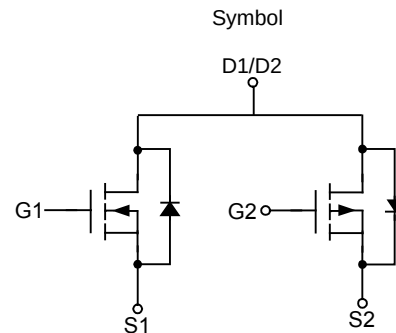


# PRODUCT CHARACTERISTICS

| N-CHANNEL                          |              | P-CHANNEL                           |              |
|------------------------------------|--------------|-------------------------------------|--------------|
| $V_{DSS}$                          | 40V          | $V_{DSS}$                           | -40V         |
| $R_{DS(ON)}$ Typ(@ $V_{GS}=10V$ )  | 17m $\Omega$ | $R_{DS(ON)}$ Typ(@ $V_{GS}=-10V$ )  | 25m $\Omega$ |
| $R_{DS(ON)}$ Typ(@ $V_{GS}=4.5V$ ) | 21m $\Omega$ | $R_{DS(ON)}$ Typ(@ $V_{GS}=-4.5V$ ) | 32m $\Omega$ |
| $I_D$                              | 28A          | $I_D$                               | -15A         |



# APPLICATIONS

- \* High efficiency switch mode power supplies
- \* Electronic lamp ballasts based on half bridge
- \* LED power supplies

# FEATURE

- \* High Switching Speed
- \* Improved dv/dt capability

# ORDER INFORMATION

| Order Codes  |          | Package   | Packing          |
|--------------|----------|-----------|------------------|
| Halogen-Free | Halogen  |           |                  |
| N/A          | MOT4025D | TO-252-4L | 2500 pieces/Reel |



# ABSOLUTE MAXIMUM RATINGS( $T_A=25^{\circ}C$ , unless otherwise specified)

| Parameter                                                     | Symbol    | N-CHANNEL | P-CHANNEL | Unit        |
|---------------------------------------------------------------|-----------|-----------|-----------|-------------|
| Drain-Source Voltage                                          | $V_{DSS}$ | 40        | -40       | V           |
| Gate-Source Voltage                                           | $V_{GSS}$ | $\pm 20$  | $\pm 20$  | V           |
| Drain Current Continuous(@ $V_{GS}=10V$ , $T_A=25^{\circ}C$ ) | $I_D$     | 28        | -15       | A           |
| Drain Current Pulsed                                          | $I_{DM}$  | 112       | -60       | A           |
| Power Dissipation                                             | $P_D$     | 35        |           | W           |
| Junction Temperature                                          | $T_J$     | +150      |           | $^{\circ}C$ |
| Storage Temperature                                           | $T_{STG}$ | -55~ +150 |           | $^{\circ}C$ |

# THERMAL CHARACTERISTICS

| Parameter        | Symbol     | Typ  | Unit          |
|------------------|------------|------|---------------|
| Junction to Case | $R_{thJC}$ | 3.57 | $^{\circ}C/W$ |

■ N-CHANNEL ELECTRICAL CHARACTERISTICS( $T_c=25^{\circ}\text{C}$ , unless otherwise noted)

| Parameter                             | Symbol              | Test Conditions                                                                        | Min | Typ  | Max  | Unit |
|---------------------------------------|---------------------|----------------------------------------------------------------------------------------|-----|------|------|------|
| Off characteristics                   |                     |                                                                                        |     |      |      |      |
| Drain to Source Breakdown Voltage     | V <sub>DSS</sub>    | V <sub>GS</sub> =0V,I <sub>D</sub> =250μA                                              | 40  | -    | -    | V    |
| Drain to Source Leakage Current       | I <sub>DSS</sub>    | V <sub>DS</sub> =40V,V <sub>GS</sub> =0V                                               | -   | -    | -1   | μA   |
| Gate to Source Forward Leakage        | I <sub>GSS(F)</sub> | V <sub>GS</sub> =+20V,V <sub>DS</sub> =0V                                              | -   | -    | 100  | nA   |
| Gate to Source Reverse Leakage        | I <sub>GSS(R)</sub> | V <sub>GS</sub> =-20V ,V <sub>DS</sub> =0V                                             | -   | -    | -100 | nA   |
| On characteristics                    |                     |                                                                                        |     |      |      |      |
| Drain to Source On-Resistance         | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V,I <sub>D</sub> =15 A                                              | -   | 17   | 25   | mΩ   |
|                                       |                     | V <sub>GS</sub> =4.5V,I <sub>D</sub> =10A                                              | -   | 21   | 30   | mΩ   |
| Gate Threshold Voltage                | V <sub>GS(TH)</sub> | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA                                | 1   | 1.75 | 2.5  | V    |
| Dynamic characteristics               |                     |                                                                                        |     |      |      |      |
| Gate Resistance                       | R <sub>g</sub>      | V <sub>GS</sub> =0V,V <sub>DS</sub> =0V ,f=1.0MHz                                      | -   | 2.2  | -    | Ω    |
| Forward Transconductance              | g <sub>fs</sub>     | V <sub>DS</sub> =5V,I <sub>D</sub> =5 A                                                | 8   | -    | -    | S    |
| Input Capacitance                     | C <sub>iss</sub>    | V <sub>DS</sub> =20V,V <sub>GS</sub> =0V<br>f=1.0MHz                                   | -   | 816  | -    | pF   |
| Output Capacitance                    | C <sub>oss</sub>    |                                                                                        | -   | 50   | -    | pF   |
| Reverse Transfer Capacitance          | C <sub>rss</sub>    |                                                                                        | -   | 41   | -    | pF   |
| Resistive Switching Characteristics   |                     |                                                                                        |     |      |      |      |
| Turn-on Delay Time                    | t <sub>d(ON)</sub>  | V <sub>GS</sub> =10V, V <sub>DS</sub> =20V,<br>I <sub>D</sub> =15 A,R <sub>G</sub> =3Ω | -   | 5.5  | -    | ns   |
| Rise Time                             | t <sub>r</sub>      |                                                                                        | -   | 14   | -    | ns   |
| Turn-off Delay Time                   | t <sub>d(OFF)</sub> |                                                                                        | -   | 24   | -    | ns   |
| Fall Time                             | t <sub>f</sub>      |                                                                                        | -   | 5    | -    | ns   |
| Total Gate Charge                     | Q <sub>g</sub>      | I <sub>D</sub> =15A, V <sub>DS</sub> =20V<br>V <sub>GS</sub> =10V                      | -   | 24   | -    | nC   |
| Gate to Source Charge                 | Q <sub>gs</sub>     |                                                                                        | -   | 4.2  | -    | nC   |
| Gate to Drain("Miller") Charge        | Q <sub>gd</sub>     |                                                                                        | -   | 6.1  | -    | nC   |
| Source-Drain Diode Characteristics    |                     |                                                                                        |     |      |      |      |
| Continuous Source Current(Body Diode) | I <sub>s</sub>      |                                                                                        | -   | -    | 28   | A    |
| Maximum Pulsed Current(Body Diode)    | I <sub>SM</sub>     |                                                                                        | -   | -    | 112  | A    |
| Diode Forward Voltage                 | V <sub>SD</sub>     | I <sub>SD</sub> =1A, V <sub>GS</sub> =0V                                               | -   | 0.74 | 1.2  | V    |

**■ P-CHANNEL ELECTRICAL CHARACTERISTICS**( $T_c=25^{\circ}\text{C}$ , unless otherwise noted)

| Parameter                             | Symbol              | Test Conditions                                                                        | Min | Typ   | Max  | Unit |
|---------------------------------------|---------------------|----------------------------------------------------------------------------------------|-----|-------|------|------|
| Off characteristics                   |                     |                                                                                        |     |       |      |      |
| Drain to Source Breakdown Voltage     | V <sub>DSS</sub>    | V <sub>GS</sub> =0V,I <sub>D</sub> =-250μA                                             | -40 | -     | -    | V    |
| Drain to Source Leakage Current       | I <sub>DSS</sub>    | V <sub>DS</sub> =-40V,V <sub>GS</sub> =0V                                              | -   | -     | -1   | μA   |
| Gate to Source Forward Leakage        | I <sub>GSS(F)</sub> | V <sub>GS</sub> =+20V,V <sub>DS</sub> =0V                                              | -   | -     | 100  | nA   |
| Gate to Source Reverse Leakage        | I <sub>GSS(R)</sub> | V <sub>GS</sub> =-20V ,V <sub>DS</sub> =0V                                             | -   | -     | -100 | nA   |
| On characteristics                    |                     |                                                                                        |     |       |      |      |
| Drain to Source On-Resistance         | R <sub>DS(ON)</sub> | V <sub>GS</sub> =-10V,I <sub>D</sub> =-7 A                                             | -   | 25    | 35   | mΩ   |
|                                       |                     | V <sub>GS</sub> =-4.5V,I <sub>D</sub> =-4 A                                            | -   | 32    | 40   | mΩ   |
| Gate Threshold Voltage                | V <sub>GS(TH)</sub> | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =-250μA                               | -1  | -1.5  | -2.5 | V    |
| Dynamic characteristics               |                     |                                                                                        |     |       |      |      |
| Gate Resistance                       | R <sub>g</sub>      | V <sub>GS</sub> =0V,V <sub>DS</sub> =0V ,f=1.0MHz                                      | -   | 1.9   | -    | Ω    |
| Forward Transconductance              | g <sub>fs</sub>     | V <sub>DS</sub> =-10V,I <sub>D</sub> =-3A                                              | 10  | -     | -    | S    |
| Input Capacitance                     | C <sub>iss</sub>    | V <sub>DS</sub> =-20V,V <sub>GS</sub> =0V<br>f=1.0MHz                                  | -   | 942   | -    | pF   |
| Output Capacitance                    | C <sub>oss</sub>    |                                                                                        | -   | 103   | -    | pF   |
| Reverse Transfer Capacitance          | C <sub>rss</sub>    |                                                                                        | -   | 89    | -    | pF   |
| Resistive Switching Characteristics   |                     |                                                                                        |     |       |      |      |
| Turn-on Delay Time                    | t <sub>d(ON)</sub>  | V <sub>GS</sub> =-10V,V <sub>DS</sub> =-20V,<br>I <sub>D</sub> =-7A,R <sub>G</sub> =6Ω | -   | 5.5   | -    | ns   |
| Rise Time                             | t <sub>r</sub>      |                                                                                        | -   | 14    | -    | ns   |
| Turn-off Delay Time                   | t <sub>d(OFF)</sub> |                                                                                        | -   | 24    | -    | ns   |
| Fall Time                             | t <sub>f</sub>      |                                                                                        | -   | 12    | -    | ns   |
| Total Gate Charge                     | Q <sub>g</sub>      | I <sub>D</sub> =-7A, V <sub>DS</sub> =-20V<br>V <sub>GS</sub> =-10V                    | -   | 22.9  | -    | nC   |
| Gate to Source Charge                 | Q <sub>gs</sub>     |                                                                                        | -   | 3.5   | -    | nC   |
| Gate to Drain("Miller") Charge        | Q <sub>gd</sub>     |                                                                                        | -   | 5.3   | -    | nC   |
| Source-Drain Diode Characteristics    |                     |                                                                                        |     |       |      |      |
| Continuous Source Current(Body Diode) | I <sub>s</sub>      |                                                                                        | -   | -     | -15  | A    |
| Maximum Pulsed Current(Body Diode)    | I <sub>SM</sub>     |                                                                                        | -   | -     | -60  | A    |
| Diode Forward Voltage                 | V <sub>SD</sub>     | I <sub>SD</sub> =-1A, V <sub>GS</sub> =0V                                              | -   | -0.76 | -1.2 | V    |

■ N-CHANNEL TYPICAL CHARACTERISTICS

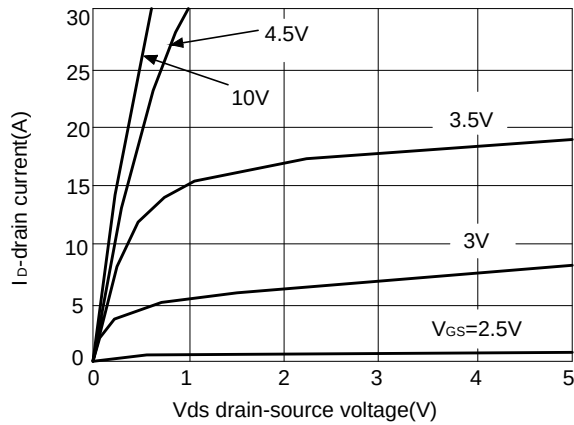


Figure 1: Output characteristics

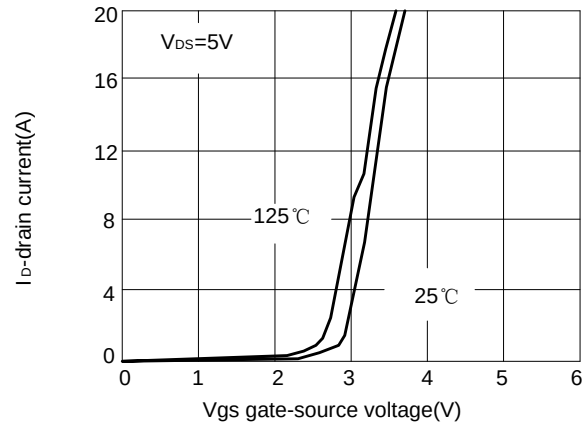


Figure 2: Transfer characteristics

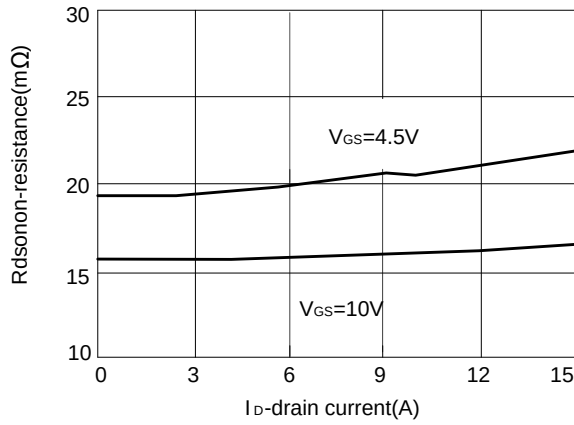


Figure 3: Drain-source on-resistance

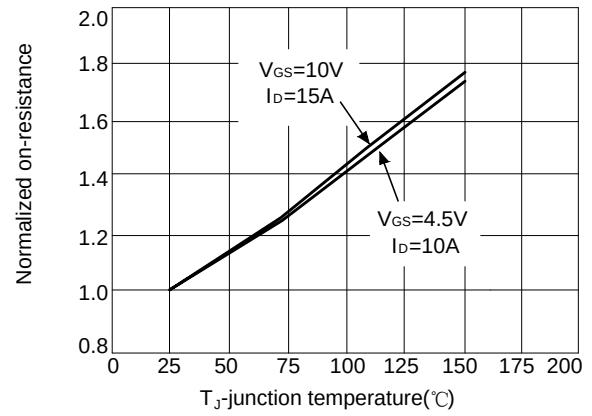


Figure 4: Drain-source on-resistance

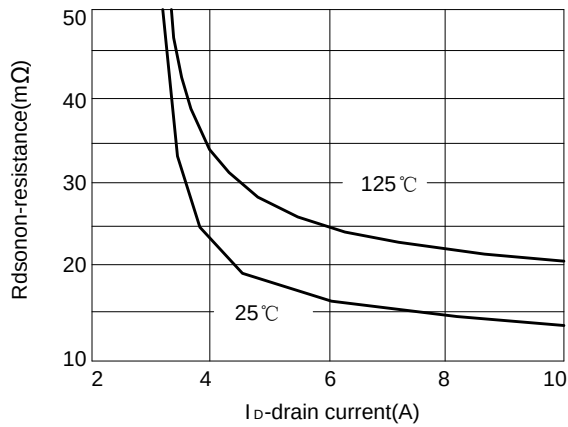


Figure 5: Drain-source on-resistance

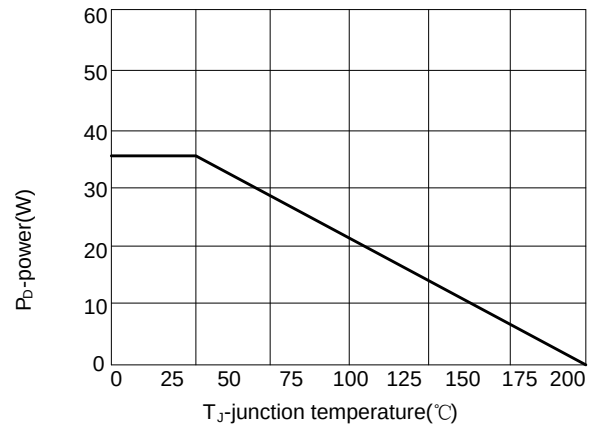


Figure 6: Power dissipation

■ N-CHANNEL TYPICAL CHARACTERISTICS(Cont.)

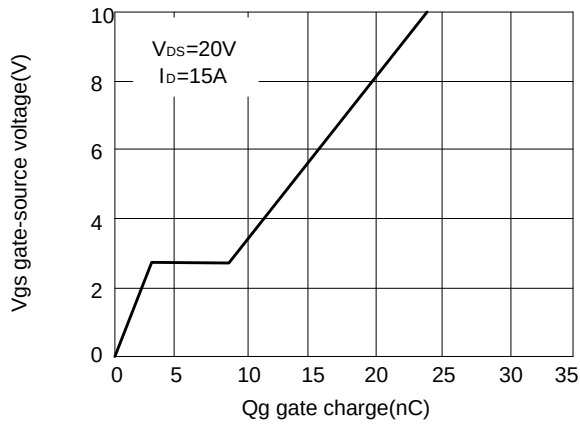


Figure 7: Gate charge

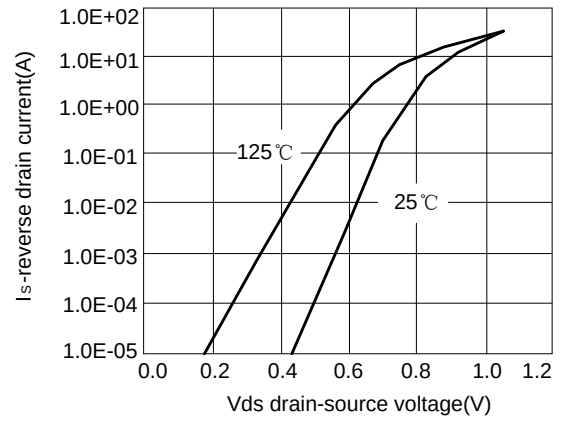


Figure 8: Source-drain diode forward

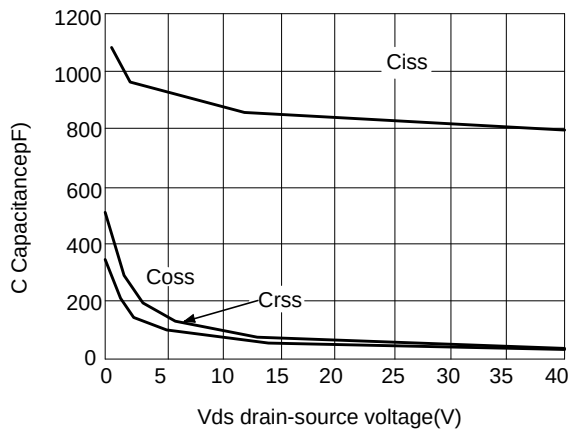


Figure 9: Safe operation safe

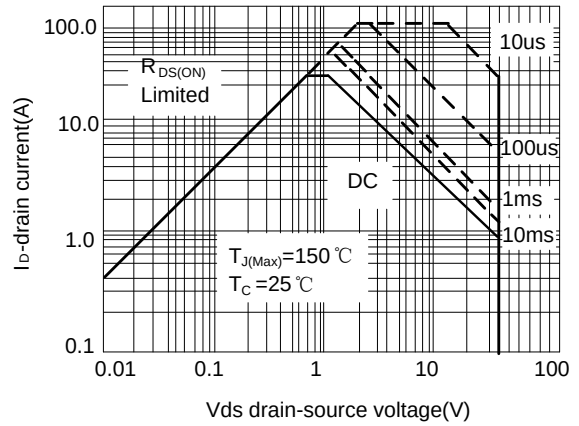


Figure 10: Safe operation safe

■ P-CHANNEL TYPICAL CHARACTERISTICS

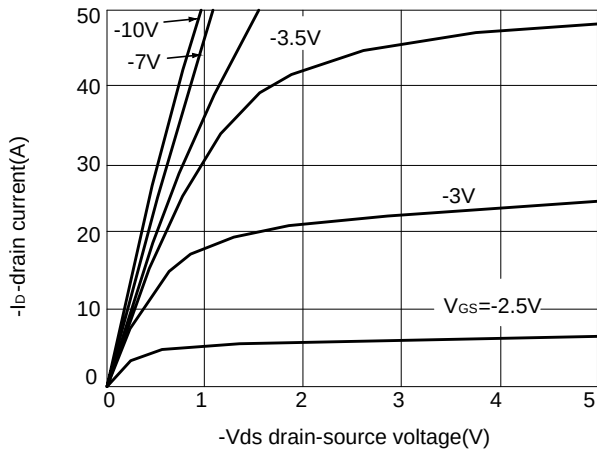


Figure 1 Output characteristics

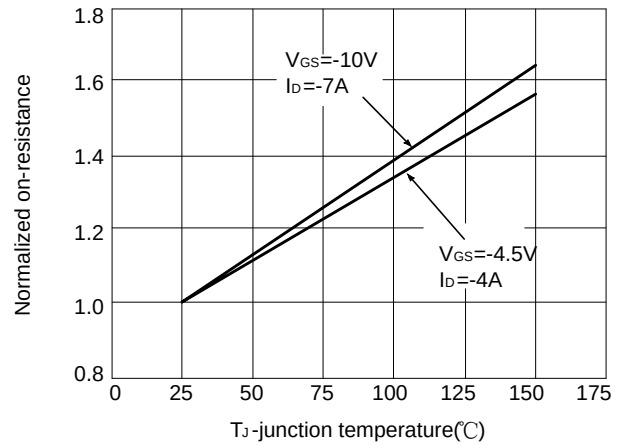


Figure 2  $R_{ds(on)}$ -junction temperature

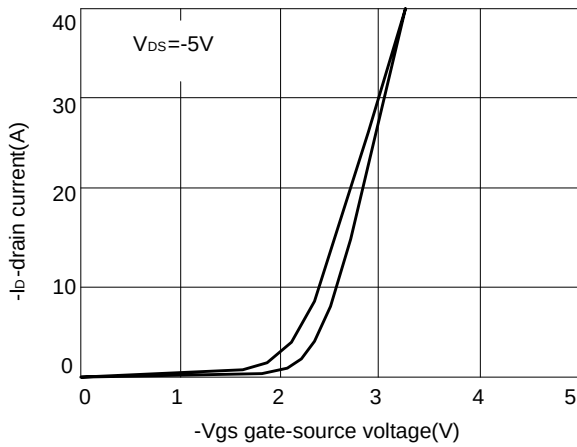


Figure 3 Transfer characteristics

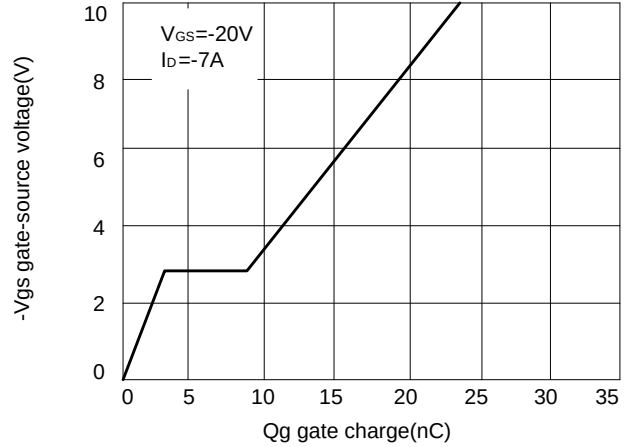


Figure 4 Gate charge

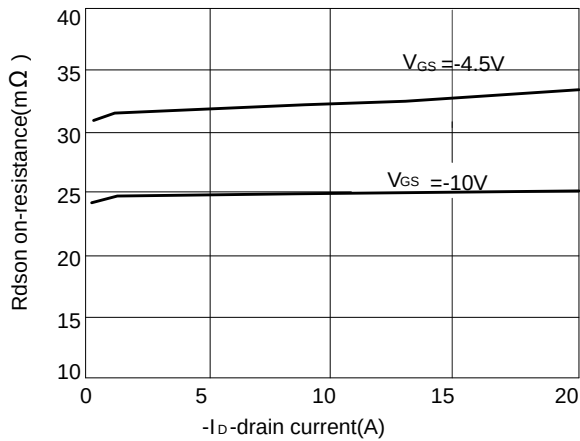


Figure 5  $R_{ds(on)}$ -drain current

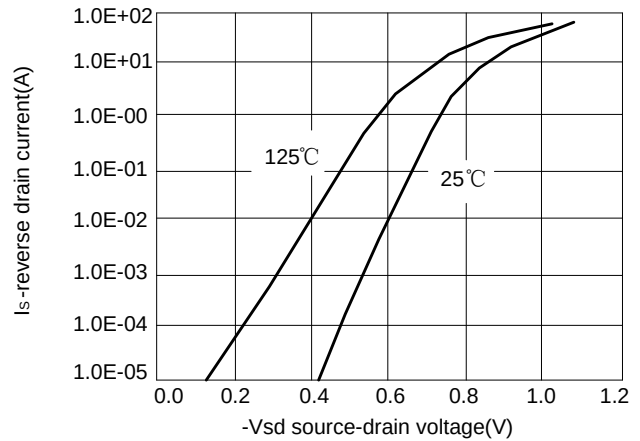


Figure 6 Source-drain diode forward

■ P-CHANNEL TYPICAL CHARACTERISTICS(Cont.)

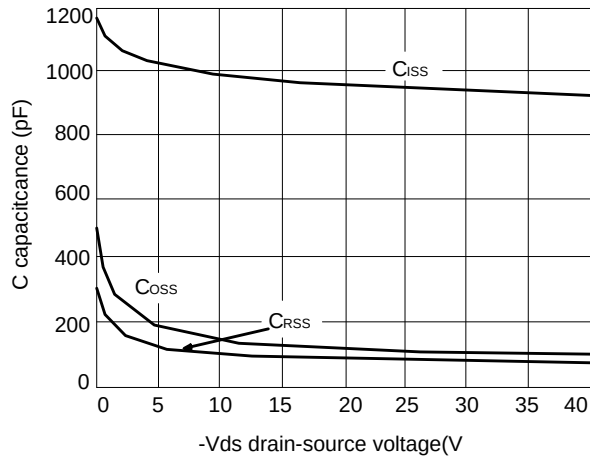


Figure 7 Capacitance vs vds

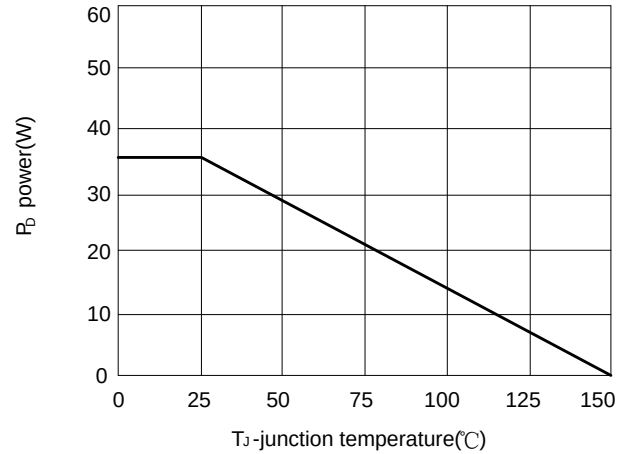


Figure 8 Power dissipation

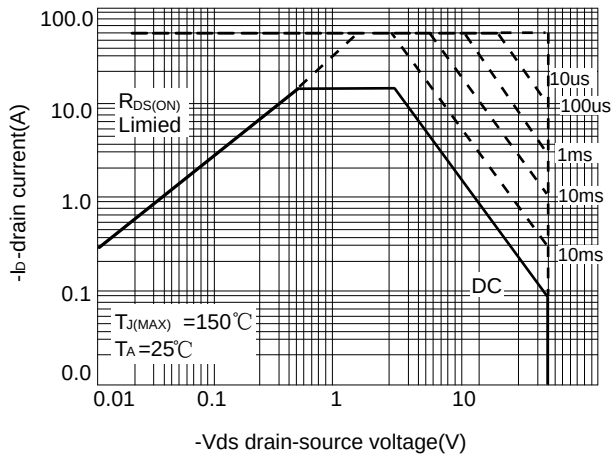


Figure 9 Safe operation area

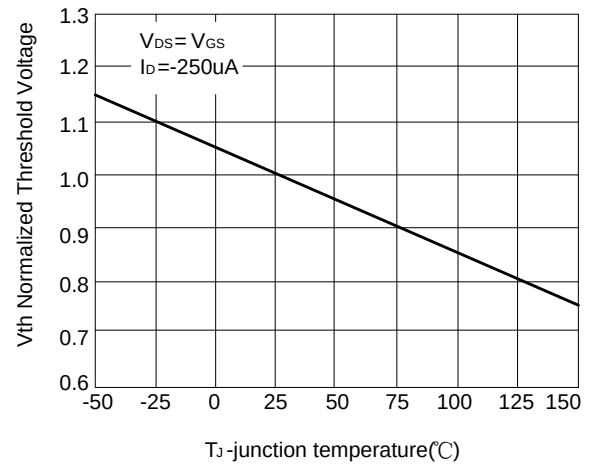


Figure 10  $V_{GS(th)}$  vs junction temperature

■ TO-252-4L PACKAGE OUTLINE DIMENSIONS

