



# MDU040N007PSLVRH

Single N-channel Trench MOSFET 40V 0.7mΩ 400A

FEATURES

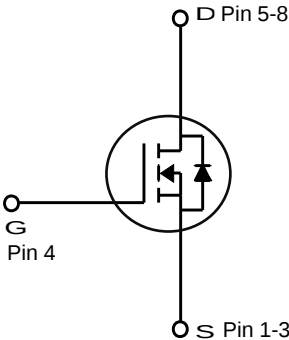
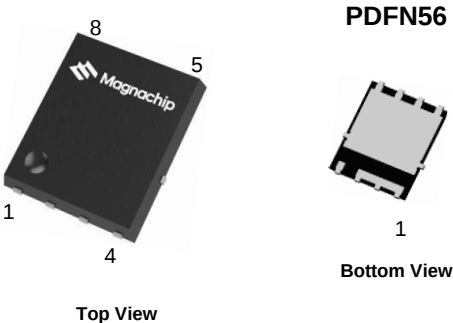
- Trench power MOSFET technology
- Single N-channel trench, logic level
- Enhanced avalanche ruggedness
- 100% Avalanche tested
- Maximum 175°C junction temperature

PRODUCT VALIDATION

- Qualified according to JEDEC Standard

KEY PERFORMANCE PARAMETERS

|                                       |         |    |
|---------------------------------------|---------|----|
| V <sub>DS</sub>                       | 40      | V  |
| R <sub>DS(on), typ.</sub>             | 0.00058 | Ω  |
| I <sub>D</sub>                        | 400     | A  |
| Q <sub>g</sub>                        | 109     | nC |
| Junction temperature <sub>, max</sub> | 175     | °C |



ORDERING INFORMATION

| Type / Ordering Code | Package | Marking   | Packing     | RoHS Status  |
|----------------------|---------|-----------|-------------|--------------|
| MDU040N007PSLVRH     | PFDN56  | 040N007PL | Tape & Reel | Halogen Free |

<http://www.magnachip.com>

**ABSOLUTE MAXIMUM RATINGS**, at T<sub>C</sub> = 25°C, unless otherwise specified

| Parameter                                    |                       | Symbol                            | Rating     | Unit |
|----------------------------------------------|-----------------------|-----------------------------------|------------|------|
| Drain-source Voltage                         |                       | V <sub>DS</sub>                   | 40         | V    |
| Gate-source Voltage                          |                       | V <sub>GS</sub>                   | ± 18       |      |
| Drain current                                | T <sub>C</sub> =25°C  | I <sub>D</sub>                    | 400        | A    |
|                                              | T <sub>C</sub> =100°C |                                   | 283        |      |
| <sup>1)</sup> Pulsed drain current           | T <sub>C</sub> =25°C  | I <sub>DM</sub>                   | 1600       |      |
| Total power dissipation                      | T <sub>C</sub> =25°C  | P <sub>tot</sub>                  | 188        | W    |
|                                              | T <sub>C</sub> =100°C |                                   | 94         |      |
| <sup>2)</sup> Avalanche energy, single pulse |                       | E <sub>AS</sub>                   | 450        | mJ   |
| Operating and storage temperature            |                       | T <sub>j</sub> , T <sub>stg</sub> | - 55 ~ 175 | °C   |

**THERMAL CHARACTERISTICS**

| Parameter                                            | Symbol           | Rating | Unit |
|------------------------------------------------------|------------------|--------|------|
| Thermal resistance, junction - case                  | R <sub>θJC</sub> | 0.8    | °C/W |
| <sup>3)</sup> Thermal resistance, junction - ambient | R <sub>θJA</sub> | 50     |      |

**ELECTRICAL CHARACTERISTICS (T<sub>j</sub> = 25°C)****STATIC CHARACTERISTICS**

| Parameter                        | Symbol               | Min. | Typ. | Max.  | Unit | Conditions / Note                                         |
|----------------------------------|----------------------|------|------|-------|------|-----------------------------------------------------------|
| Drain-source breakdown voltage   | V <sub>(BR)DSS</sub> | 40   | -    | -     | V    | V <sub>GS</sub> =0 V, I <sub>D</sub> =250 μA              |
| Gate threshold voltage           | V <sub>GS(th)</sub>  | 1.05 | -    | 2.55  |      | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250 μA |
| Zero gate voltage drain current  | I <sub>DSS</sub>     | -    | -    | 1     | μA   | V <sub>DS</sub> =40 V, V <sub>GS</sub> =0 V               |
| Gate-source leakage current      | I <sub>GSS</sub>     | -    | -    | ± 100 | nA   | V <sub>GS</sub> =±18 V, V <sub>DS</sub> =0 V              |
| Drain-source on-state resistance | R <sub>DS(on)</sub>  | -    | 0.58 | 0.70  | mΩ   | V <sub>GS</sub> =10 V, I <sub>D</sub> =50 A               |
|                                  |                      | -    | 0.84 | 1.20  |      | V <sub>GS</sub> =4.5 V, I <sub>D</sub> =50 A              |
| <sup>4)</sup> Gate resistance    | R <sub>g</sub>       | -    | 1.0  | -     | Ω    | f=1MHz                                                    |
| <sup>4)</sup> Transconductance   | g <sub>fs</sub>      | -    | 160  | -     | S    | V <sub>DS</sub> =10 V, I <sub>D</sub> =50 A               |

**<sup>4)</sup> DYNAMIC CHARACTERISTICS**

| Parameter                    | Symbol              | Min. | Typ. | Max. | Unit | Conditions / Note                                                                               |
|------------------------------|---------------------|------|------|------|------|-------------------------------------------------------------------------------------------------|
| Input capacitance            | C <sub>iss</sub>    | -    | 7104 | -    | pF   | V <sub>GS</sub> =0 V, V <sub>DS</sub> =20 V, f=1 MHz                                            |
| Output capacitance           | C <sub>oss</sub>    | -    | 1855 | -    |      |                                                                                                 |
| Reverse transfer capacitance | C <sub>rss</sub>    | -    | 61   | -    |      |                                                                                                 |
| Turn-on delay time           | t <sub>d(on)</sub>  | -    | 26   | -    | ns   | V <sub>DD</sub> =20 V, V <sub>GS</sub> =10 V,<br>I <sub>D</sub> =50 A, R <sub>G,ext</sub> =1.6Ω |
| Rise time                    | t <sub>r</sub>      | -    | 6    | -    |      |                                                                                                 |
| Turn-off delay time          | t <sub>d(off)</sub> | -    | 65   | -    |      |                                                                                                 |
| Fall time                    | t <sub>f</sub>      | -    | 15   | -    |      |                                                                                                 |

**<sup>4)</sup> GATE CHARGE CHARACTERISTICS**

| Parameter                | Symbol               | Min. | Typ. | Max. | Unit | Conditions / Note                                                          |
|--------------------------|----------------------|------|------|------|------|----------------------------------------------------------------------------|
| Gate to source charge    | Q <sub>gs</sub>      | -    | 20   | -    | nC   | V <sub>DD</sub> =20 V, I <sub>D</sub> =50 A,<br>V <sub>GS</sub> =0 to 10 V |
| Gate charge at threshold | Q <sub>gs(th)</sub>  | -    | 8    | -    |      |                                                                            |
| Gate to drain charge     | Q <sub>gd</sub>      | -    | 15   | -    |      |                                                                            |
| Switching charge         | Q <sub>sw</sub>      | -    | 22   | -    |      |                                                                            |
| Gate charge total        | Q <sub>g</sub>       | -    | 109  | -    |      |                                                                            |
| Gate plateau voltage     | V <sub>plateau</sub> | -    | 3.4  | -    | V    |                                                                            |

**SOURCE-DRAIN DIODE**

| Parameter                                      | Symbol               | Min. | Typ. | Max. | Unit | Conditions / Note                                  |
|------------------------------------------------|----------------------|------|------|------|------|----------------------------------------------------|
| <sup>4)</sup> Diode continuous forward current | I <sub>S</sub>       | -    | -    | 280  | A    | -                                                  |
| <sup>4)</sup> Diode pulse current              | I <sub>S,pulse</sub> | -    | -    | 1120 |      | pulsed; t <sub>p</sub> ≤ 10 μs                     |
| Diode forward voltage                          | V <sub>SD</sub>      | -    | 0.78 | 1.0  | V    | V <sub>GS</sub> =0 V, I <sub>F</sub> =50 A         |
| <sup>4)</sup> Reverse recovery time            | t <sub>rr</sub>      | -    | 93   | -    | ns   | I <sub>F</sub> =50 A, dI <sub>F</sub> /dt=100 A/μs |
| <sup>4)</sup> Reverse recovery charge          | Q <sub>rr</sub>      | -    | 241  | -    | nC   |                                                    |

**Notes**

1. Pulse width limited by T<sub>jmax</sub>
2. Starting T<sub>j</sub>=25°C, L=1mH, I<sub>AS</sub>=30A, V<sub>DD</sub>=36V, V<sub>GS</sub>=10V
3. Surface mounted FR-4 board by JEDEC (jesd51-7)
4. The parameter is not subject to production testing - guaranteed by design.

## ELECTRICAL CHARACTERISTICS DIAGRAMS

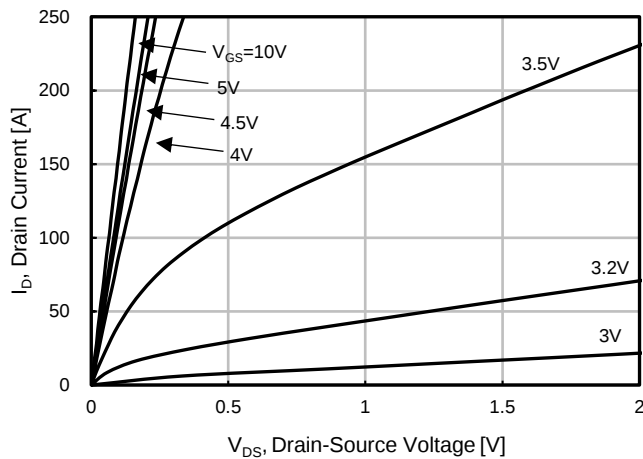


Fig. 1. Typ. Output Characteristics

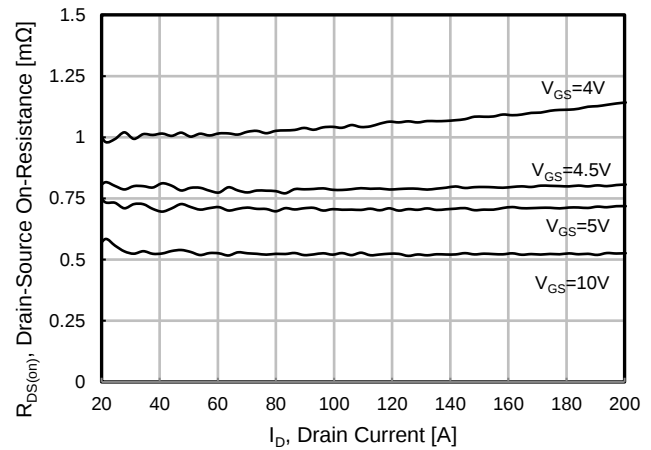


Fig. 2. Typ. Drain-Source On-Resistance

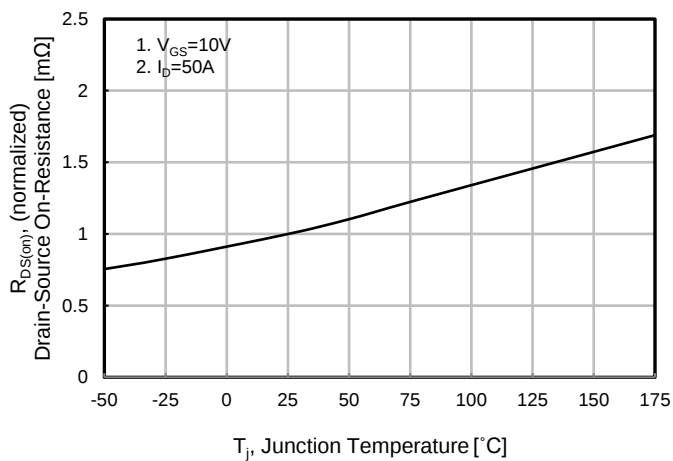


Fig. 3. On-Resistance vs. Junction Temperature

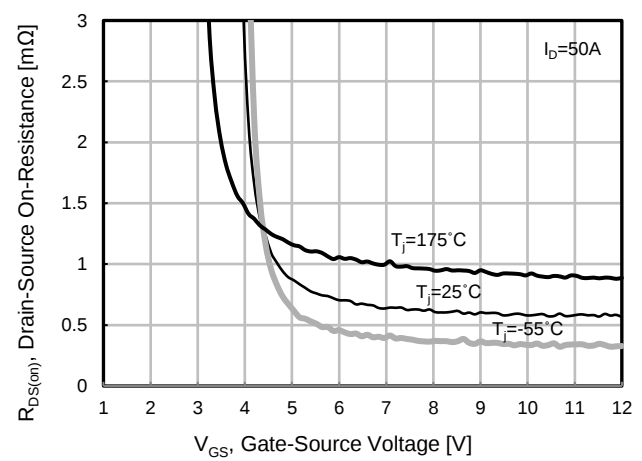


Fig. 4. On-Resistance vs. Gate-Source Voltage

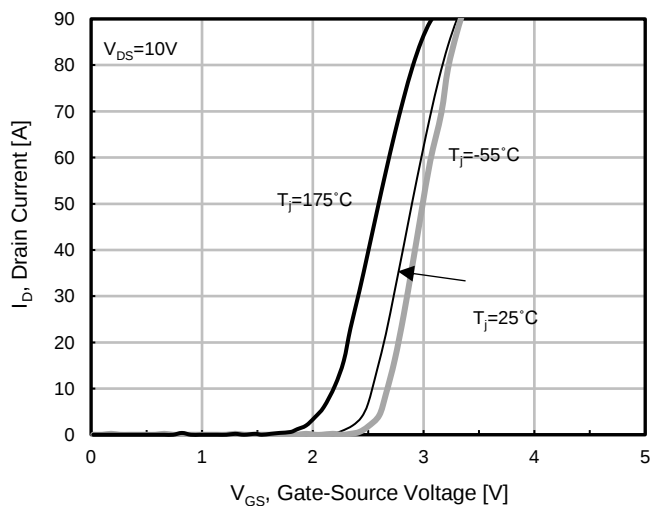


Fig. 5. Typ. Transfer Characteristics

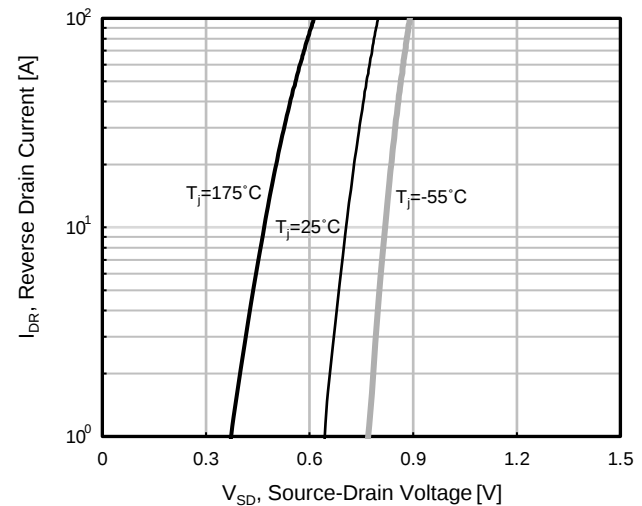


Fig. 6. Forward Characteristics of Reverse Diode

## ELECTRICAL CHARACTERISTICS DIAGRAMS

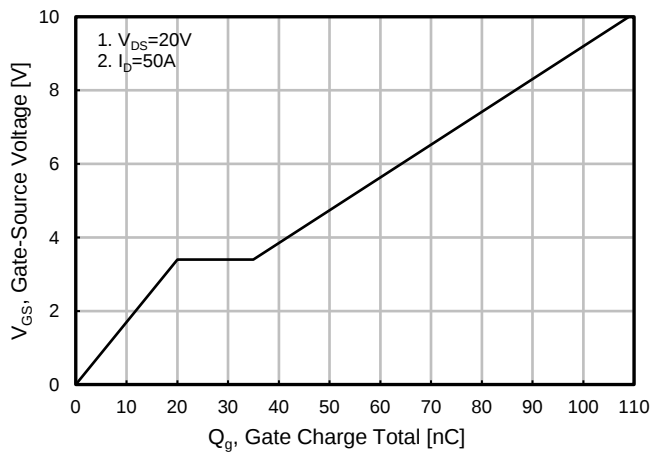


Fig. 7. Typ. Gate Charge

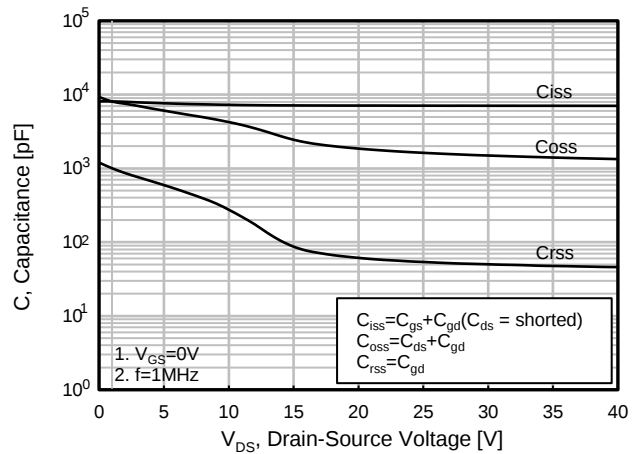


Fig. 8. Typ. Capacitance

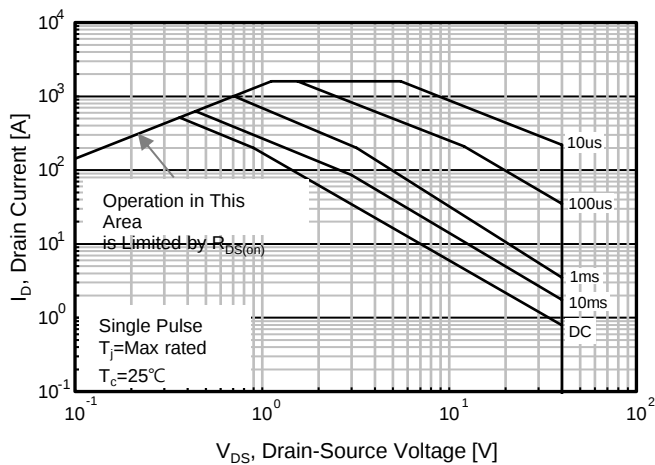


Fig. 9. Safe Operating Area

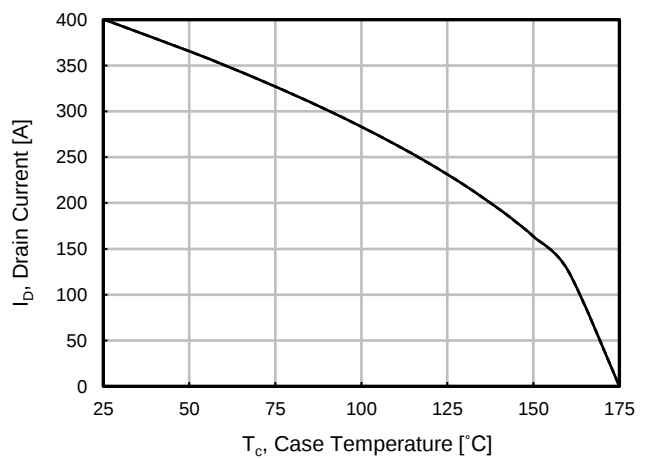


Fig. 10. Drain Current vs. Temperature

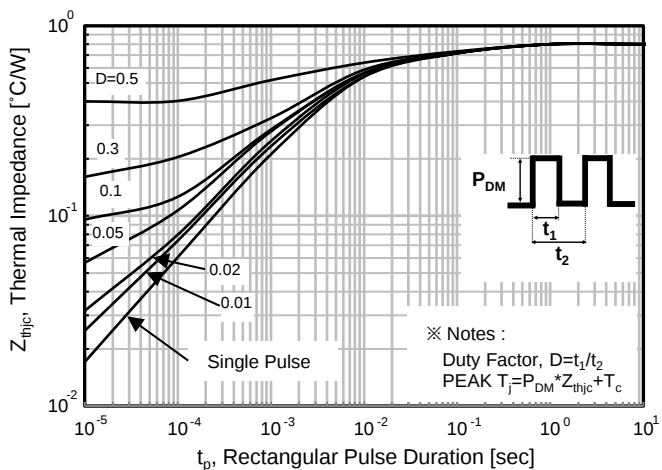
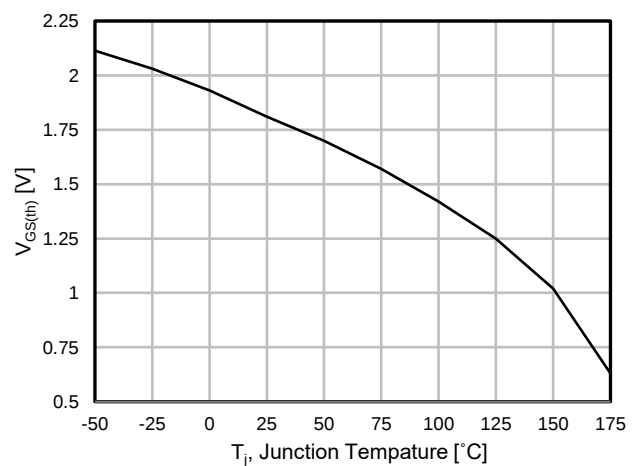


Fig. 11. Transient Thermal Impedance

Fig. 12.  $V_{GS(th)}$  Variation with Temperature

ELECTRICAL CHARACTERISTICS DIAGRAMS

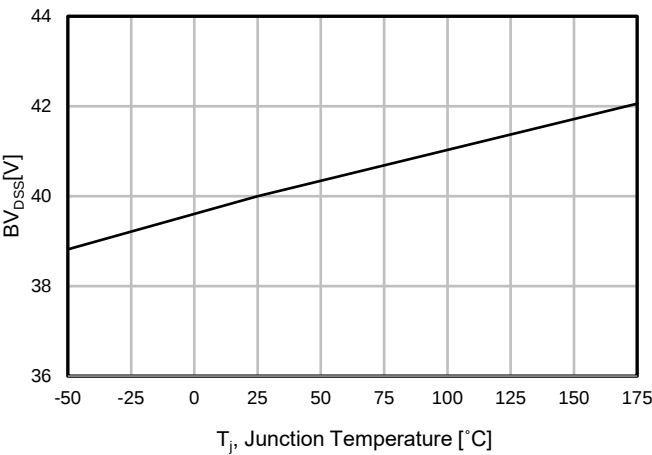
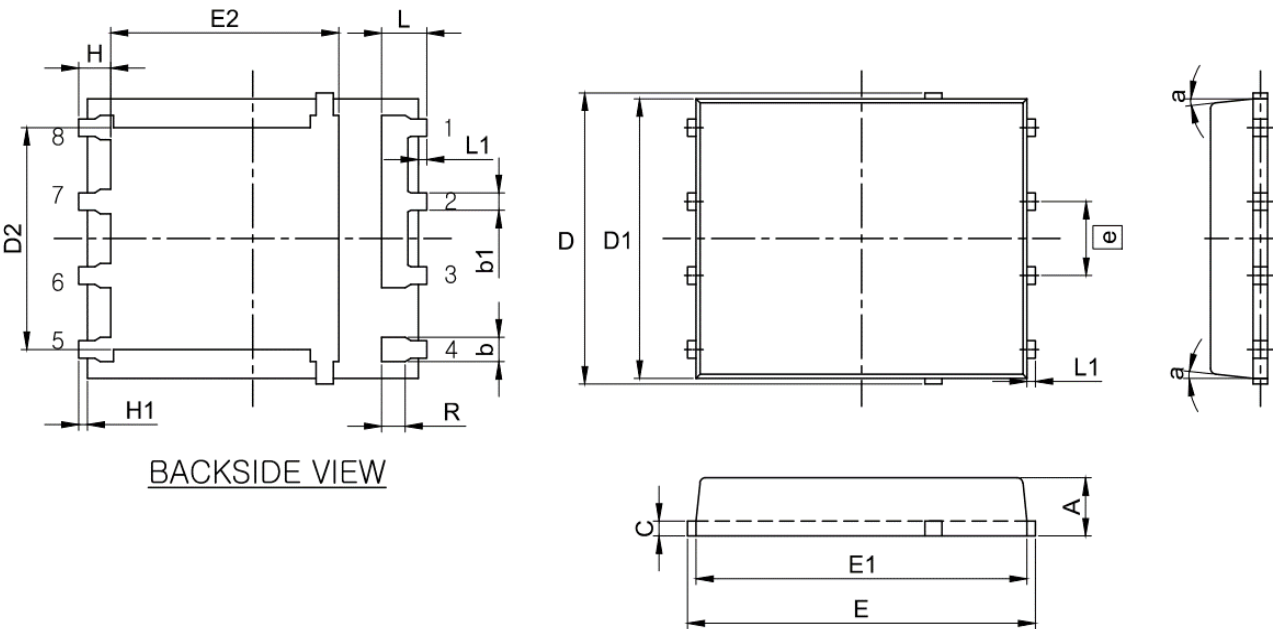


Fig. 13.  $BV_{DSS}$  Variation with Temperature

# Package Outlines

PFDN56



| Symbol | Dimension (mm) |      |      |
|--------|----------------|------|------|
|        | Min            | Nom  | Max  |
| A      | 0.90           | –    | 1.10 |
| b      | 0.33           | –    | 0.49 |
| b1     | 0.26           | –    | 1.36 |
| C      | 0.20           | 0.25 | 0.34 |
| D      | 4.50           | 5.15 | 5.30 |
| D1     | 4.50           | 5.00 | 5.10 |
| D2     | 3.65           | –    | 3.95 |
| E      | 5.90           | 6.15 | 6.30 |
| E1     | 5.85           | 6.00 | 6.10 |
| E2     | 3.46           | –    | 3.86 |
| e      | 1.27 BSC       |      |      |
| H      | 0.50           | –    | 0.71 |
| H1     | 0.03           | –    | 0.13 |
| L      | 0.74           | –    | 0.84 |
| L1     | 0.03           | –    | 0.13 |
| R      | 0.48           | –    | 0.58 |
| a      | 0°             | –    | 12°  |

Notes

Package body size, length and width do not include mold flash, protrusions and gate burrs.

**DISCLAIMER :**

The Products are not designed for use in hostile environments, including, without limitation, aircraft, nuclear power generation, medical appliances, and devices or systems in which malfunction of any Product can reasonably be expected to result in a personal injury. Seller's customers using or selling Seller's products for use in such applications do so at their own risk and agree to fully defend and indemnify Seller.

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