

## PRODUCT CHARACTERISTICS

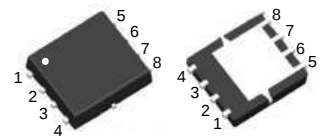
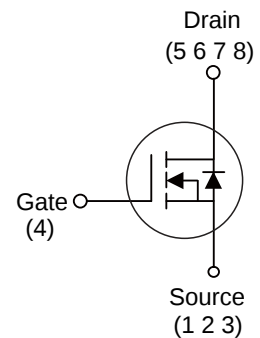
|                                |               |
|--------------------------------|---------------|
| $V_{DSS}$                      | 30V           |
| $R_{DS(ON)} Typ(@V_{GS}=10V)$  | 3.1m $\Omega$ |
| $R_{DS(ON)} Typ(@V_{GS}=4.5V)$ | 4.8m $\Omega$ |
| $I_D$                          | 120A          |

## APPLICATIONS

- \* Electronic lamp ballasts based on half bridge
- \* Load Switching, Quick/Wireless Charge.
- \* Motor Driving

## FEATURE

- \* Low Gate Charge
- \* Pb-Free Lead Plating



PDFN3X3

## ORDER INFORMATION

| Order Codes  |          | Package | Packing          |
|--------------|----------|---------|------------------|
| Halogen-Free | Halogen  |         |                  |
| N/A          | MOT3138J | PDFN3X3 | 5000 pieces/Reel |

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

| Parameter                                                   | Symbol    | Ratings   | Unit        |
|-------------------------------------------------------------|-----------|-----------|-------------|
| Drain-Source Voltage                                        | $V_{DSS}$ | 30        | V           |
| Gate-Source Voltage                                         | $V_{GSS}$ | $\pm 20$  | V           |
| Drain Current Continuous( $@V_{GS}=10V, T_A=25^{\circ}C$ )  | $I_D$     | 120       | A           |
| Drain Current Continuous( $@V_{GS}=10V, T_A=100^{\circ}C$ ) | $I_D$     | 84        | A           |
| Drain Current Pulsed                                        | $I_{DM}$  | 480       | A           |
| Avalanche Energy *                                          | $E_{AS}$  | 210       | mJ          |
| Power Dissipation                                           | $P_D$     | 93        | 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 | $R_{thJC}$ | 1.34 | $^{\circ}C/W$ |

Note: \* EAS condition:  $T_J=25^{\circ}C, V_{DD}=20V, V_G=10V, L=0.5mH, R_g=25\Omega$

**■ 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                                               | 30  | -    | -    | V    |
| Drain to Source Leakage Current       | I <sub>DSS</sub>    | V <sub>DS</sub> =30V,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> =20 A                                               | -   | 3.1  | 4    | mΩ   |
|                                       |                     | V <sub>GS</sub> =4.5V,I <sub>D</sub> =20 A                                              | -   | 4.8  | 5.8  | mΩ   |
| Gate Threshold Voltage                | V <sub>GS(TH)</sub> | V <sub>DS</sub> =V <sub>GS</sub> ,I <sub>D</sub> =250μA                                 | 0.8 | 1.4  | 2    | V    |
| Dynamic characteristics               |                     |                                                                                         |     |      |      |      |
| Gate Resistance                       | R <sub>g</sub>      | V <sub>GS</sub> =0V,V <sub>DS</sub> =0V ,f=1.0MHz                                       | -   | 2.0  | -    | Ω    |
| Forward Transconductance              | g <sub>fs</sub>     | V <sub>DS</sub> =5V,I <sub>D</sub> =5A                                                  | -   | 15   | -    | S    |
| Input Capacitance                     | C <sub>iss</sub>    | V <sub>DS</sub> =20V,V <sub>GS</sub> =0V<br>f=1.0MHz                                    | -   | 1900 | -    | pF   |
| Output Capacitance                    | C <sub>oss</sub>    |                                                                                         | -   | 270  | -    | pF   |
| Reverse Transfer Capacitance          | C <sub>rss</sub>    |                                                                                         | -   | 220  | -    | 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> =20 A ,R <sub>G</sub> =3Ω | -   | 12   | -    | ns   |
| Rise Time                             | t <sub>r</sub>      |                                                                                         | -   | 9    | -    | ns   |
| Turn-off Delay Time                   | t <sub>d(OFF)</sub> |                                                                                         | -   | 45   | -    | ns   |
| Fall Time                             | t <sub>f</sub>      |                                                                                         | -   | 15   | -    | ns   |
| Total Gate Charge                     | Q <sub>g</sub>      | I <sub>D</sub> =20 A, V <sub>DS</sub> =20V<br>V <sub>GS</sub> =10V                      | -   | 58   | -    | nC   |
| Gate to Source Charge                 | Q <sub>gs</sub>     |                                                                                         | -   | 13   | -    | nC   |
| Gate to Drain("Miller") Charge        | Q <sub>gd</sub>     |                                                                                         | -   | 21   | -    | nC   |
| Source-Drain Diode Characteristics    |                     |                                                                                         |     |      |      |      |
| Continuous Source Current(Body Diode) | I <sub>s</sub>      |                                                                                         | -   | -    | 120  | A    |
| Maximum Pulsed Current(Body Diode)    | I <sub>SM</sub>     |                                                                                         | -   | -    | 480  | A    |
| Diode Forward Voltage                 | V <sub>SD</sub>     | I <sub>SD</sub> =1A, V <sub>GS</sub> =0V                                                | -   | 0.71 | 1.2  | V    |
| Reverse Recovery Time                 | t <sub>rr</sub>     | I <sub>SD</sub> =20 A, T <sub>j</sub> =25℃<br>dI/dt=100A/μs                             | -   | 68   | -    | ns   |
| Reverse Recovery Charge               | Q <sub>rr</sub>     |                                                                                         | -   | 121  | -    | nC   |

■ TYPICAL CHARACTERISTICS

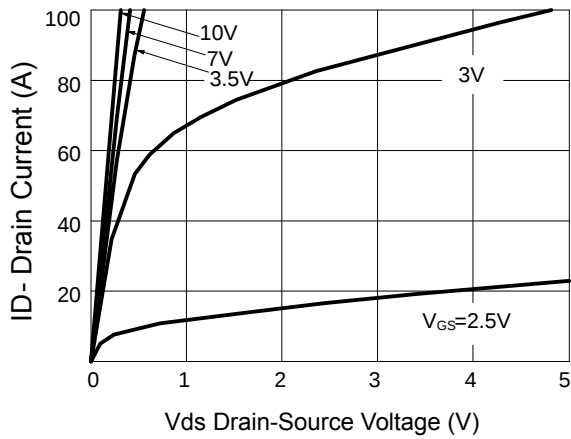


Figure 1: Output characteristics

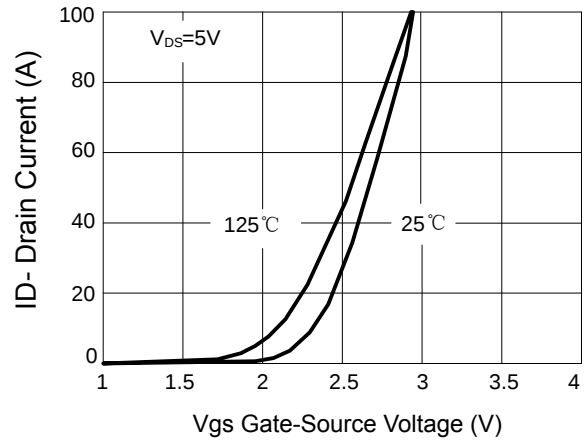


Figure 2: Transfer characteristics

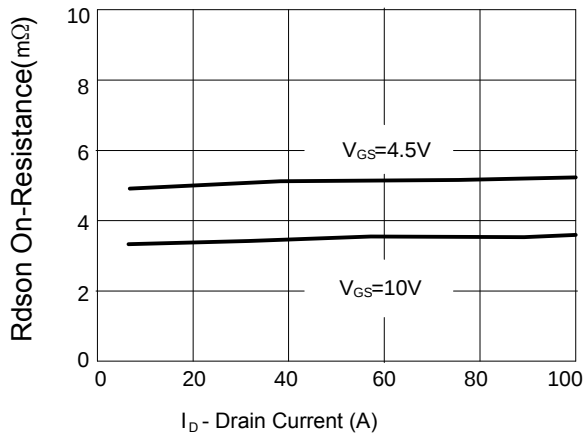


Figure 3: Rdson-drain-current

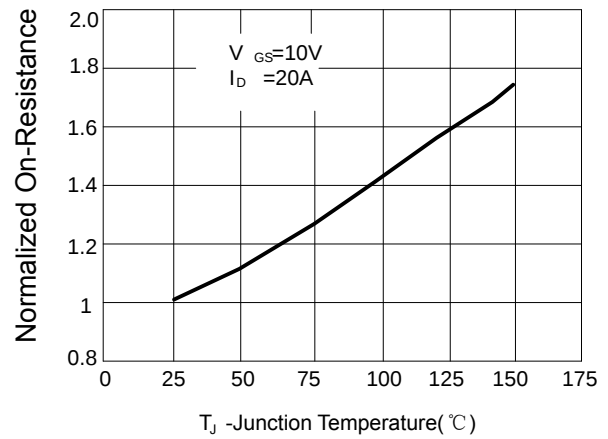


Figure 4: Rdson-temperature

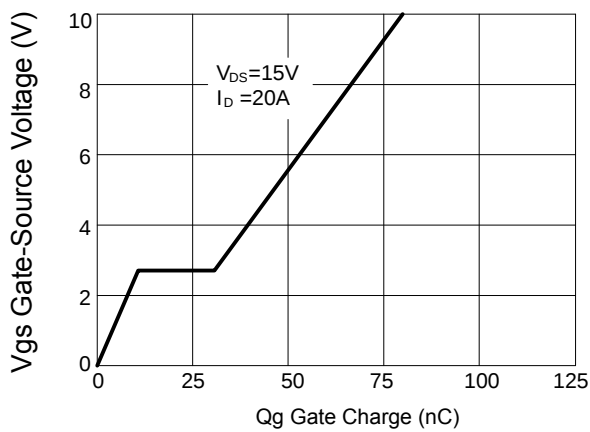


Figure 5: Gate charge

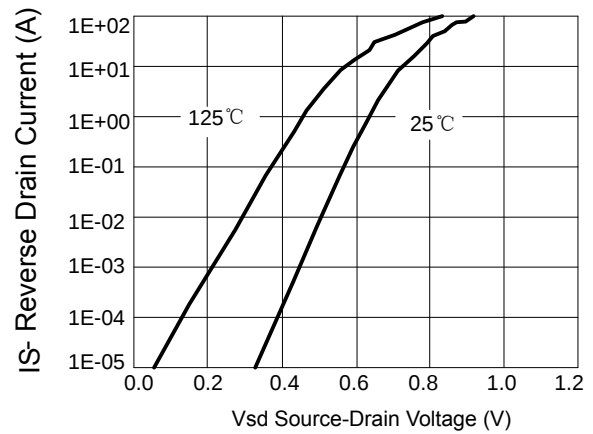


Figure 6: Source-drain diode forward

■ TYPICAL CHARACTERISTICS(Cont.)

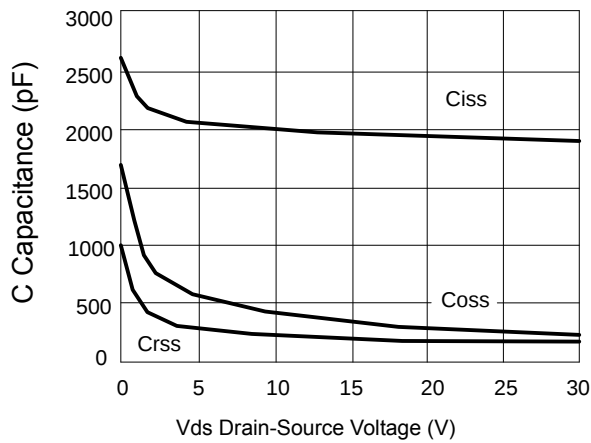


Figure 7: Capacitance vs vds

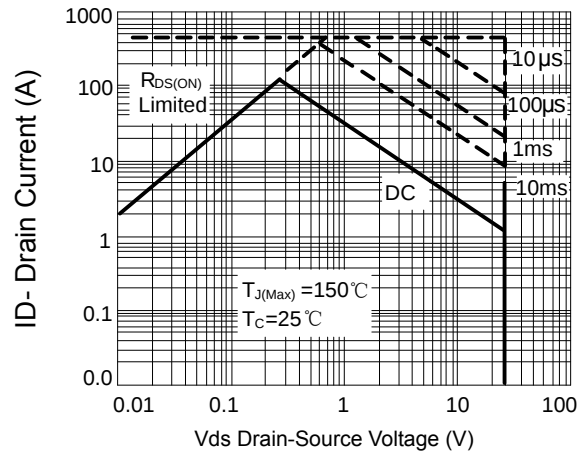


Figure 8: Safe operating area

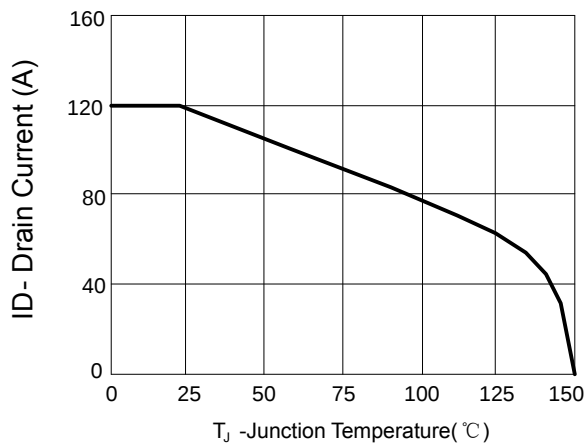


Figure 9: Current de-rating

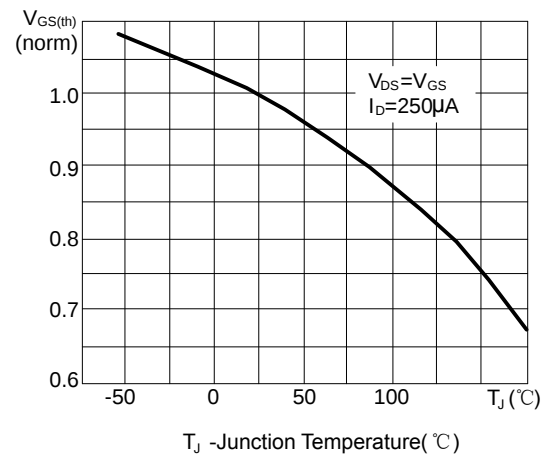
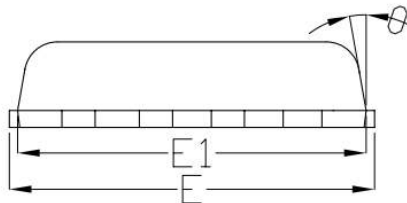
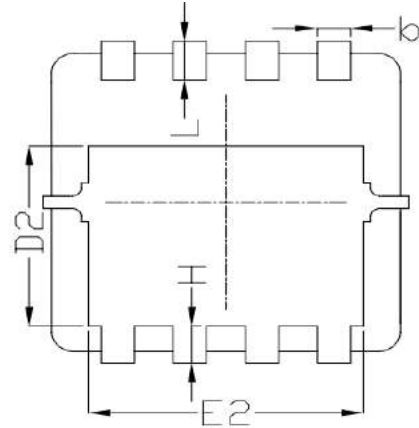
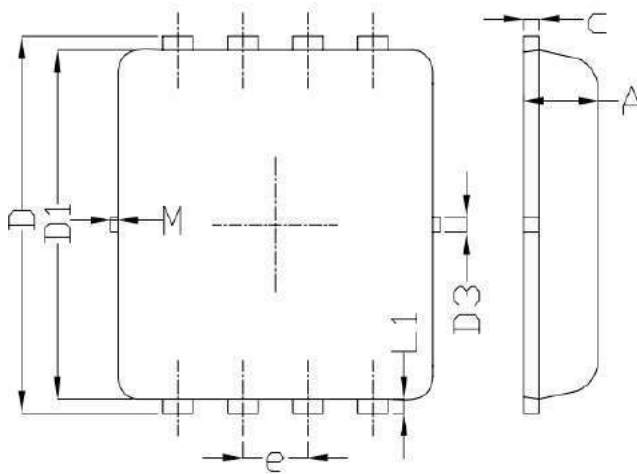
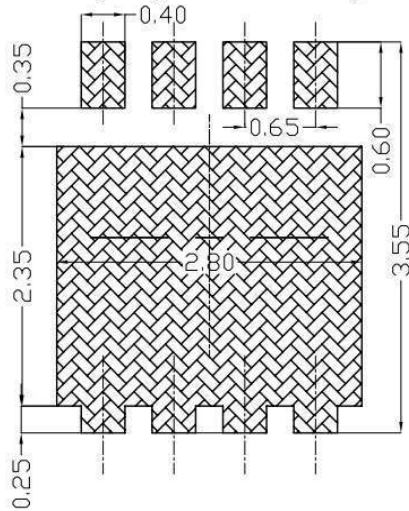


Figure 10: Vgs vs junction temperature

■ PDFN3X3 PACKAGE OUTLINE DIMENSIONS



Land Pattern  
(Only for Reference)



| SYMBOL          | DIMENSIONAL REQMTS |      |      |
|-----------------|--------------------|------|------|
|                 | MIN                | NOM  | MAX  |
| A               | 0.70               | 0.75 | 0.80 |
| b               | 0.25               | 0.30 | 0.35 |
| c               | 0.10               | 0.15 | 0.25 |
| D               | 3.25               | 3.35 | 3.45 |
| D1              | 3.00               | 3.10 | 3.20 |
| D2              | 1.78               | 1.88 | 1.98 |
| D3              | ---                | 0.13 | ---  |
| E               | 3.20               | 3.30 | 3.40 |
| E1              | 3.00               | 3.15 | 3.20 |
| E2              | 2.39               | 2.49 | 2.59 |
| e               | 0.65BSC            |      |      |
| H               | 0.30               | 0.39 | 0.50 |
| L               | 0.30               | 0.40 | 0.50 |
| L1              | ---                | 0.13 | ---  |
| $\theta$        | ---                | 10°  | 12°  |
| M               | *                  | *    | 0.15 |
| * Not specified |                    |      |      |