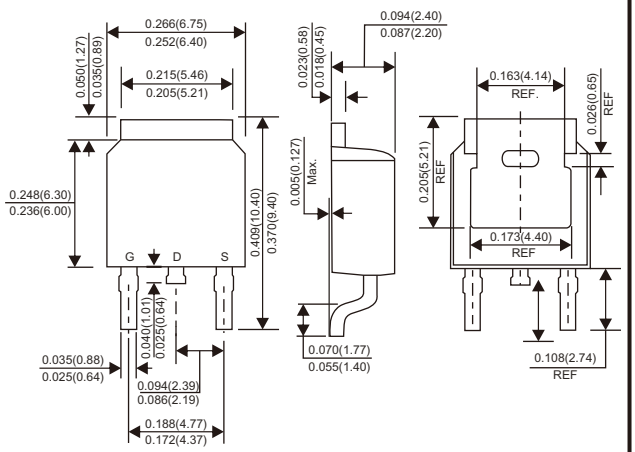
# MOSFET

# CMS16N06D-HF

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

D-PAK(TO-252)




Dimensions in inches and (millimeters)

## Features

- Low reverse transfer capacitance.
- High switching speed.
- Improved dv/dt capability.
- 100% EAS guaranteed.
- Green device available.

## Mechanical data

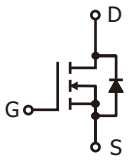
- Case: D-PAK/TO-252 standard package, molded plastic.

## Description

The CMS16N06D is the highest performance N-ch MOSFETs with super high dense cell density for extremely low $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications. The CMS16N06D meet the ROHS and Green Product require ment, 100% EAS guaranteed with full function reliability approved.

## Circuit Diagram

- G : Gate
- D : Drain
- S : Source




## Maximum Ratings (at $T_A$=25°C unless otherwise noted)

| Parameter | Conditions | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-source voltage | | $V_{DS}$ | 60 | V |
| Gate-source voltage | | $V_{GS}$ | ±20 | V |
| Continuous drain current (Note 1) | $T_C$ = 25°C | $I_D$ | 16 | A |
| | $T_C$ = 100°C | $I_D$ | 10 | |
| Pulsed drain current (Note 1, 2) | $T_C$ = 25°C | $I_{DM}$ | 64 | A |
| Continuous drain current | $T_A$ = 25°C | $I_D$ | 4.4 | A |
| | $T_A$ = 70°C | $I_D$ | 3.5 | |
| Total power dissipation (Note 4) | $T_C$ = 25°C | $P_D$ | 27 | W |
| | $T_A$ = 25°C | $P_D$ | 2 | |
| Single pulse avalanche energy, L=0.1mH (Note 3) | | $E_{AS}$ | 11 | mJ |
| Single pulse avalanche current, L=0.1mH (Note 3) | | $I_{AS}$ | 15 | A |
| Operating junction and storage temperature range | | $T_J$, $T_{STG}$ | -55 to +150 | °C |

## Thermal Data

| Parameter | Conditions | Symbol | Max. Value | Unit |
|---|---|---|---|---|
| Thermal resistance junction-ambient (Note 1) | Steady state | $R_{\theta JA}$ | 62.5 | °C/W |
| Thermal resistance junction-case (Note 1) | Steady state | $R_{\theta JC}$ | 4.6 | °C/W |

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

| Parameter | Symbol | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $BV_{DSS}$ | 60 | | | V | $V_{GS}$ = 0, $I_D$ = 250μA |
| Gate threshold voltage | $V_{GS(th)}$ | 1.0 | 1.8 | 2.5 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA |
| Gate-source leakage current | $I_{GSS}$ | | | ±100 | nA | $V_{GS}$ = ±20V |
| Drain-source leakage current | $I_{DSS}$ | | | 1 | μA | $V_{DS}$ = 60V, $V_{GS}$ = 0 |
| Static drain-source on-resistance (Note 2) | $R_{DS(on)}$ | | 37 | 50 | mΩ | $V_{GS}$ = 10V, $I_D$ = 8A |
| | | | 42 | 60 | | $V_{GS}$ = 4.5V, $I_D$ = 4A |
| Total gate charge (Note 2) | $Q_g$ | | 14 | | nC | $I_D$ = 4A, $V_{DS}$ = 30V, $V_{GS}$ = 10V |
| Gate-source charge | $Q_{gs}$ | | 2.9 | | | |
| Gate-drain (“Miller”) change | $Q_{gd}$ | | 2.3 | | | |
| Turn-on delay time (Note 2) | $t_{d(on)}$ | | 3.9 | | ns | $V_{DS}$ = 30V, $I_D$ = 1A, $V_{GS}$ = 10V, $R_G$ = 3.3Ω |
| Rise time | $t_r$ | | 13 | | | |
| Turn-off delay time | $t_{d(off)}$ | | 23 | | | |
| Fall time | $t_f$ | | 6.7 | | | |
| Input capacitance | $C_{iss}$ | | 815 | | pF | $V_{GS}$ = 0V, $V_{DS}$ = 15V, f = 1MHz |
| Output capacitance | $C_{oss}$ | | 379 | | | |
| Reverse transfer capacitance | $C_{rss}$ | | 110 | | | |
| **Guaranteed avalanche characteristics** | | | | | | |
| Single pulse avalanche energy (Note 5) | EAS | 3.2 | | | mJ | $V_{DD}$ = 25V, L = 0.1mH, $I_{AS}$ = 8A |
| **Source-drain diode** | | | | | | |
| Diode forward voltage (Note 2) | $V_{SD}$ | | 0.73 | 1.0 | V | $I_S$ = 1A, $V_{GS}$ = 0V, $T_J$ = 25°C |
| Continuous source current (Note 1, 6) | $I_S$ | | | 16 | A | |

Notes: 1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%.
3. The EAS data shows Max. rating. The test condition is VDD=25V, VGS=10V, L=0.1mH, IAS=15A.
4. The power dissipation is limited by 150°C junction temperature.
5. The min. value is 100% EAS tested guarantee.
6. The data is theoretically the same as ID and IDM, in real applications, should be limited by total power dissipation.

Rating and Characteristic Curves (CMS16N06D-HF)

## Typical Characteristics

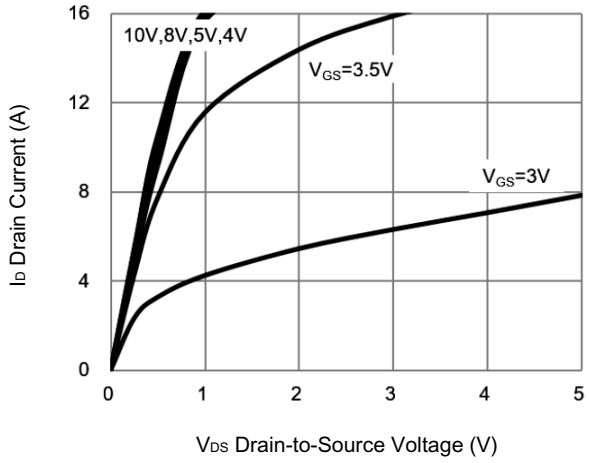



Fig.1 Typical Output Characteristics

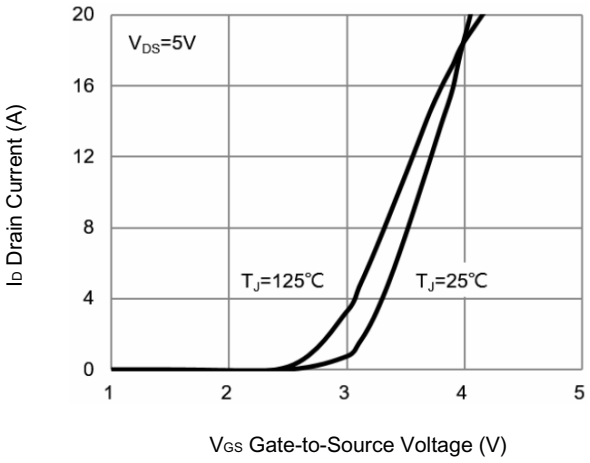



Fig.2 Transfer Characteristics

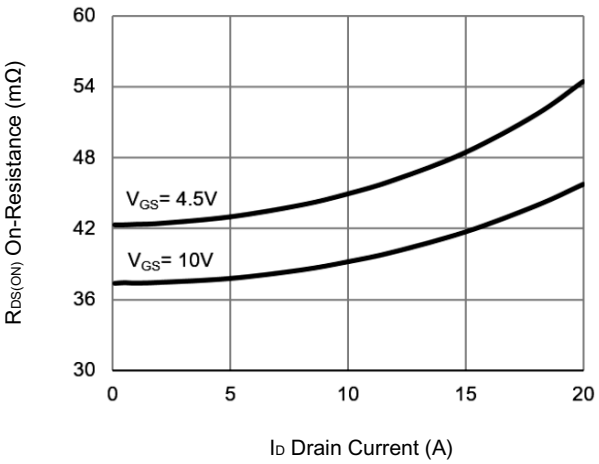



Fig.3 On-Resistance vs. Drain Current

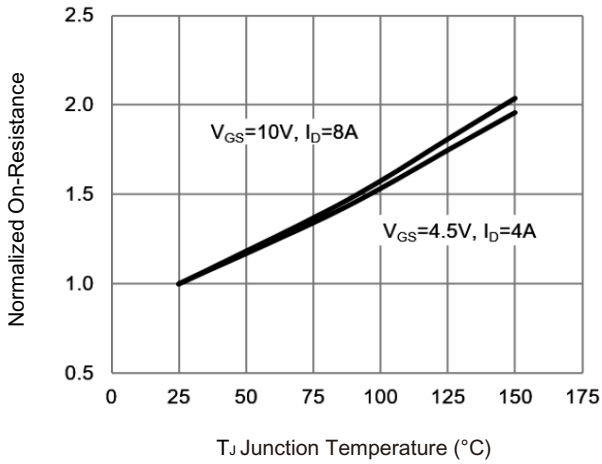



Fig.4 Normalized RDSON vs. TJ

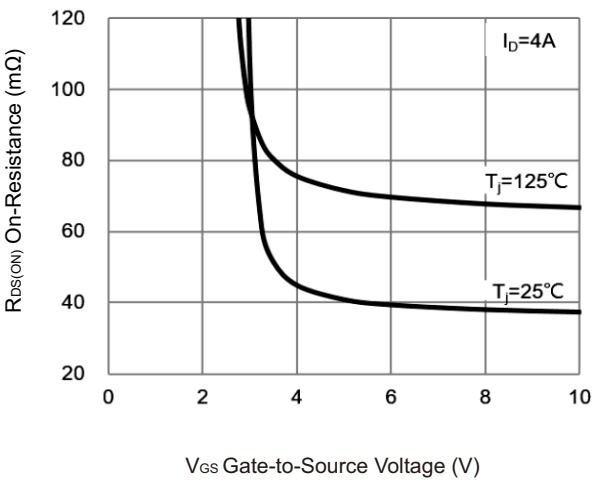



Fig.5 On-Resistance vs. G-S Voltage

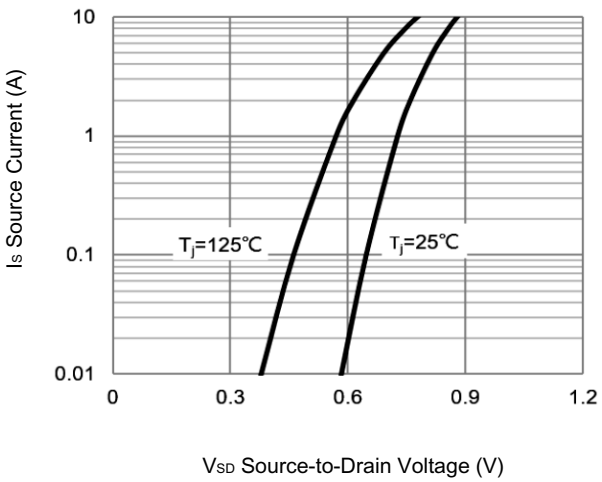



Fig.6 Forward Characteristics of Reverse

## Rating and Characteristic Curves (CMS16N06D-HF)

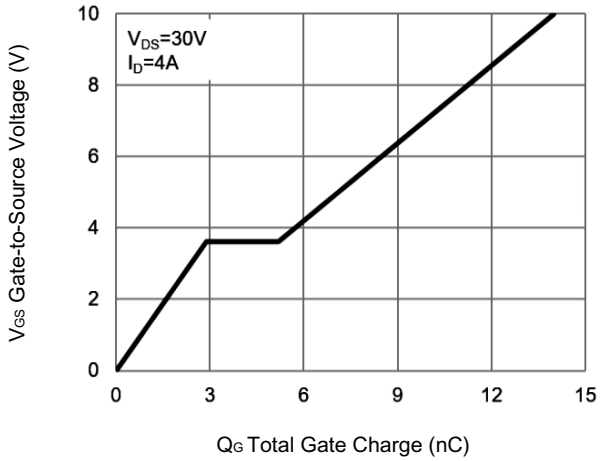



Fig.7 Gate Charge Characteristics

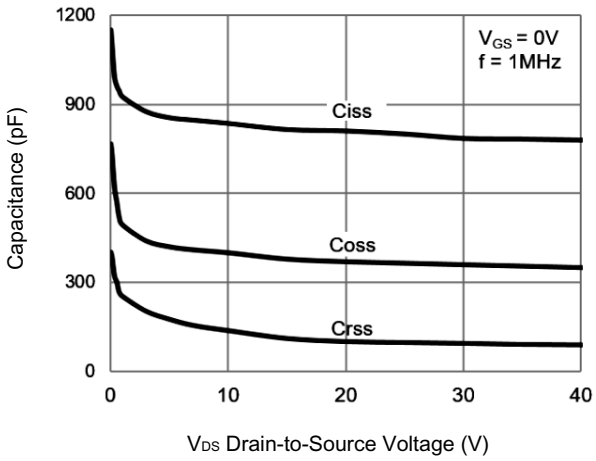



Fig.8 Capacitance Characteristics

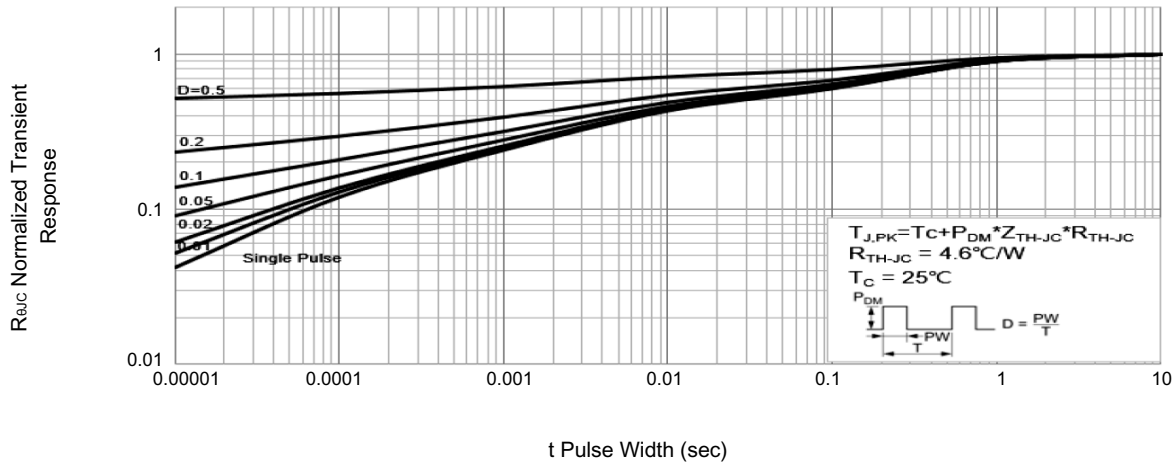



Fig.9 Normalized Maximum Transient Thermal Impedance

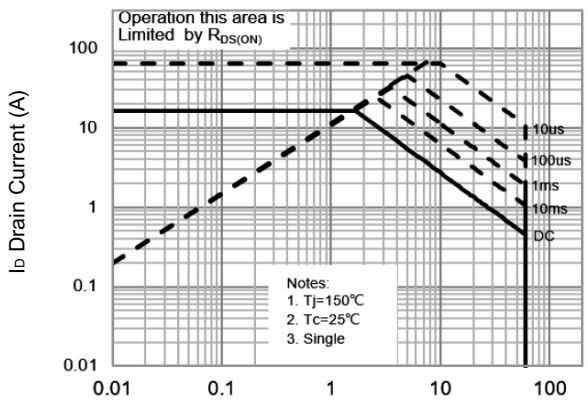



Fig.10 Safe Operating Area

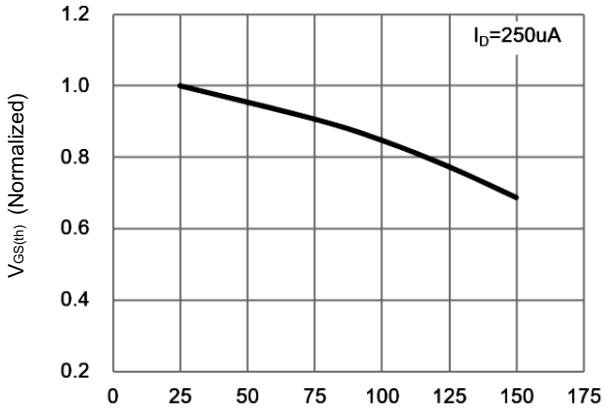
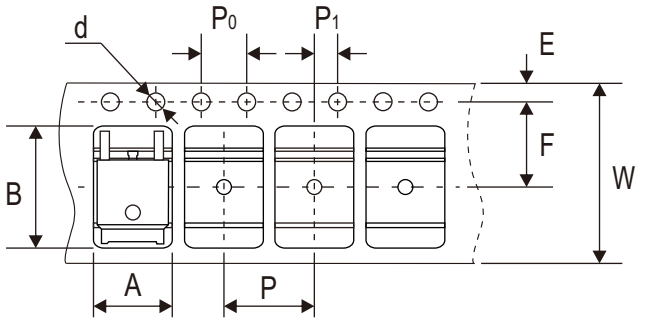
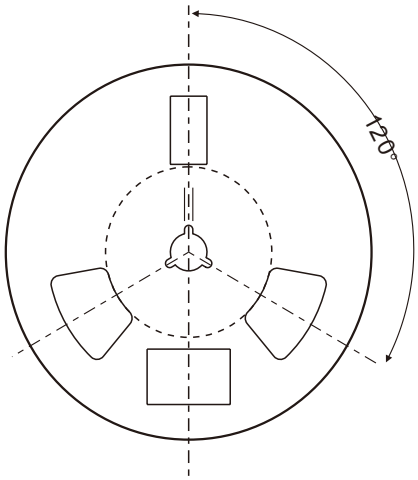
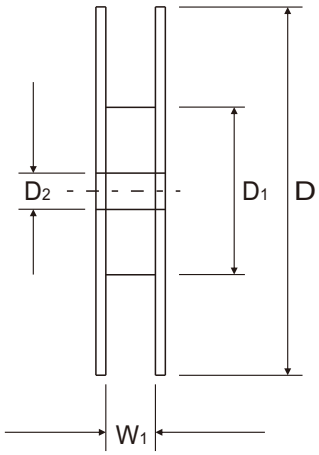


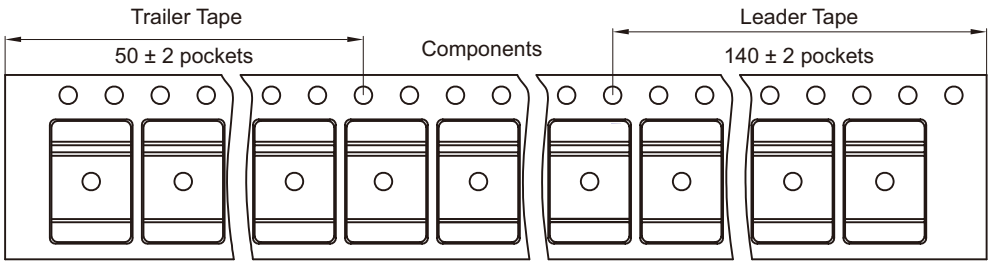

Fig.11 Normalized $V_{GS(th)}$ vs. Temperature

## Reel Taping Specification



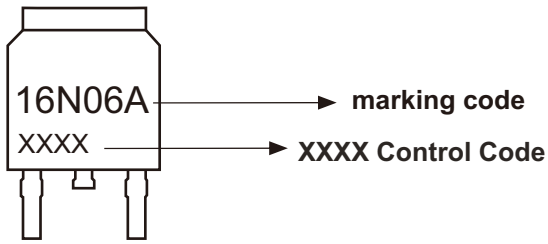

| | SYMBOL | A | B | C | d | D | D1 | D2 |
|---|---|---|---|---|---|---|---|---|
| TO-252 (D-PAK) | (mm) | 6.90 ± 0.10 | 10.50 ± 0.10 | 2.78 ± 0.10 | 1.50 ± 0.10 | 330 ± 1.00 | 100.00 ± 0.50 | 13.20 ± 0.20 |
| | (inch) | 0.272 ± 0.004 | 0.413 ± 0.004 | 0.109 ± 0.004 | 0.059 ± 0.004 | 12.992 ± 0.039 | 3.937 ± 0.020 | 0.520 ± 0.008 |

| | SYMBOL | E | F | P | P0 | P1 | T | W | W1 |
|---|---|---|---|---|---|---|---|---|---|
| TO-252 (D-PAK) | (mm) | 1.75 ± 0.10 | 7.50 ± 0.10 | 8.00 ± 0.10 | 4.00 ± 0.10 | 2.00 ± 0.10 | 0.25 ± 0.02 | 16.00 ± 0.10 | 16.40 ± 0.02 |
| | (inch) | 0.069 ± 0.004 | 0.295 ± 0.004 | 0.315 ± 0.004 | 0.157 ± 0.004 | 0.079 ± 0.004 | 0.010 ± 0.001 | 0.630 ± 0.004 | 0.646 ± 0.01 |

 REV:B

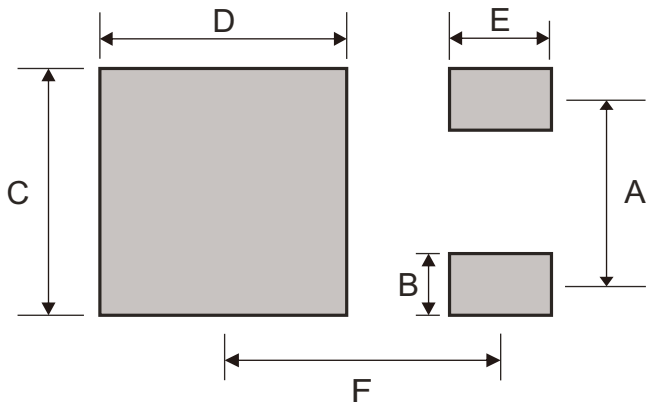
## Marking Code

| Part Number | Marking Code |
|---|---|
| CMS16N06D-HF | 16N06A |




## Suggested P.C.B. PAD Layout

| SIZE | TO-252 / DPAK | |
|---|---|---|
| | (mm) | (inch) |
| A | 4.60 | 0.181 |
| B | 1.40 | 0.055 |
| C | 6.00 | 0.236 |
| D | 6.50 | 0.256 |
| E | 3.00 | 0.118 |
| F | 6.25 | 0.246 |




Note: 1. The pad layout is for reference purposes only.

## Standard Packaging

| Case Type | REEL PACK | |
|---|---|---|
| | REEL ( pcs ) | REEL SIZE (inch) |
| TO-252/D-PAK | 2,500 | 13 |