# ON Semiconductor

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# MOSFET - Power, Single N-Channel, DUAL COOL™, DFN8 5x6.15

## 60 V, 1.9 mΩ, 199 A

# NTMFSC1D9N06HL

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### Features

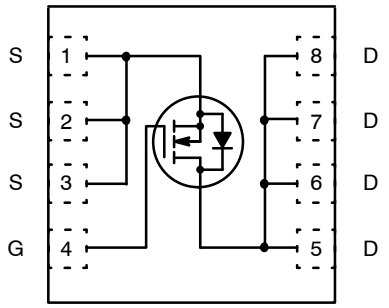
- Advanced Dual−Side Cooled Packaging
- Ultra Low $R_{DS(on)}$ to Minimize Conduction Losses
- MSL1 Robust Packaging Design
- Low Qg and Qoss to Minimize Charge Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

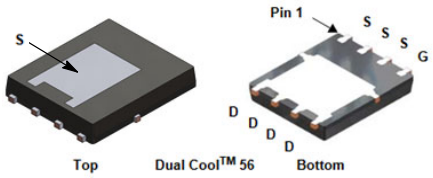
### Typical Applications

- DC−DC Conversion
- Orring FET/Load Switching
- Synchronous Rectification

| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 60 V | 1.9 mΩ @ 10 V | 199 A |

**N−Channel MOSFET**




**DFN8 5x6.15**
**CASE 506EG**

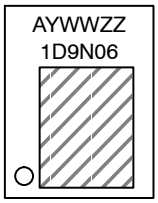
**MAXIMUM RATINGS** ($T_J$ = 25°C, Unless otherwise specified)

| Parameter | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain−to−Source Breakdown Voltage | | | $V_{(BR)DSS}$ | 60 | V |
| Gate−to−Source Voltage | | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current $R_{\theta JC}$ (Note 2) | Steady State | $T_C$ = 25°C | $I_D$ | 199 | A |
| Power Dissipation $R_{\theta JC}$ (Note 2) | | | $P_D$ | 166 | W |
| Continuous Drain Current $R_{\theta JA}$ (Note 1, 2) | Steady State | $T_A$ = 25°C | $I_D$ | 30 | A |
| Power Dissipation $R_{\theta JA}$ (Note 1, 2) | | | $P_D$ | 3.8 | W |
| Pulsed Drain Current | $T_A$ = 25°C, $t_p$ = 100 μs | | $I_{DM}$ | 820 | A |
| Operating Junction and Storage Temperature Range | | | $T_J$, $T_{stg}$ | −55 to +175 | °C |
| Source Current (Body Diode) | | | $I_S$ | 138 | A |
| Single Pulse Drain−to−Source Avalanche Energy ($I_{AV}$ = 43 A) | | | $E_{AS}$ | 277 | mJ |
| Lead Temperature Soldering Reflow for Soldering Purposes (1/8″ from case for 10 s) | | | $T_L$ | 260 | °C |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface−mounted on FR4 board using 1 $in^2$ pad size, 1 oz Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

### MARKING DIAGRAM




1D9N06 = Specific Device Code
A = Assembly Plant Code
YWW = Date Code (Year & Week)
ZZ = Lot Code

### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

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## THERMAL CHARACTERISTICS

| Symbol | Parameter | Max | Unit |
|---|---|---|---|
| $R_{\theta JC}$ | Junction−to−Case − Steady State (Note 2) | 0.9 | °C/W |
| $R_{\theta JT}$ | Junction−to−Top Source − Steady State (Note 2) | 1.4 | |
| $R_{\theta JA}$ | Junction−to−Ambient − Steady State (Note 2) | 39 | |

## ELECTRICAL CHARACTERISTICS ($T_J$ = 25°C unless otherwise noted)

| Parameter | Symbol | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain−to−Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 μA | | 60 | | | V |
| Drain−to−Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}$ / $T_J$ | | | | 38 | | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 60 V | $T_J$ = 25°C | | | 10 | μA |
| | | | $T_J$ = 125°C | | | 250 | |
| Gate−to−Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 20 V | | | | 100 | nA |
| **ON CHARACTERISTICS** (Note 3) | | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 250 μA | | 1.2 | | 2.0 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}$ / $T_J$ | $I_D$ = 250 μA, ref to 25°C | | | −5.6 | | mV/°C |
| Drain−to−Source On Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 50 A | | | 1.4 | 1.9 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 40 A | | | 1.9 | 2.6 | |
| Forward Trans−conductance | $g_{FS}$ | $V_{DS}$ = 15V, $I_D$ = 50A | | | 357 | | S |
| Gate−Resistance | $R_G$ | $V_{GS}$ = 0 V, f = 1 MHz | | | 1.4 | 2.6 | Ω |
| **CHARGES & CAPACITANCES** | | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0 V, f = 1 MHz, $V_{DS}$ = 30 V | | | 4910 | | pF |
| Output Capacitance | $C_{OSS}$ | | | | 862 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | | 12 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 30 V, $I_D$ = 50 A | | | 64 | | nC |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 4.5 V, $V_{DS}$ = 30 V, $I_D$ =50 A | | | 29 | | |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | | 7.2 | | |
| Gate−to−Source Charge | $Q_{GS}$ | | | | 13.2 | | nC |
| Gate−to−Drain Charge | $Q_{GD}$ | | | | 5.7 | | |
| Output Charge | $Q_{OSS}$ | $V_{DD}$ = 30 V, $V_{GS}$ = 0 V | | | 92 | | nC |
| **SWITCHING CHARACTERISTICS** (Note 3) | | | | | | | |
| Turn−On Delay Time | $t_{d(ON)}$ | $V_{GS}$ = 4.5 V, $V_{DS}$ = 30 V, $I_D$ = 50 A, $R_G$ = 2.5 Ω | | | 25.4 | | ns |
| Rise Time | $t_r$ | | | | 16.2 | | |
| Turn−Off Delay Time | $t_{d(OFF)}$ | | | | 30.3 | | |
| Fall Time | $t_f$ | | | | 10.1 | | |
| **DRAIN−SOURCE DIODE CHARACTERISTICS** | | | | | | | |
| Forward Diode Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 50 A | $T_J$ = 25°C | | 0.80 | 1.2 | V |
| | | | $T_J$ = 150°C | | 0.63 | | |
| Reverse Recovery Time | $t_{RR}$ | $V_{GS}$ = 0 V, $dI_S/dt$ = 100 A/μs, $I_S$ = 50 A | | | 56 | | ns |
| Reverse Recovery Charge | $Q_{RR}$ | | | | 67 | | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Switching characteristics are independent of operating junction temperatures.

## TYPICAL CHARACTERISTICS

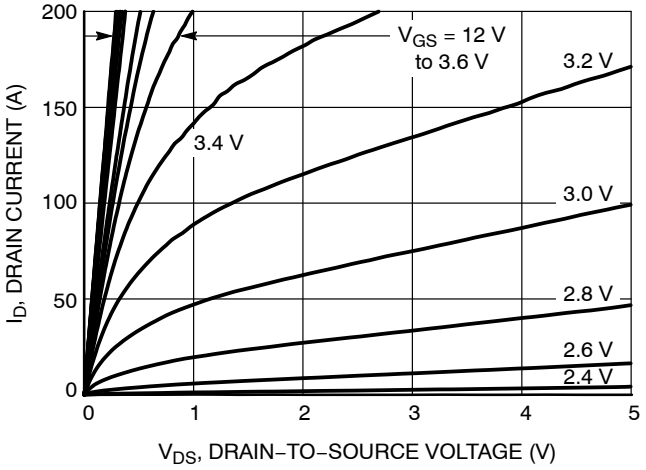



**Figure 1. On−Region Characteristics**

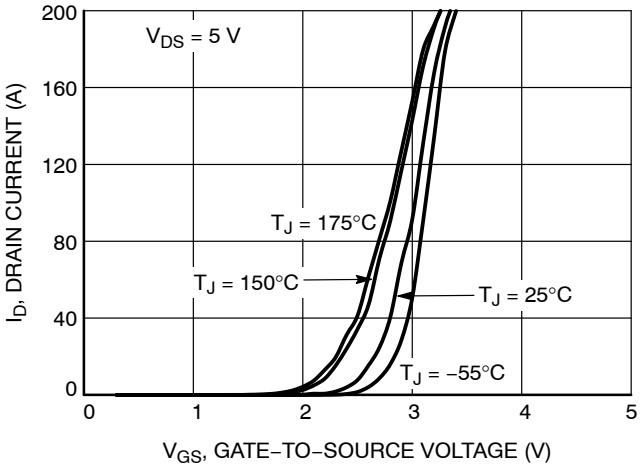



**Figure 2. Transfer Characteristics**

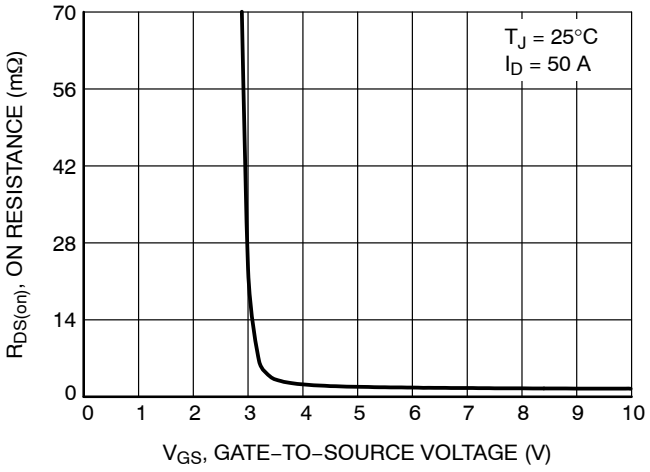



**Figure 3. On−Resistance vs. Gate−to−Source Voltage**

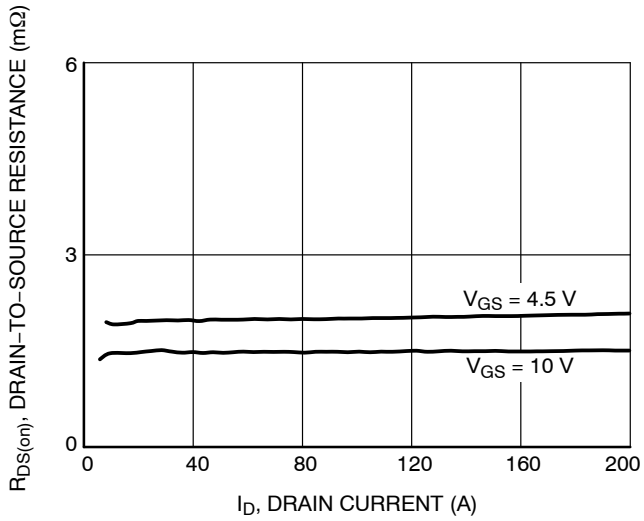



**Figure 4. On−Resistance vs. Drain Current and Gate Voltage**

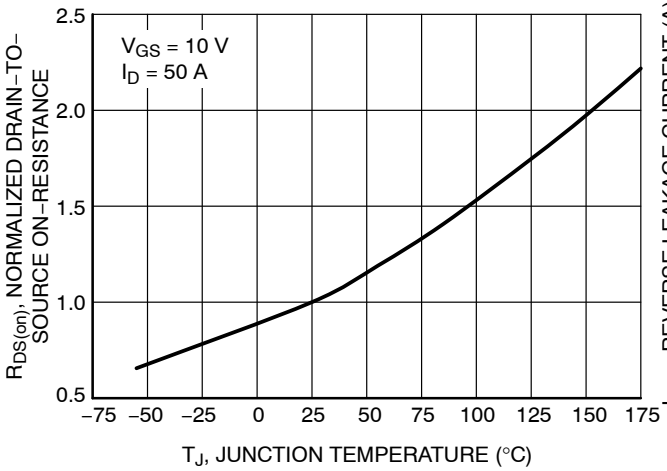



**Figure 5. On−Resistance Variation with Temperature**

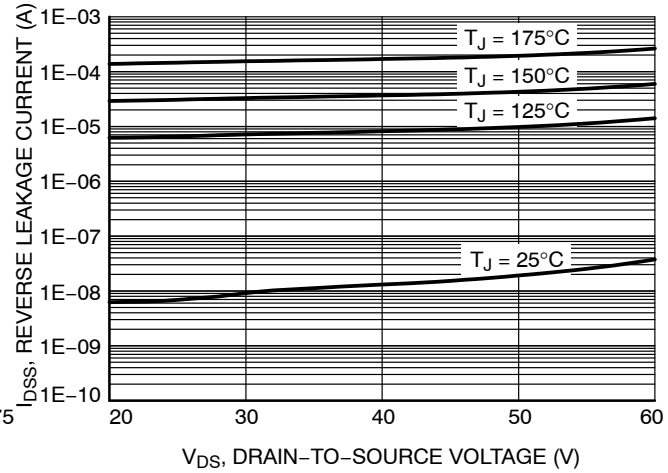



**Figure 6. Drain−to−Source Leakage Current vs. Voltage**

## TYPICAL CHARACTERISTICS

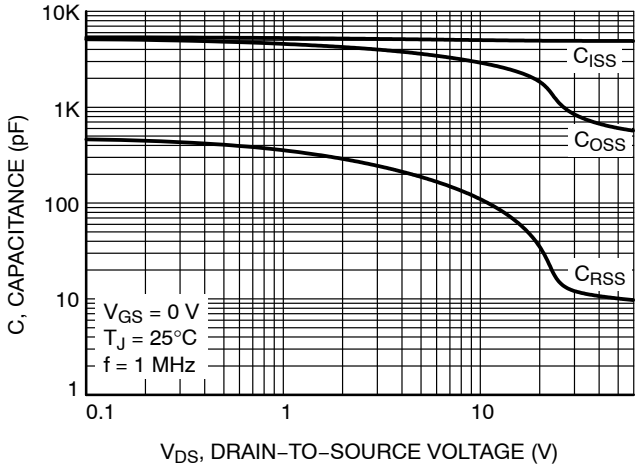



**Figure 7. Capacitance Variation**

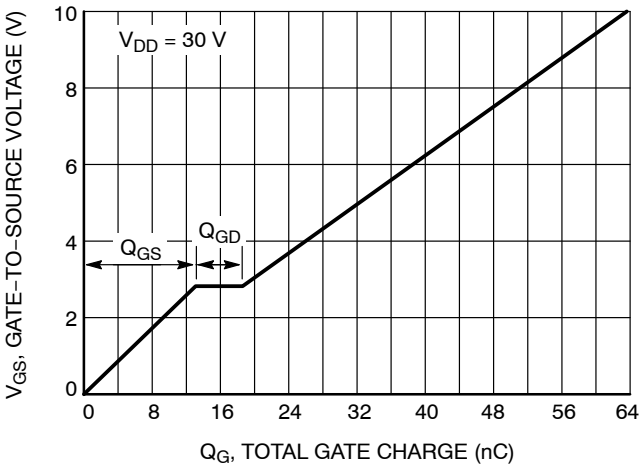



**Figure 8. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge**

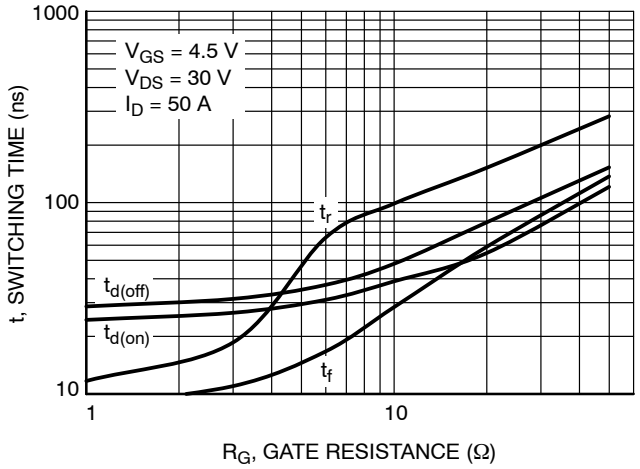



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

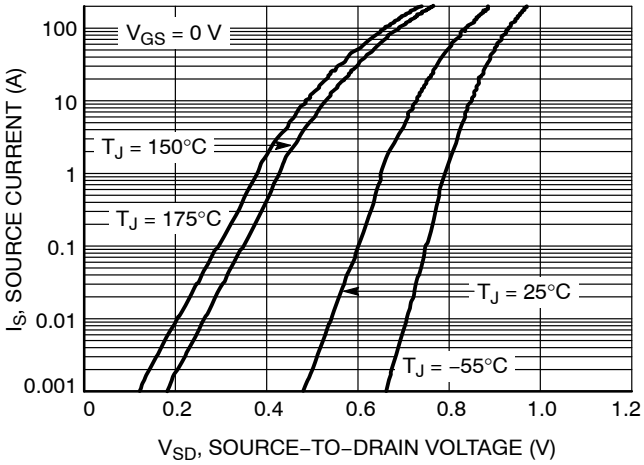



**Figure 10. Diode Forward Voltage vs. Current**

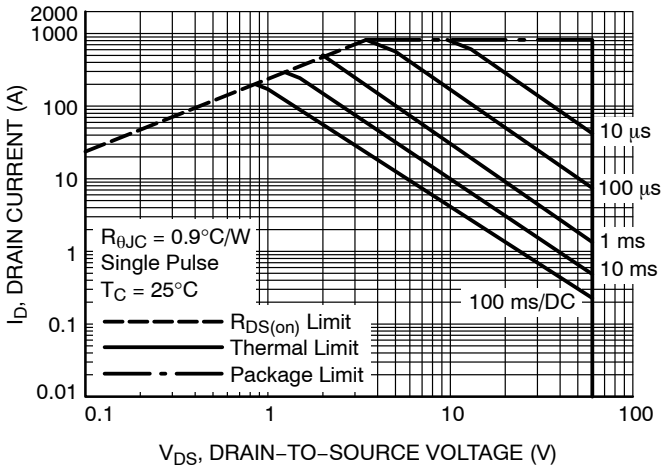



**Figure 11. Forward Bias Safe Operating Area**

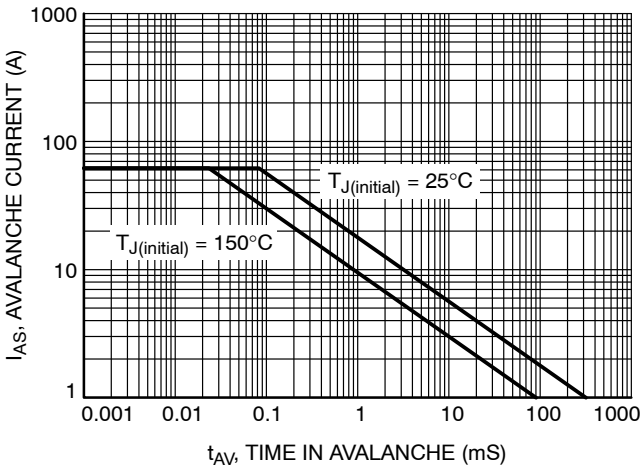



**Figure 12. Unclamped Inductive Switching Capability**

## TYPICAL CHARACTERISTICS

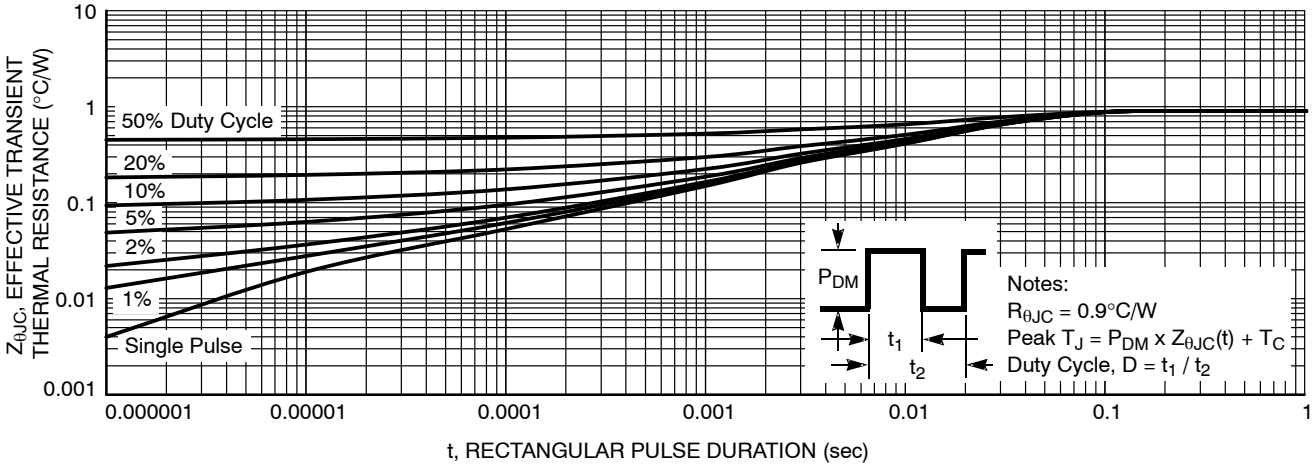



**Figure 13. Transient Thermal Impedance**

### ORDERING INFORMATION

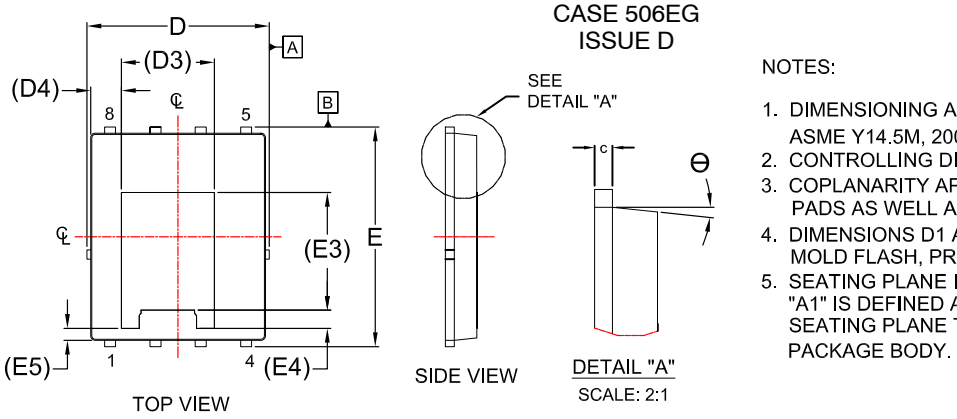
| Device | Device Marking | Package | Shipping† |
|---|---|---|---|
| NTMFSC1D9N06HL | 1D9N06 | DFN8<br>(Pb−Free/Halogen Free) | 3000 / Tape & Reel |

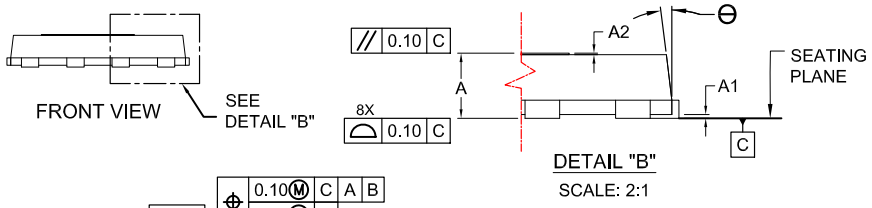
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

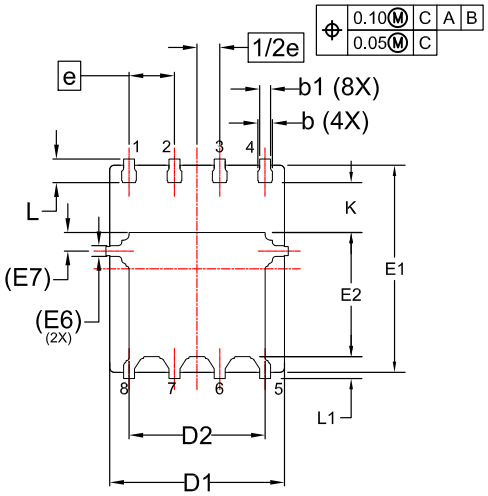
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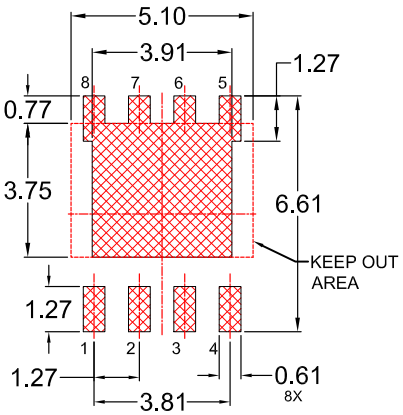
## PACKAGE DIMENSIONS

**DFN8 5x6.15, 1.27P, DUAL COOL**
CASE 506EG
ISSUE D




*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. SEATING PLANE IS DEFINED BY THE TERMINALS. "A1" IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 0.85 | 0.90 | 0.95 |
| A1 | - | - | 0.05 |
| A2 | - | - | 0.05 |
| b | 0.31 | 0.41 | 0.51 |
| b1 | 0.21 | 0.31 | 0.41 |
| c | 0.20 | 0.25 | 0.30 |
| D | 4.90 | 5.00 | 5.10 |
| D1 | 4.80 | 4.90 | 5.00 |
| D2 | 3.67 | 3.82 | 3.97 |
| D3 | 2.60 REF | | |
| D4 | 0.86 REF | | |
| E | 6.05 | 6.15 | 6.25 |
| E1 | 5.70 | 5.80 | 5.90 |
| E2 | 3.38 | 3.48 | 3.58 |
| E3 | 3.30 REF | | |
| E4 | 0.50 REF | | |
| E5 | 0.34 REF | | |
| E6 | 0.30 REF | | |
| E7 | 0.52 REF | | |
| e | 1.27 BSC | | |
| 1/2e | 0.635 BSC | | |
| K | 1.30 | 1.40 | 1.50 |
| L | 0.56 | 0.66 | 0.76 |
| L1 | 0.52 | 0.62 | 0.72 |
| Θ | 0° | --- | 12° |

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### Parça koduyla arama

Üretici parça numarasını yazın; stok ve fiyatı hemen görün.

**www.entegreci.com**

### Ürün kategorileri

Entegreden kapasitöre tüm elektronik komponent kategorileri.

**Kategorilere göz atın**

### Üreticiler

Aradığınız üreticinin ürünlerini tek sayfada inceleyin.

**Üreticileri görün**

### Toplu alım ve teklif

Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

**Teklif isteyin**

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Entegreci is an online electronic components store based in Türkiye. Search by manufacturer part number to see stock, prices and datasheets for integrated circuits, microcontrollers, transistors, passive components and connectors, or request a quote for parts that are not listed.

Bu sayfa Entegreci tarafından eklenmiştir. Belgenin önceki sayfaları asıl yayıncısına aittir ve içeriği değiştirilmemiştir; en güncel sürüm için belgenin yayıncısına başvurun.