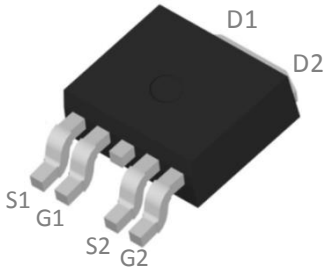
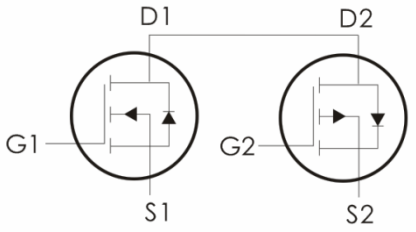
## Description：

This N+P Channel MOSFET uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge.

It can be used in a wide variety of applications.




## Features：

N-Channel:$V_{DS}$=40V,$I_D$=20A,$R_{DS(ON)}$<25m Ω @$V_{GS}$=10V

$R_{DS(ON)}$<35m Ω @$V_{GS}$=4.5V

P-Channel: $V_{DS}$=-40V,$I_D$=-12A,$R_{DS(ON)}$<40m Ω @$V_{GS}$=10V

$R_{DS(ON)}$<52m Ω @$V_{GS}$=4.5V

1) Low gate charge.
2) Green device available.
3) Advanced high cell denity trench technology for ultra low $R_{DS(ON)}$.
4) Excellent package for good heat dissipation.

## Absolute Maximum Ratings： ($T_C$=25℃ unless otherwise noted)

| Symbol | Parameter | N-Channel | P-Channel | Units |
|---|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 40 | -40 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | ±20 | V |
| $I_D$ | Continuous Drain Current- $T_C$=25℃ | 20 | -12 | A |
| | Continuous Drain Current-$T_C$=100℃ | 12 | -7 | |
| $I_{DM}$ | Pulsed Drain Current note1 | 70 | -48 | A |
| $P_D$ | Power Dissipation $T_C$=25℃ | 28 | 20 | W |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | -55 to +150 | | ℃ |

## Thermal Characteristics：

| Symbol | Parameter | Max | | Units |
|---|---|---|---|---|
| N $R_{\theta JC}$ | Thermal Resistance,Junction to Case[1] | --- | 4.5 | ℃/W |
| P $R_{\theta JC}$ | Thermal Resistance,Junction to Case[1] | --- | 6 | |

## Package Marking and Ordering Information：

| Part NO. | Marking | Package |
|---|---|---|
| DOD609D | D609D | TO-252-4 |

## N-CH Electrical Characteristics： ($T_C$=25℃ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Sourtce Breakdown Voltage | $V_{GS}$=0V,$I_D$=250μA | 40 | --- | --- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{GS}$=0V, $V_{DS}$=400V | --- | --- | 1 | μA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V, $V_{DS}$=0A | --- | --- | ±100 | nA |
| **On Characteristics**[3] | | | | | | |
| $V_{GS(th)}$ | GATE-Source Threshold Voltage | $V_{GS}$=$V_{DS}$, $I_D$=250μA | 1 | 1.5 | 2.5 | V |
| $R_{DS(ON)}$ | Drain-Source On Resistance | $V_{GS}$=10V,$I_D$=8A | --- | 17 | 25 | mΩ |
| | | $V_{GS}$=4.5V,$I_D$=5A | --- | 25 | 35 | |
| **Dynamic Characteristics**[4] | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=20V, $V_{GS}$=0V, f=1MHz | --- | 620 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 65 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 55 | --- | |
| **Switching Characteristics**[4] | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DS}$=20V, $R_L$=2.5Ω<br>$R_{GEN}$=3Ω, $V_{GS}$=10V | --- | 4 | --- | ns |
| $t_r$ | Rise Time[2,3] | | --- | 3 | --- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time[2,3] | | --- | 15 | --- | ns |
| $t_f$ | Fall Time[2,3] | | --- | 2 | --- | ns |
| $Q_g$ | Total Gate Charge[2,3] | $V_{GS}$=8V, $V_{DS}$=20V,<br>$I_D$=10A | --- | 12 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge[2,3] | | --- | 3.2 | --- | nC |
| $Q_{gd}$ | Gate-Drain “Miller” Charge[2,3] | | --- | 3.1 | --- | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| $V_{SD}$ | Drain Diode Forward Voltage[3] | $V_{GS}$=0V,$I_S$=3A | --- | --- | 1.2 | V |
| **I S** | Continuous Source Current | $V_G$=$V_D$ =0V Force Current | --- | --- | 20 | A |

## Notes:

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

## Typical Performance Characteristics-N

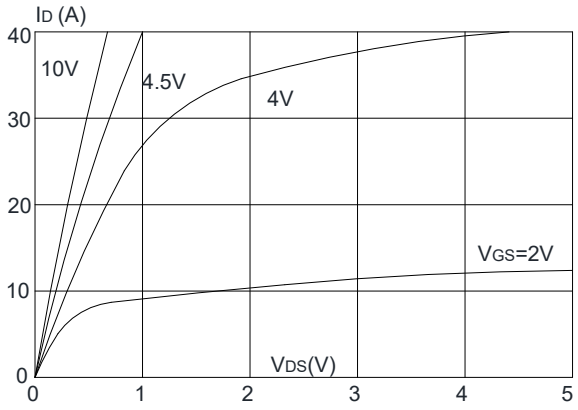



**Figure1:** Output Characteristics

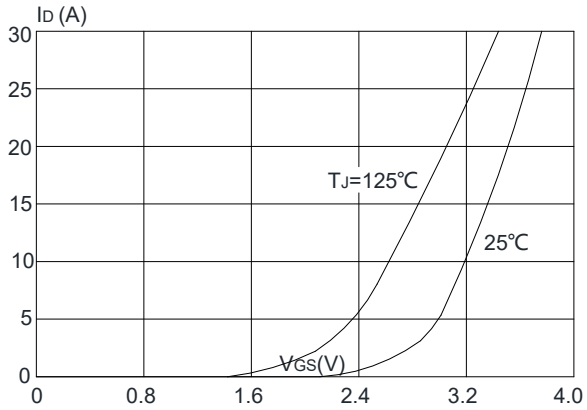



**Figure 2:** Typical Transfer Characteristics

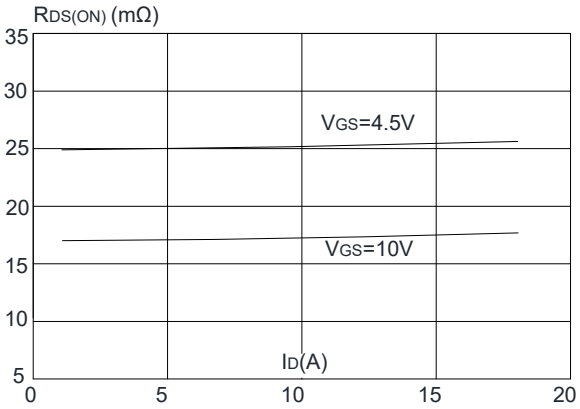



**Figure 3:**On-resistance vs. Drain Current

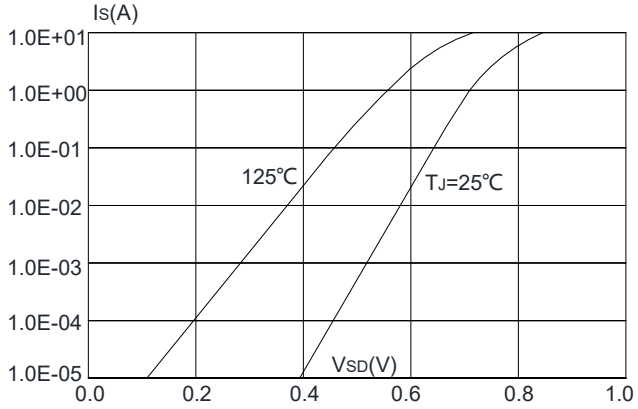



**Figure 4**: Body Diode Characteristics

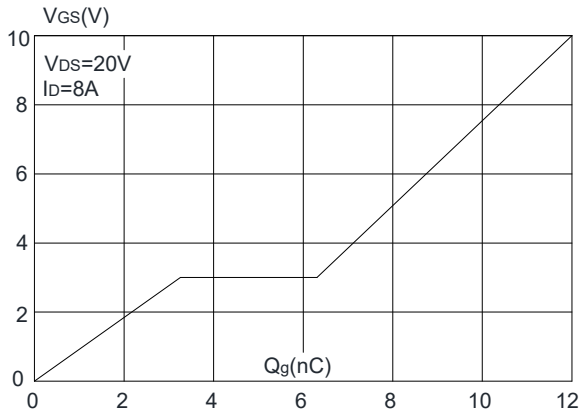



**Figure 5:** Gate Charge Characteristics

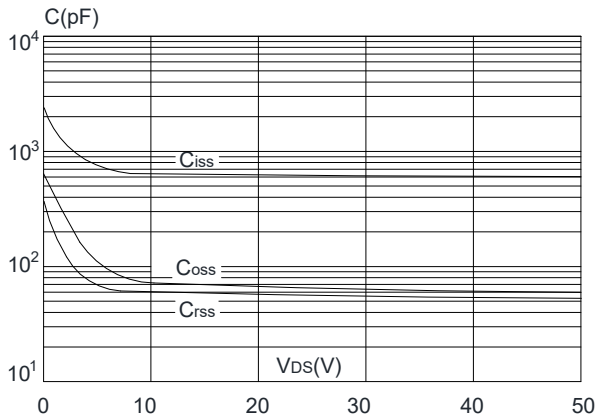



**Figure 6:** Capacitance Characteristics

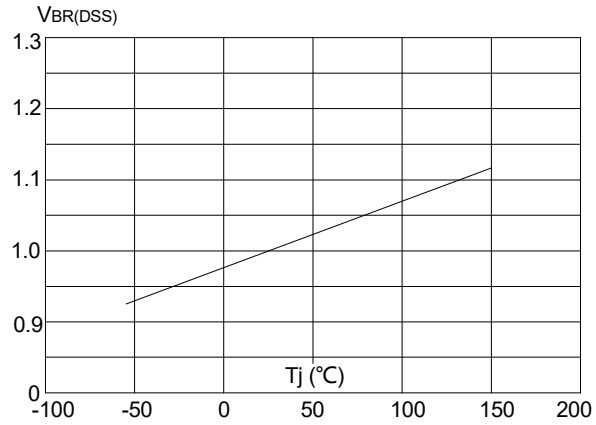



**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature

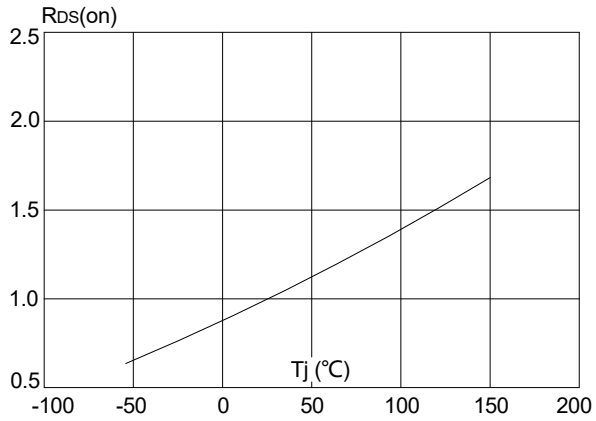



**Figure 8:** Normalized on Resistance vs. Junction Temperature

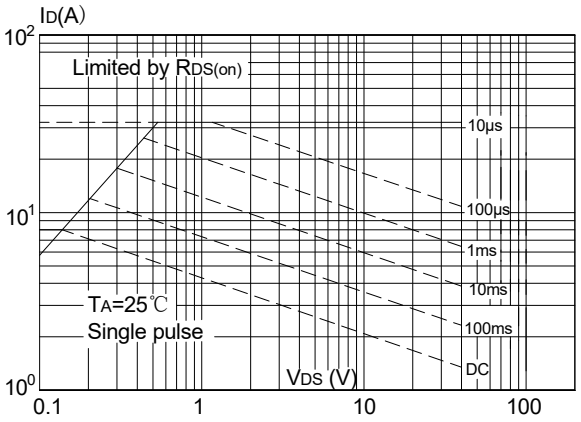



**Figure 9:** Maximum Safe Operating Area

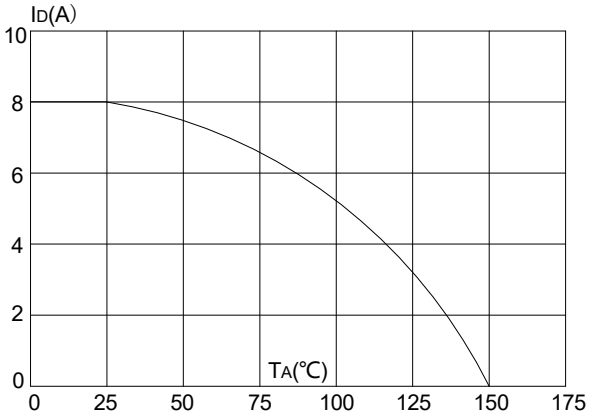



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature

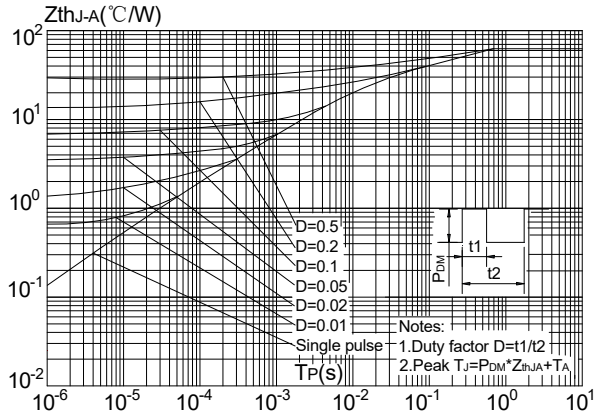



**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

## P-CH Electrical Characteristics: ($T_C$=25℃ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Sourtce Breakdown Voltage | $V_{GS}$=0V,$I_D$=250μA | -40 | --- | --- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{GS}$=0V, $V_{DS}$=-40V | --- | --- | -1 | μA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V, $V_{DS}$=0A | --- | --- | ±100 | nA |
| **On Characteristics**[3] | | | | | | |
| $V_{GS(th)}$ | GATE-Source Threshold Voltage | $V_{GS}$=$V_{DS}$, $I_D$=250μA | -1.2 | -1.6 | -2.5 | V |
| $R_{DS(ON)}$ | Drain-Source On Resistance[2,] | $V_{GS}$=-10V,$I_D$=-5A | --- | 30 | 40 | mΩ |
| | | $V_{GS}$=4.5V,$I_D$=-4A | --- | 42 | 52 | |
| $G_{FS}$ | Forward Transconductance | $V_{DS}$ =-10V, $I_D$=-3A | --- | 9 | --- | S |
| **Dynamic Characteristics**[4] | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-15V, $V_{GS}$=0V, f=1MHz | --- | 1020 | 1570 | pF |
| $C_{oss}$ | Output Capacitance | | --- | 100 | 150 | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 78 | 118 | |
| **Switching Characteristics**[4] | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DS}$=-20V, $I_D$=- 1A, $R_{GEN}$=25Ω, $V_{GS}$=-4.5V | --- | 20 | 40 | ns |
| $t_r$ | Rise Time[2,3] | | --- | 12 | 24 | ns |
| $t_{d(off)}$ | Turn-Off Delay Time[2,3] | | --- | 46 | 80 | ns |
| $t_f$ | Fall Time[2,3] | | --- | 6 | 12 | ns |
| $Q_g$ | Total Gate Charge[2,3] | $V_{GS}$=-4.5V, $V_{DS}$=20V, $I_D$=-5A | --- | 9 | 15 | nC |
| $Q_{gs}$ | Gate-Source Charge[2,3] | | --- | 2.5 | 5 | nC |
| $Q_{gd}$ | Gate-Drain “Miller” Charge[2,3] | | --- | 3.2 | 7 | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| $V_{SD}$ | Source -Drain Diode Forward Voltage | V GS=0V,I S=-1A | --- | --- | -1.0 | V |
| Is | Continuous Source Current | VG=VD=0V , Force Current | --- | --- | -12 | A |
| Ism | Pulsed Source Current | | --- | --- | -24 | A |

## Notes:

1. Repetitive Rating : Pulsed width limited by maximum junction temperature.
2. The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%.
3. Essentially independent of operating temperature.

## Typical Performance Characteristics-P

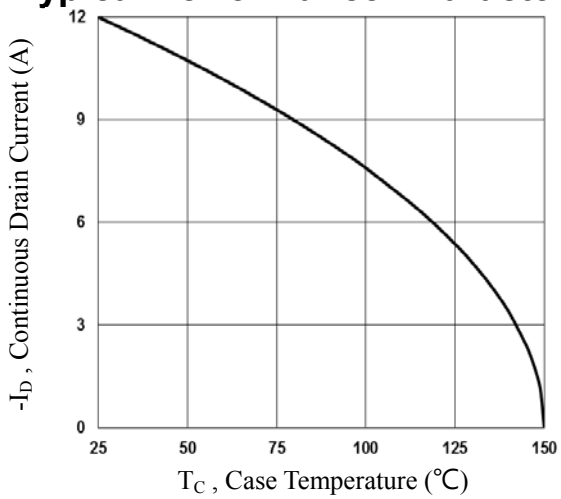



Fig.1 Continuous Drain Current vs. $T_C$

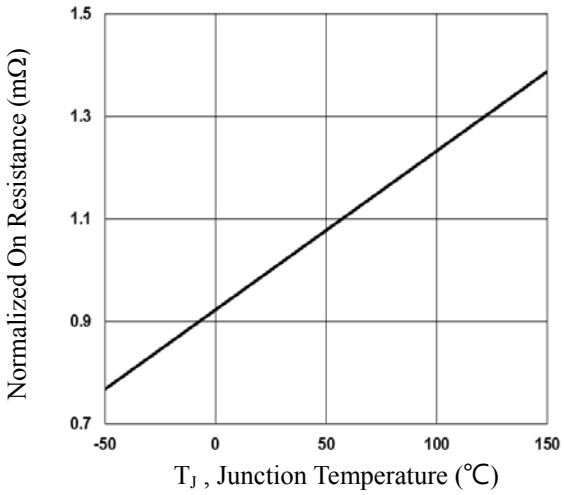



Fig.2 Normalized RDSON vs. $T_J$

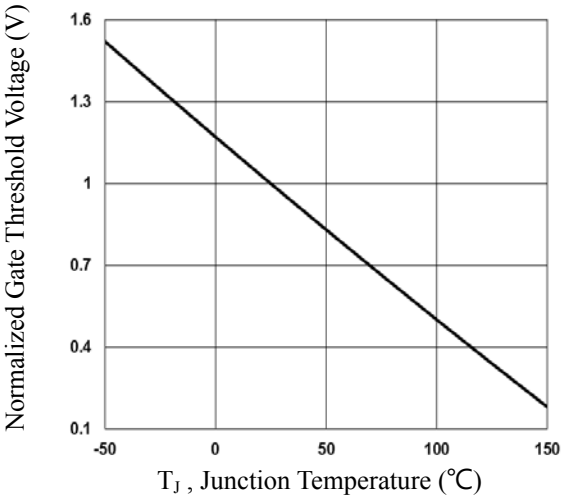



Fig.3 Normalized $V_{th}$ vs. $T_J$

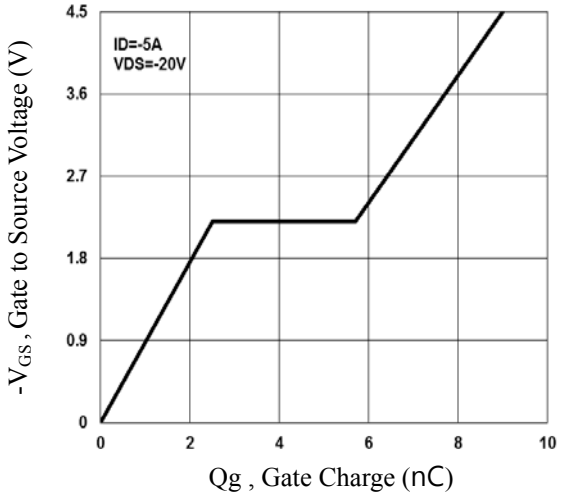



Fig.4 Gate Charge Waveform

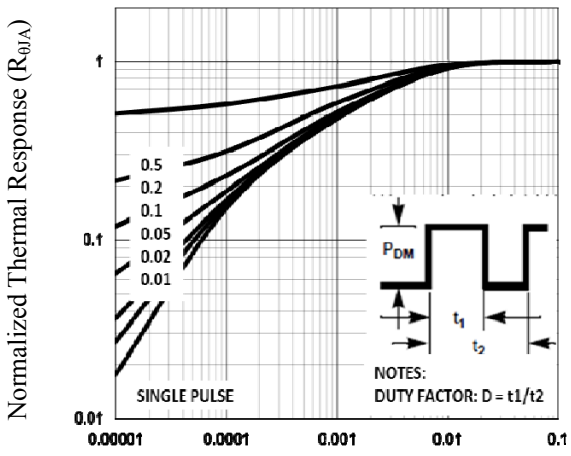



Fig.5 Normalized Transient Impedance

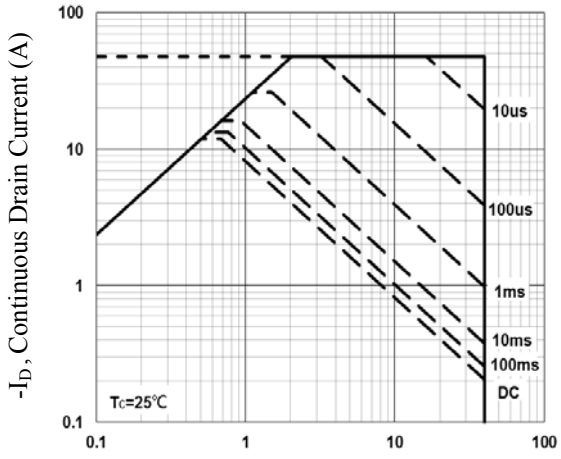



Fig.6 Maximum Safe Operation Area