

**Features**

- Uses PingWei advanced PerfectMOS2 technology
- Extremely low on-resistance  $R_{DS(on)}$
- Excellent  $Q_g \times R_{DS(on)}$  product(FOM)
- Qualified according to AEC-Q101 criteria

**Benefits**

- High robustness and reliability
- Increases maximum current capability
- Low power loss, high power density
- Easy paralleling
- Solid design of source leadframe

**Applications**

- General Automotive Applications
- Motor Drivers
- Switching Mode Power Supply

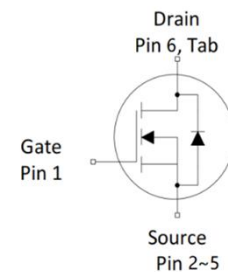
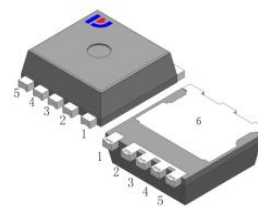


**100% DVDS Tested**  
**100% Avalanche Tested**

**Product Summary**

|                      |        |
|----------------------|--------|
| $V_{DS}$             | 40V    |
| $R_{DS(on)}@10V$ typ | 0.85mΩ |
| $I_D$ (Silicon)      | 315A   |

STOLL

**Package Marking and Ordering Information**

| Part #       | Marking    | Package | Packing   | Reel Size | Tape Width | Qty     |
|--------------|------------|---------|-----------|-----------|------------|---------|
| PWC010N04USQ | C010N04USQ | STOLL   | Tape&Reel | 13 inches | 16mm       | 1800pcs |

**Absolute Maximum Ratings**

| Parameter                                                                                                                                                                                         | Symbol                | Value                   | Unit             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------|------------------|
| Drain-source voltage                                                                                                                                                                              | $V_{DS}$              | 40                      | V                |
| Continuous drain current<br>$T_C = 25^\circ\text{C}$ (Silicon limit)<br>$T_C = 100^\circ\text{C}$ (Silicon limit)<br>$T_C = 25^\circ\text{C}$ (Package limit)<br>$T_a = 25^\circ\text{C}$ (Note1) | $I_D$                 | 315<br>223<br>180<br>42 | A                |
| Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p = 100\mu\text{s}$ )                                                                                                                        | $I_{D \text{ pulse}}$ | 1199                    | A                |
| Avalanche energy, single pulse ( $L=0.1\text{mH}$ )                                                                                                                                               | $E_{AS}$              | 286                     | mJ               |
| Gate-Source voltage                                                                                                                                                                               | $V_{GS}$              | $\pm 20$                | V                |
| Power dissipation<br>$T_C = 25^\circ\text{C}$                                                                                                                                                     | $P_{tot}$             | 181                     | W                |
| Operating junction and storage temperature                                                                                                                                                        | $T_j, T_{stg}$        | -55...+175              | $^\circ\text{C}$ |
| Reflow soldering temperature (10s)                                                                                                                                                                | $T_{sold}$            | 260                     | $^\circ\text{C}$ |

**Thermal Resistance**

| Parameter                              | Symbol | Value |      |      | Unit | Test Condition |
|----------------------------------------|--------|-------|------|------|------|----------------|
|                                        |        | min.  | typ. | max. |      |                |
| Thermal resistance, junction – case.   | RthJC  | -     | -    | 0.83 | °C/W | -              |
| Thermal resistance, junction - ambient | RthJA  | -     | -    | 47   | °C/W | Note 1         |

**Electrical Characteristic (at Tj = 25 °C, unless otherwise specified)**

| Parameter | Symbol | Value |      |      | Unit | Test Condition |
|-----------|--------|-------|------|------|------|----------------|
|           |        | min.  | typ. | max. |      |                |

**Static Characteristic**

|                                  |                     |    |      |          |    |                                                                                            |
|----------------------------------|---------------------|----|------|----------|----|--------------------------------------------------------------------------------------------|
| Drain-source breakdown voltage   | BV <sub>DSS</sub>   | 40 | -    | -        | V  | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                                 |
| Gate threshold voltage           | V <sub>GS(th)</sub> | 2  | -    | 4        | V  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                   |
| Zero gate voltage drain current  | I <sub>DSS</sub>    | -  | -    | 1<br>100 | μA | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V<br>T <sub>j</sub> =25°C<br>T <sub>j</sub> =150°C |
| Gate-source leakage current      | I <sub>GSS</sub>    | -  | -    | ±100     | nA | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                                 |
| Drain-source on-state resistance | R <sub>DS(on)</sub> | -  | 0.85 | 1.0      | mΩ | V <sub>GS</sub> =10V, I <sub>D</sub> =50A                                                  |
| Transconductance                 | g <sub>fs</sub>     | -  | 109  | -        | S  | V <sub>DS</sub> =5V, I <sub>D</sub> =50A                                                   |

**Dynamic Characteristic**

|                              |                     |   |      |   |    |                                                                                              |
|------------------------------|---------------------|---|------|---|----|----------------------------------------------------------------------------------------------|
| Input Capacitance            | C <sub>iss</sub>    | - | 5410 | - | pF | V <sub>GS</sub> =0V, V <sub>DS</sub> =20V,<br>f=100KHz                                       |
| Output Capacitance           | C <sub>oss</sub>    | - | 2235 | - |    |                                                                                              |
| Reverse Transfer Capacitance | C <sub>rss</sub>    | - | 98   | - |    |                                                                                              |
| Gate Total Charge            | Q <sub>G</sub>      | - | 76   | - | nC | V <sub>DS</sub> =20V, I <sub>D</sub> =75A,<br>V <sub>GS</sub> =10V                           |
| Gate-Source charge           | Q <sub>gs</sub>     | - | 23   | - |    |                                                                                              |
| Gate-Drain charge            | Q <sub>gd</sub>     | - | 12   | - |    |                                                                                              |
| Turn-on delay time           | t <sub>d(on)</sub>  | - | 16   | - | ns | V <sub>GS</sub> =10V, V <sub>DD</sub> =20V,<br>R <sub>G_ext</sub> =1.6Ω, I <sub>D</sub> =20A |
| Rise time                    | t <sub>r</sub>      | - | 26   | - |    |                                                                                              |
| Turn-off delay time          | t <sub>d(off)</sub> | - | 60   | - |    |                                                                                              |
| Fall time                    | t <sub>f</sub>      | - | 25   | - |    |                                                                                              |
| Gate resistance              | R <sub>G</sub>      | - | 2.5  | 5 | Ω  | V <sub>GS</sub> =0V, V <sub>DS</sub> =0V,<br>f=1MHz                                          |

**Body Diode Characteristic**

| Parameter                             | Symbol      | Value |      |      | Unit | Test Condition                   |
|---------------------------------------|-------------|-------|------|------|------|----------------------------------|
|                                       |             | min.  | typ. | max. |      |                                  |
| Body Diode Forward Voltage            | $V_{SD}$    | -     | -    | 1.2  | V    | $V_{GS}=0V, I_{SD}=50A$          |
| Body Diode Continuous Forward Current | $I_S$       | -     | -    | 180  | A    | TC = 25°C                        |
| Body Diode Pulsed Current             | $I_S$ pulse | -     | -    | 1199 | A    | TC = 25°C, $t_p = 100\mu s$      |
| Body Diode Reverse Recovery Time      | $t_{rr}$    | -     | 49   | -    | ns   | $I_F=20A,$<br>$dI/dt=100A/\mu s$ |
| Body Diode Reverse Recovery Charge    | $Q_{rr}$    | -     | 34   | -    | nC   |                                  |

Note 1: 1 inch<sup>2</sup>, 2oz single copper FR-4 PCB.

## Typical Performance Characteristics

Fig 1: Output Characteristics

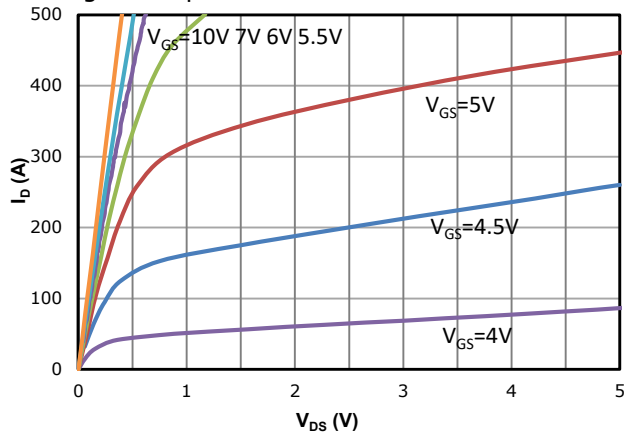


Fig 2: Transfer Characteristics

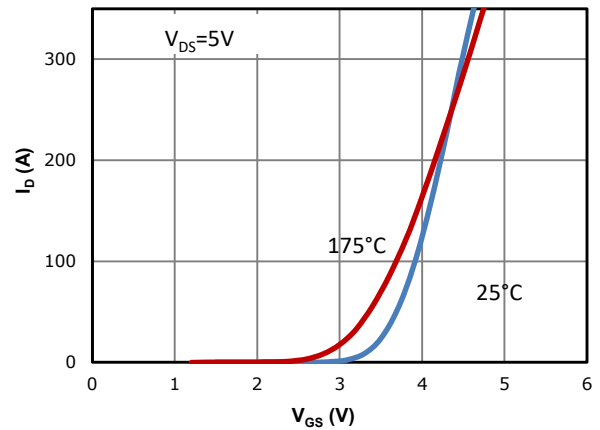


Fig 3:  $R_{DS(on)}$  vs Drain Current and Gate Voltage

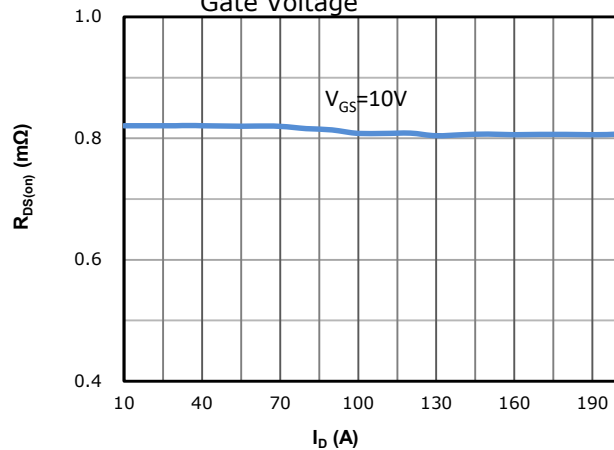


Fig 4:  $R_{DS(on)}$  vs Gate Voltage

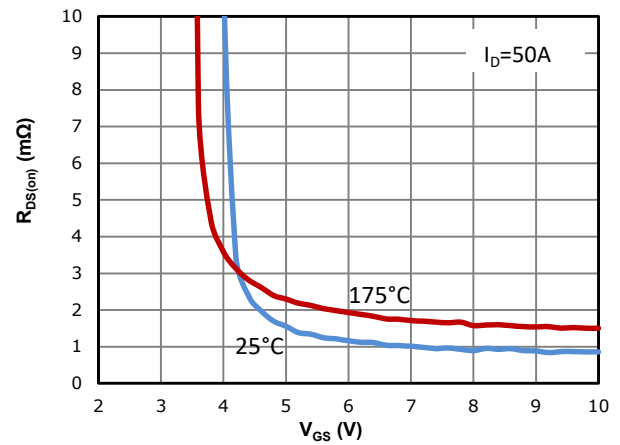


Fig 5:  $R_{DS(on)}$  vs. Temperature

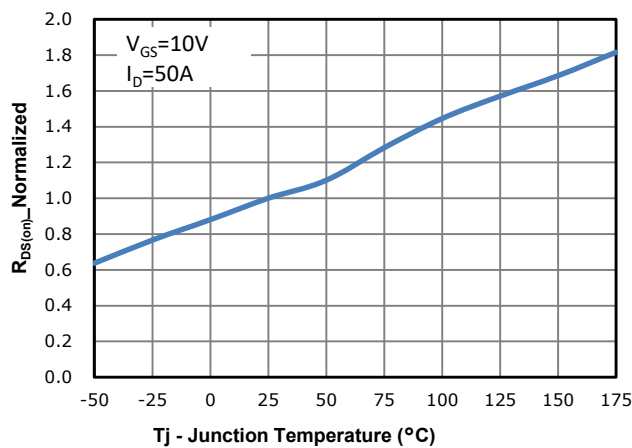


Fig 6:  $V_{GS(th)}$  vs. Temperature

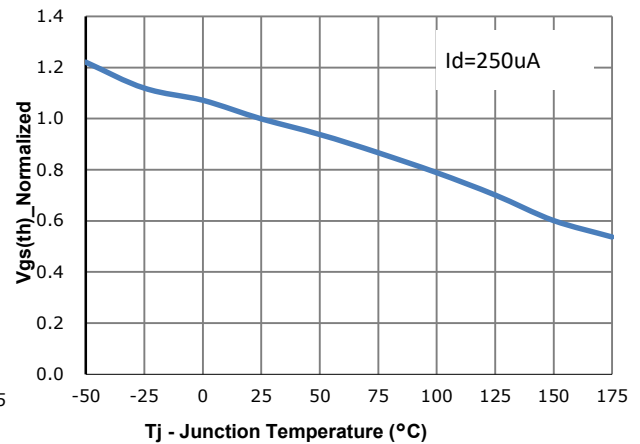


Fig 7: BVdss vs. Temperature

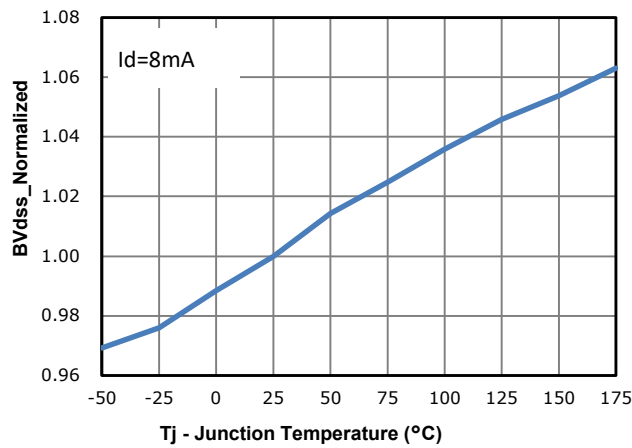


Fig 8: Capacitance Characteristics

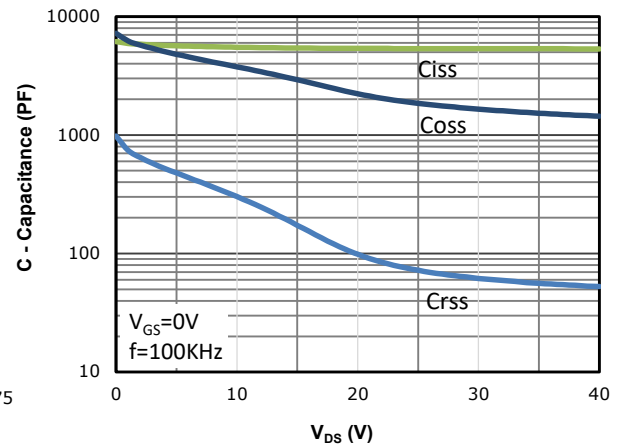


Fig 9: Gate Charge Characteristics

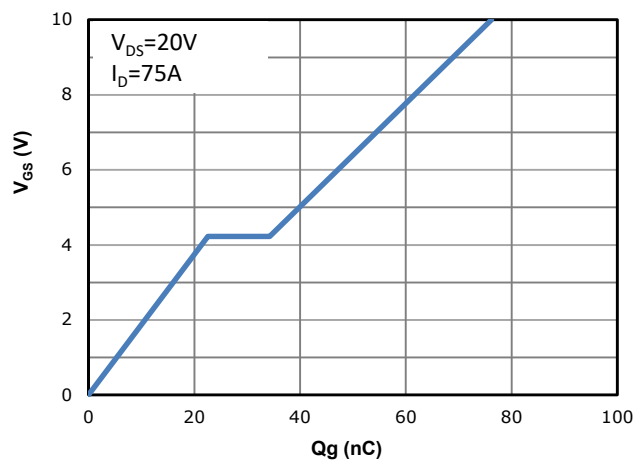


Fig 10: Body-diode Forward Characteristics

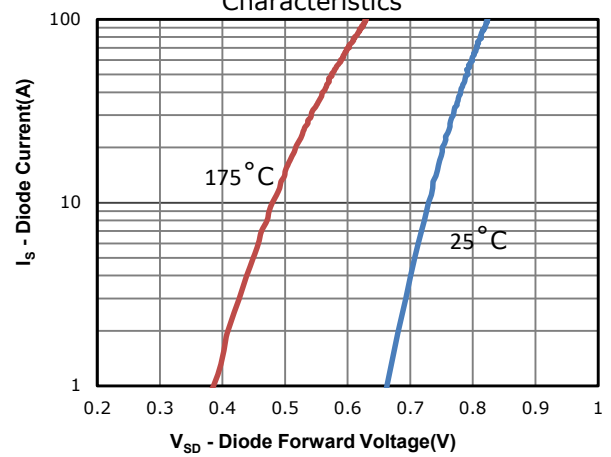


Fig 11: Power Dissipation

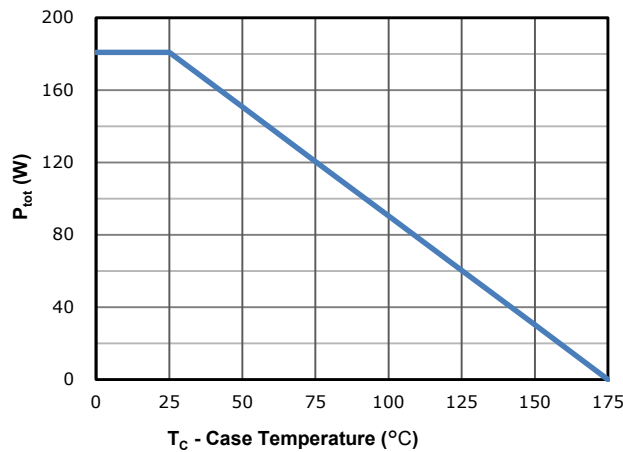


Fig 12: Drain Current Derating

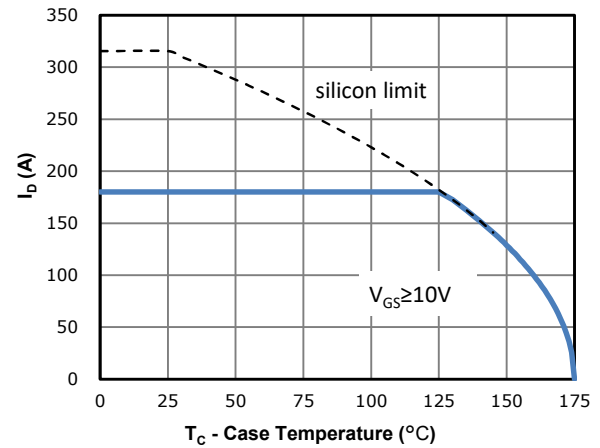


Fig 13: Safe Operating Area

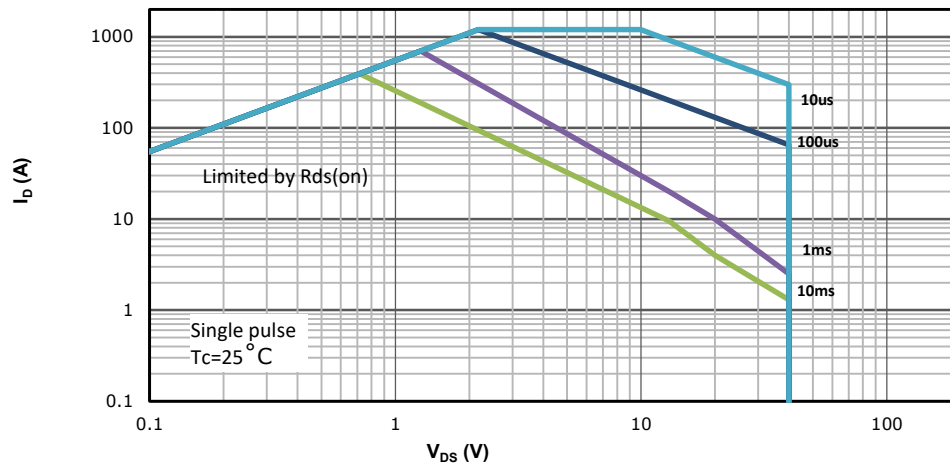
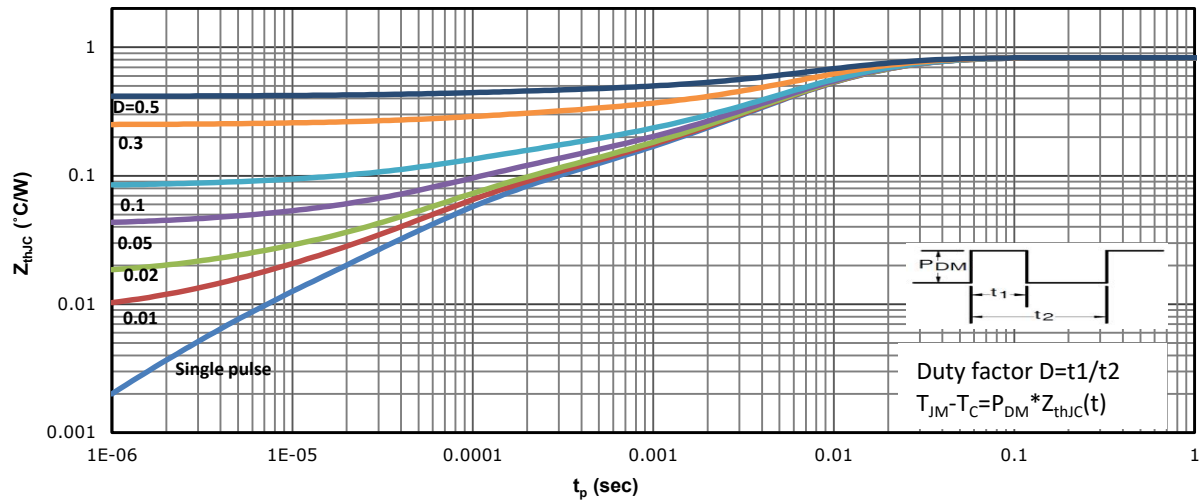
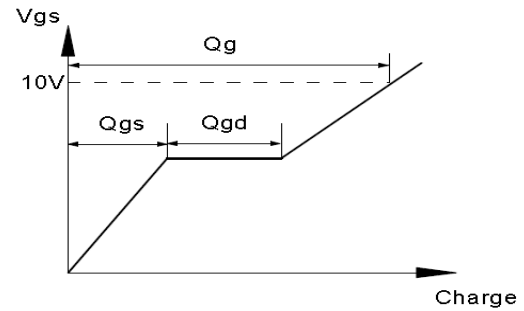
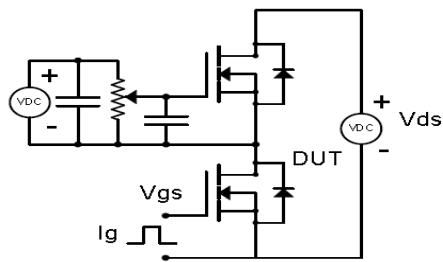


Fig 14: Max. Transient Thermal Impedance

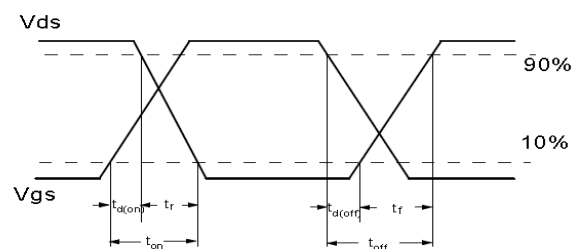
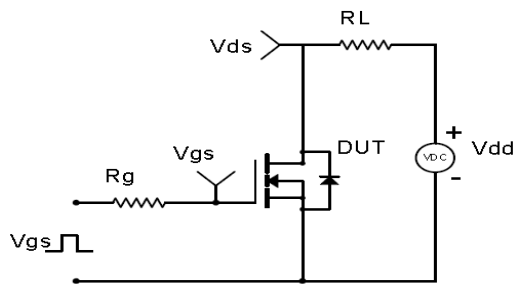


## Test Circuit & Waveform

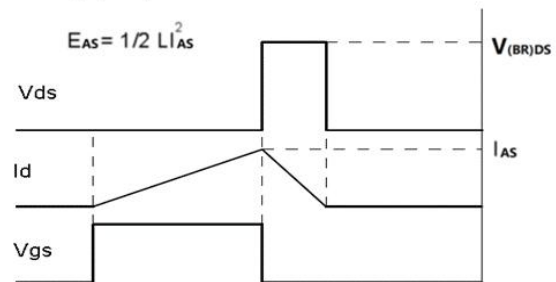
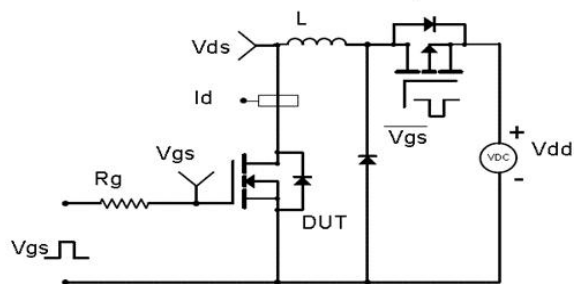
Gate Charge Test Circuit & Waveform



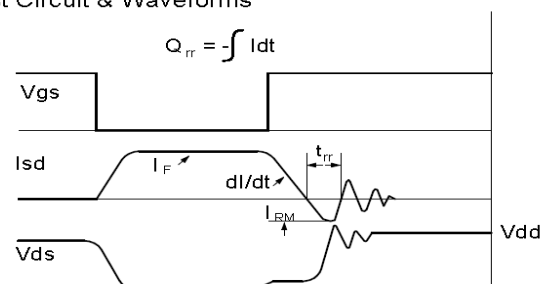
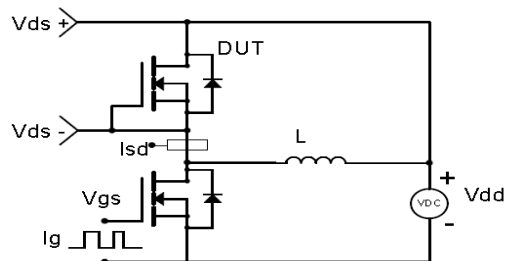
Resistive Switching Test Circuit & Waveforms



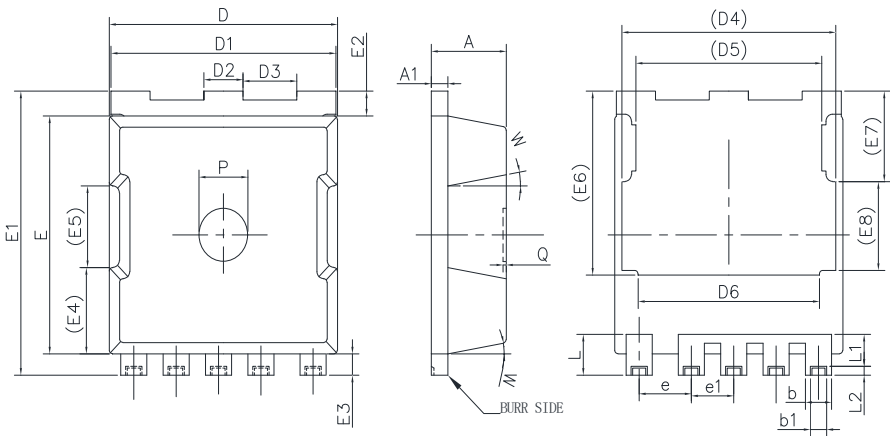
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Outline: STOLL



| SYMBOL | MILLIMETERS |      | INCHES |       |
|--------|-------------|------|--------|-------|
|        | MIN         | MAX  | MIN    | MAX   |
| A      | 2.20        | 2.40 | 0.087  | 0.094 |
| A1     | 0.40        | 0.60 | 0.016  | 0.024 |
| b      | 0.70        | 0.90 | 0.028  | 0.035 |
| b1     | 0.40        | 0.60 | 0.016  | 0.024 |
| D      | 6.80        | 7.20 | 0.268  | 0.283 |
| D1     | 6.80        | 7.20 | 0.268  | 0.283 |
| D2     | 1.10        | 1.30 | 0.043  | 0.051 |
| D3     | 1.55        | 1.75 | 0.061  | 0.069 |
| D4     | 6.56        |      | 0.258  |       |
| D5     | 5.70        |      | 0.224  |       |
| D6     | 5.56        |      | 0.219  |       |
| E      | 6.50        | 6.90 | 0.256  | 0.272 |
| E1     | 7.80        | 8.20 | 0.307  | 0.323 |
| E2     | 0.60        | 0.80 | 0.024  | 0.031 |
| E3     | 0.50        | 0.70 | 0.020  | 0.028 |
| E4     | 2.43        |      | 0.096  |       |
| E5     | 2.30        |      | 0.091  |       |
| E6     | 5.18        |      | 0.204  |       |
| E7     | 2.55        |      | 0.100  |       |
| E8     | 2.50        |      | 0.098  |       |
| e      | 1.60        |      | 0.063  |       |
| e1     | 1.30        |      | 0.051  |       |
| L      | 1.05        | 1.25 | 0.041  | 0.049 |
| L1     | 0.80        | 1.00 | 0.031  | 0.039 |
| L2     | 0.15        | 0.35 | 0.006  | 0.014 |
| P      | 1.40        | 1.60 | 0.055  | 0.063 |
| Q      | 0.00        | 0.10 | 0.000  | 0.004 |
| W      | 8°          | 11°  | 8°     | 11°   |

**Revision History**

| Revision | Date      | Major changes             |
|----------|-----------|---------------------------|
| 1.0      | 2025/7/31 | Release of Formal Version |

**Disclaimer**

Any and all semiconductor products have certain probability to fail or malfunction, which may result in personal injury, death or property damage. Customer are solely responsible for providing adequate safe measures when design their systems.

The product is not intended for use in applications that require extraordinary levels of quality and reliability, such as aviation/aerospace and life-support devices or systems.

Buyer is responsible for its products and applications using PingWei products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by PingWei.

"Typical" parameters which may be provided in PingWei data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE