

# FH3415N

## P-Channel Enhancement Mode MOSFET

### Description

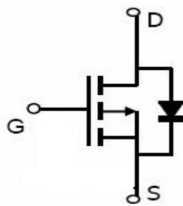
- ◆ Trench Power LV MOSFET technology
- ◆ High Power and Current handling capability
- ◆ Low Gate Charge

### Application

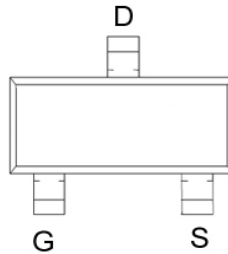
- ◆ PWM applications
- ◆ Power management
- ◆ Load switch

### General Features

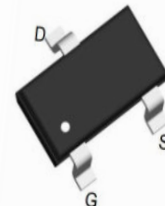
- ◆  $V_{DS} = -20V ; I_D = -3.2A$
- ◆  $R_{DS(ON)}(Typ.) = 52 m\Omega$  @  $V_{GS} = -5V$
- ◆  $R_{DS(ON)}(Typ.) = 55 m\Omega$  @  $V_{GS} = -4.5V$
- ◆  $R_{DS(ON)}(Typ.) = 69 m\Omega$  @  $V_{GS} = -2.5V$
- ◆ LogicLevelCompatible
- ◆ SMDPackage(SOT-23)
- ◆ TrenchTechnology
- ◆ FastSwitching



Schematic diagram



Marking and Pin Assignment



SOT-23 top view

### Absolute Maximum Ratings ( $T_A=25^\circ C$ unless otherwise noted)

| Parameter   | Symbol          | Maximum          | Unit           |
|---|-----------------|------------------|----------------|
| Drain-source Voltage                                | $V_{DS}$        | -20              | V              |
| Gate-source Voltage                                 | $V_{GS}$        | $\pm 12$         | V              |
| Drain Current                                       | $I_D$           | $T_A=25^\circ C$ | -3.2           |
|   |                 | $T_A=70^\circ C$ | -2.55          |
| Pulsed Drain Current <sup>A</sup>                   | $I_{DM}$        | -12.8            | A              |
| Total Power Dissipation @ $T_A=25^\circ C$          | $P_D$           | 1                | W              |
| Thermal Resistance Junction-to-Ambient <sup>B</sup> | $R_{\theta JA}$ | 134              | $^\circ C / W$ |
| Junction and Storage Temperature Range              | $T_J, T_{STG}$  | -55~+150         | $^\circ C$     |

## Electrical Characteristics (TA=25°C unless otherwise noted)

| Parameter                             | Symbol       | Conditions  | Min  | Typ   | Max       | Units      |
|---------------------------------------|--------------|---|------|-------|-----------|------------|
| <b>Static Parameter</b>               |              |   |      |       |           |            |
| Drain-Source Breakdown Voltage        | $BV_{DSS}$   | $V_{GS}=0V, I_D=-250\mu A$                              | -20  | -22   |           | V          |
| Zero Gate Voltage Drain Current       | $I_{DSS}$    | $V_{DS}=-20V, V_{GS}=0V, T_C=25^\circ C$                |      |       | -1        | $\mu A$    |
| Gate-Body Leakage Current             | $I_{GSS}$    | $V_{GS}=\pm 12V, V_{DS}=0V$                             |      |       | $\pm 100$ | nA         |
| Gate Threshold Voltage                | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$                          | -0.4 | -0.65 | -1.0      | V          |
| Static Drain-Source On-Resistance     | $R_{DS(on)}$ | $V_{GS}=-5.0V, I_D=-1A$                                 |      | 52    | 67        | m $\Omega$ |
|                                       |              | $V_{GS}=-4.5V, I_D=-3A$                                 |      | 55    | 69        |            |
|                                       |              | $V_{GS}=-2.5V, I_D=-2A$                                 |      | 69    | 88        |            |
| Diode Forward Voltage                 | $V_{SD}$     | $I_S=-3A, V_{GS}=0V$                                    |      | -0.8  | -1.2      | V          |
| Maximum Body-Diode Continuous Current | $I_S$        |   |      |       | -3.2      | A          |
| <b>Dynamic Parameters</b>             |              |   |      |       |           |            |
| Input Capacitance                     | $C_{iss}$    | $V_{DS}=-10V, V_{GS}=0V, f=1MHz$                        |      | 512   |           | pF         |
| Output Capacitance                    | $C_{oss}$    |   |      | 82    |           |            |
| Reverse Transfer Capacitance          | $C_{rss}$    |   |      | 57    |           |            |
| <b>Switching Parameters</b>           |              |   |      |       |           |            |
| Total Gate Charge                     | $Q_g$        | $V_{GS}=-4.5V, V_{DS}=-10V, I_D=-3.2A$                  |      | 4.0   |           | nC         |
| Gate Source Charge                    | $Q_{gs}$     |   |      | 0.8   |           |            |
| Gate Drain Charge                     | $Q_{gd}$     |   |      | 1.1   |           |            |
| Turn-on Delay Time                    | $t_{D(on)}$  | $V_{GS}=-4.5V, V_{DD}=-10V, I_D=-1A, R_{GEN}=2.5\Omega$ |      | 12    |           | ns         |
| Turn-on Rise Time                     | $t_r$        |   |      | 54    |           |            |
| Turn-off Delay Time                   | $t_{D(off)}$ |   |      | 15    |           |            |
| Turn-off Fall Time                    | $t_f$        |   |      | 9     |           |            |

- A. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty cycle  $\leq 2\%$ .  
 B. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch.

## Typical Performance Characteristics

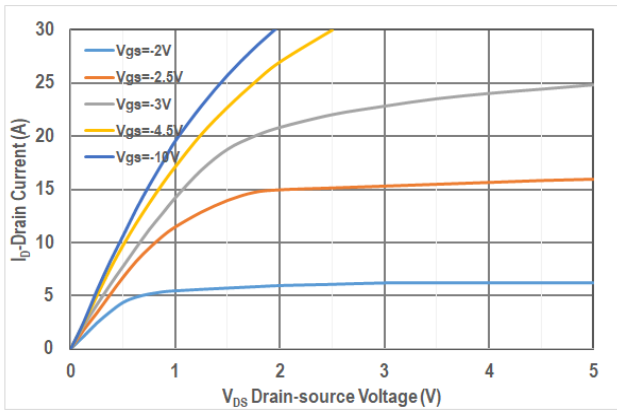


Figure1. Output Characteristics

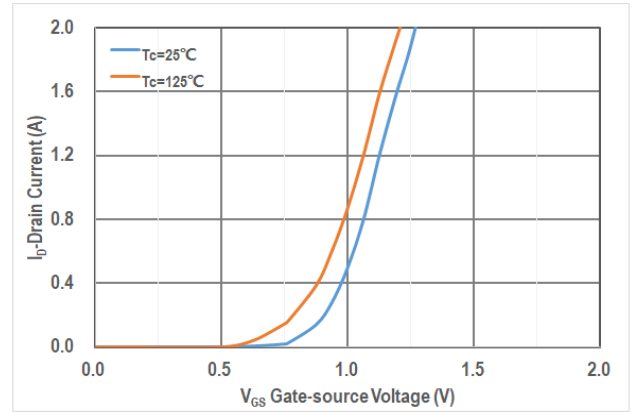


Figure2. Transfer Characteristics

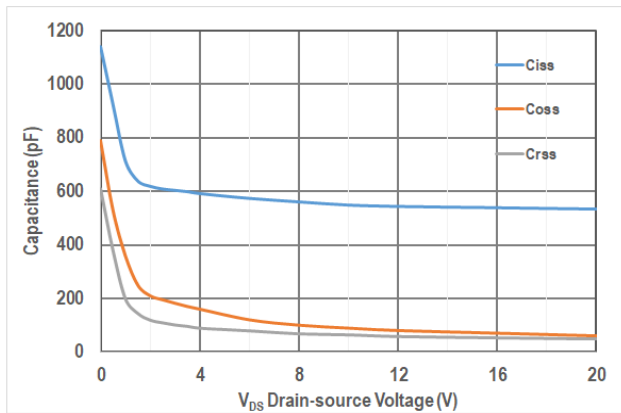


Figure3. Capacitance Characteristics

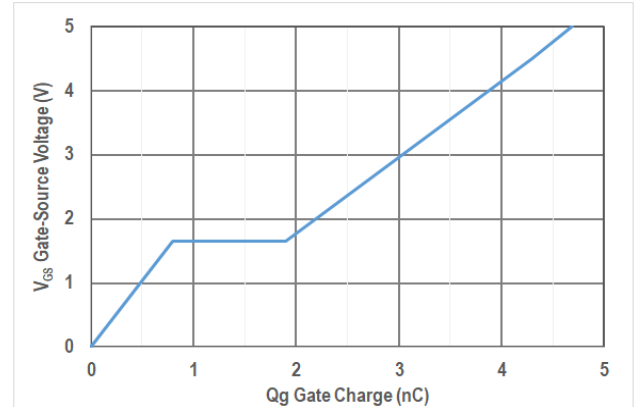


Figure4. Gate Charge

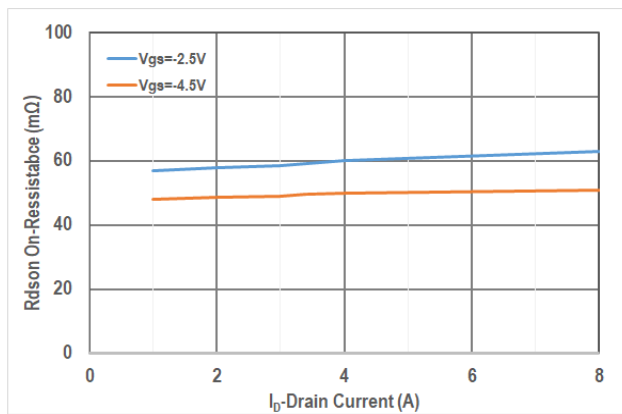


Figure5. Drain-Source on Resistance

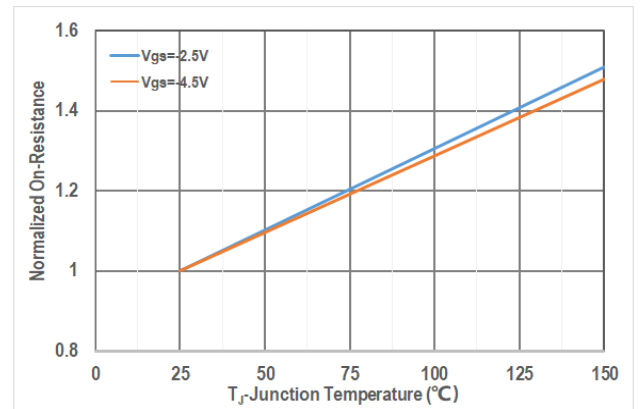


Figure6. Drain-Source on Resistance

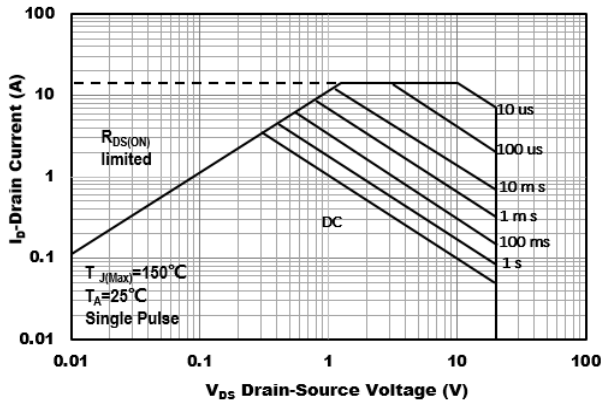


Figure7. Safe Operation Area

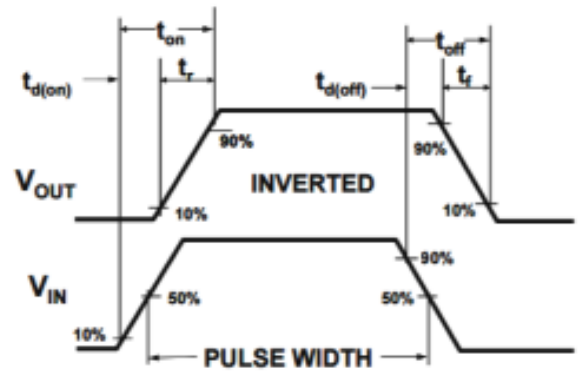
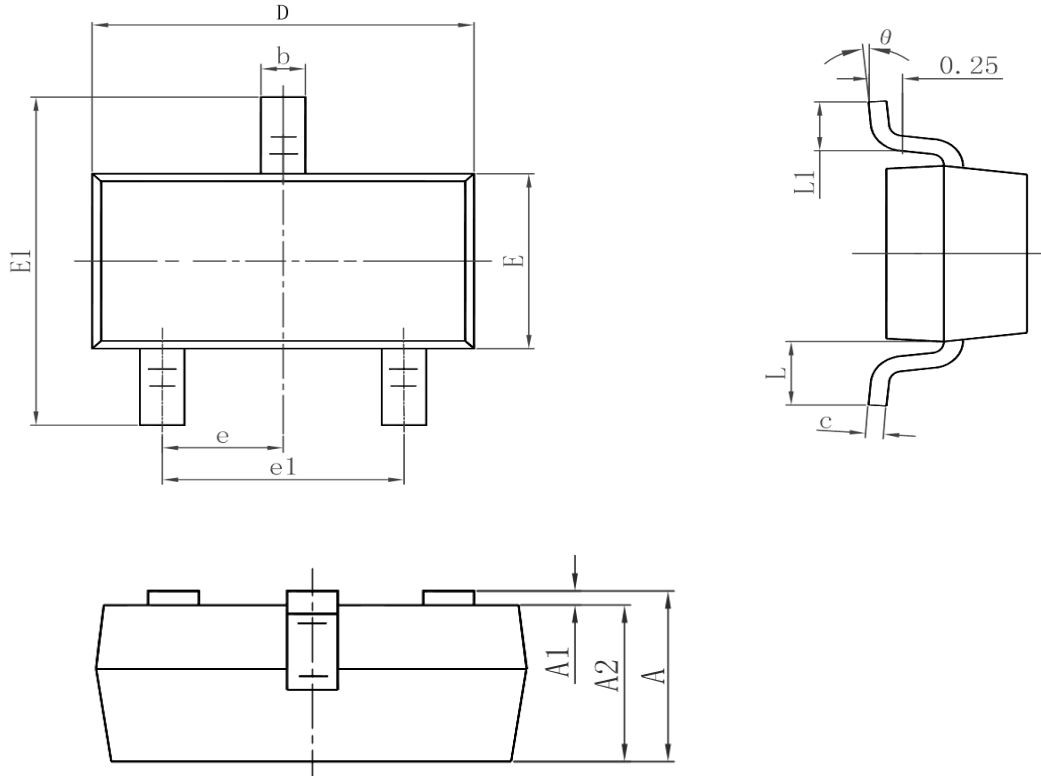


Figure8. Switching wave

## Package Information : SOT-23



| Symbol   | Dimensions In Millimeters |       | Dimensions In Inches |       |
|----------|---------------------------|-------|----------------------|-------|
|          | Min.                      | Max.  | Min.                 | Max.  |
| A        | 0.900                     | 1.150 | 0.035                | 0.045 |
| A1       | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2       | 0.900                     | 1.050 | 0.035                | 0.041 |
| b        | 0.300                     | 0.500 | 0.012                | 0.020 |
| c        | 0.080                     | 0.150 | 0.003                | 0.006 |
| D        | 2.800                     | 3.000 | 0.110                | 0.118 |
| E        | 1.200                     | 1.400 | 0.047                | 0.055 |
| E1       | 2.250                     | 2.550 | 0.089                | 0.100 |
| e        | 0.950 TYP.                |       | 0.037 TYP.           |       |
| e1       | 1.800                     | 2.000 | 0.071                | 0.079 |
| L        | 0.550 REF.                |       | 0.022 REF.           |       |
| L1       | 0.300                     | 0.500 | 0.012                | 0.020 |
| $\theta$ | 0°                        | 8°    | 0°                   | 8°    |