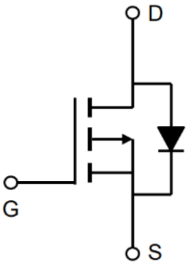
# -30V P-Channel Enhancement Mode MOSFET

## Description



The HN40P03DF uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

$V_{DS}$ = -30V $I_D$ =-40A

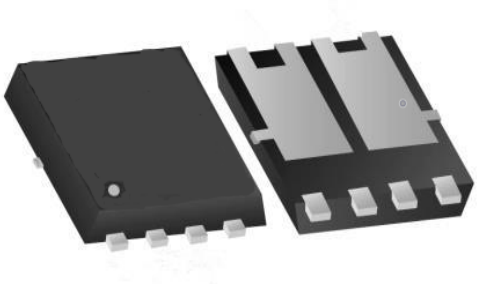
$R_{DS(ON)}$ <16mΩ @ $V_{GS}$=-10V

## Application

Lithium battery protection

Wireless impact

Mobile phone fast charging



## Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|---|---|---|---|
| HN40P03DF | PDFN3*3-8L | HN40P03DF XXX YYYY | 5000 |

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

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| VDS | Drain-Source Voltage | -30 | V |
| VGS | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_A$=25℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1] | -40 | A |
| $I_D$@$T_A$=70℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1] | -23 | A |
| IDM | Pulsed Drain Current[2] | -120 | A |
| EAS | Single Pulse Avalanche Energy[3] | 68 | mJ |
| IAS | Avalanche Current | -29.4 | A |
| $P_D$@$T_A$=25℃ | Total Power Dissipation[4] | 3.1 | W |
| $P_D$@$T_A$=70℃ | Total Power Dissipation[4] | 2 | W |
| TSTG | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] | 75 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1](t≦ 10s) | 40 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | 24 | ℃/W |

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

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| V(BR)DSS | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_D$= -250μA | -30 | -32.5 | - | V |
| IDSS | Zero Gate Voltage Drain Current | $V_{DS}$= -30V, $V_{GS}$=0V, | - | - | -1 | μA |
| IGSS | Gate to Body Leakage Current | $V_{DS}$=0V, $V_{GS}$= ±20V | - | - | ±100 | nA |
| VGS(th) | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$= -250μA | -1.2 | -1.5 | -2.5 | V |
| RDS(on) | Static Drain-Source on-Resistance note3 | $V_{GS}$= -10V, $I_D$= -10A | - | 11 | 16 | mΩ |
| | | $V_{GS}$= -4.5V, $I_D$= -5A | - | 16 | 20 | |
| Rg | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | 4.9 | 7.0 | 9.1 | Ω |
| $C_{iss}$ | Input Capacitance | $V_{DS}$= -24V, $V_{GS}$=10V, f=1.0MHz | - | 2130 | - | pF |
| Coss | Output Capacitance | | - | 280 | - | pF |
| Crss | Reverse Transfer Capacitance | | - | 252 | - | pF |
| $Q_g$ | Total Gate Charge | $V_{DS}$= -24V, $I_D$= -1A, $V_{GS}$= -10V | - | 22 | - | nC |
| $Q_{gs}$ | Gate-Source Charge | | - | 4 | - | nC |
| $Q_{gd}$ | Gate-Drain("Miller") Charge | | - | 5.8 | - | nC |
| td(on) | Turn-on Delay Time | $V_{DD}$= -24V, $I_D$= -1A, $V_{GS}$= -10V, $R_{GEN}$=7.0Ω | - | 9 | - | ns |
| $t_r$ | Turn-on Rise Time | | - | 13 | - | ns |
| td(off) | Turn-off Delay Time | | - | 48 | - | ns |
| $t_f$ | Turn-off Fall Time | | - | 20 | - | ns |
| IS | Maximum Continuous Drain to Source Diode Forward Current | | - | - | -29.5 | A |
| ISM | Maximum Pulsed Drain to Source Diode Forward Current | | - | - | -44 | A |
| VSD | Drain to Source Diode Forward Voltage | $V_{GS}$=0V, $I_S$= -1A | - | -0.74 | -1.2 | V |

**Note :**

1、Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2、$E_{AS}$ condition: $T_J$=25℃, $V_{DD}$= -24V, $V_G$= -10V, $R_G$=7Ω, L=0.1mH, $I_{AS}$= -29.5A

3、Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

## Typical Characteristics

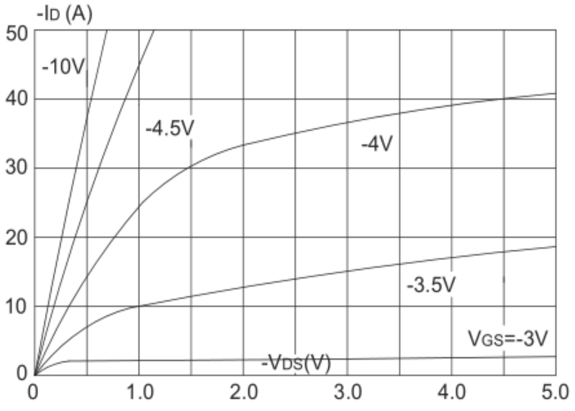


Figure1: Output Characteristics  Figure

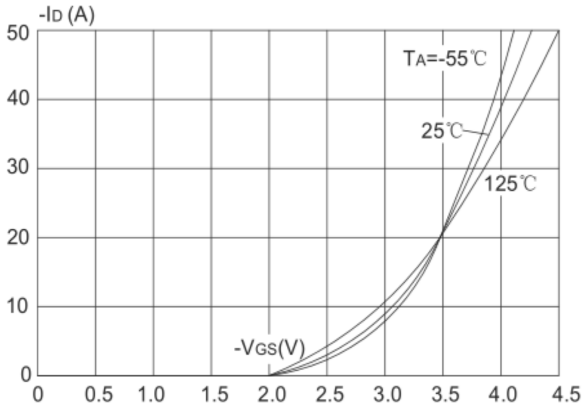


Figure2: Typical Transfer Characteristics

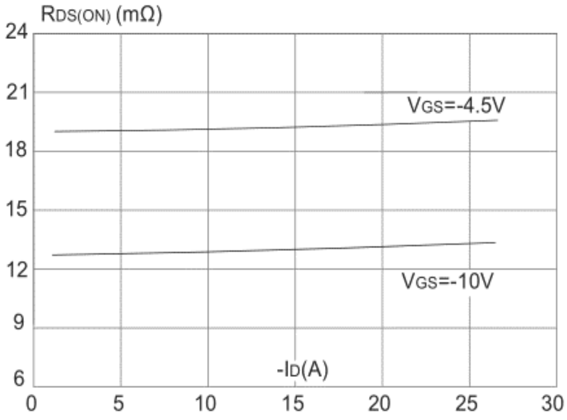


Figure 3:On-resistance vs. Drain Current

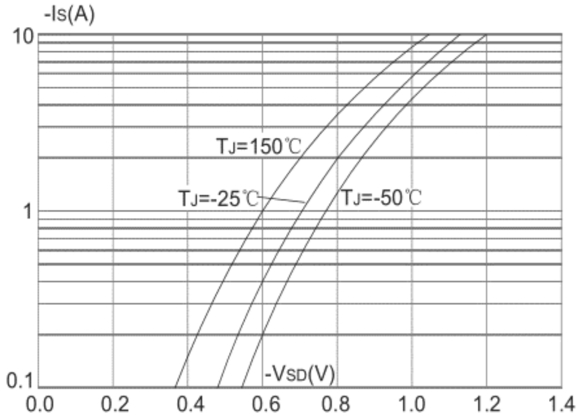


Figure 4: Body Diode Characteristics

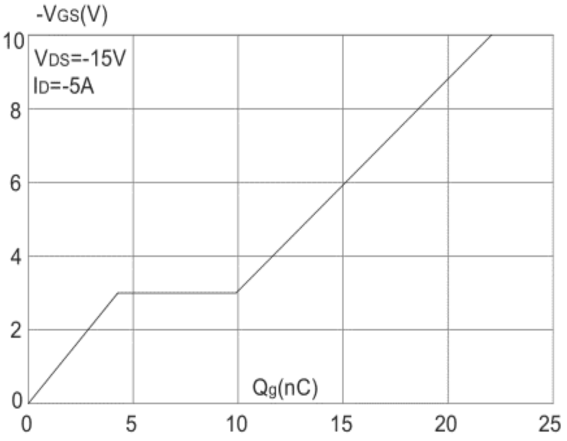


Figure 5: Gate Charge Characteristics

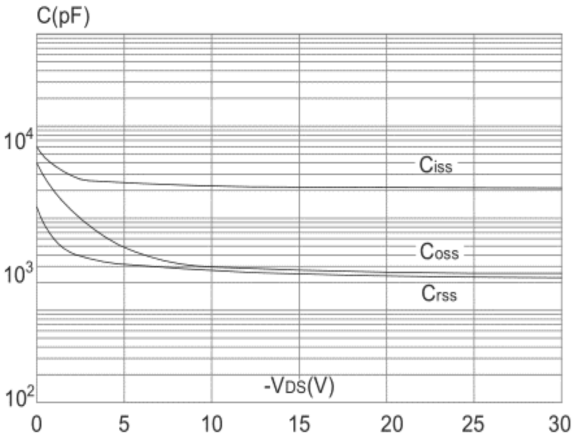


Figure 6: Capacitance Characteristics

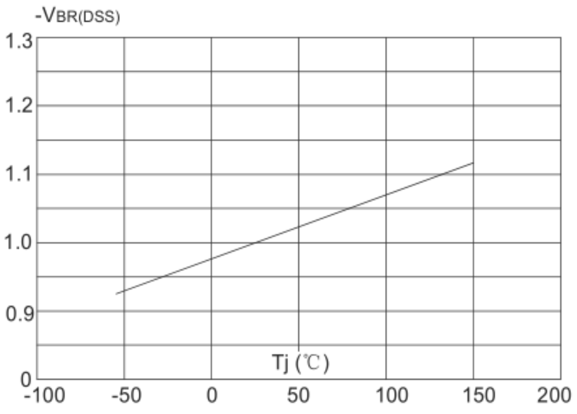


Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

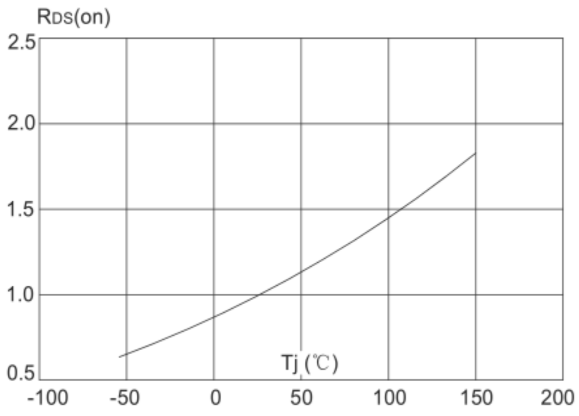


Figure 8: Normalized on Resistance vs. Junction Temperature

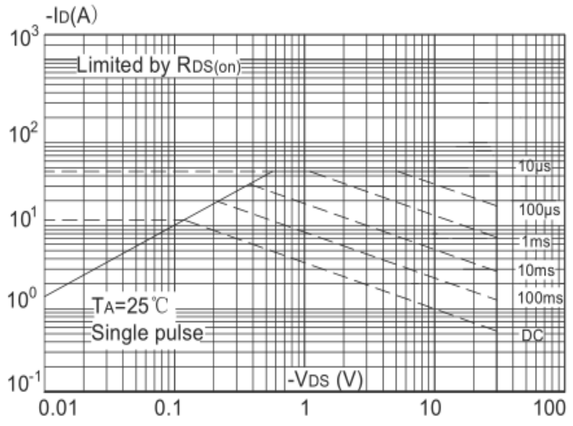


Figure 9: Maximum Safe Operating Area

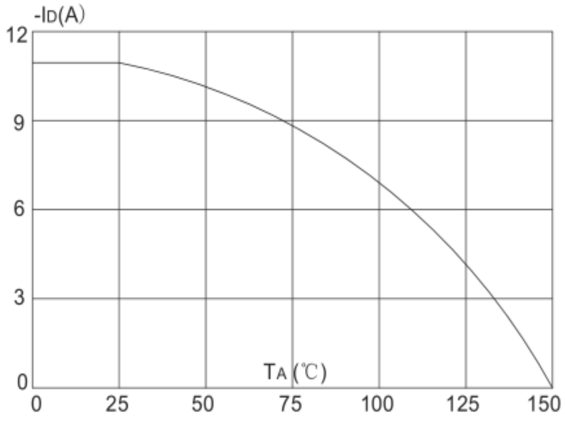


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

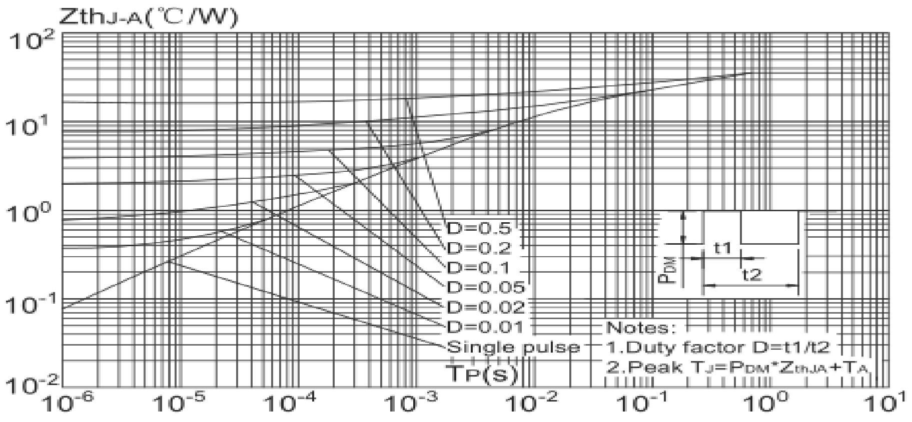
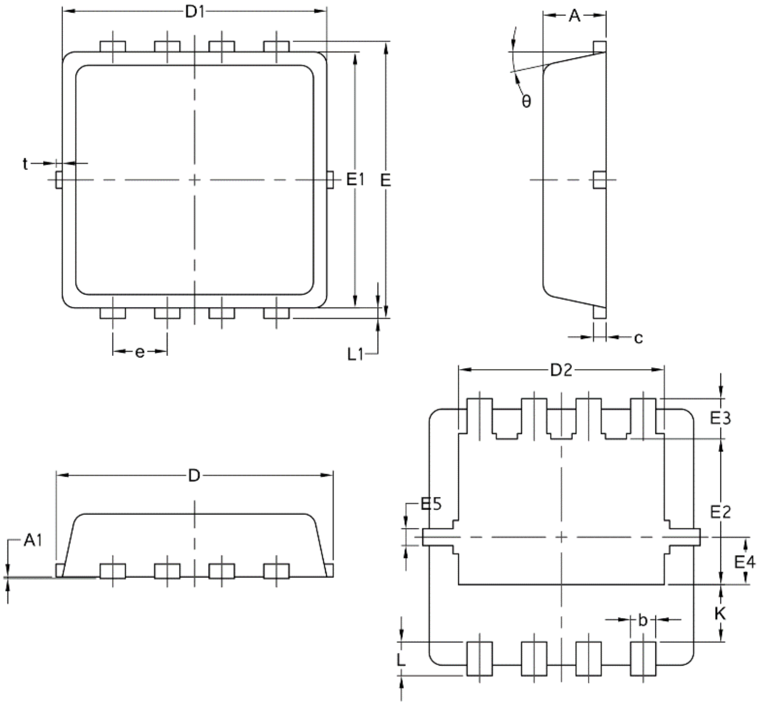


Figure.11: Maximum Effective
Transient Thermal Impedance, Junction-to-Ambient

## Package Mechanical Data-DFN3*3-8L-JQ Single



| Symbol | Common | | |
|---|---|---|---|
| | mm | | |
| | Mim | Nom | Max |
| A | 0.70 | 0.75 | 0.85 |
| A1 | / | / | 0.05 |
| b | 0.20 | 0.30 | 0.40 |
| c | 0.10 | 0.152 | 0.25 |
| D | 3.15 | 3.30 | 3.45 |
| D1 | 3.00 | 3.15 | 3.25 |
| D2 | 2.29 | 2.45 | 2.65 |
| E | 3.15 | 3.30 | 3.45 |
| E1 | 2.90 | 3.05 | 3.20 |
| E2 | 1.54 | 1.74 | 1.94 |
| E3 | 0.28 | 0.48 | 0.65 |
| E4 | 0.37 | 0.57 | 0.77 |
| E5 | 0.10 | 0.20 | 0.30 |
| e | 0.60 | 0.65 | 0.70 |
| K | 0.59 | 0.69 | 0.89 |
| L | 0.30 | 0.40 | 0.50 |
| L1 | 0.06 | 0.125 | 0.20 |
| t | 0 | 0.075 | 0.13 |
| Φ | 10 | 12 | 14 |