

180A 80V N-channel Enhancement Mode Power MOSFET

1 Description

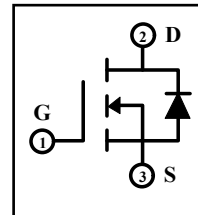
These N-channel enhancement mode power mosfets used advanced trench technology design, provided excellent $R_{DS(on)}$ and low gate charge. Which accords with the RoHS standard.

2 Features

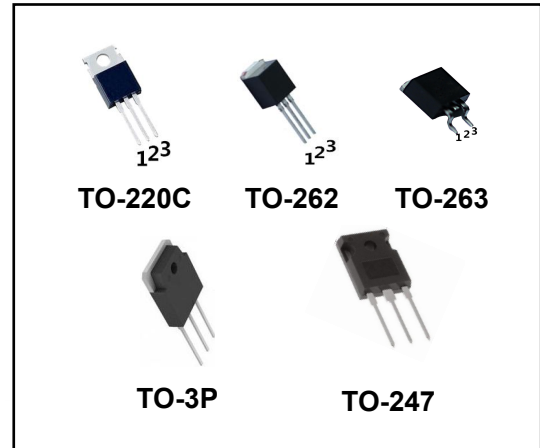
- Fast switching
- Low on resistance
- Low gate charge
- Low reverse transfer capacitances
- 100% single pulse avalanche energy test
- 100% ΔV_{DS} test

3 Applications

- Switching power supply
- DC-DC converters
- Power tool control
- Automotive electronics applications



| |
|----------------------------------|
| $V_{DSS} = 80V$ |
| $R_{DS(on)} (Type) = 2.8m\Omega$ |
| $I_D = 180A$ |



4 Electrical Characteristics

4.1 Absolute Maximum Ratings ($T_c=25^\circ C$, unless otherwise noted)

| Parameter | Symbol | Rating | | Units | |
|--|-----------|---------------------------|--------------------|------------|---|
| | | DH8004 DHI8004/DHE8004 | DH8004D DH8004B | | |
| Drain-to-Source Voltage | V_{DSS} | 80 | | V | |
| Gate-to-Source Voltage | V_{GSS} | ± 25 | | V | |
| Continuous Drain Current | I_D | $T_c=25^\circ C$ | 180 | A | |
| | | $T_c=100^\circ C$ | 134 | A | |
| Pulsed Drain Current ⁽¹⁾ | I_{DM} | 780 | | A | |
| Single Pulse Avalanche Energy ⁽⁴⁾ | E_{AS} | 1720 | | mJ | |
| Avalanche Current ⁽⁴⁾ | I_{AS} | 50 | | A | |
| Power Dissipation | P_{tot} | $T_a=25^\circ C$ | 2 | 3 | W |
| | | $T_c=25^\circ C$ | 245 | 245 | W |
| Junction Temperature Range | T_j | -55~175 | | $^\circ C$ | |
| Storage Temperature Range | T_{stg} | -55~175 | | $^\circ C$ | |
| Maximum Temperature for soldering | T_L | 300 | | $^\circ C$ | |

4.2 Thermal Characteristics

| Parameter | Symbol | Rating | | Unit |
|---|-----------------|---------------------------|--------------------|--------------|
| | | DH8004 DHI8004/DHE8004 | DH8004D DH8004B | |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.61 | 0.61 | $^\circ C/W$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 75 | 50 | $^\circ C/W$ |

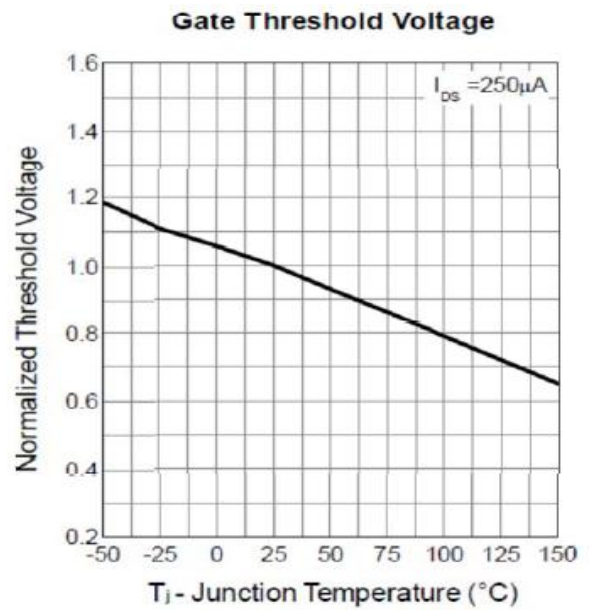
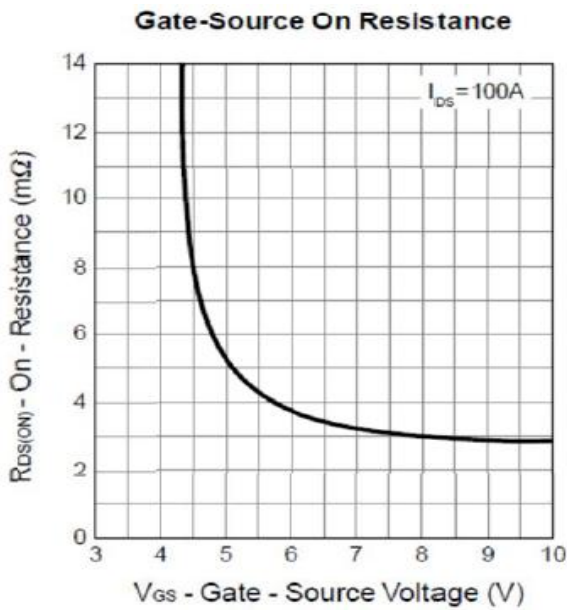
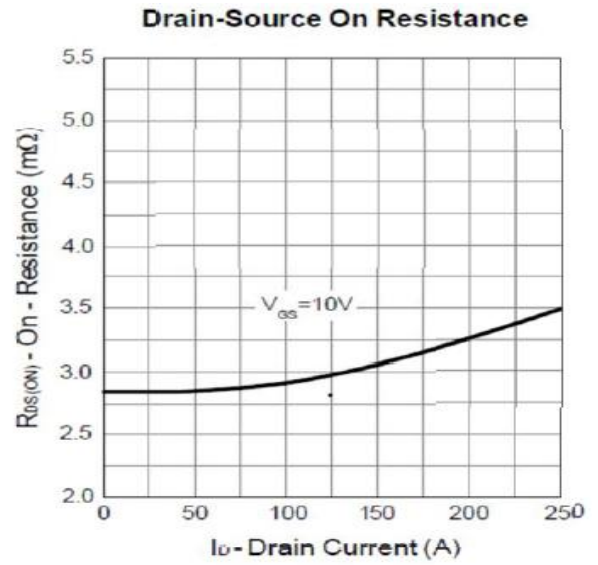
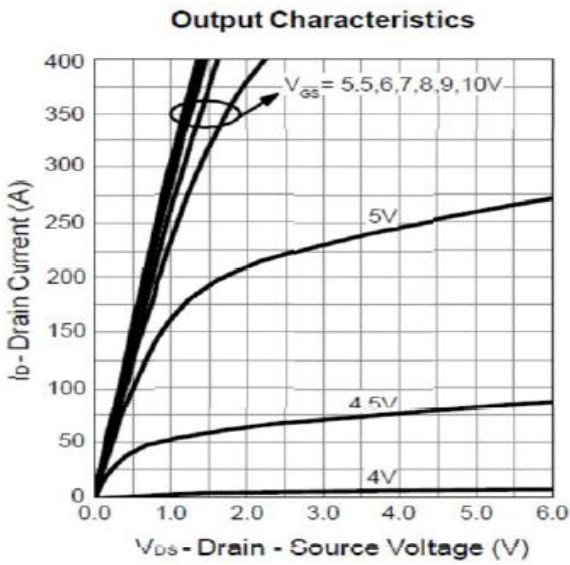
4.3 Electrical Characteristics (T_c=25°C, unless otherwise noted)

| Parameter | Symbol | Test Condition | Value | | | Units |
|---|---------------------|--|-------|------|------|-------|
| | | | Min | Typ | Max | |
| Off Characteristics | | | | | | |
| Drain-to-Source Breakdown Voltage | BV _{DSS} | I _D =250μA, V _{GS} =0V | 80 | 85 | -- | V |
| Drain-to-Source Leakage Current | I _{DSS} | V _{DS} =80V, V _{GS} =0V, T _C =25°C | -- | -- | 1 | μA |
| | | V _{DS} =64V, V _{GS} =0V, T _C =125°C | -- | -- | 100 | μA |
| Gate-to-Source Leakage Current | I _{GSS} | V _{GS} =±25V, V _{DS} =0V | -- | -- | ±100 | nA |
| On Characteristics | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 2 | 3 | 4 | V |
| Drain-to-Source on-state Resistance | R _{DS(on)} | V _{GS} =10V, I _D =80A | -- | 2.8 | 4 | mΩ |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C _{iss} | V _{GS} =0V, V _{DS} =25V, f=1MHz | -- | 8200 | -- | pF |
| Output Capacitance | C _{oss} | | -- | 1030 | -- | |
| Reverse Transfer Capacitance | C _{rss} | | -- | 660 | -- | |
| Gate Resitance | R _G | V _{DD} =0V, V _{GS} =0V, f=1MHz | -- | 3.2 | -- | Ω |
| Switching Characteristics | | | | | | |
| Turn-on Delay Time | t _{d(on)} | I _D =40A, V _{DS} =40V, V _{GS} =10V, R _{GEN} =6Ω | -- | 28 | -- | nS |
| Turn-on Rise Time | t _r | | -- | 18 | -- | |
| Turn-off Delay Time | t _{d(off)} | | -- | 44 | -- | |
| Turn-off Fall Time | t _f | | -- | 55 | -- | |
| Total Gate Charge | Q _g | I _D =40A, V _{DS} =40V, V _{GS} =10V | -- | 195 | -- | nC |
| Gate-to-Source Charge | Q _{gs} | | -- | 32 | -- | |
| Gate-to-Drain("Miller") Charge | Q _{gd} | | -- | 74 | -- | |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage ⁽³⁾ | V _{FSD} | V _{GS} =0V, I _S =180A | -- | -- | 1.3 | V |
| Diode Forward Current | I _S | | -- | -- | 180 | A |
| Reverse Recovery Time ⁽³⁾ | t _{rr} | T _J =25°C, I _F =40A, di _F /dt=100A/μS, V _{GS} =0V | -- | 30 | -- | nS |
| Reverse Recovery Charge ⁽³⁾ | Q _{rr} | | -- | 54 | -- | nC |

Notes:

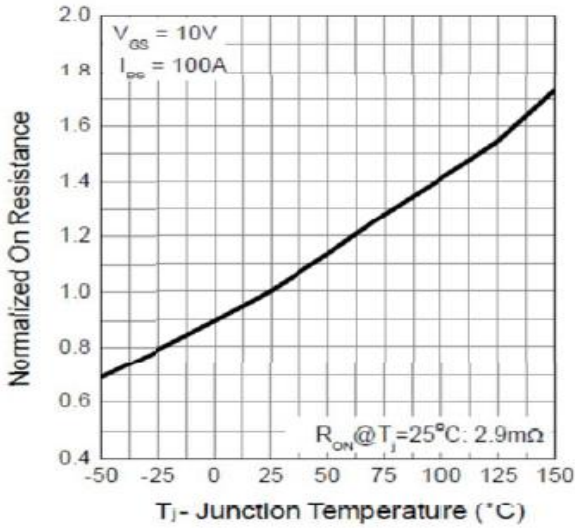
- 1: Repetitive rating, pulse width limited by maximum junction temperature.
- 2: Surface mounted on FR4 Board, t_s≤10sec.
- 3: Pulse width ≤ 300μs, duty cycle ≤ 2%.
- 4: L=0.5mH, I_D=83A, V_{DD}=64V, V_{GATE}=80V, Start T_J=25°C.

5 Typical characteristics diagrams

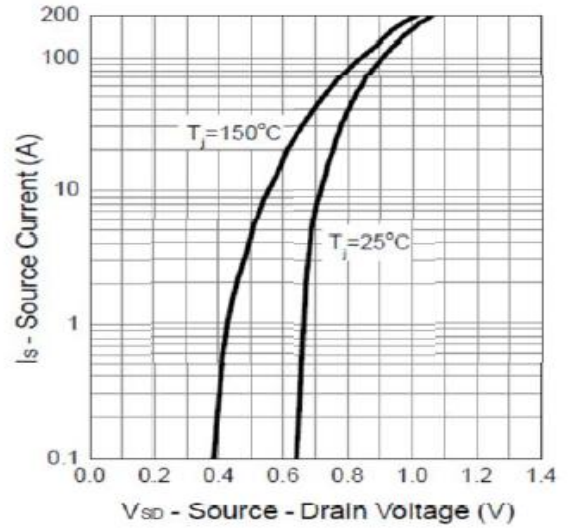


5 Typical characteristics diagrams(continues)

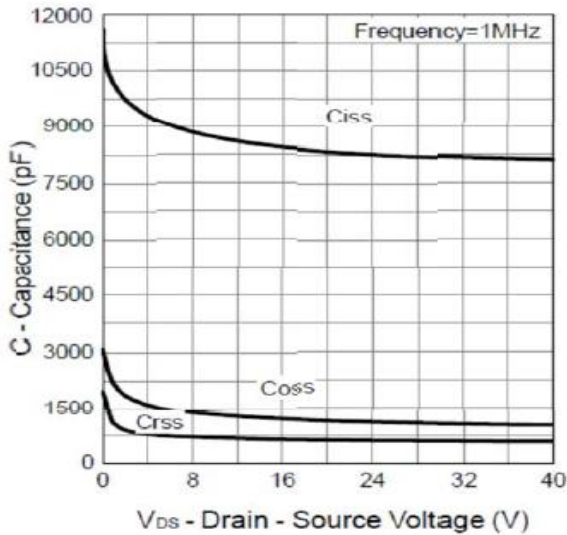
Drain-Source On Resistance



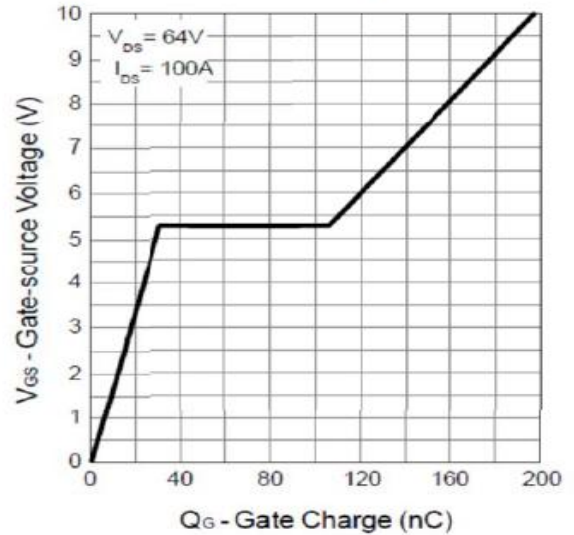
Source-Drain Diode Forward



Capacitance

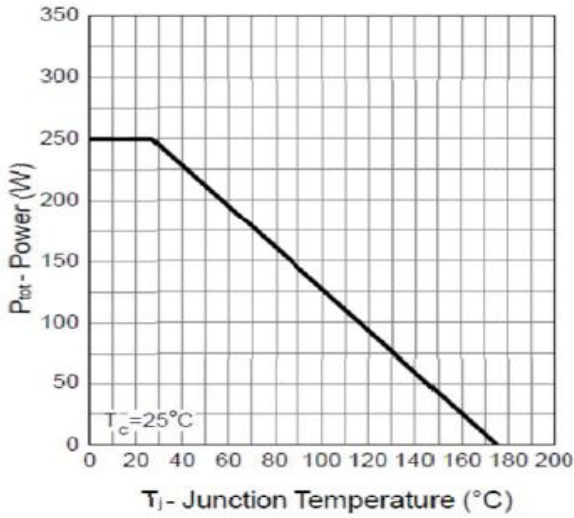


Gate Charge

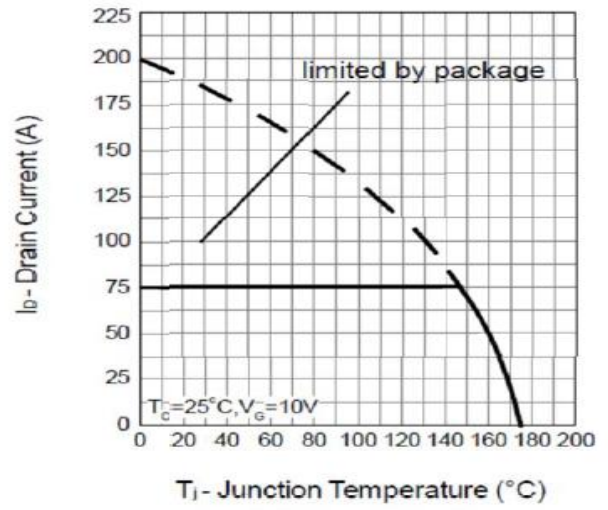


5 Typical characteristics diagrams(continues)

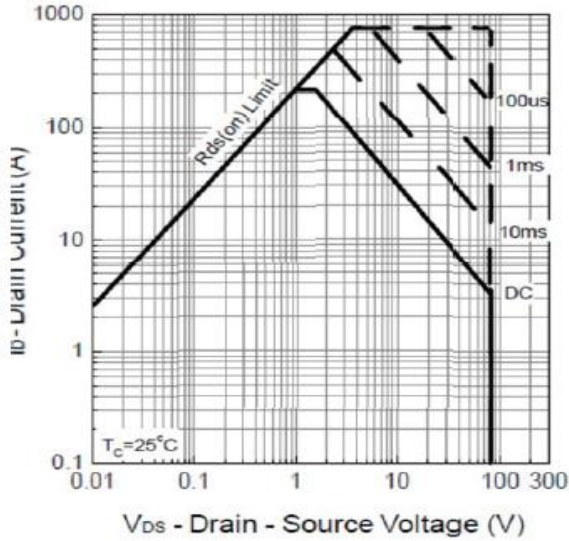
Power Dissipation



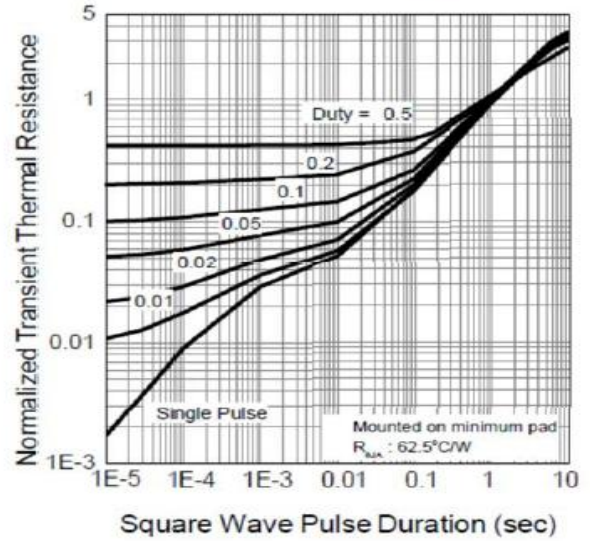
Drain Current



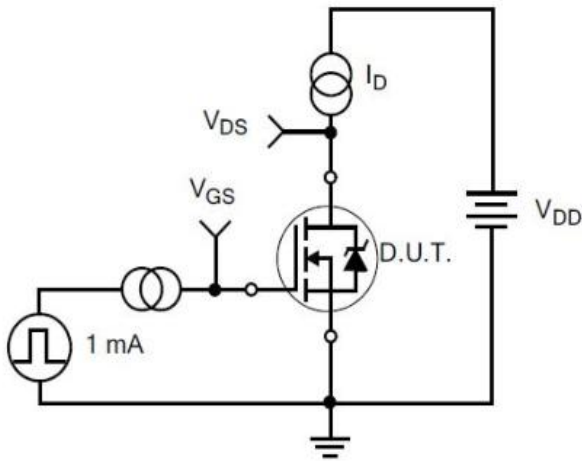
Safe Operation Area



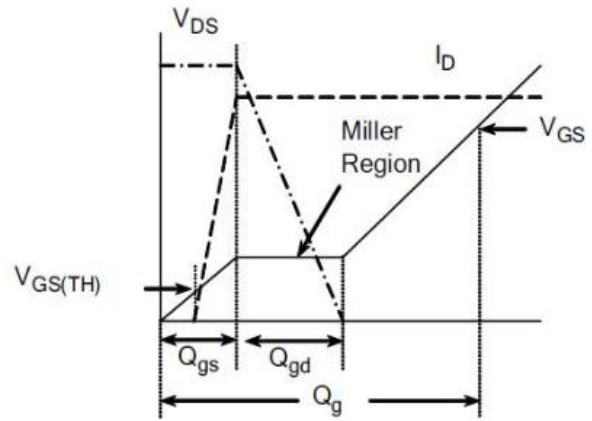
Thermal Transient Impedance



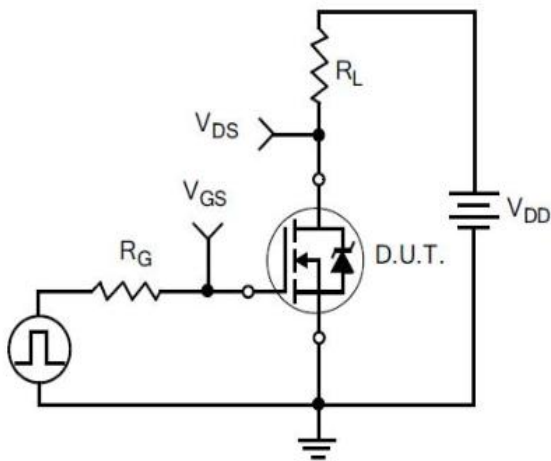
6 Typical Test Circuit and Waveform



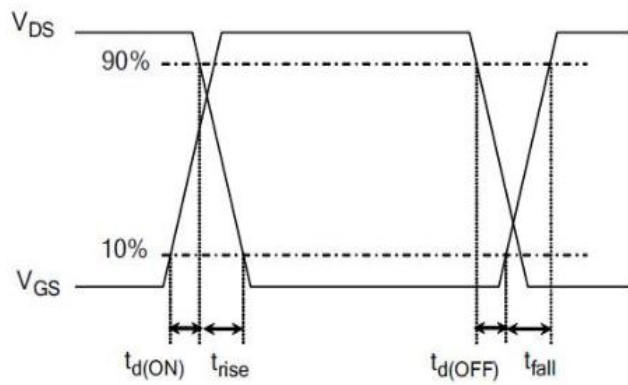
1) Gate Charge Test Circuit



2) . Gate Charge Waveform

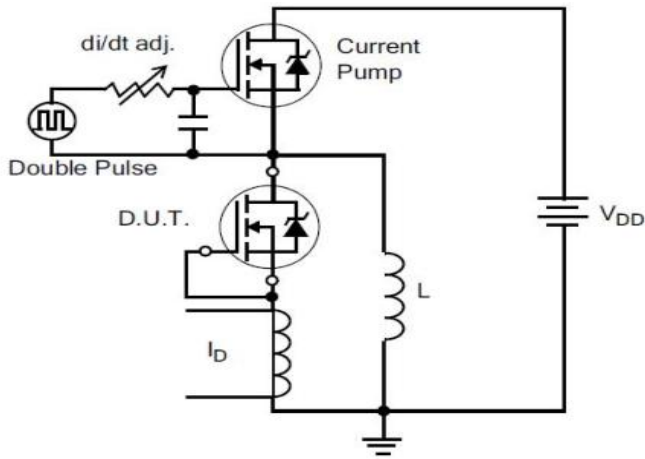


3) Resistive Switching Test Circuit

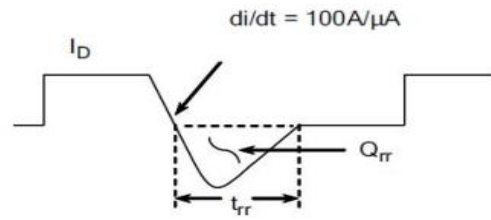


4) Resistive Switching Waveforms

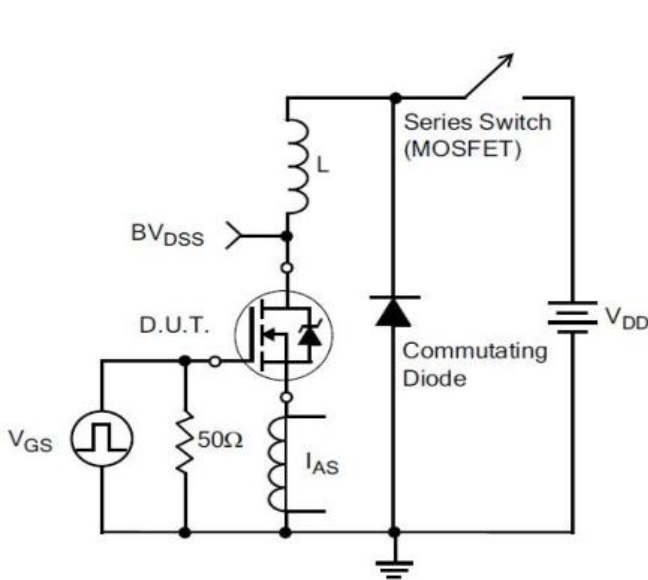
6 Typical Test Circuit and Waveform(continues)



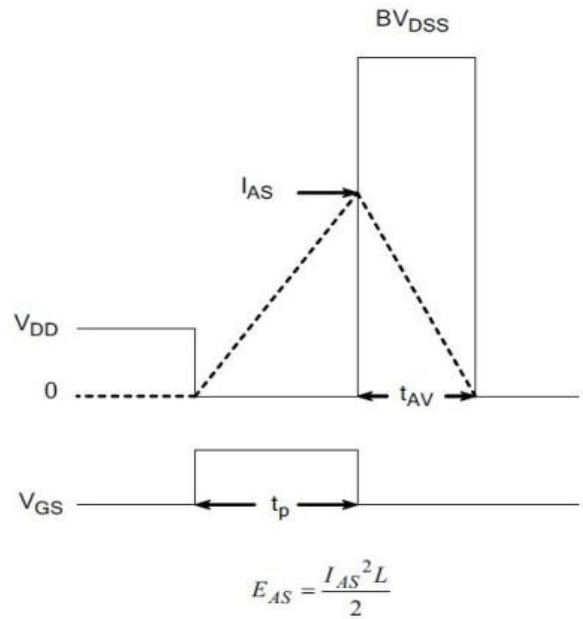
5) Diode Reverse Recovery Test Circuit



6) Diode Reverse Recovery Waveform

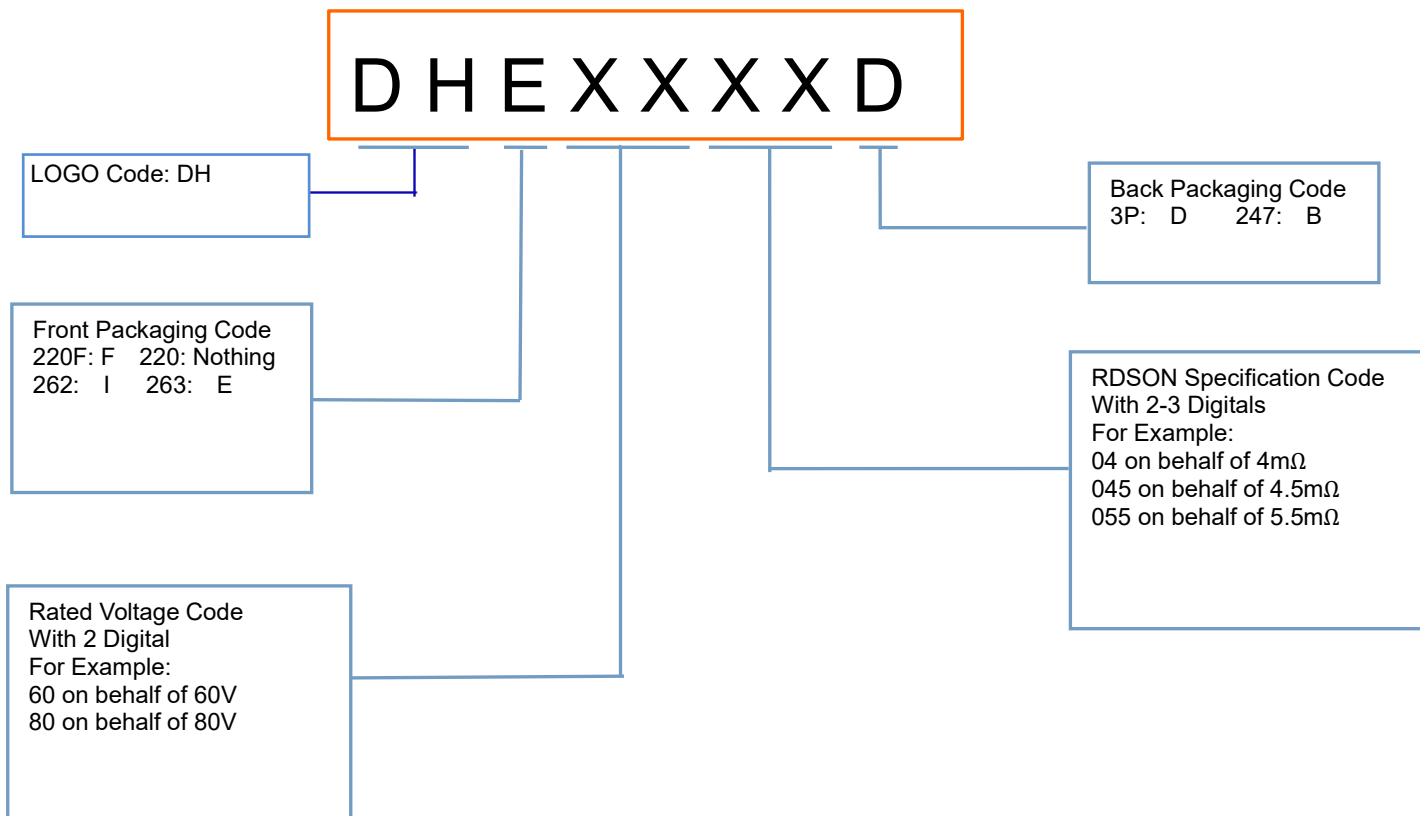


7) . Unclamped Inductive Switching Test Circuit



8) Unclamped Inductive Switching Waveforms

7 Product Names Rules

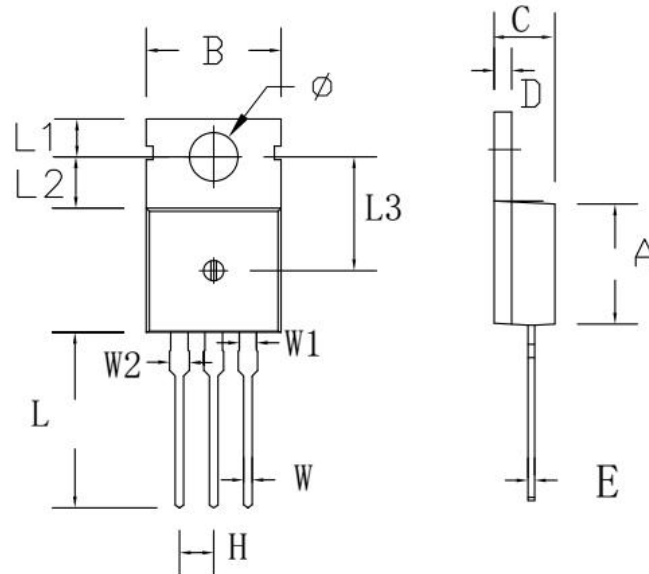


8 Product Specifications and Packaging Models

| Product Model | Package Type | Mark Name | RoHS | Package | Quantity |
|---------------|--------------|-----------|---------|-------------|----------|
| DH8004 | TO-220 | DH8004 | Pb-free | Tube | 1000/box |
| DHI8004 | TO-262 | DHI8004 | Pb-free | Tube | 1000/box |
| DHE8004 | TO-263 | DHE8004 | Pb-free | Tape & Reel | 800/box |
| DH8004D | TO-3P | DH8004D | Pb-free | Tube | 600/box |
| DH8004B | TO-247 | DH8004B | Pb-free | Tube | 600/box |

9 Dimensions

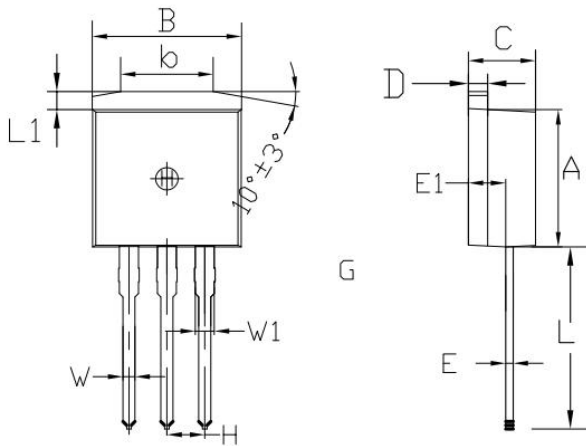
TO-220C PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | min. | max. | min. | max. |
| A | 8.80 | 9.30 | 0.346 | 0.366 |
| B | 9.70 | 10.30 | 0.382 | 0.406 |
| C | 4.25 | 4.75 | 0.167 | 0.187 |
| D | 1.20 | 1.45 | 0.047 | 0.057 |
| E | 0.40 | 0.60 | 0.016 | 0.024 |
| H | 2.54 TYP | | 0.100 TYP | |
| W | 0.60 | 0.95 | 0.024 | 0.037 |
| W1 | 1.05 | 1.45 | 0.041 | 0.057 |
| W2 | 1.20 | 1.60 | 0.047 | 0.063 |
| L | 12.60 | 13.40 | 0.496 | 0.528 |
| L1 | 2.45 | 2.95 | 0.096 | 0.116 |
| L2 | 3.45 | 3.95 | 0.136 | 0.156 |
| L3 | 8.15 | 8.65 | 0.321 | 0.341 |
| Φ | 3.50 | 3.90 | 0.138 | 0.154 |

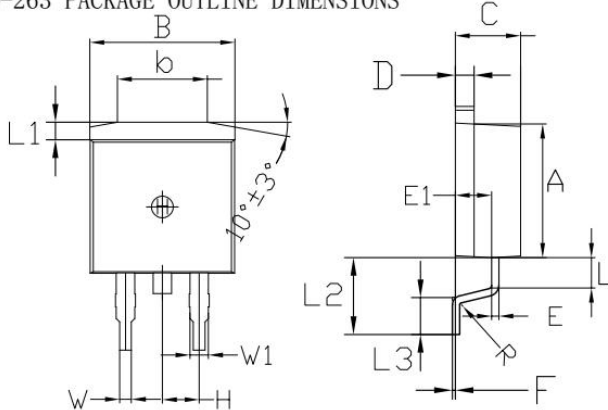
9 Dimensions(continues)

TO-262 PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|--------|
| | min. | max. | min. | max. |
| A | 8.80 | 9.30 | 0.346 | 0.366 |
| B | 9.70 | 10.30 | 0.382 | 0.406 |
| C | 4.25 | 4.75 | 0.167 | 0.187 |
| D | 1.20 | 1.45 | 0.047 | 0.057 |
| E | 0.40 | 0.60 | 0.016 | 0.024 |
| L | 12.25 | 13.75 | 0.482 | 0.541 |
| L1 | 1.15 | 1.45 | 0.045 | 0.057 |
| E1 | 2.4 | 2.6 | 0.0945 | 0.1024 |
| W | 0.80 | 0.82 | 0.0315 | 0.034 |
| W1 | 1.20 | 1.30 | 0.047 | 0.051 |
| H | 2.54 TYP | | 0.200 TYP | |
| b | 5.50 | 6.50 | 0.216 | 0.256 |

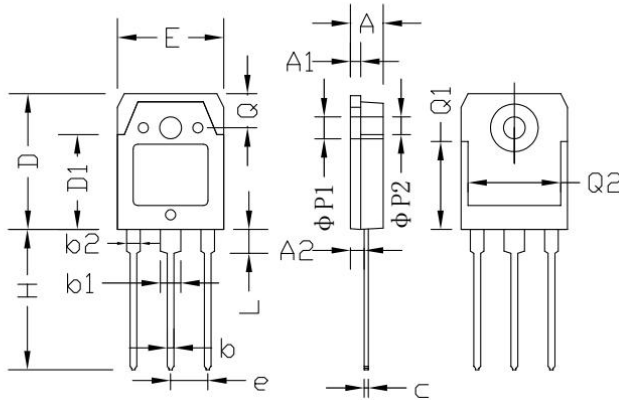
TO-263 PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|--------|
| | min. | max. | min. | max. |
| A | 8.80 | 9.30 | 0.346 | 0.366 |
| B | 9.70 | 10.30 | 0.382 | 0.406 |
| C | 4.25 | 4.75 | 0.167 | 0.187 |
| D | 1.20 | 1.45 | 0.047 | 0.057 |
| E | 0.40 | 0.60 | 0.016 | 0.024 |
| L | 1.90 | 2.30 | 0.075 | 0.091 |
| L1 | 1.15 | 1.45 | 0.045 | 0.057 |
| R | 0.24 | 0.26 | 0.0095 | 0.0102 |
| W | 0.80 | 0.82 | 0.0315 | 0.0323 |
| W1 | 1.20 | 1.30 | 0.047 | 0.051 |
| H | 2.54 TYP | | 0.200 TYP | |
| b | 5.50 | 6.50 | 0.216 | 0.256 |
| E1 | 2.4 | 2.6 | 0.0946 | 0.1024 |
| L2 | 5.20 | 5.80 | 0.205 | 0.228 |
| L3 | 2.20 | 3.20 | 0.087 | 0.126 |
| F | 0.03 | 0.23 | 0.0012 | 0.0091 |

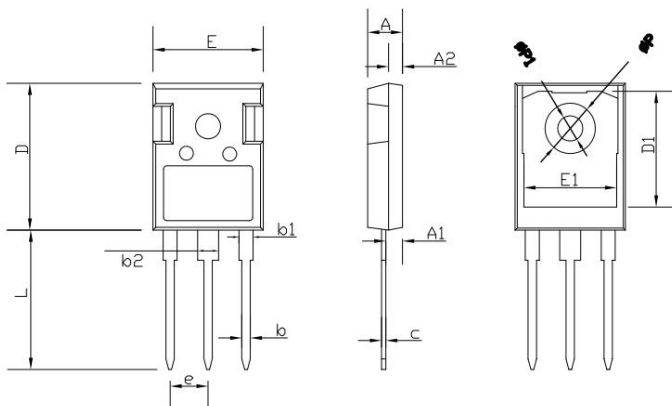
9 Dimensions(continues)

TO-3PN PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | min. | max. | min. | max. |
| A | 4.60 | 5.00 | 0.181 | 0.197 |
| A1 | 1.45 | 1.65 | 0.057 | 0.065 |
| A2 | 2.20 | 2.60 | 0.087 | 0.102 |
| b | 0.80 | 1.20 | 0.032 | 0.047 |
| b1 | 2.80 | 3.20 | 0.110 | 0.126 |
| b2 | 1.80 | 2.20 | 0.071 | 0.087 |
| C | 0.55 | 0.75 | 0.022 | 0.030 |
| D | 19.20 | 19.70 | 0.756 | 0.776 |
| D1 | 13.10 | 14.70 | 0.516 | 0.578 |
| E | 15.40 | 15.80 | 0.607 | 0.623 |
| e | 5.45 TYP | | 0.215 TYP | |
| H | 19.80 | 20.20 | 0.780 | 0.826 |
| L | 3.30 | 3.70 | 0.130 | 0.146 |
| ΦP1 | 3.20 TYP | | 0.126 TYP | |
| ΦP2 | 3.50 TYP | | 0.138 TYP | |
| Q | 5.00 TYP | | 0.197 TYP | |
| Q1 | 12.40 TYP | | 0.488 TYP | |
| Q2 | 12.6 | - | 0.496 | - |

TO-247 PACKAGE OUTLINE DIMENSIONS



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|--------|
| | min. | max. | min. | max. |
| A | 4.90 | 5.10 | 0.193 | 0.201 |
| A1 | 2.31 | 2.51 | 0.091 | 0.099 |
| A2 | 1.90 | 2.10 | 0.075 | 0.083 |
| b | 1.16 | 1.26 | 0.046 | 0.050 |
| b1 | 1.96 | 2.06 | 0.0772 | 0.0812 |
| b2 | 2.96 | 3.06 | 0.117 | 0.121 |
| c | 0.59 | 0.66 | 0.0232 | 0.0260 |
| D | 20.90 | 21.10 | 0.8235 | 0.8313 |
| D1 | 16.25 | 16.85 | 0.6403 | 0.6639 |
| E | 15.70 | 15.90 | 0.6186 | 0.6265 |
| E1 | 13.10 | 13.50 | 0.5161 | 0.5319 |
| e | 5.44 | | 0.2143 | |
| L | 19.80 | 20.10 | 0.7801 | 0.7919 |
| ΦP | 3.50 | 3.70 | 0.1379 | 0.1458 |
| ΦP1 | 0 | 7.30 | 0 | 0.2876 |

10 Attentions

- Jiangsu Donghai Semiconductor Technology CO.,LTD. reserves the right to change the specification without prior notice! The customer should obtain the latest version of the information before making the order and verify that the information is complete and up to date.
- It is the responsibility of the purchaser for any failure or failure of any semiconductor product under certain conditions. It is the responsibility of the purchaser to comply with safety standards and to take safety measures in the system design and machine manufacturing of Donghai products in order to avoid potential risk of failure. Injury or property damage.
- Product promotion is endless, our company will be dedicated to provide customers with better products.

11 Appendix

Revision history:

| Date | REV. | Description | Page |
|------------|------|-------------|------|
| 2017.04.11 | 1.0 | Original | |