

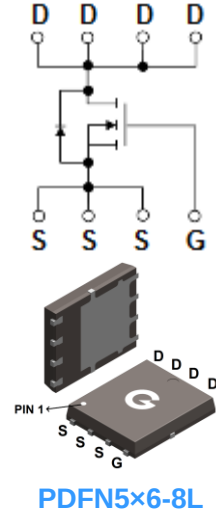
### Features

- Advanced Shielded-Gate Trench technology
- Ultra low  $R_{DS(ON)}$  to minimize conduction losses
- Superior thermal resistance
- HBM: AEC-Q101-001: H2 (JESD22-A114-B: 2)
- Halogen free
- Qualified to AEC-Q101 standards for high reliability

HF

### Mechanical Data

- Case: PDFN5×6-8L
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208



### Ordering Information

| Part Number       | Package    | Shipping Quantity      | Marking Code |
|-------------------|------------|------------------------|--------------|
| TBLS009N04TH-5DL8 | PDFN5×6-8L | 5000 pcs / Tape & Reel | 009N04TH     |

### Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

| Parameter                                                                               | Symbol    | Value           | Unit             |
|-----------------------------------------------------------------------------------------|-----------|-----------------|------------------|
| Drain-to-Source Voltage                                                                 | $V_{DS}$  | 40              | V                |
| Gate-to-Source Voltage                                                                  | $V_{GS}$  | $\pm 20$        | V                |
| Continuous Drain Current ( $T_C = 25^\circ\text{C}$ , Silicon limited) <sup>*1</sup>    | $I_D$     | 320             | A                |
| Continuous Drain Current ( $T_C = 100^\circ\text{C}$ , Silicon limited) <sup>*1</sup>   |           | 226             | A                |
| Continuous Drain Current ( $T_A = 25^\circ\text{C}$ ) <sup>*2</sup>                     |           | 51              | A                |
| Continuous Drain Current ( $T_A = 100^\circ\text{C}$ ) <sup>*2</sup>                    |           | 36              | A                |
| Pulsed Drain Current ( $t_p = 10\mu\text{s}$ , $T_C = 25^\circ\text{C}$ ) <sup>*1</sup> | $I_{DM}$  | 1280            | A                |
| Single Pulse Avalanche Energy <sup>*3</sup>                                             | $E_{AS}$  | 600             | mJ               |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ )                                          | $P_D$     | 167             | W                |
| Power Dissipation ( $T_A = 25^\circ\text{C}$ ) <sup>*2</sup>                            |           | 4.3             | W                |
| Operating Junction Temperature Range                                                    | $T_J$     | $-55 \sim +175$ | $^\circ\text{C}$ |
| Storage Temperature Range                                                               | $T_{STG}$ | $-55 \sim +175$ | $^\circ\text{C}$ |

### Thermal Characteristics

| Parameter                                        | Symbol          | Min. | Typ. | Max. | Unit               |
|--------------------------------------------------|-----------------|------|------|------|--------------------|
| Thermal Resistance Junction-to-Case              | $R_{\theta JC}$ | -    | 0.85 | 0.9  | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-to-Air <sup>*2</sup> | $R_{\theta JA}$ | -    | 23   | 35   | $^\circ\text{C/W}$ |

### Electrical Characteristics (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

| Symbol                             | Parameter                       | Test Condition                                             | Min. | Typ. | Max. | Unit |
|------------------------------------|---------------------------------|------------------------------------------------------------|------|------|------|------|
| Static Characteristics             |                                 |                                                            |      |      |      |      |
| V <sub>DS</sub>                    | Drain-Source Breakdown Voltage  | V <sub>GS</sub> = 0V, I <sub>D</sub> = 1mA                 | 40   | -    | -    | V    |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current | V <sub>DS</sub> = 40V, V <sub>GS</sub> = 0V                | -    | -    | 1    | μA   |
| I <sub>GSS</sub>                   | Gate-Body Leakage Current       | V <sub>GS</sub> = ±20V, V <sub>DS</sub> = 0V               | -    | -    | ±100 | nA   |
| On Characteristics                 |                                 |                                                            |      |      |      |      |
| R <sub>DS(ON)</sub>                | Drain-Source On-resistance *4   | V <sub>GS</sub> = 10V, I <sub>D</sub> = 75A                | -    | 0.7  | 0.9  | mΩ   |
|                                    |                                 | V <sub>GS</sub> = 6V, I <sub>D</sub> = 75A                 | -    | 1.1  | 1.5  | mΩ   |
| V <sub>GS(th)</sub>                | Gate Threshold Voltage          | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA | 2    | 2.8  | 4    | V    |
| R <sub>G</sub>                     | Gate Resistance                 | V <sub>GS</sub> = 0V, f = 1MHz                             | -    | 1.9  | -    | Ω    |
| Dynamic Characteristics            |                                 |                                                            |      |      |      |      |
| C <sub>ISS</sub>                   | Input Capacitance               | V <sub>GS</sub> = 0V                                       | -    | 6518 | -    | pF   |
| C <sub>OSS</sub>                   | Output Capacitance              | V <sub>DS</sub> = 25V                                      | -    | 1697 | -    |      |
| C <sub>RSS</sub>                   | Reverse Transfer Capacitance    | f = 300KHz                                                 | -    | 137  | -    |      |
| Switching Characteristics          |                                 |                                                            |      |      |      |      |
| t <sub>d(ON)</sub>                 | Turn-on Delay Time              | V <sub>DD</sub> = 30V                                      | -    | 36   | -    | ns   |
| t <sub>r</sub>                     | Turn-on Rise Time               | V <sub>GS</sub> = 15V                                      | -    | 97   | -    |      |
| t <sub>d(OFF)</sub>                | Turn-Off Delay Time             | I <sub>D</sub> = 40A                                       | -    | 115  | -    |      |
| t <sub>f</sub>                     | Turn-Off Fall Time              | R <sub>G</sub> = 3.3Ω                                      | -    | 100  | -    |      |
| Q <sub>G</sub>                     | Total Gate-Charge               | V <sub>DD</sub> = 32V                                      | -    | 108  | -    | nC   |
| Q <sub>GS</sub>                    | Gate to Source Charge           | V <sub>GS</sub> = 10V                                      | -    | 25   | -    |      |
| Q <sub>GD</sub>                    | Gate to Drain (Miller) Charge   | I <sub>D</sub> = 75A                                       | -    | 26   | -    |      |
| Source-Drain Diode Characteristics |                                 |                                                            |      |      |      |      |
| V <sub>SD</sub>                    | Diode Forward Voltage *4        | I <sub>S</sub> = 75A, V <sub>GS</sub> = 0V                 | -    | 0.8  | 1.2  | V    |
| t <sub>rr</sub>                    | Reverse Recovery Time           | I <sub>S</sub> = 40A, V <sub>GS</sub> = 0V                 | -    | 88   | -    | ns   |
| Q <sub>rr</sub>                    | Reverse Recovery Charge         | di/dt = 100A/μs                                            | -    | 145  | -    | nC   |

Notes:

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted. De-rating will be required based on the actual environmental conditions
- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper
- The  $E_{AS}$  data shows Max. rating. The test condition is  $V_{DD} = 30V, V_{GS} = 10V, L = 0.5mH$
- The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$

Ratings and Characteristics Curves (@  $T_A = 25^\circ\text{C}$  unless otherwise specified)

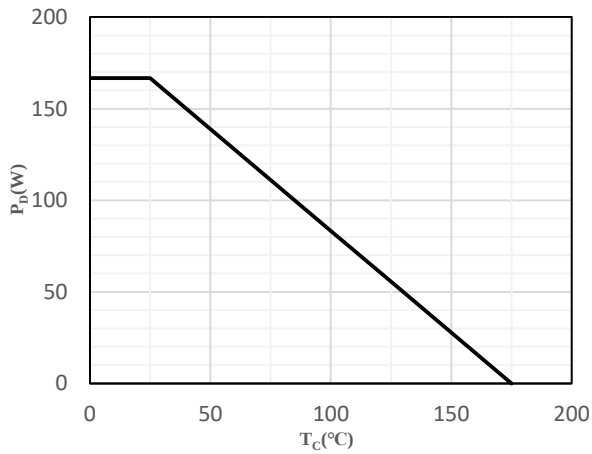


Fig 1 Power Dissipation

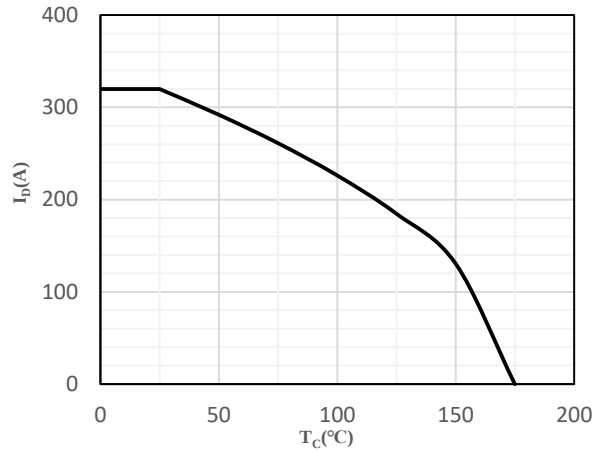


Fig 2 Drain Current

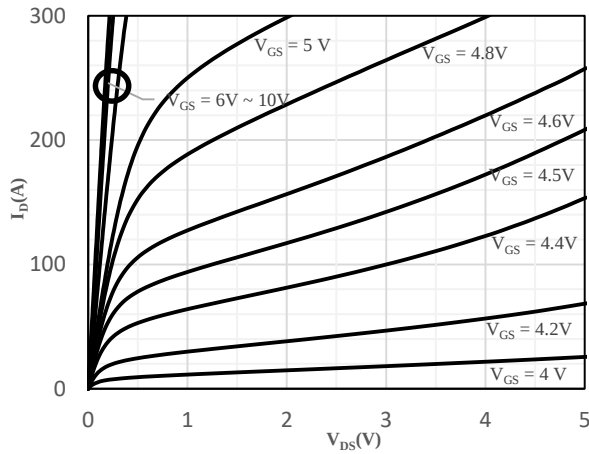


Fig 3 Typical Output Characteristics

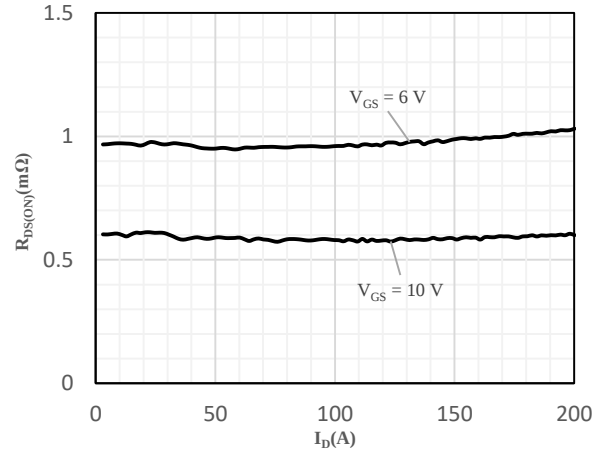


Fig 4 On-Resistance vs. Drain Current  
and Gate Voltage

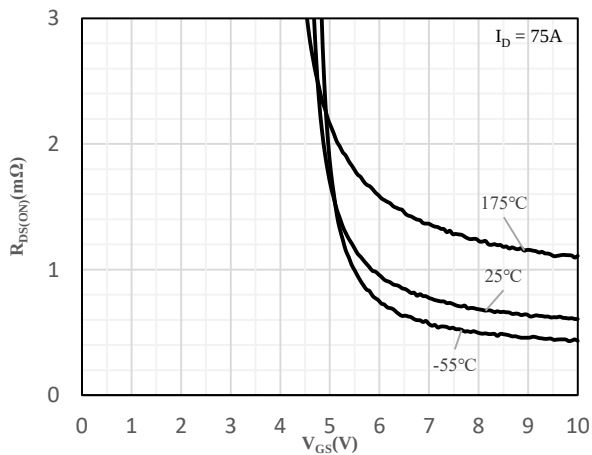


Fig 5 On-Resistance vs. Gate-Source Voltage

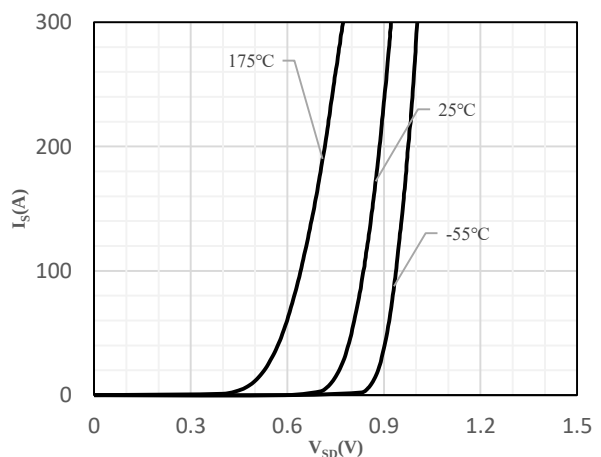


Fig 6 Body-Diode Characteristics

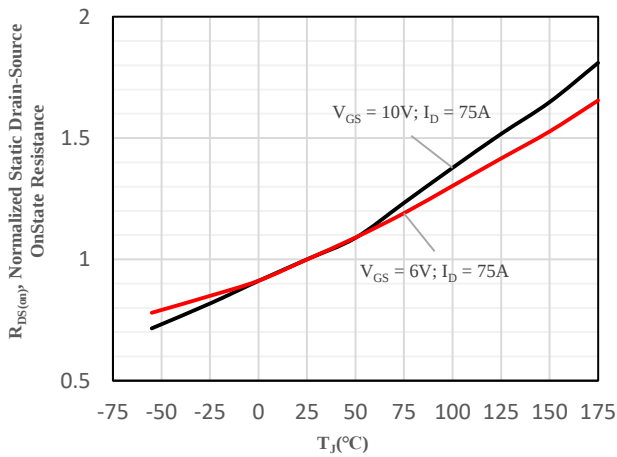


Fig 7 Normalized On-Resistance vs. Junction Temperature

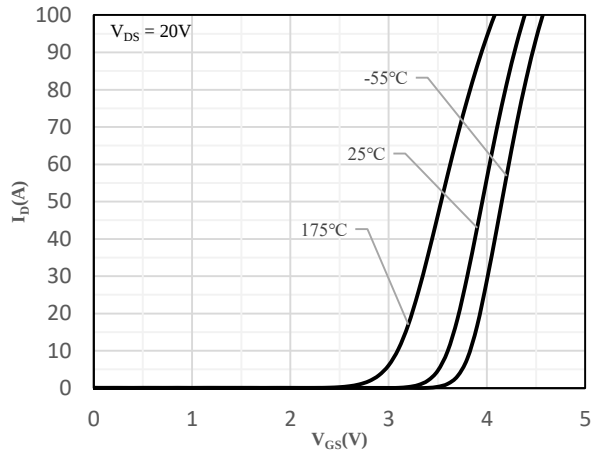


Fig 8 Transfer Characteristics

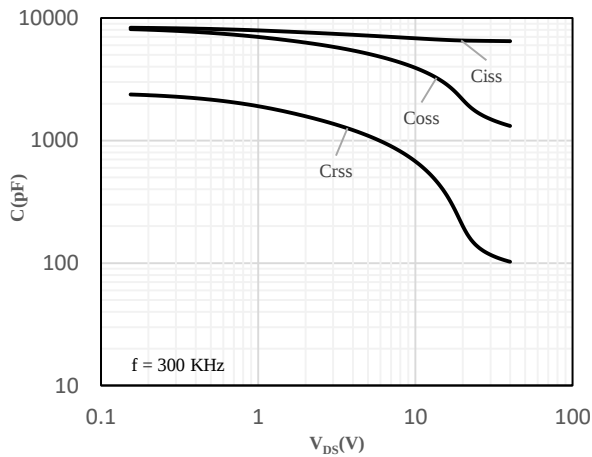


Fig 9 Capacitance Characteristics

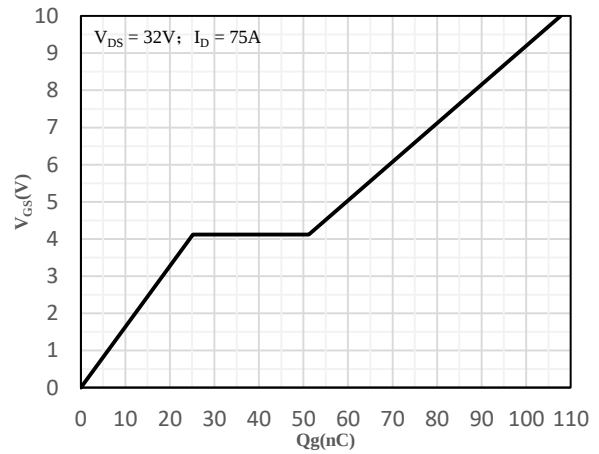


Fig 10 Gate-Charge Characteristics

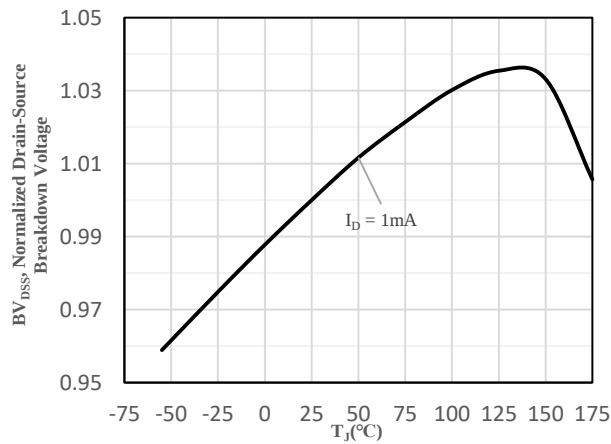


Fig 11 Normalized Breakdown Voltage vs. Junction Temperature

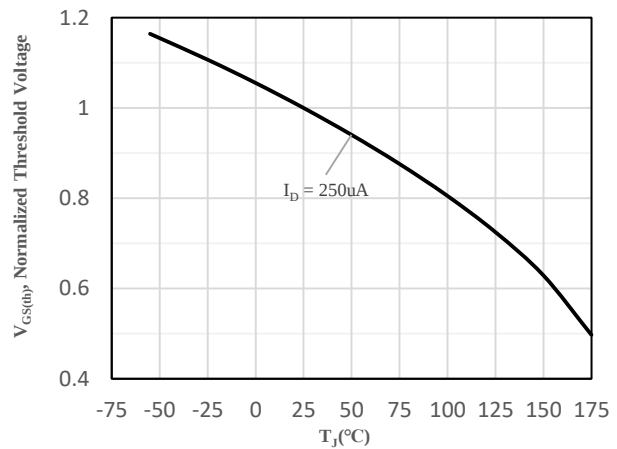


Fig 12 Normalized  $V_{GS(th)}$  vs. Junction Temperature

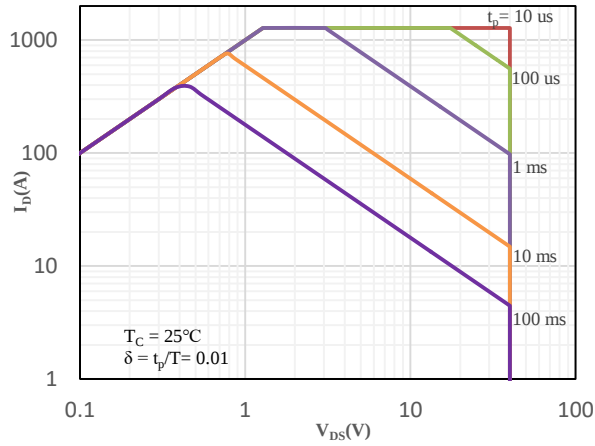


Fig 13 Safe Operation Area

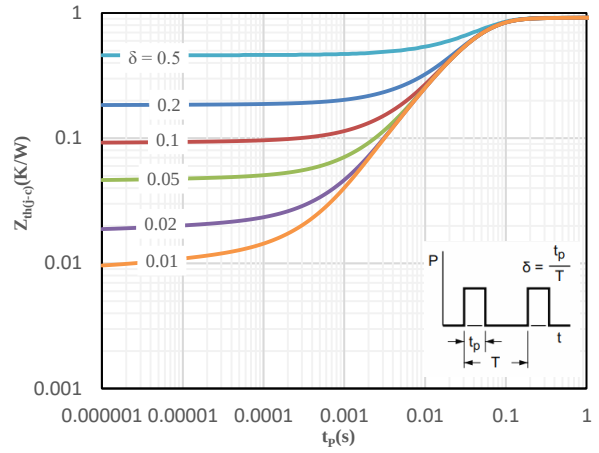
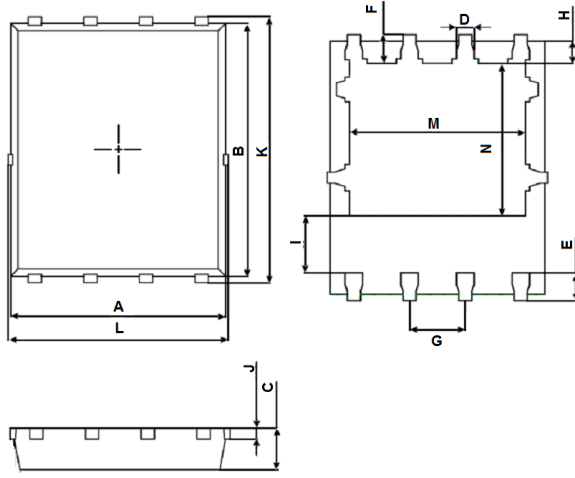


Fig 14 Maximum transient thermal impedance

Package Outline Dimensions (Unit: mm)



| PDFN5x6-8L |       |       |
|------------|-------|-------|
| Dimension  | Min.  | Max.  |
| A          | 4.824 | 4.976 |
| B          | 5.674 | 5.826 |
| C          | 0.900 | 1.000 |
| D          | 0.350 | 0.450 |
| E          | 0.559 | 0.711 |
| F          | 0.574 | 0.726 |
| G          | 1.250 | 1.290 |
| H          | 0.424 | 0.576 |
| I          | 1.190 | 1.390 |
| J          | 0.154 | 0.354 |
| K          | 5.974 | 6.126 |
| L          | 4.944 | 5.096 |
| M          | 3.910 | 4.110 |
| N          | 3.375 | 3.575 |

Mounting Pad Layout (Unit: mm)

PDFN5x6-8L

