

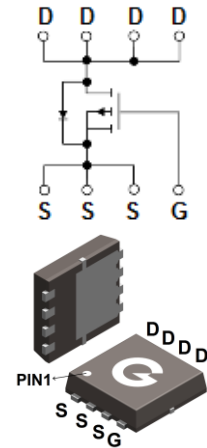
## Features

- Advanced trench technology
- Super low on-resistance
- Superior thermal behavior
- Excellent  $c_{dv} / d_t$  effect decline
- RoHS compliant with Halogen-free
- Qualified to AEC-Q101 Standards

HF

## Mechanical Data

- Case: PDFN3×3-8L
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208



PDFN3×3-8L

## Ordering Information

| Part Number     | Package    | Shipping Quantity      | Marking Code |
|-----------------|------------|------------------------|--------------|
| TQBL130P04-3DL8 | PDFN3×3-8L | 5000 pcs / Tape & Reel | 130P04       |

## 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 ( $T_C = 25^\circ\text{C}$ )                     | $I_D$     | -50             | A                |
| Continuous Drain Current ( $T_C = 100^\circ\text{C}$ )                    |           | -35             |                  |
| Continuous Drain Current ( $T_A = 25^\circ\text{C}$ ) <sup>*1</sup>       |           | -11             |                  |
| Continuous Drain Current ( $T_A = 100^\circ\text{C}$ ) <sup>*1</sup>      |           | -8              |                  |
| Pulsed Drain Current ( $t_p = 10\mu\text{s}$ , $T_C = 25^\circ\text{C}$ ) | $I_{DM}$  | -200            | A                |
| Single Pulse Avalanche Energy ( $L = 0.5\text{mH}$ ) <sup>*3</sup>        | $E_{AS}$  | 120             | mJ               |
| Power Dissipation ( $T_C = 25^\circ\text{C}$ )                            | $P_D$     | 58              | W                |
| Power Dissipation ( $T_A = 25^\circ\text{C}$ ) <sup>*1</sup>              |           | 3               |                  |
| 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              | $R_{\theta JC}$ | -    | 2.2  | 2.6  | $^\circ\text{C/W}$ |
| Thermal Resistance Junction-to-Air <sup>*1</sup> | $R_{\theta JA}$ | -    | 40   | 50   | $^\circ\text{C/W}$ |

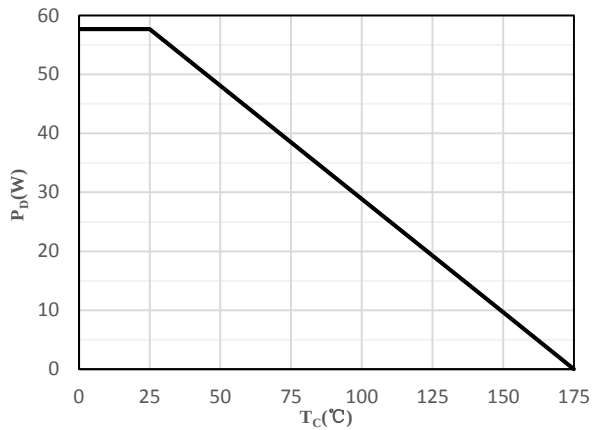
### Electrical Characteristics (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

| Symbol                             | Parameter                                   | Test Condition                                                            | Min. | Typ. | Max. | Unit |
|------------------------------------|---------------------------------------------|---------------------------------------------------------------------------|------|------|------|------|
| Static Characteristics             |                                             |                                                                           |      |      |      |      |
| V <sub>DSS</sub>                   | Drain-Source Breakdown Voltage              | V <sub>GS</sub> = 0V, I <sub>D</sub> = -250μA                             | -40  | -    | -    | V    |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current             | V <sub>DS</sub> = -32V, 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 *2               | V <sub>GS</sub> = -10V,I <sub>D</sub> = -15A                              | -    | 11   | 13   | mΩ   |
|                                    |                                             | V <sub>GS</sub> = -4.5V,I <sub>D</sub> = -10A                             | -    | 15   | 20   | mΩ   |
| V <sub>GS(th)</sub>                | Gate Threshold Voltage                      | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA              | -1   | -1.7 | -2.5 | V    |
| R <sub>G</sub>                     | Gate Resistance                             | V <sub>GS</sub> = 0V, f = 1MHz                                            | -    | 10.8 | -    | Ω    |
| Dynamic Characteristics            |                                             |                                                                           |      |      |      |      |
| C <sub>ISS</sub>                   | Input Capacitance                           | V <sub>GS</sub> = 0V                                                      | -    | 2983 | -    | pF   |
| C <sub>OSS</sub>                   | Output Capacitance                          | V <sub>DS</sub> = 25V                                                     | -    | 238  | -    |      |
| C <sub>RSS</sub>                   | Reverse Transfer Capacitance                | f = 1.0MHz                                                                | -    | 195  | -    |      |
| Switching Characteristics          |                                             |                                                                           |      |      |      |      |
| t <sub>d(ON)</sub>                 | Turn-on Delay Time *4                       | V <sub>DD</sub> =-15V                                                     | -    | 40   | -    | ns   |
| t <sub>r</sub>                     | Turn-on Rise Time *4                        | V <sub>GS</sub> = -10V                                                    | -    | 35   | -    |      |
| t <sub>d(OFF)</sub>                | Turn-Off Delay Time *4                      | R <sub>G</sub> = 3.3Ω                                                     | -    | 100  | -    |      |
| t <sub>f</sub>                     | Turn-Off Fall Time *4                       | R <sub>L</sub> = 15Ω<br>I <sub>D</sub> = -1A                              | -    | 9.6  | -    |      |
| Q <sub>G</sub>                     | Total Gate-Charge (V <sub>GS</sub> = -4.5V) | V <sub>DD</sub> = -32V<br>V <sub>GS</sub> = -10V<br>I <sub>D</sub> = -50A | -    | 30   | -    | nC   |
|                                    | Total Gate-Charge (V <sub>GS</sub> = -10V)  |                                                                           | -    | 60.7 | -    |      |
| Q <sub>GS</sub>                    | Gate to Source Charge                       |                                                                           | -    | 16   | -    |      |
| Q <sub>GD</sub>                    | Gate to Drain (Miller) Charge               |                                                                           | -    | 9    | -    |      |
| Source-Drain Diode Characteristics |                                             |                                                                           |      |      |      |      |
| V <sub>SD</sub>                    | Diode Forward Voltage *2                    | I <sub>SD</sub> = -10A, V <sub>GS</sub> = 0V                              | -    | -0.8 | -1.2 | V    |
| t <sub>rr</sub>                    | Reverse Recovery Time                       | I <sub>SD</sub> = -15A, V <sub>GS</sub> = 0V                              | -    | 65   | -    | ns   |
| Q <sub>rr</sub>                    | Reverse Recovery Charge                     | di/dt = 100A/μs                                                           | -    | 48   | -    | nC   |

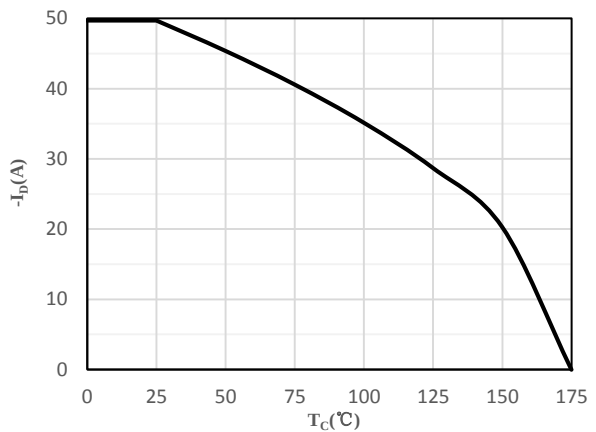
Notes:

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper
- The data tested by pulsed, pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$
- The  $E_{AS}$  data shows Max. rating. The test condition is  $V_{DD} = -25V, V_{GS} = -10V, L = 0.5mH$
- Guaranteed by design, not subject to production

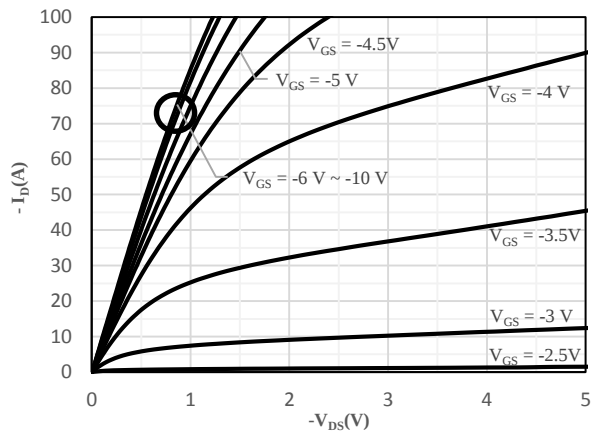
**Ratings and Characteristics Curves** (@  $T_A = 25^\circ\text{C}$  unless otherwise specified)



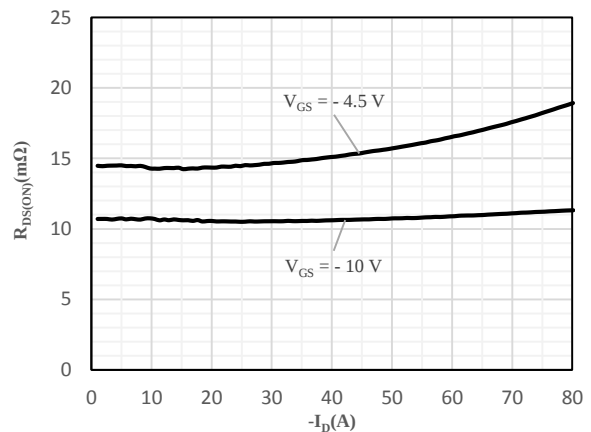
**Fig 1 Power Dissipation**



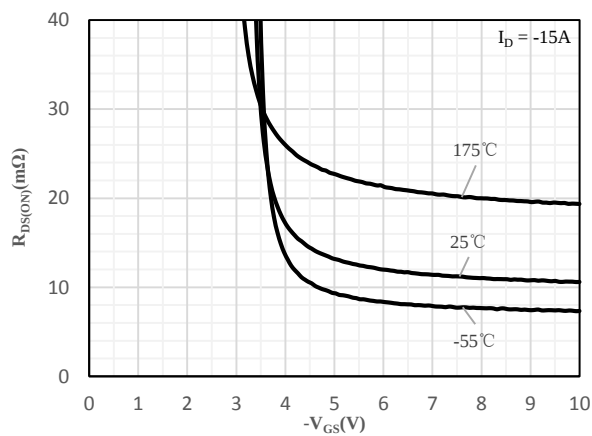
**Fig 2 Drain Current**



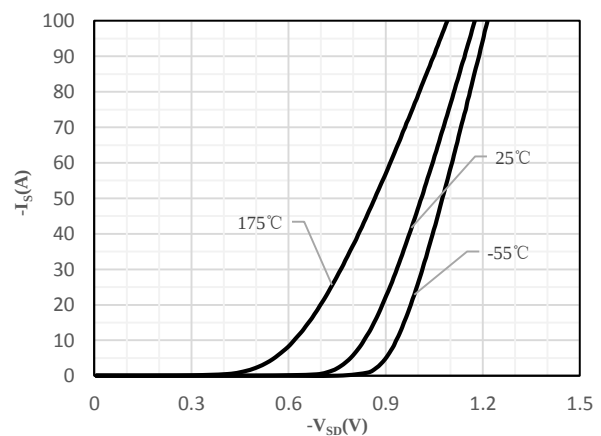
**Fig 3 Typical Output Characteristics**



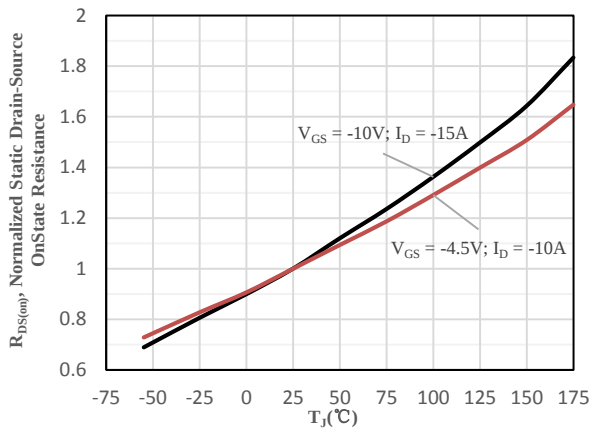
**Fig 4 On-Resistance vs. Drain Current  
and Gate Voltage**



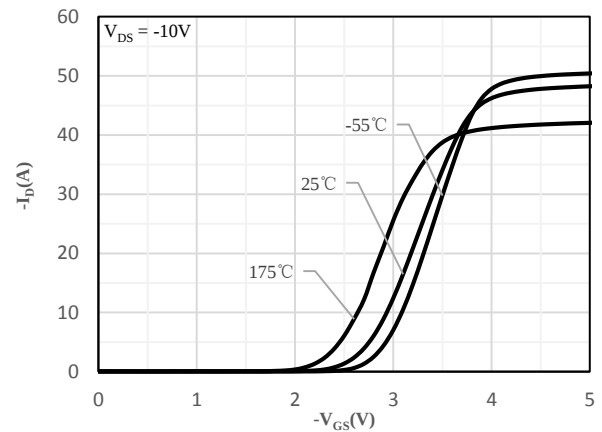
**Fig 5 On-Resistance vs. Gate-Source Voltage**



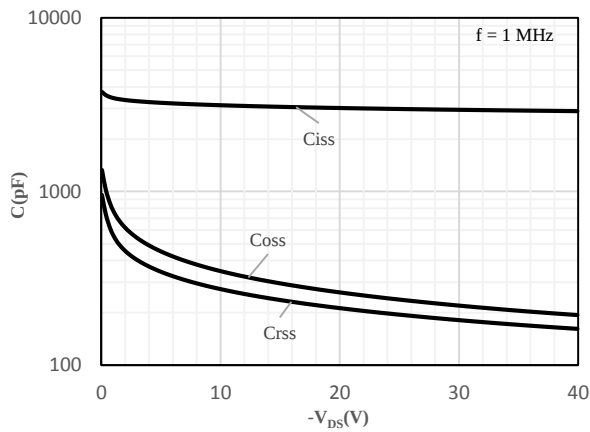
**Fig 6 Body-Diode Characteristics**



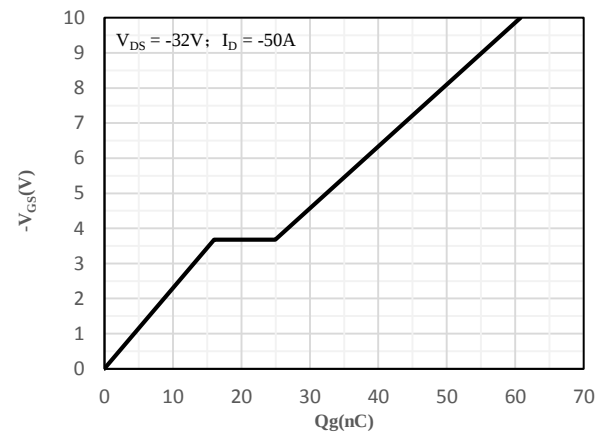
**Fig 7 Normalized On-Resistance vs. Junction Temperature**



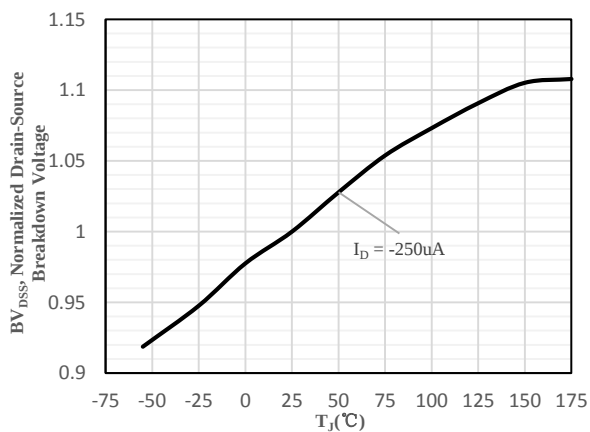
**Fig 8 Transfer Characteristics**



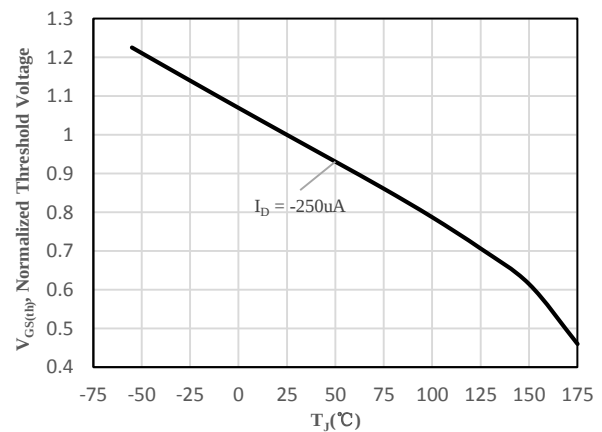
**Fig 9 Capacitance Characteristics**



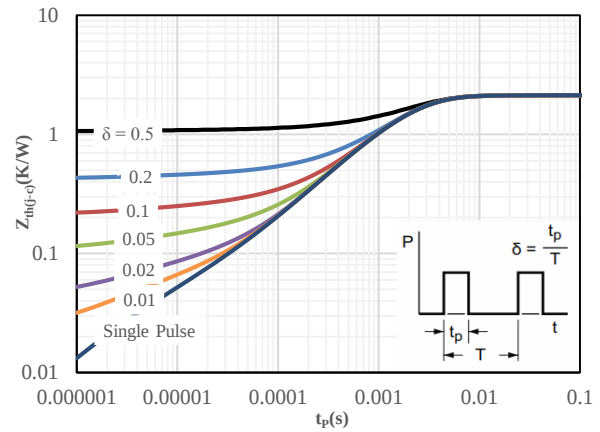
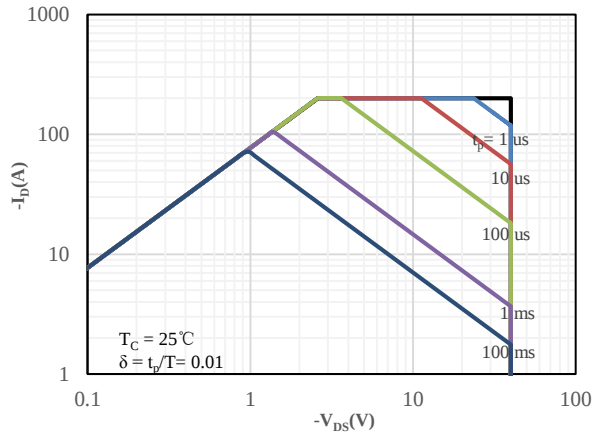
**Fig 10 Gate-Charge Characteristics**



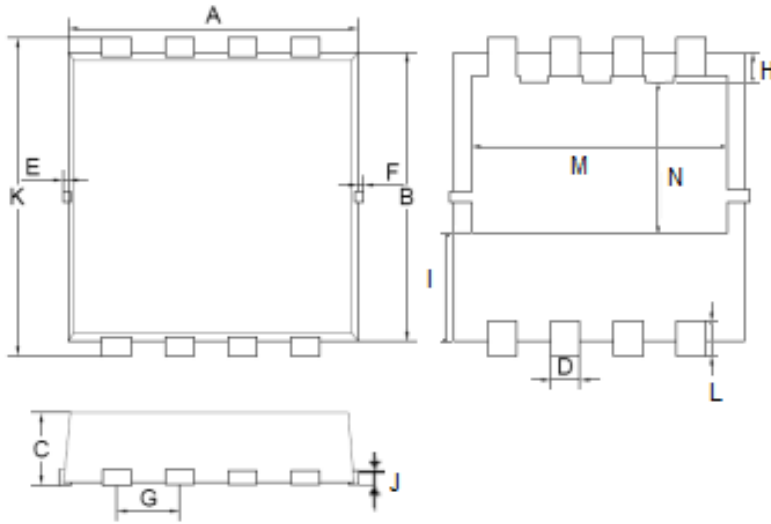
**Fig 11 Normalized Breakdown Voltage vs. Junction Temperature**



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



**Package Outline Dimensions** (Unit: mm)



| PDFN3x3-8L |       |       |
|------------|-------|-------|
| Dimension  | Min.  | Max.  |
| A          | 2.90  | 3.10  |
| B          | 2.90  | 3.10  |
| C          | 0.65  | 0.85  |
| D          | 0.20  | 0.40  |
| E          | 0.00  | 0.10  |
| F          | 0.00  | 0.10  |
| G          | 0.55  | 0.75  |
| H          | 0.20  | 0.40  |
| I          | 0.70  | 1.10  |
| J          | 0.10  | 0.20  |
| K          | 3.15  | 3.45  |
| L          | 0.20  | 0.40  |
| M          | 2.35  | 2.55  |
| N          | 1.500 | 1.900 |

**Mounting Pad Layout** (Unit: mm)

**PDFN3x3-8L**

