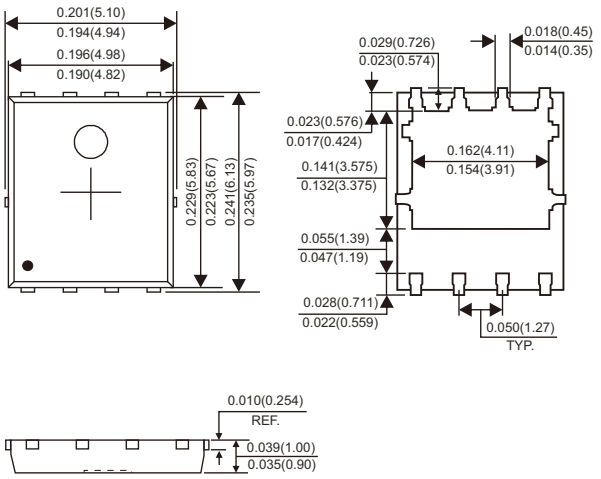
# CMS13N06H8-HF

## N-Channel
## RoHS Device
## Halogen Free

| | |
|---|---|
| $BV_{DSS}$ | 60V |
| $I_D$@$V_{GS}$=10V, $T_C$=25°C | 56A |
| $I_D$@$V_{GS}$=10V, $T_A$=25°C | 13.8A |
| $R_{DS(ON)}$@ $V_{GS}$=10V, $I_D$=25A | 5.1mΩ(typ) |
| $R_{DS(ON)}$@ $V_{GS}$=4.5V, $I_D$=25A | 7.4mΩ(typ) |

**PDFN5x6-8L**




Dimensions in inches and (millimeter)

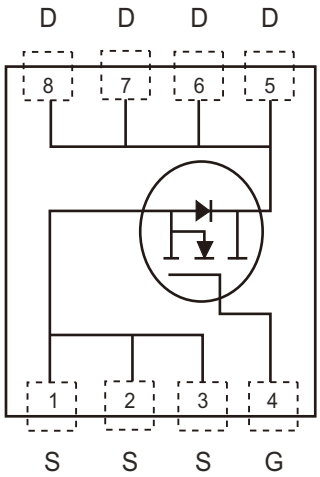
## Features

- Single drive requirement.
- Low On-resistance.
- Fast switching characteristic.
- Repetitive avalanche rated.

## Mechanical data

- Case : PDFN5x6-8L, molded plastic.
- Epoxy : UL 94V-0 rated flame retardant.
- Lead: Pure tin plated.

## Circuit Diagram



## Absolute Maximum Ratings (at Ta=25°C unless otherwise noted)

| Parameter | | Symbol | 10s | Steady State | Unit |
|---|---|---|---|---|---|
| Drain-source voltage | | $V_{DS}$ | 60 | | V |
| Gate-source voltage | | $V_{GS}$ | ±20 | | V |
| Drain current-continuous @ $T_C$=25°C,$V_{GS}$=10V (silicon limit) (Note 1) | | $I_D$ | 80 | | A |
| Continuous drain current @ $T_C$=25°C,$V_{GS}$=10V (package limit) (Note 1) | | | 56 | | A |
| Continuous drain current @ $T_C$=100°C,$V_{GS}$=10V (Note 1) | | | 35 | | A |
| Continuous drain current @ $T_A$=25°C,$V_{GS}$=10V (Note 2) | | $I_{DSM}$ | 20.8 | 13.8 | A |
| Continuous drain current @ $T_A$=70°C,$V_{GS}$=10V (Note 2) | | | 16.6 | 11.0 | A |
| Continuous drain current @ $T_A$=85°C,$V_{GS}$=10V (Note 2) | | | 15.0 | 9.9 | A |
| Pulsed drain current (Note 3) | | $I_{DM}$ | 224 * 1 | | A |
| Avalanche current (Note 3) | | $I_{AS}$ | 40 | | A |
| Avalanche energy @ L=0.1mH, $I_D$=40A, $V_{DD}$=30V (Note 2,4) | | $E_{AS}$ | 80 | | mJ |
| Repetitive avalanche energy @ L=0.05mH (Note 3) | | $E_{AR}$ | 10 * 2 | | |
| Total power dissipation | $T_C$=25°C (Note 1) | $P_D$ | 83 | | W |
| | $T_C$=100°C (Note 1) | | 33 | | |
| | $T_A$=25°C (Note 2) | $P_{DSM}$ | 5.7 | 2.5 | |
| | $T_A$=70°C (Note 2) | | 4.0 | 1.8 | |
| | $T_A$=85°C (Note 2) | | 3.6 | 1.6 | |
| Operating temperature range | | TJ | -55~+150 | | °C |
| Storage temperature range | | $T_{STG}$ | -55 to +150 | | °C |

## Thermal Data

| Parameter | | Symbol | Typical | Maximum | Unit |
|---|---|---|---|---|---|
| Thermal resistance, junction to ambient (Note 2) | t≤10s | $R_{\theta JA}$ | 18 | 22 | °C/W |
| | Steady state | | 42 | 50 | °C/W |
| Thermal resistance | junction to case | $R_{\theta JC}$ | 1.4 | 1.5 | °C/W |

Notes: 1. The power dissipation $P_D$ is based on $T_{J(MAX)}$=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.

2. The value of $R_{\theta JA}$ is measured with the device mounted on 1 in² FR-4 board with 2 oz. copper, in a still air environment with $T_A$=25°C. The power dissipation $P_{DSM}$ is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.

3. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$=150°C. Ratings are based on low frequency and low duty cycles to keep initial $T_J$=25°C .

4. 100% tested by conditions of L=0.1mH, $I_{AS}$=10A, $V_{GS}$=10V, $V_{DD}$=30V .

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

| Parameter | Conditions | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-source breakdown voltage | $V_{GS}$ = 0V, $I_D$ = 250μA | $BV_{DSS}$ | 60 | | | V |
| Gate-threshold voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | $V_{GS(th)}$ | 1.4 | | 2.6 | V |
| Forward transconductance (Note 1) | $V_{DS}$ = 10V, $I_D$ = 30A | $G_{FS}$ | | 30 | | S |
| Gate-Source leakage current | $V_{GS}$ = ±20V | $I_{GSS}$ | | | ±100 | nA |
| Zero gate voltage drain current | $V_{DS}$ = 48V, $V_{GS}$ = 0V | $I_{DSS}$ | | | 1 | μA |
| | $V_{DS}$ = 48V, $V_{GS}$ = 0V, $T_J$ = 125°C | $I_{DSS}$ | | | 25 | |
| Static drain-source on-resistance (Note 1) | $V_{GS}$ = 10V, $I_D$ = 25A | $R_{DS(ON)}$ | | 5.1 | 6.4 | mΩ |
| | $V_{GS}$ = 4.5V, $I_D$ = 25A | | | 7.4 | 9.6 | |
| **Dynamic** | | | | | | |
| Input capacitance | $V_{DS}$ = 25V, $V_{GS}$ = 0V, f = 1MHz | $C_{iss}$ | | 1619 | | pF |
| Output capacitance | | $C_{oss}$ | | 275 | | |
| Reverse transfer capacitance | | $C_{rss}$ | | 143 | | |
| Total gate charge (Note 1,2) | $V_{DS}$ = 48V, $V_{GS}$ = 10V, $I_D$ = 25A | $Q_g$ | | 42.8 | | nC |
| Gate-source charge (Note 1,2) | | $Q_{gs}$ | | 5.8 | | |
| Gate-drain charge (Note 1,2) | | $Q_{gd}$ | | 15.6 | | |
| Turn-on delay time (Note 1,2) | $V_{DS}$ = 30V, $I_D$ = 1A, $V_{GS}$ = 10V, $R_{GS}$ = 6Ω | $t_{d(on)}$ | | 15.2 | | ns |
| Turn-on rise time (Note 1,2) | | $t_r$ | | 22.4 | | |
| Turn-off delay time (Note 1,2) | | $t_{d(off)}$ | | 74 | | |
| Turn-off fall time (Note 1,2) | | $t_f$ | | 36 | | |
| Gate resistance | f =1MHz | Rg | | 4 | | |
| **Source-Drain Diode** | | | | | | |
| Drain-source diode forward current (Note 1) | | $I_S$ | | | 56 | A |
| Pulse diode forward current (Note 3) | | $I_{SM}$ | | | 224 | |
| Drain-source diode forward voltage (Note 1) | $V_{GS}$ = 0V, $I_S$ = 25A | $V_{SD}$ | | 0.82 | 1.2 | V |
| Body Diode Reverse Recovery Time | $I_F$ = 25A, $dI_F/d_t$ = 100A/μs | trr | | 18 | | nS |
| Body Diode Reverse Recovery Charge | | Qrr | | 12 | | nC |

Notes: 1. Pulse test : Pulse width ≤300μs, Duty cycle ≤ 2%.
2. Independent of operating temperature.
3. Pulse width limited by maximum junction temperature.

## Rating and Characteristic Curves (CMS13N06H8-HF)

Fig.1 - Typical Output Characteristics

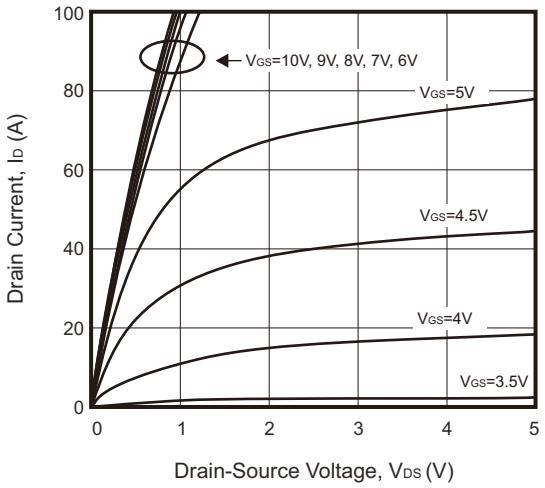



Fig.2 - Static Drain-Source On-State Resistance VS Drain Current

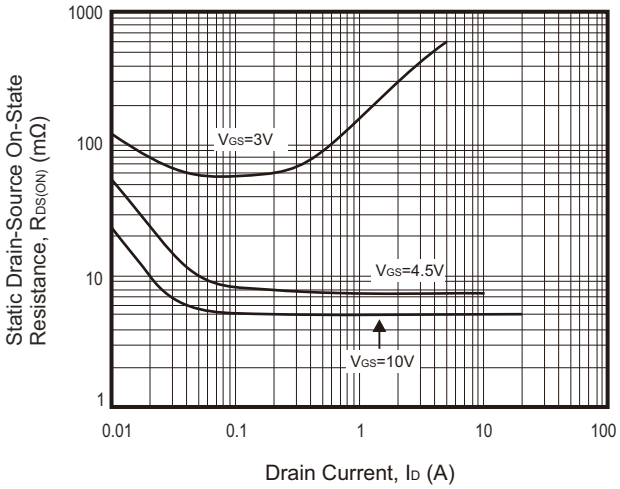



Fig.3 - Static Drain-Source On-State Resistance VS Gate-Source Voltage

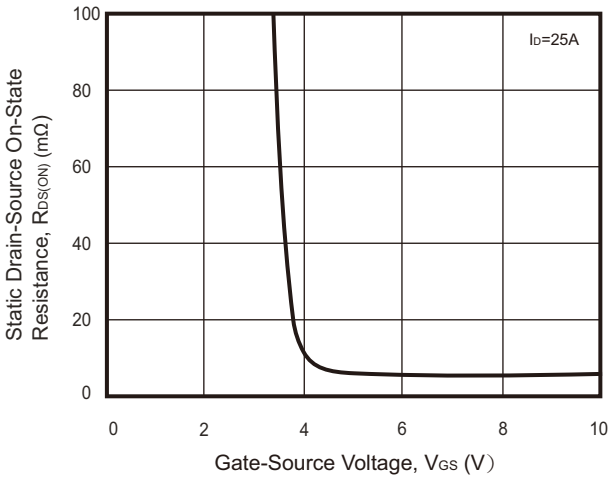



Fig.4 - Capacitance VS Drain-Source Voltage

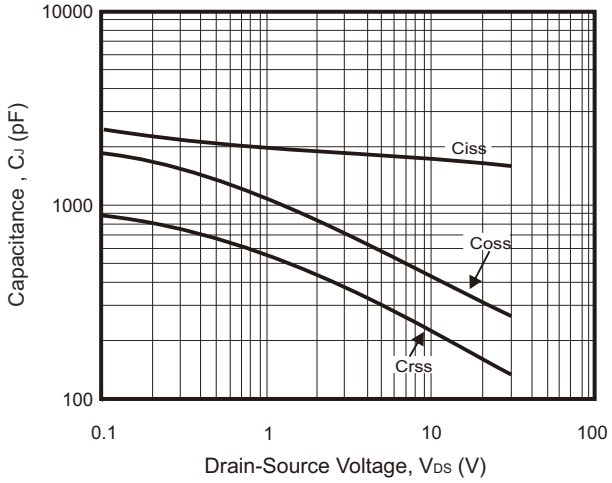



Fig.5 - Forward Transfer Admittance VS Drain Current

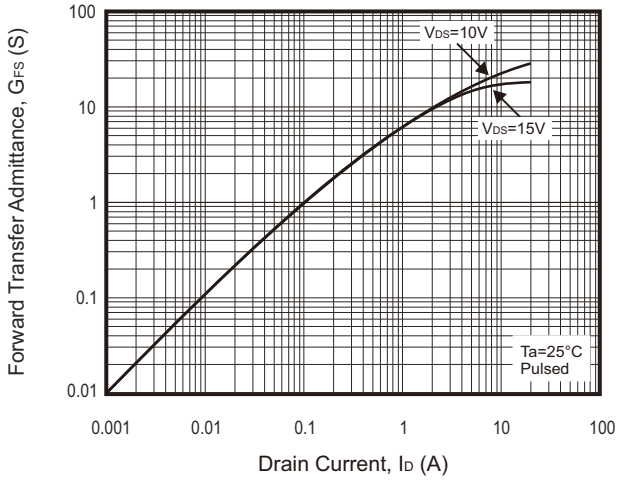
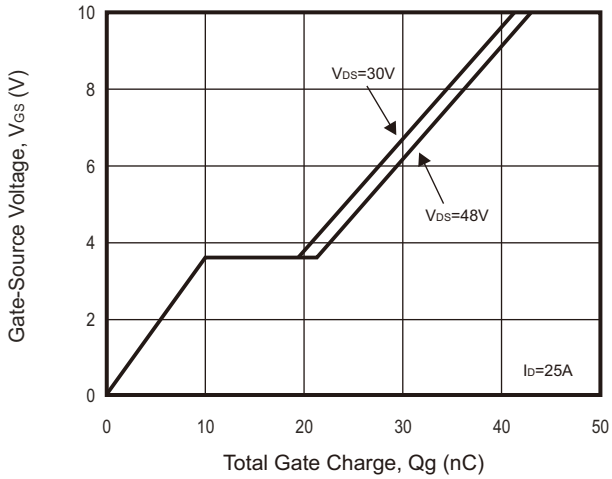
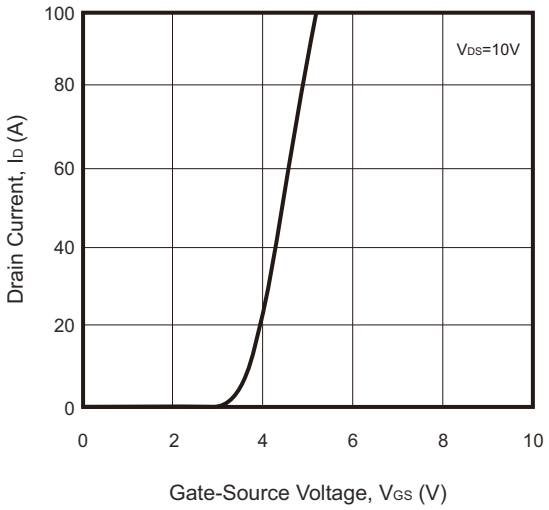



Fig.6 - Gate Charge Characteristics

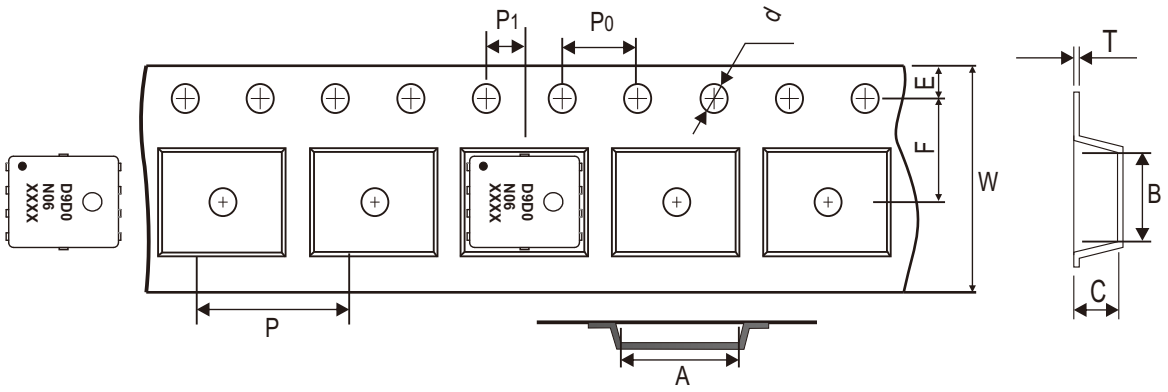


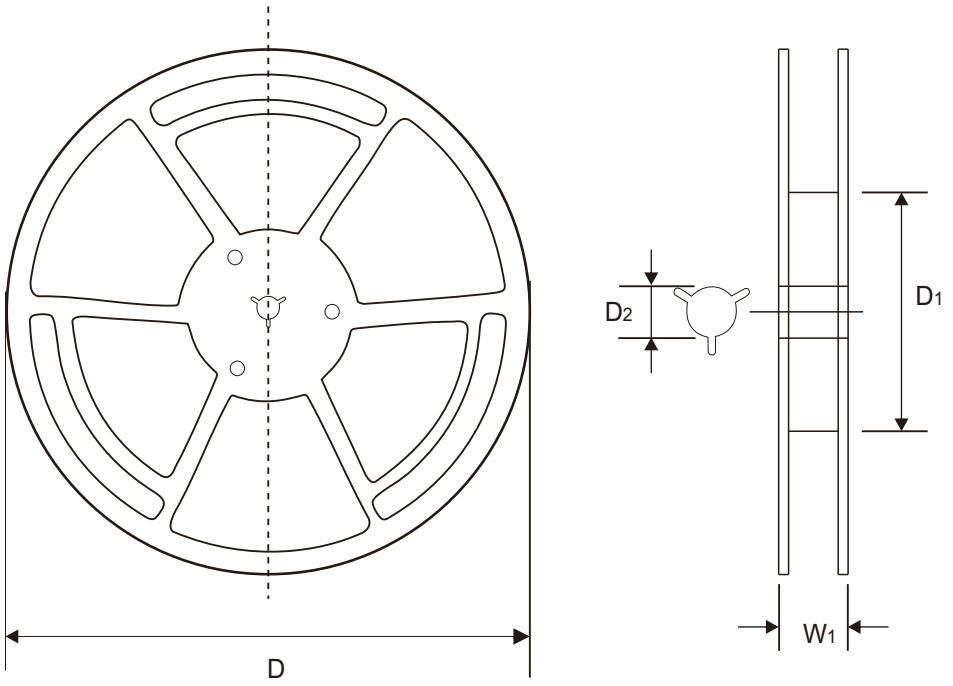
## Rating and Characteristic Curves (CMS13N06H8-HF)

Fig.7 - Typical Transfer Characteristics



## Reel Taping Specification



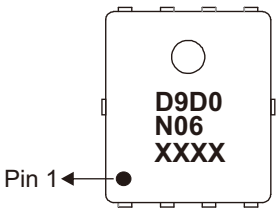




| | SYMBOL | A | B | C | d | D | D1 | D2 |
|---|---|---|---|---|---|---|---|---|
| PDFN5x6 8L | (mm) | 6.30 ± 0.10 | 5.30 ± 0.10 | 1.10 ± 0.10 | 1.50 + 0.10 - 0.00 | 330.00 ± 1.00 | 100.00 ± 0.50 | 13.00 ± 0.20 |
| | (inch) | 0.248 ± 0.004 | 0.209 ± 0.004 | 0.043 ± 0.004 | 0.059 + 0.004 - 0.000 | 12.992 ± 0.039 | 3.937 ± 0.020 | 0.512 ± 0.008 |

| | SYMBOL | E | F | P | P0 | P1 | T | W | W1 |
|---|---|---|---|---|---|---|---|---|---|
| PDFN5x6 8L | (mm) | 1.75 ± 0.10 | 5.50 ± 0.05 | 8.00 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.05 | 0.25 ± 0.02 | 12.00 + 0.30 - 0.10 | 17.60 + 1.00 - 0.00 |
| | (inch) | 0.069 ± 0.004 | 0.217 ± 0.002 | 0.315 ± 0.004 | 0.157 ± 0.004 | 0.079 ± 0.002 | 0.010 ± 0.001 | 0.472 + 0.012 - 0.004 | 0.693 + 0.039 - 0.000 |

## Marking Code

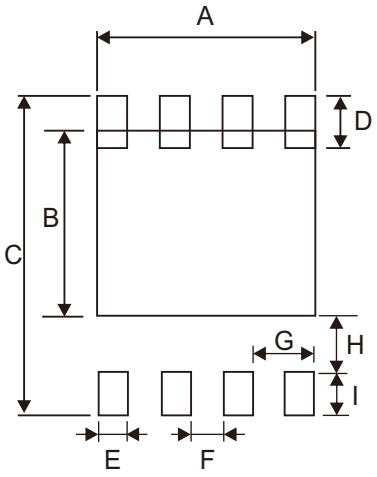
| Part Number | Marking Code |
|---|---|
| CMS13N06H8-HF | D9D0N06 |




XXXX = Control code

## Suggested P.C.B. PAD Layout

| SIZE | PDFN5x6-8L | |
|---|---|---|
| | (mm) | (inch) |
| A | 4.42 | 0.174 |
| B | 3.81 | 0.150 |
| C | 6.61 | 0.260 |
| D | 1.02 | 0.040 |
| E | 0.61 | 0.024 |
| F | 0.66 | 0.026 |
| G | 1.27 | 0.050 |
| H | 1.23 | 0.048 |
| I | 0.86 | 0.034 |




## Standard Packaging

| Case Type | REEL PACK | |
|---|---|---|
| | REEL ( pcs ) | Reel Size (inch) |
| PDFN5x6-8L | 3,000 | 13 |