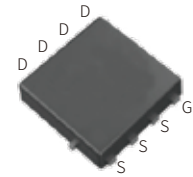


## FEATURES

| Advanced trench cell design

| Low Thermal Resistance

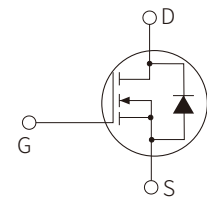


PDFN5×6-8L

## APPLICATION

| Motor drivers

| DC - DC Converter



Schematic Symbol

## APPROVALS

|             |                                    |
|-------------|------------------------------------|
| <b>RoHS</b> | Compliance with 2011/65/EU         |
| <b>HF</b>   | Compliance with IEC61249-2-21:2003 |

## ABSOLUTE MAXIMUM RATINGS

| Parameter                                                              |                                               | Symbol              | Value      | Unit                 |
|------------------------------------------------------------------------|-----------------------------------------------|---------------------|------------|----------------------|
| Drain-Source Voltage $T_c=25^{\circ}\text{C}$                          |                                               | $V_{DS}$            | 40         | V                    |
| Drain Current ( Pulsed ) $T_c=25^{\circ}\text{C}$ $V_{GS}=10\text{V}$  |                                               | $I_{DM}^{***}$      | 800        | A                    |
| Drain Current ( DC )                                                   | $T_c=25^{\circ}\text{C}$ $V_{GS}=10\text{V}$  | $I_D^{***}$         | 200        | A                    |
|                                                                        | $T_c=100^{\circ}\text{C}$ $V_{GS}=10\text{V}$ |                     | 200        | A                    |
| Gate-Source Voltage $T_c=25^{\circ}\text{C}$                           |                                               | $V_{GS}$            | $\pm 20$   | V                    |
| Total Power Dissipation $T_c=25^{\circ}\text{C}$                       |                                               | $P_{tot}^{*}$       | 150        | W                    |
| Diode Forward Current $T_c=25^{\circ}\text{C}$                         |                                               | $I_S$               | 200        | A                    |
| Junction Temperature                                                   |                                               | $T_J$               | 175        | $^{\circ}\text{C}$   |
| Storage Temperature                                                    |                                               | $T_{STG}$           | -55 to 175 | $^{\circ}\text{C}$   |
| Single Pulsed Avalanche Energy $V_{DD}=40\text{ V}$ , $L=1.0\text{mH}$ |                                               | $E_{AS}^{*}$        | 1012       | mJ                   |
| Thermal Resistance –Junction to Ambient                                |                                               | $R_{\theta JA}^{*}$ | 56         | $^{\circ}\text{C/W}$ |
| Thermal Resistance- Junction to Case                                   |                                               | $R_{\theta JC}^{*}$ | 1          | $^{\circ}\text{C/W}$ |

Notes:

\* Surface Mounted on 1 in<sup>2</sup> pad area,  $t \leq 10$  sec

\*\* Pulse width  $\leq 10\mu\text{s}$ , duty cycle  $\leq 1\%$

\*\*\* Limited by bonding wire

## ELECTRICAL CHARACTERISTICS ( $T_A=25^{\circ}\text{C}$ )

| Parameter                                | Symbol         | Test Conditions                                                               | Min. | Typ. | Max.      | Unit       |
|------------------------------------------|----------------|-------------------------------------------------------------------------------|------|------|-----------|------------|
| Static Characteristics                   |                |                                                                               |      |      |           |            |
| Drain-source Breakdown Voltage           | $V_{(BR)DSS}$  | $V_{GS}=0V, I_{DS}=250\mu A$                                                  | 40   |      |           | V          |
| Gate Threshold Voltage                   | $V_{GS(th)}$   | $V_{DS}=V_{GS}, I_{DS}=250\mu A$                                              | 1    |      | 2.5       | V          |
| Drain Leakage Current                    | $I_{DSS}$      | $V_{DS}=32V, V_{GS}=0V$                                                       |      |      | 1         | $\mu A$    |
| Gate Leakage Current                     | $I_{GSS}$      | $V_{GS}=\pm 20V, V_{DS}=0V$                                                   |      |      | $\pm 100$ | nA         |
| On-State Resistance                      | $R_{DS(on)}^a$ | $V_{GS}=10V, I_{DS}=30A$                                                      |      | 0.65 | 0.8       | m $\Omega$ |
|                                          |                | $V_{GS}=4.5V, I_{DS}=20A$                                                     |      | 1.1  | 1.3       | m $\Omega$ |
| Diode Characteristics                    |                |                                                                               |      |      |           |            |
| Diode Forward Voltage                    | $V_{SD}^a$     | $I_{SD}=30A, V_{GS}=0V$                                                       |      |      | 1.3       | V          |
| Reverse Recovery Time                    | $t_{rr}$       | $I_{DS}=30A, V_{GS}=0V$<br>$dI_{SD}/dt=100A/\mu s$                            |      | 40   |           | nS         |
| Reverse Recovery Charge                  | $Q_{rr}$       |                                                                               |      | 28   |           | nC         |
| Diode Characteristics <sup>b</sup>       |                |                                                                               |      |      |           |            |
| Input capacitance                        | $C_{iss}$      | $V_{GS}=0V, V_{DS}=20V,$<br>Frequency = 1 MHz                                 |      | 5702 |           | pF         |
| Output capacitance                       | $C_{oss}$      |                                                                               |      | 1876 |           | pF         |
| Reverse transfer capacitance             | $C_{rss}$      |                                                                               |      | 204  |           | pF         |
| Turn-on Delay Time                       | $t_{d(on)}$    | $V_{DS}=20V, V_{GEN}=10V$<br>$R_G=3.9\Omega, R_L=0.66\Omega,$<br>$I_{DS}=30A$ |      | 54   |           | nS         |
| Turn-on Rise Time                        | $t_r$          |                                                                               |      | 65   |           | nS         |
| Turn-Off Delay Time                      | $t_{d(off)}$   |                                                                               |      | 101  |           | nS         |
| Turn-Off Fall Time                       | $t_f$          |                                                                               |      | 73   |           | nS         |
| Gate Charge Characteristics <sup>b</sup> |                |                                                                               |      |      |           |            |
| Total Gate Charge                        | $Q_g$          | $V_{DS}=20V, V_{GS}=10V, I_{DS}=30A$                                          |      | 114  |           | nC         |
| Gate-Source Charge                       | $Q_{gs}$       |                                                                               |      | 23   |           | nC         |
| Gate-Drain Charge                        | $Q_{gd}$       |                                                                               |      | 25   |           | nC         |

Notes:

a : Pulse test ; pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$

b : Guaranteed by design, not subject to production testing

## PARAMETER CHARACTERISTIC CURVE

Figure1: Power Capability

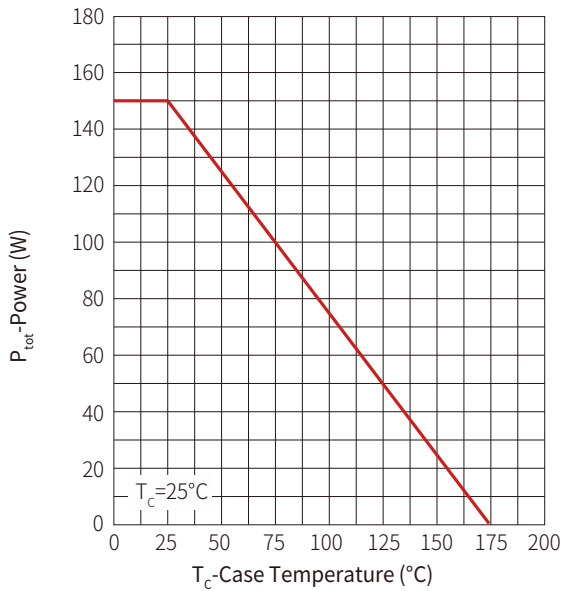


Figure2: Current Capability

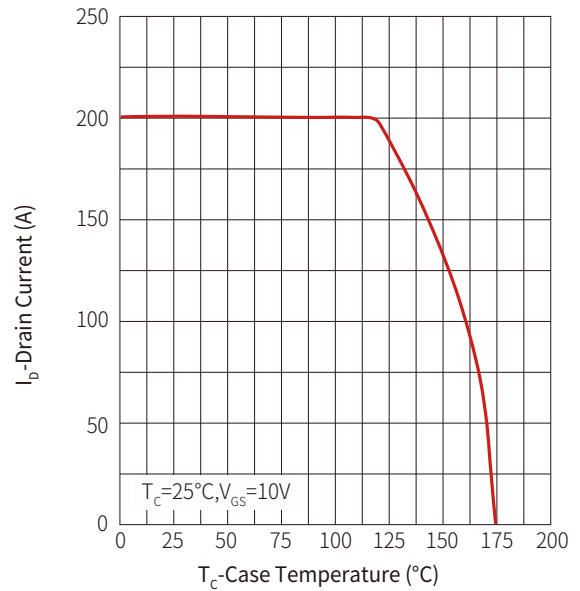


Figure3: Safe Operation Area

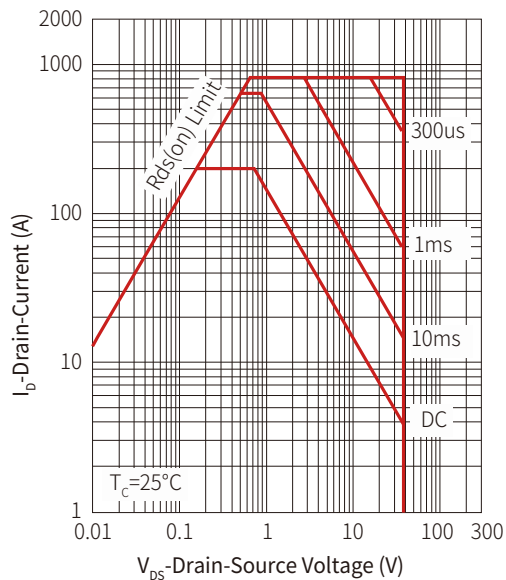
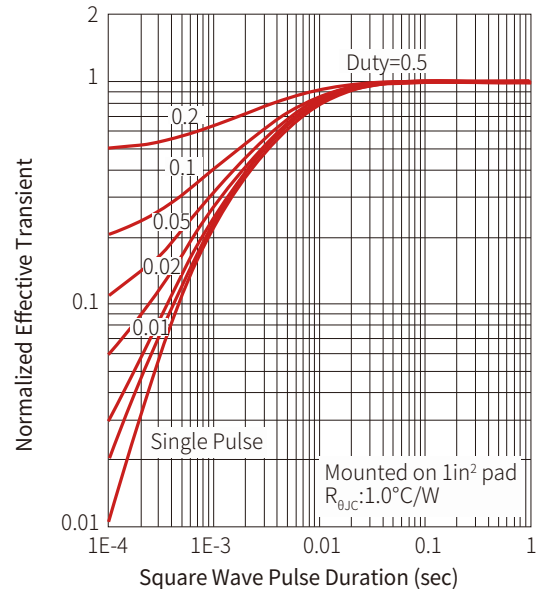
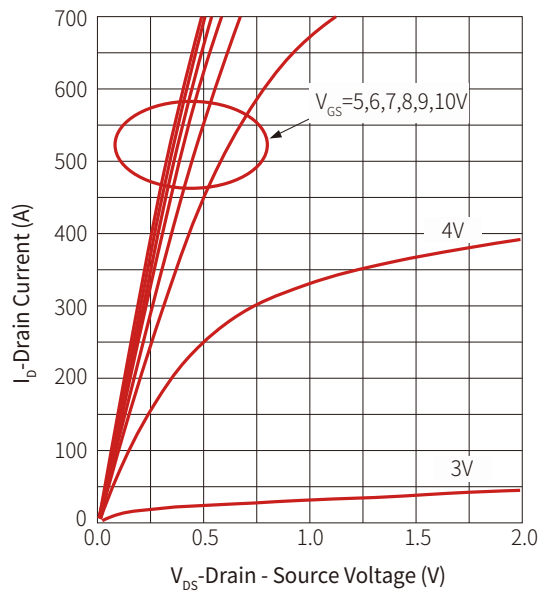
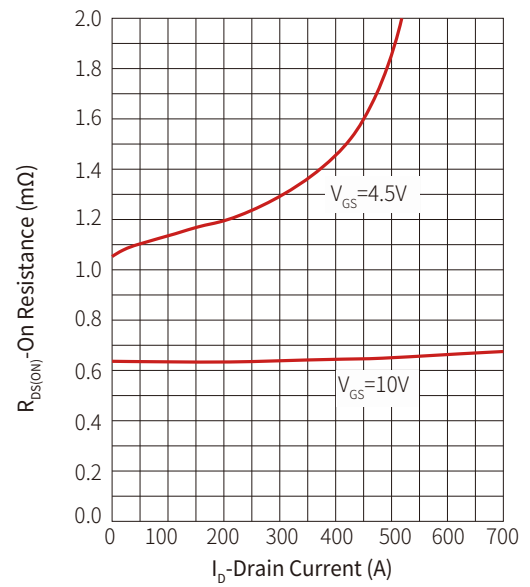
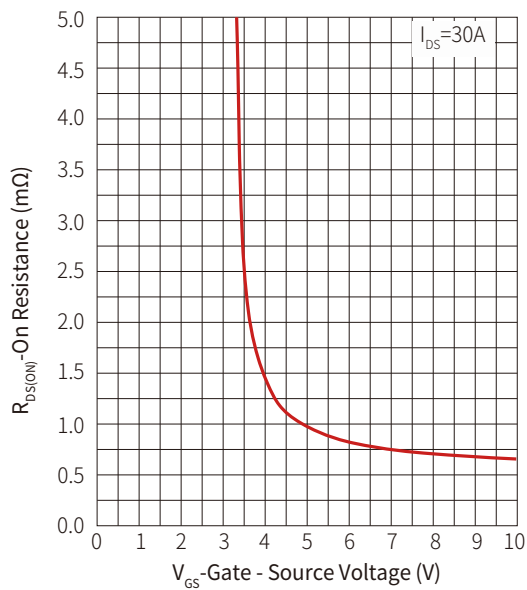
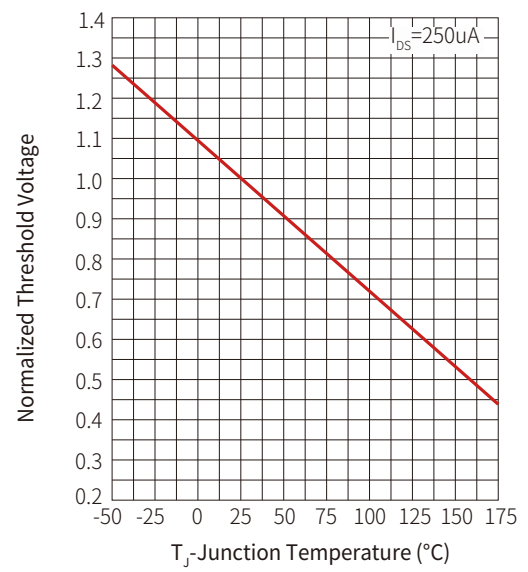


Figure 4: Transient Thermal Impedance



**Figure 5: Output Characteristics**

**Figure 6: On Resistance**

**Figure 7: Transfer Characteristics**

**Figure 8: Normalized Threshold Voltage**


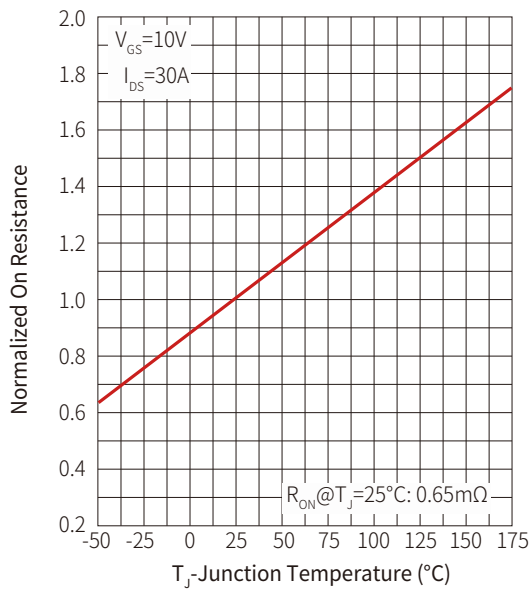
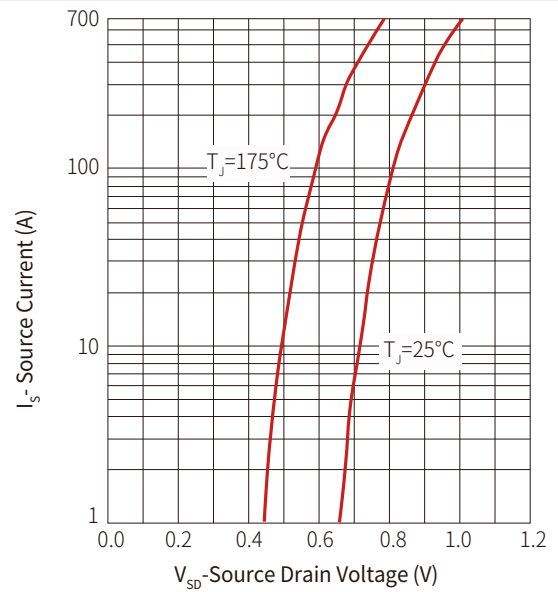
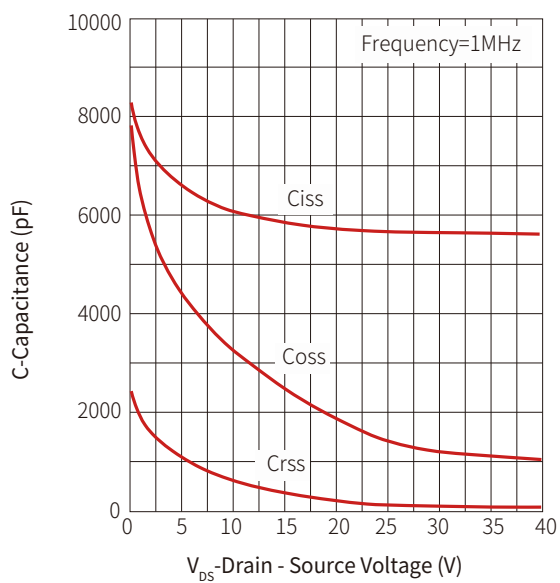
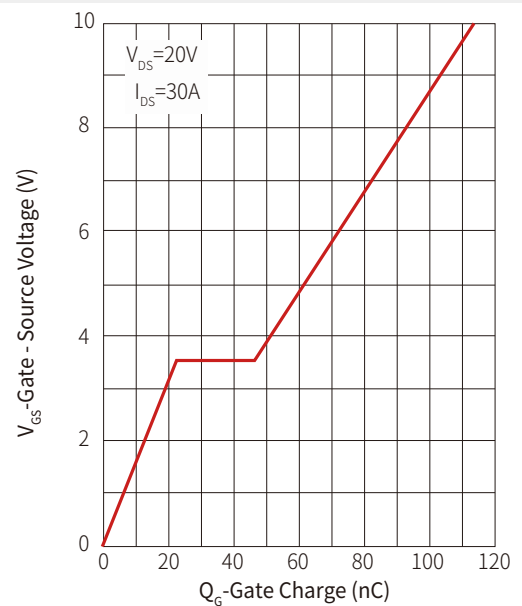
**Figure 9: Normalized On Resistance**

**Figure 10: Diode Forward Current**

**Figure 11: Capacitance**

**Figure 12: Gate Charge**


Figure 1: Mechanical drawing of the package. The drawing includes a top view showing dimensions D1, E1, and a central pin with dimensions PIN#1 I.D., Ø0.80, and DP:0.08 MAX. A side view shows the package height M. A cross-section view shows the package profile with dimensions b1, e, 4XL, and 4XM. A detailed view of the exposed die attached pad shows dimensions b1, b2, 8x, and 4XL. A detail view of the terminal tip shows dimensions L, b1, e, and 0.08. A detail view of the package profile shows dimensions A, A1, A3, and P. The drawing also includes various callouts for dimensions and features.

| Ref. | Millimeters |      | Inches   |        |
|------|-------------|------|----------|--------|
|      | Min.        | Max. | Min.     | Max.   |
| A    | 0.90        | 1.17 | 0.035    | 0.046  |
| A1   | 0.00        | 0.05 | 0.000    | 0.002  |
| A3   | 0.254REF    |      | 0.010REF |        |
| b    | 0.31        | 0.51 | 0.012    | 0.020  |
| b1   | 0.03        | 0.13 | 0.001    | 0.005  |
| b2   | 0.21        | 0.41 | 0.008    | 0.016  |
| D    | 5.15BSC     |      | 0.203BSC |        |
| D1   | 5.00BSC     |      | 0.197BSC |        |
| D2   | 3.70        | 3.90 | 0.146    | 0.154  |
| E    | 6.15BSC     |      | 0.242BSC |        |
| E1   | 6.00BSC     |      | 0.236BSC |        |
| E2   | 3.56        | 3.76 | 0.140    | 0.148  |
| e    | 1.27BSC     |      | 0.050BSC |        |
| L    | 0.51        | 0.71 | 0.020    | 0.028  |
| M    | 0.51        | 0.71 | 0.020    | 0.028  |
| P    | 10°         | 12°  | 0.394°   | 0.472° |
| aaa  | 0.10        |      | 0.004    |        |
| bbb  | 0.10        |      | 0.004    |        |
| ccc  | 0.10        |      | 0.004    |        |
| ddd  | 0.05        |      | 0.002    |        |
| eee  | 0.08        |      | 0.003    |        |

| Part Number | Component Package | Marking                                                                                       | QTY/Reel | Reel Size |
|-------------|-------------------|-----------------------------------------------------------------------------------------------|----------|-----------|
| SNM009N04GL | PDFN5×6-8L        |  9N04 XXXX | 5000PCS  | 13"       |

**Headquarters**

No.3387 Shendu Road  
Pujiang I&E Park  
Minhang Shanghai China  
201000

**Hotline**

400-021-5756

**Web**

<https://www.semiware.com>

**Sales Center**

Tel: 86-21-3463-7458  
Email: [sales18@semiware.com](mailto:sales18@semiware.com)

**Customer Service**

Tel: 86-21-5484-1001  
Email: [sales17@semiware.com](mailto:sales17@semiware.com)

**Technical Support**

Tel: 86-21-3463-7654  
Email: [fae01@semiware.com](mailto:fae01@semiware.com)

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Ext: 8868  
Email: [cs03@semiware.com](mailto:cs03@semiware.com)

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