

## N-Ch 40V Fast Switching MOSFETs

- ★ Green Device Available
- ★ Super Low Gate Charge
- ★ Excellent  $CdV/dt$  effect decline
- ★ Advanced high cell density Trench technology

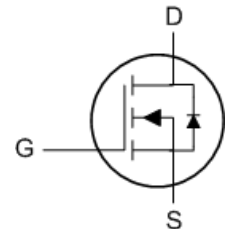
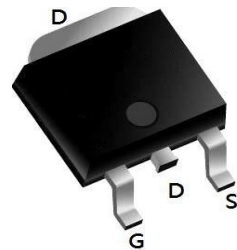
### Product Summary

| BVDSS | RDSON | ID  |
|-------|-------|-----|
| 40V   | 11mΩ  | 60A |

### Description

The AOD4186 is the high cell density trench N-ch MOSFETs, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications. The AOD4186 meet the RoHS and Green

### TO-252



### Absolute Maximum Ratings

| Symbol                      | Parameter                                  | Rating     | Units            |
|-----------------------------|--------------------------------------------|------------|------------------|
| $V_{DS}$                    | Drain-Source Voltage                       | 30         | V                |
| $V_{GS}$                    | Gate-Source Voltage                        | $\pm 20$   | V                |
| $I_D@T_C=25^\circ\text{C}$  | Continuous Drain Current, $V_{GS} @ 10V^1$ | 60         | A                |
| $I_D@T_C=100^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10V^1$ | 25         | A                |
| $I_{DM}$                    | Pulsed Drain Current <sup>2</sup>          | 80         | A                |
| EAS                         | Single Pulse Avalanche Energy <sup>3</sup> | 19         | mJ               |
| $I_{AS}$                    | Avalanche Current                          | 30         | A                |
| $P_D@T_C=25^\circ\text{C}$  | Total Power Dissipation <sup>4</sup>       | 20         | W                |
| $T_{STG}$                   | Storage Temperature Range                  | -55 to 150 | $^\circ\text{C}$ |
| $T_J$                       | Operating Junction Temperature Range       | -55 to 150 | $^\circ\text{C}$ |

### Thermal Data

| Symbol          | Parameter                                        | Typ. | Max. | Unit               |
|-----------------|--------------------------------------------------|------|------|--------------------|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient <sup>1</sup> | ---  | 55   | $^\circ\text{C/W}$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case <sup>1</sup>    | ---  | 4.32 | $^\circ\text{C/W}$ |

## N-Ch 40V Fast Switching MOSFETs

### N-CH Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| Parameter                          | Symbol       | Condition                                                    | Min | Typ  | Max       | Unit       |
|------------------------------------|--------------|--------------------------------------------------------------|-----|------|-----------|------------|
| Off Characteristics                |              |                                                              |     |      |           |            |
| Drain-Source Breakdown Voltage     | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                                    | 40  | -    | -         | V          |
| Zero Gate Voltage Drain Current    | $I_{DSS}$    | $V_{DS}=40V, V_{GS}=0V$                                      | -   | -    | 1         | $\mu A$    |
| Gate-Body Leakage Current          | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                                  | -   | -    | $\pm 100$ | nA         |
| On Characteristics (Note 3)        |              |                                                              |     |      |           |            |
| Gate Threshold Voltage             | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                                | 1   | 1.5  | 2.0       | V          |
| Drain-Source On-State Resistance   | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=8A$                                         | -   | 11.0 | 16        | m $\Omega$ |
|                                    |              | $V_{GS}=4.5V, I_D=4A$                                        | -   | 18.9 | 24        | m $\Omega$ |
| Forward Transconductance           | $g_{FS}$     | $V_{DS}=5V, I_D=8A$                                          | 33  | -    | -         | S          |
| Dynamic Characteristics (Note4)    |              |                                                              |     |      |           |            |
| Input Capacitance                  | $C_{iss}$    | $V_{DS}=20V, V_{GS}=0V,$<br>$F=1.0MHz$                       | -   | 964  | -         | PF         |
| Output Capacitance                 | $C_{oss}$    |                                                              | -   | 109  | -         | PF         |
| Reverse Transfer Capacitance       | $C_{rss}$    |                                                              | -   | 96   | -         | PF         |
| Switching Characteristics (Note 4) |              |                                                              |     |      |           |            |
| Turn-on Delay Time                 | $t_{d(on)}$  | $V_{DD}=20V, R_L=2.5\Omega$<br>$V_{GS}=10V, R_{GEN}=3\Omega$ | -   | 5.5  | -         | nS         |
| Turn-on Rise Time                  | $t_r$        |                                                              | -   | 14   | -         | nS         |
| Turn-Off Delay Time                | $t_{d(off)}$ |                                                              | -   | 24   | -         | nS         |
| Turn-Off Fall Time                 | $t_f$        |                                                              | -   | 12   | -         | nS         |
| Total Gate Charge                  | $Q_g$        | $V_{DS}=20V, I_D=8A,$<br>$V_{GS}=10V$                        | -   | 22.9 | -         | nC         |
| Gate-Source Charge                 | $Q_{gs}$     |                                                              | -   | 3.5  | -         | nC         |
| Gate-Drain Charge                  | $Q_{gd}$     |                                                              | -   | 5.3  | -         | nC         |
| Drain-Source Diode Characteristics |              |                                                              |     |      |           |            |
| Diode Forward Voltage (Note 3)     | $V_{SD}$     | $V_{GS}=0V, I_S=9A$                                          | -   | 0.8  | 1.2       | V          |

## N-Channel Typical Electrical and Thermal Characteristics (Curves)

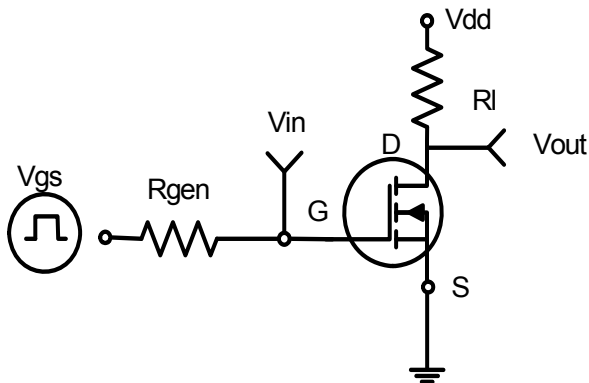


Figure 1: Switching Test Circuit

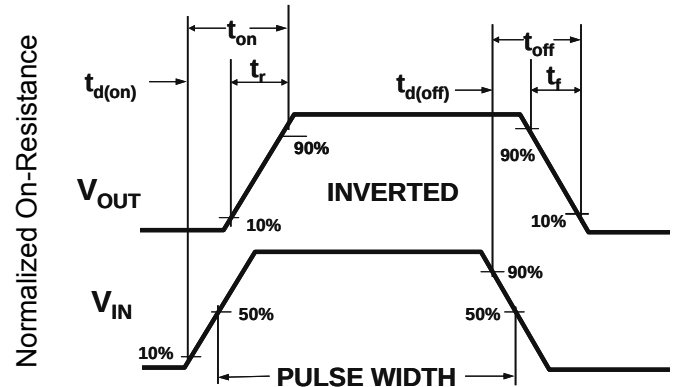


Figure 2: Switching Waveforms

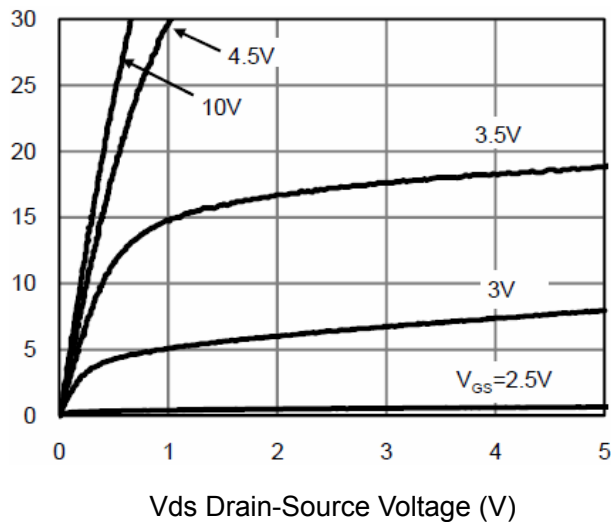


Figure 3 Output Characteristics

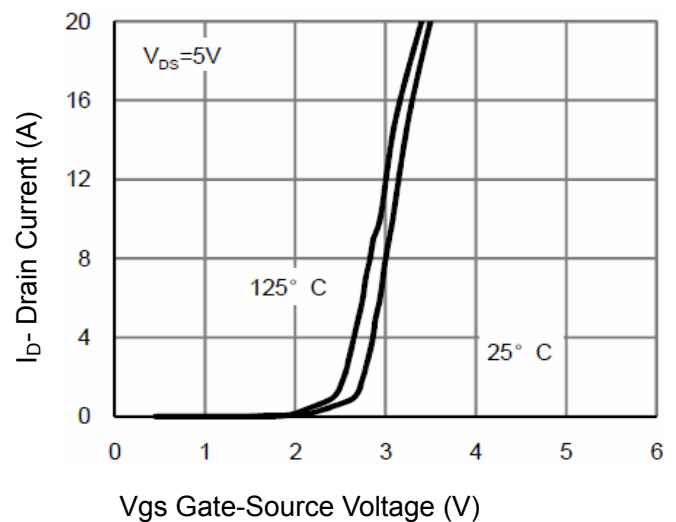


Figure 4 Transfer Characteristics

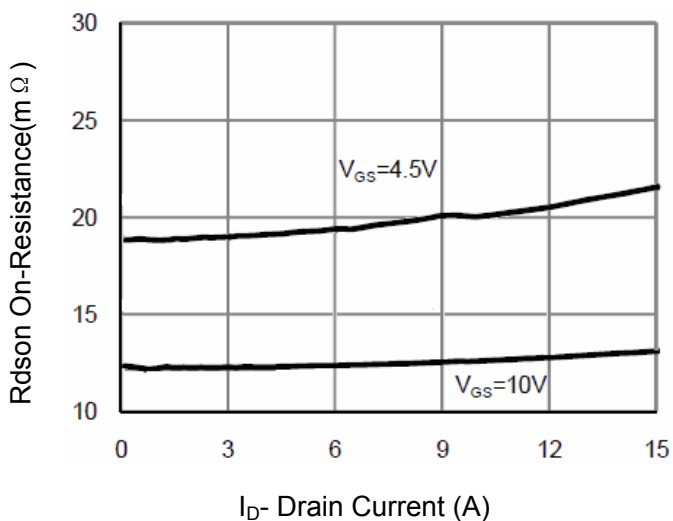


Figure 5 Drain-Source On-Resistance

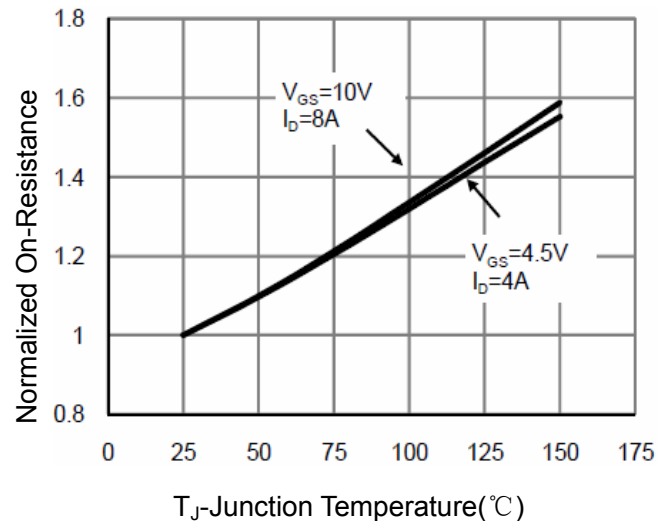
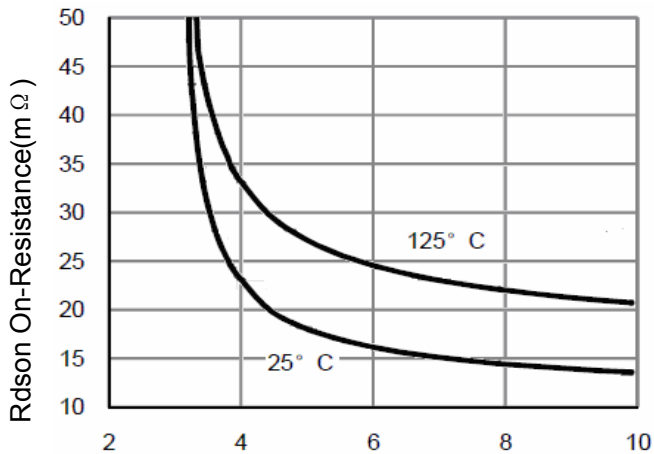
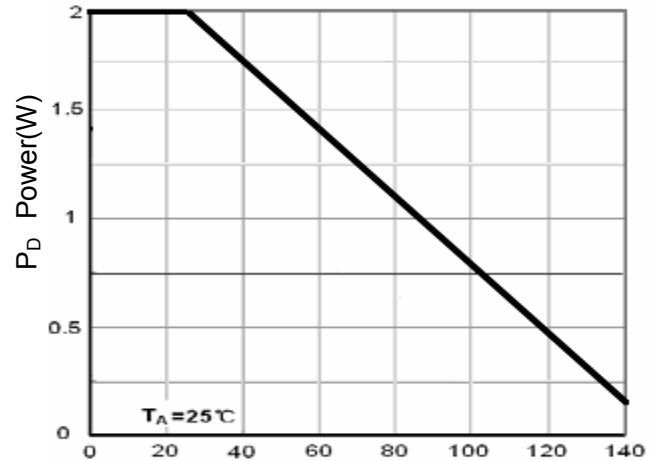


Figure 6 Drain-Source On-Resistance

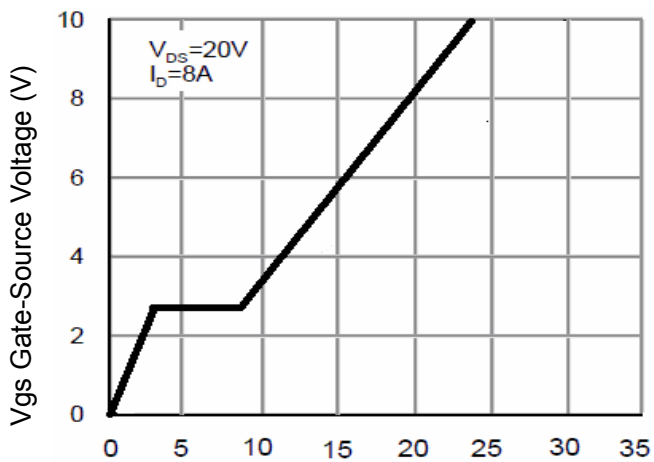
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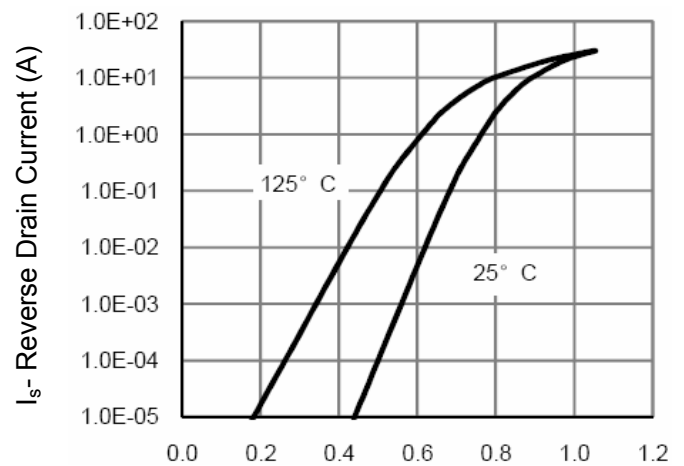
Vgs Gate-Source Voltage (V)  
**Figure 7 Rdson vs Vgs**



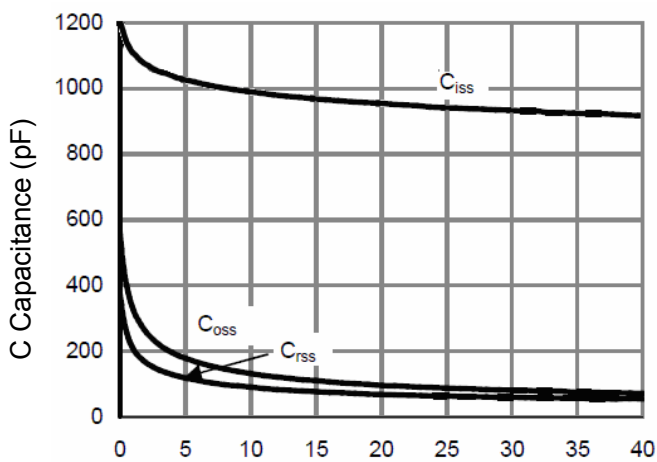
Tj Junction Temperature (°C)  
**Figure 8 Power Dissipation**



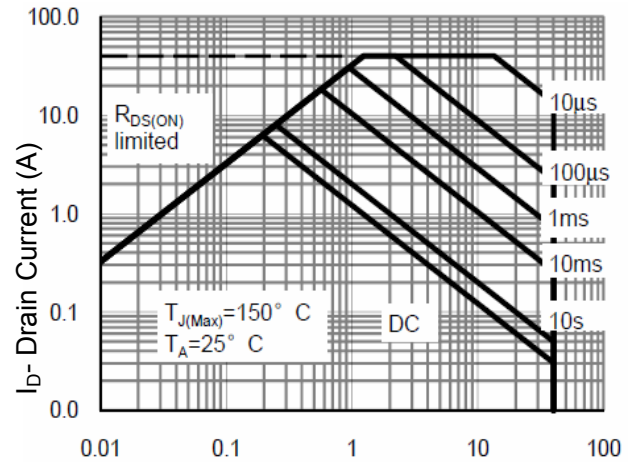
Qg Gate Charge (nC)  
**Figure 9 Gate Charge**



Vds Drain-Source Voltage (V)  
**Figure 10 Source- Drain Diode Forward**



Vds Drain-Source Voltage (V)  
**Figure 11 Capacitance vs Vds**



Vds Drain-Source Voltage (V)  
**Figure 12 Safe Operation Area**