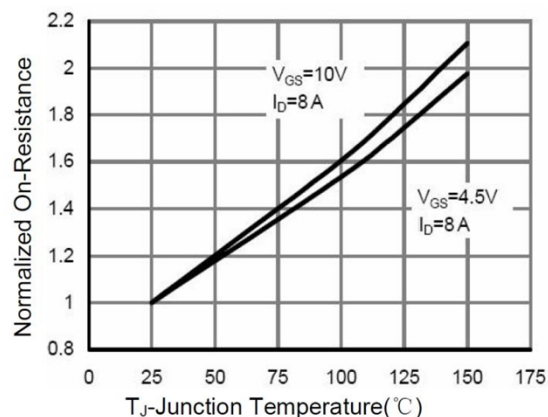


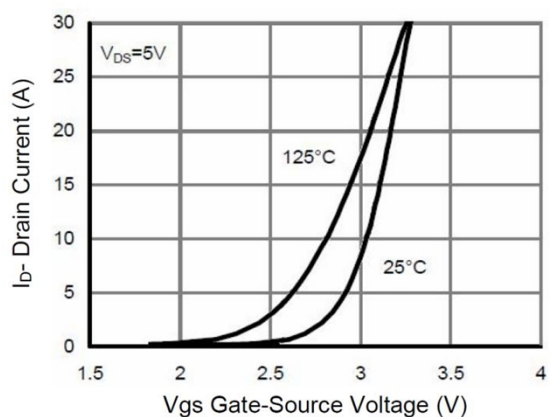**Figure 1 Output Characteristics**



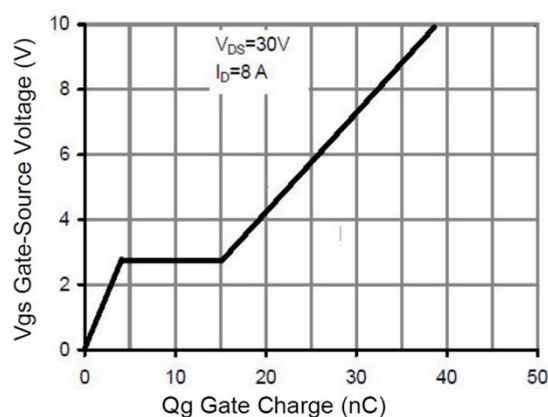**Figure 4 Rdson-JunctionTemperature**



**Figure 2 Transfer Characteristics**
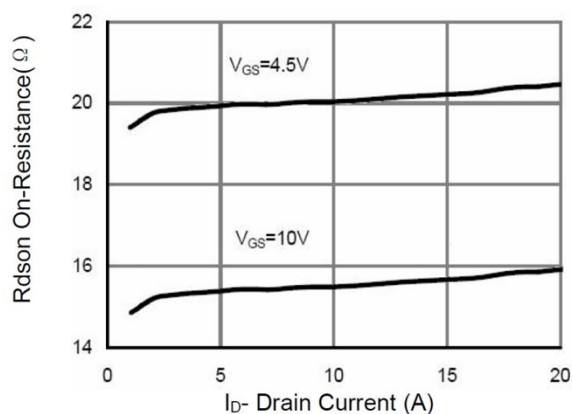


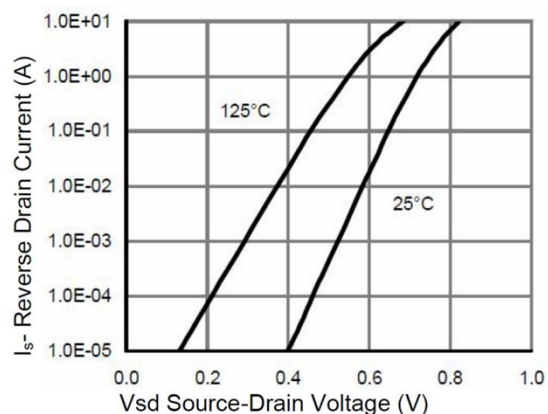**Figure 5 Gate Charge**



**Figure 3 Rdson- Drain Current**



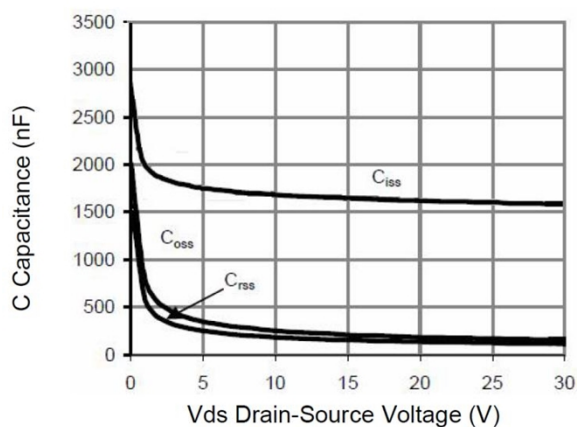**Figure 6 Source- Drain Diode Forward**
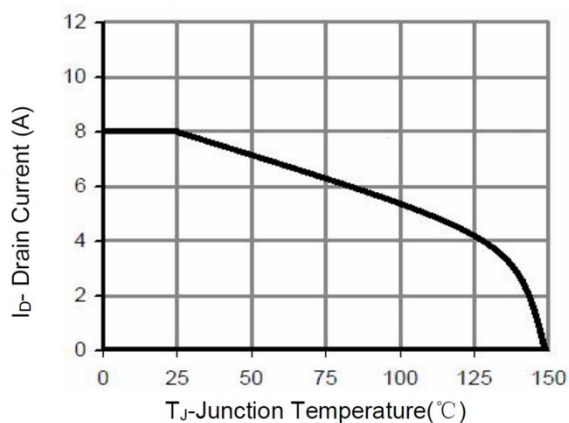
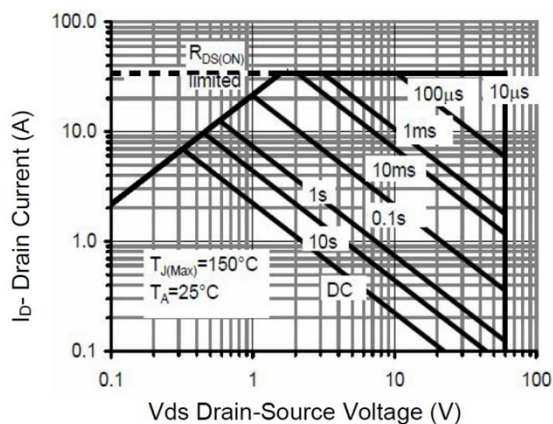Figure 7 Capacitance vs Vds

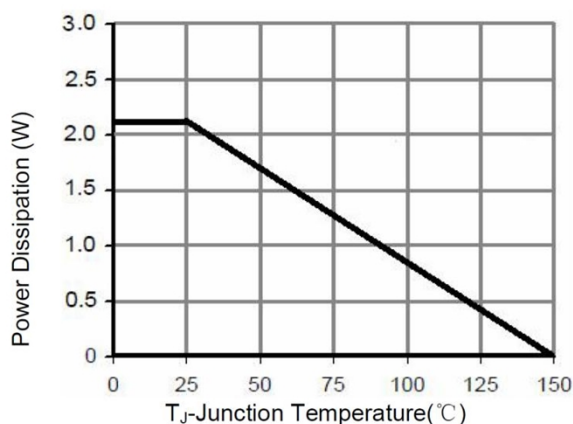Figure 9 Current De-rating
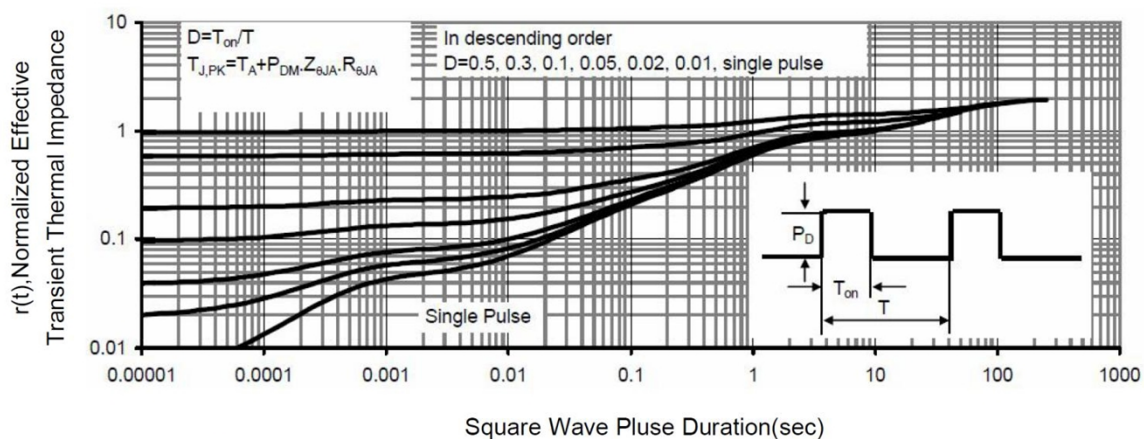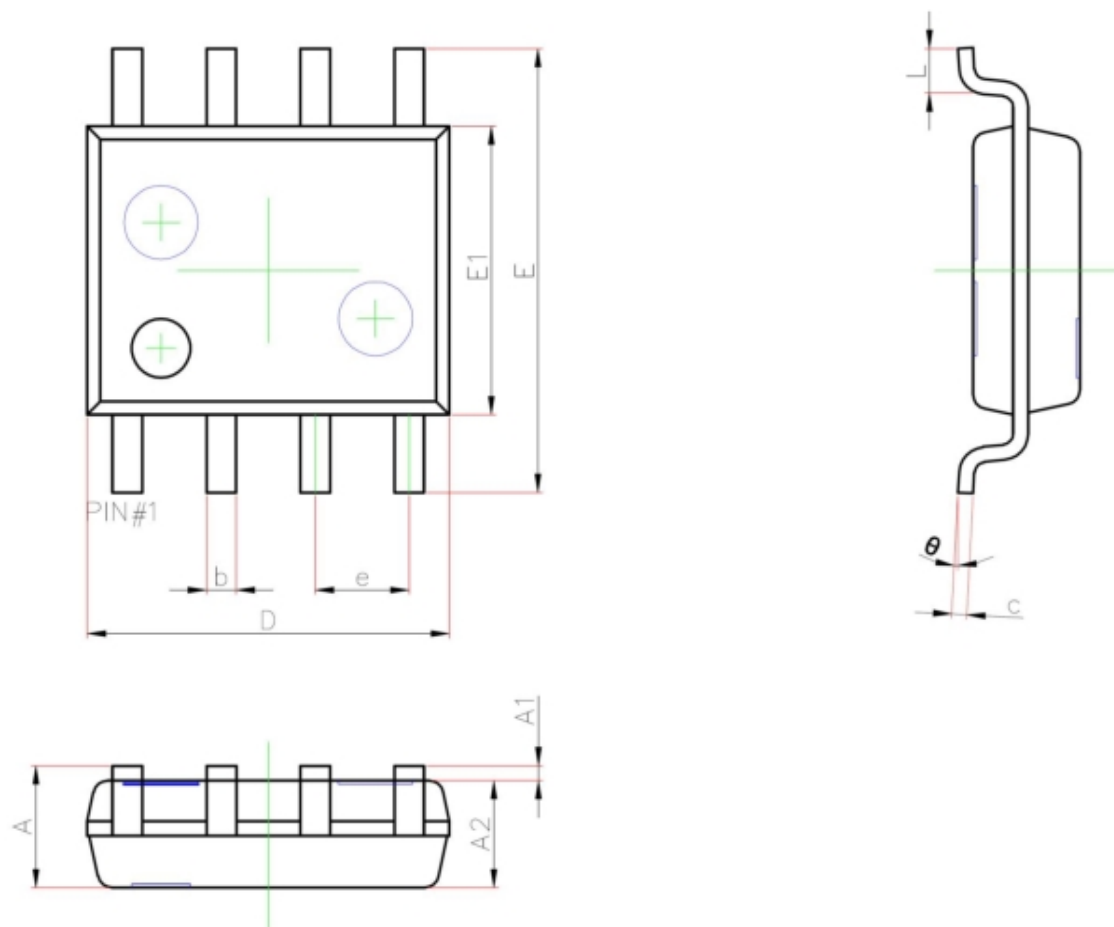
Figure 8 Safe Operation Area

Figure 10 Power De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance

## SOP-8 Package Information



| Symbol | Dimensions In Millimeters | |
|---|---|---|
| | Min. | Max. |
| A | 1.35 | 1.75 |
| A1 | 0.10 | 0.25 |
| A2 | 1.35 | 1.55 |
| b | 0.33 | 0.51 |
| c | 0.17 | 0.25 |
| D | 4.80 | 5.00 |
| e | 1.27 REF. | |
| E | 5.80 | 6.20 |
| E1 | 3.80 | 4.00 |
| L | 0.40 | 1.27 |
| θ | 0° | 8° |