
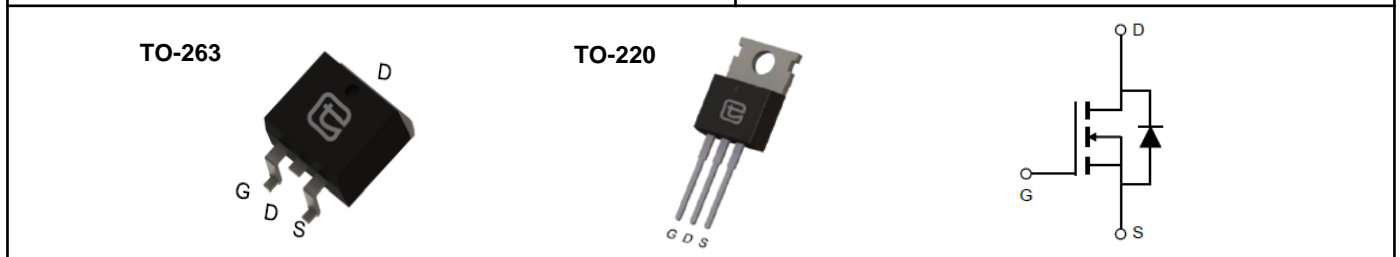




60V N-Channel Trench MOSFET

| | | | | | | | |
|--|--|----------|-----|--------------------------|------|---------------------------------|-----------------|
| <p>General Description</p> <ul style="list-style-type: none"> ● Trench Power technology ● Low $R_{DS(ON)}$ ● Low Gate Charge ● Optimized for fast-switching applications <p>Applications</p> <ul style="list-style-type: none"> ● Synchronous Rectification in DC/DC and AC/DC Converters ● Isolated DC/DC Converters in Telecom and Industrial | <p>Product Summary</p> <table border="0"> <tr> <td>V_{DS}</td> <td>60V</td> </tr> <tr> <td>I_D (at $V_{GS}=10V$)</td> <td>145A</td> </tr> <tr> <td>$R_{DS(ON)}$ (at $V_{GS}=10V$)</td> <td>< 4.8mΩ</td> </tr> </table> <p>100% UIS Tested</p>  | V_{DS} | 60V | I_D (at $V_{GS}=10V$) | 145A | $R_{DS(ON)}$ (at $V_{GS}=10V$) | < 4.8m Ω |
| V_{DS} | 60V | | | | | | |
| I_D (at $V_{GS}=10V$) | 145A | | | | | | |
| $R_{DS(ON)}$ (at $V_{GS}=10V$) | < 4.8m Ω | | | | | | |



| Part Number | Package Type | Form | Marking |
|-------------|--------------|-------------|------------|
| TTB145N06A | TO-263 | Tape & Reel | TTB145N06A |
| TTP145N06A | TO-220 | Tube | TTP145N06A |

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | Symbol | Maximum | Units |
|---|----------------|---------------------------|------------------|
| Drain-Source Voltage | V_{DS} | 60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current ^B | I_D | $T_C = 25^\circ\text{C}$ | 105 |
| | | $T_C = 100^\circ\text{C}$ | 105 |
| Pulsed Drain Current ^A | I_{DM} | 435 | A |
| Avalanche Current ^A | I_{AS} | 57 | A |
| Single Pulse Avalanche Energy $L = 0.3\text{mH}$ ^A | E_{AS} | 487 | mJ |
| Power Dissipation ^C | P_D | $T_C = 25^\circ\text{C}$ | 217 |
| | | $T_C = 100^\circ\text{C}$ | 108 |
| Junction and Storage Temperature Range | T_J, T_{STG} | -55 to 175 | $^\circ\text{C}$ |

Thermal Characteristics

| Parameter | Symbol | Maximum | Units |
|-----------------------------|-----------------|---------|--------------------|
| Maximum Junction-to-Case | $R_{\theta JC}$ | 0.69 | $^\circ\text{C/W}$ |
| Maximum Junction-to-Ambient | | | |
| | $R_{\theta JA}$ | 100 | |



| Electrical Characteristics($T_J = 25^\circ\text{C}$ unless otherwise noted) | | | | | | | |
|--|--|---|---------------------------|------|-----------|---------------|---------------|
| Symbol | Parameter | Conditions | Value | | | Units | |
| | | | Min | Typ | Max | | |
| STATIC PARAMETERS | | | | | | | |
| BV_{DSS} | Drain-Source Breakdown Voltage | $I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$ | 60 | -- | -- | V | |
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 60\text{V}, V_{GS} = 0\text{V}$ | $T_J = 25^\circ\text{C}$ | -- | -- | 1 | μA |
| | | | $T_J = 125^\circ\text{C}$ | -- | -- | 100 | |
| I_{GSS} | Gate-Body Leakage Current | $V_{DS} = 0\text{V}, V_{GS} = \pm 20\text{V}$ | -- | -- | ± 100 | nA | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}, I_D = 250\mu\text{A}$ | 2 | 3 | 4 | V | |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS} = 10\text{V}, I_D = 30\text{A}$ | -- | 3.8 | 4.8 | m Ω | |
| g_{FS} | Forward Transconductance | $V_{DS} = 5\text{V}, I_D = 20\text{A}$ | -- | 38 | -- | S | |
| V_{SD} | Diode Forward Voltage | $I_S = 30\text{A}, V_{GS} = 0\text{V}$ | -- | -- | 1 | V | |
| I_S | Maximum Body-Diode Continuous Current ^B | | -- | -- | 105 | A | |
| DYNAMIC PARAMETERS | | | | | | | |
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{V}, V_{DS} = 30\text{V}, f = 1\text{MHz}$ | -- | 6819 | -- | μF | |
| C_{oss} | Output Capacitance | | -- | 481 | -- | | |
| C_{rss} | Reverse Transfer Capacitance | | -- | 461 | -- | | |
| R_g | Gate Resistance | $f = 1\text{MHz}$ | -- | 1.6 | -- | Ω | |
| SWITCHING PARAMETERS | | | | | | | |
| Q_g | Total Gate Charge | $V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 20\text{A}$ | -- | 125 | -- | nC | |
| Q_{gs} | Gate Source Charge | | -- | 31.6 | -- | | |
| Q_{gd} | Gate Drain Charge | | -- | 36.7 | -- | | |
| $t_{D(on)}$ | Turn-On Delay Time | $V_{GS} = 10\text{V}, V_{DS} = 30\text{V}, I_D = 20\text{A}, R_G = 2.5\Omega$ | -- | 25 | -- | ns | |
| t_r | Turn-On Rise Time | | -- | 20 | -- | | |
| $T_{D(off)}$ | Turn-Off Delay Time | | -- | 72 | -- | | |
| t_f | Turn-Off Fall Time | | -- | 31 | -- | | |
| t_{rr} | Body Diode Reverse Recovery Time | $I_F = 20\text{A}, di/dt = 100\text{A}/\mu\text{s}$ | -- | 36 | -- | ns | |
| Q_{rr} | Body Diode Reverse Recovery Charge | | -- | 60 | -- | nC | |

A. Single pulse width limited by maximum junction temperature.

B. The maximum current rating is package limited.

C. The power dissipation P_D is based on $T_{J(MAX)} = 175^\circ\text{C}$, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

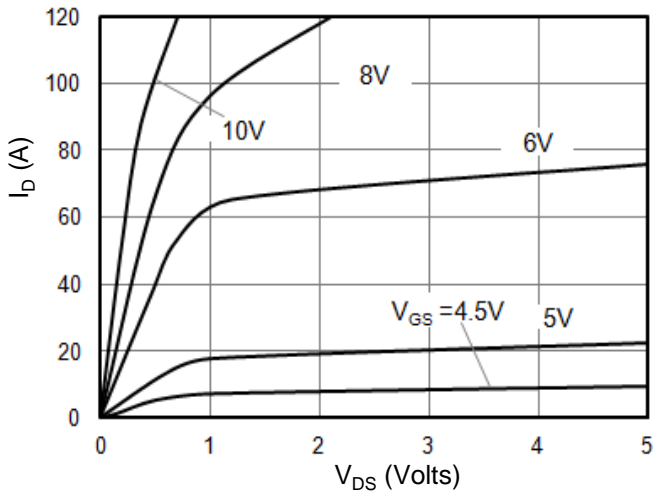


Figure 1: On-Region Characteristics

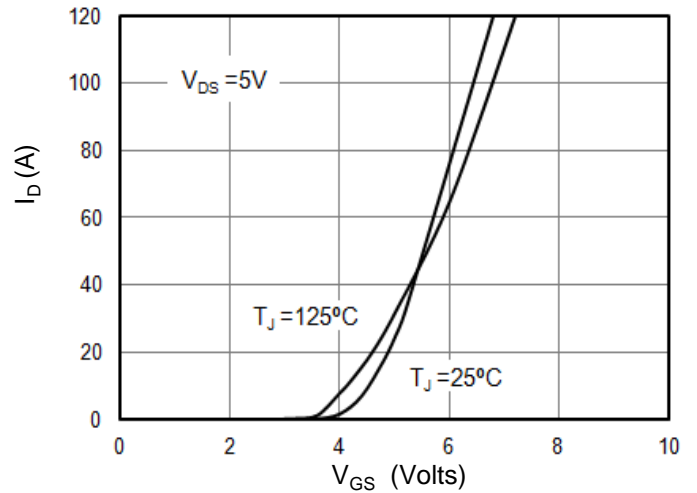


Figure 2: Transfer Characteristics

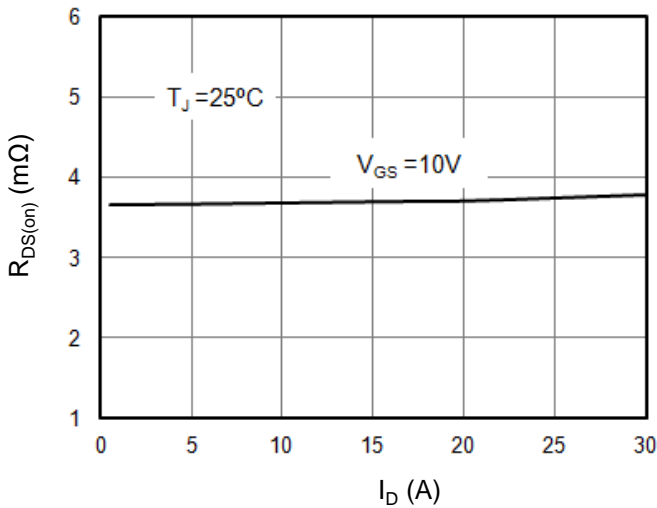


Figure 3: On-Resistance vs. Drain Current

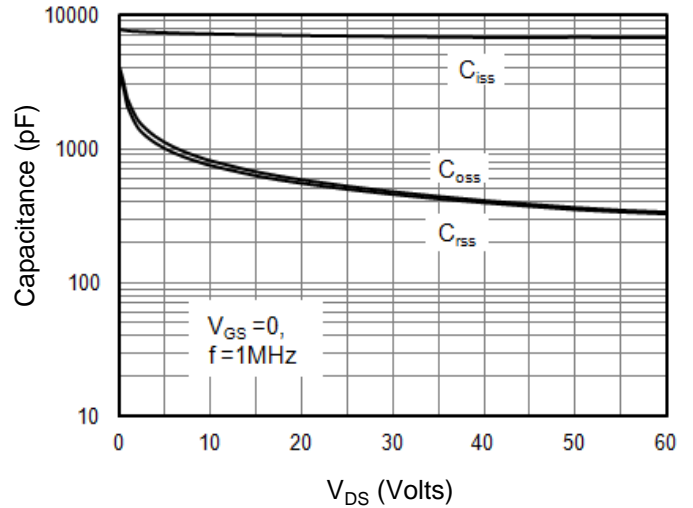


Figure 4: Capacitance Characteristics

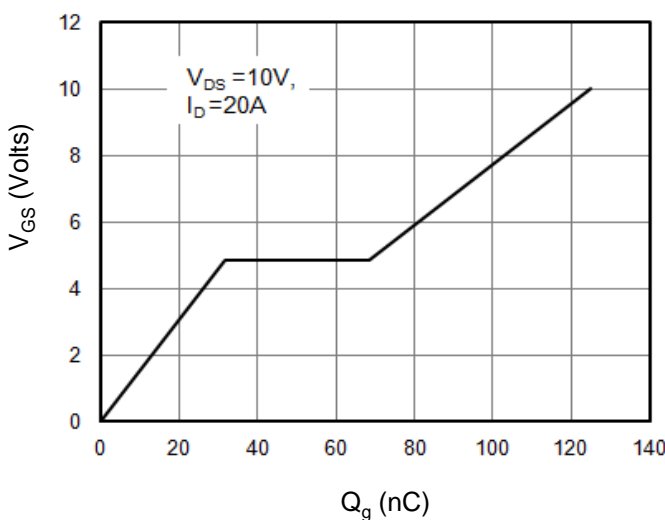


Figure 5: Gate Charge Characteristics

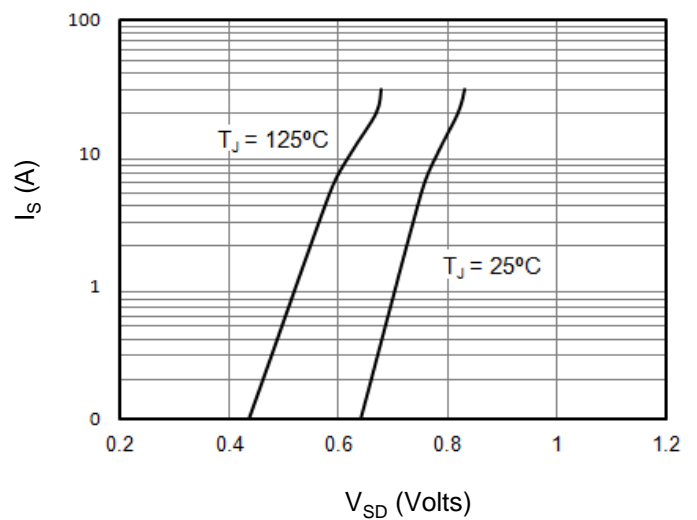


Figure 6: Body Diode Forward Voltage



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

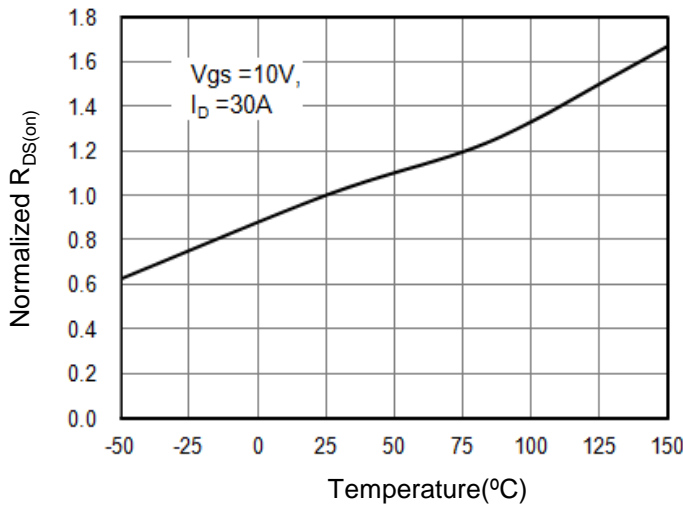


Figure 7: On-Resistance vs. Junction Temperature

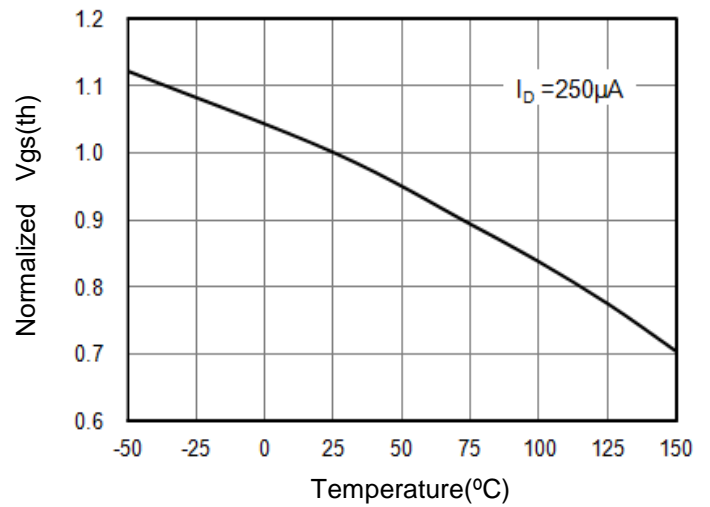


Figure 8: V_GS(th) vs. Junction Temperature

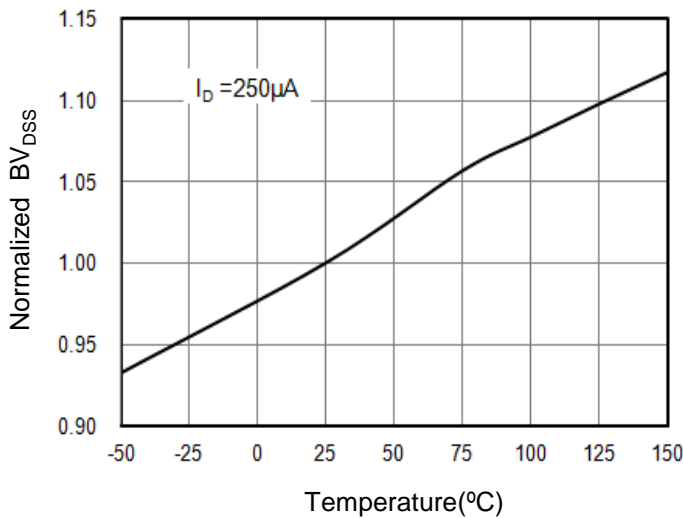


Figure 9: BV_DS vs. Junction Temperature

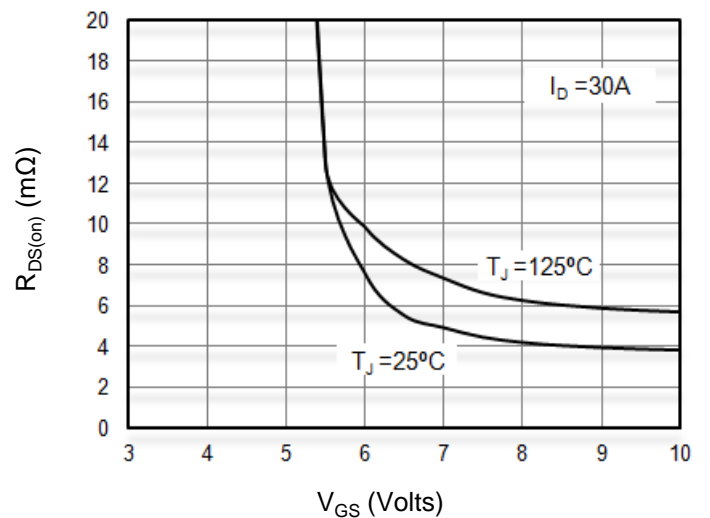


Figure 10: On-Resistance vs. Gate-Source Voltage

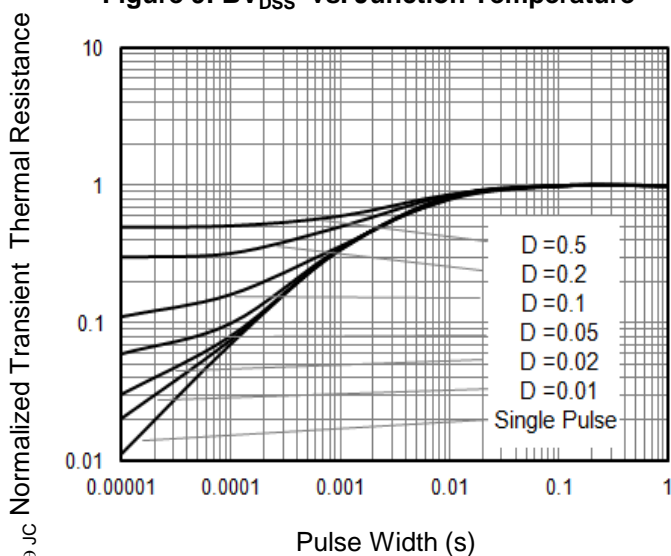


Figure 11: Normalized Transient Thermal Resistance

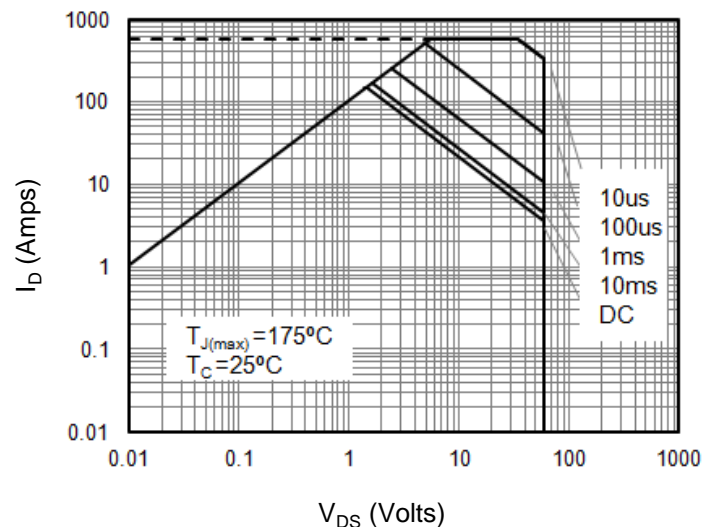


Figure 12: Safe Operating Area



Figure A: Gate Charge Test Circuit and Waveforms

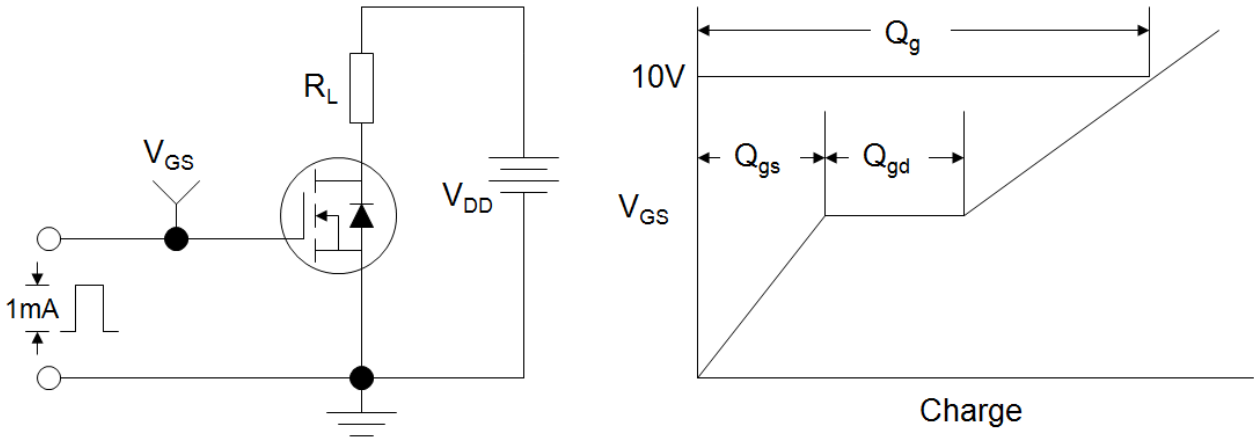


Figure B: Resistive Switching Test Circuit and Waveforms

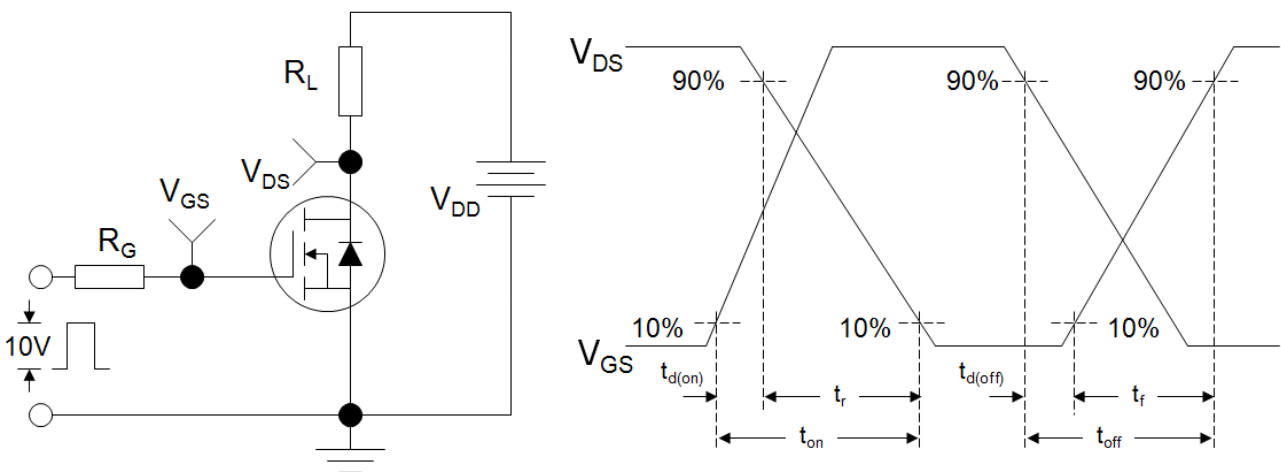
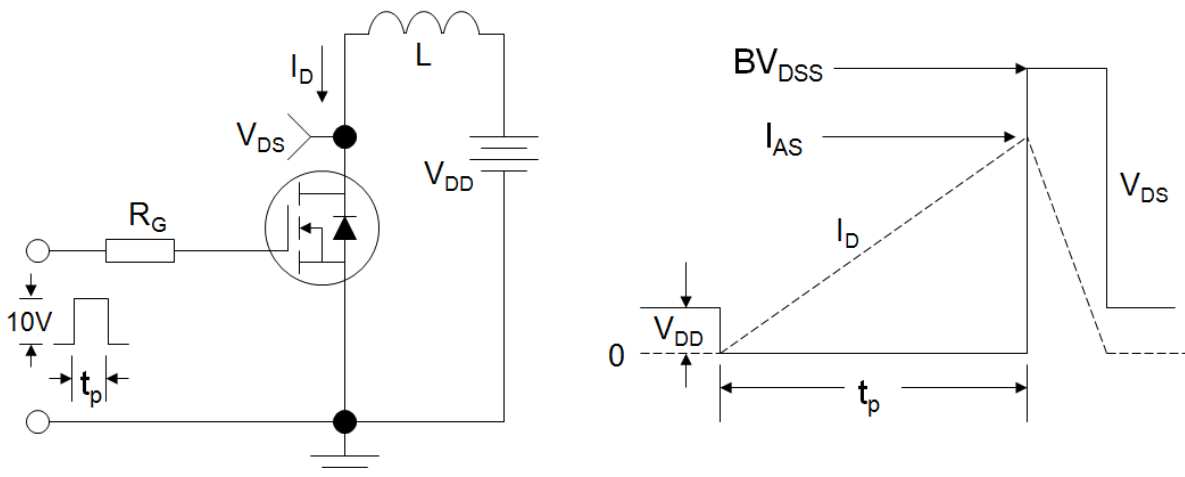
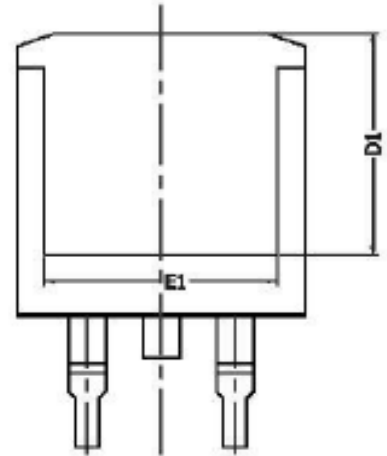
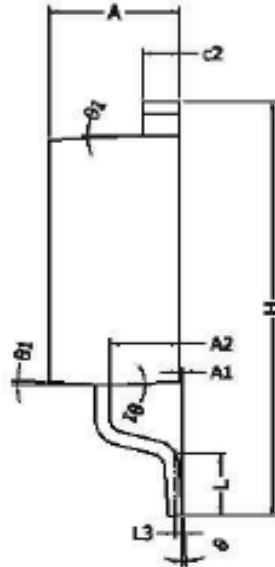
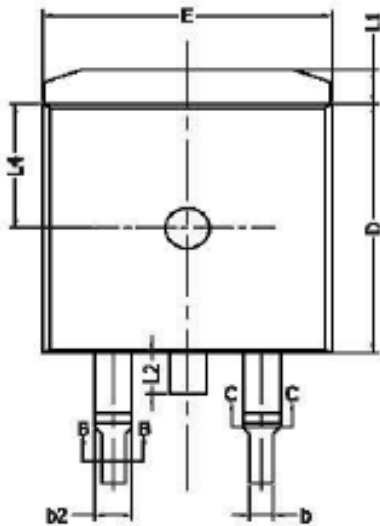


Figure C: Unclamped Inductive Switching (UIS) Test Circuit and Waveforms





TO-263(集佳)



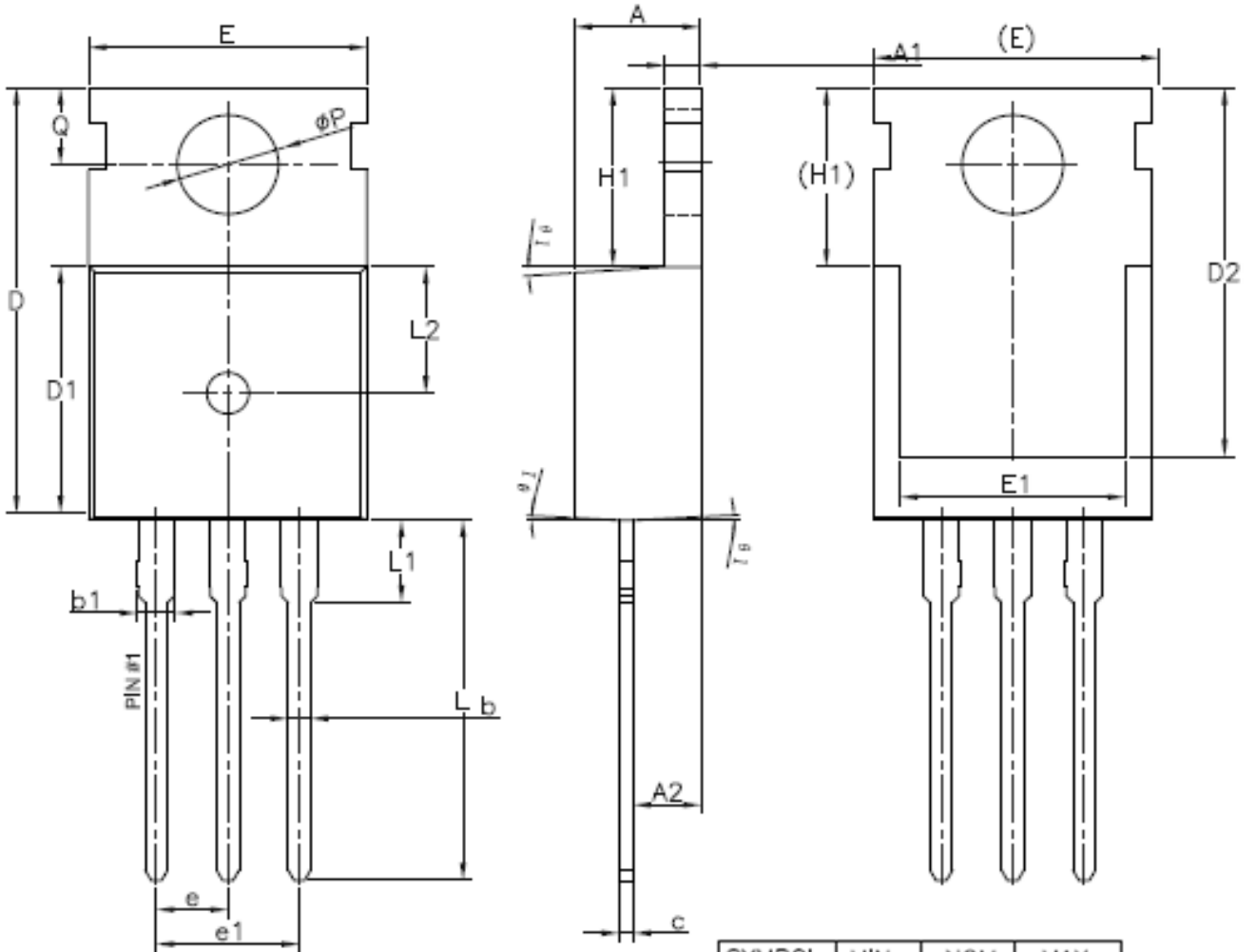
COMMON DIMENSIONS
(UNITS OF MEASURE -MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|--------|----------|-------|-------|
| A | 4.40 | 4.50 | 4.60 |
| A1 | 0 | 0.10 | 0.25 |
| A2 | 2.20 | 2.40 | 2.60 |
| b | 0.76 | — | 0.89 |
| b1 | 0.75 | 0.80 | 0.85 |
| b2 | 1.23 | — | 1.37 |
| b3 | 1.22 | 1.27 | 1.32 |
| c | 0.47 | — | 0.60 |
| c1 | 0.46 | 0.51 | 0.56 |
| c2 | 1.25 | 1.30 | 1.35 |
| D | 9.10 | 9.20 | 9.30 |
| D1 | 8.00 | — | — |
| E | 9.80 | 9.90 | 10.00 |
| E1 | 7.80 | — | — |
| e | 2.54 BSC | | |
| H | 14.90 | 15.30 | 15.70 |
| L | 2.00 | 2.30 | 2.60 |
| L1 | 1.17 | 1.27 | 1.40 |
| L2 | — | — | 1.75 |
| L3 | 0.25BSC | | |
| L4 | 4.60 REF | | |
| theta | 0° | — | 8° |
| theta1 | 1° | 3° | 5° |





TO-220 (集佳)



| SYMBOL | MIN | NOM | MAX |
|--------|---------|-------|-------|
| A | 4.40 | 4.50 | 4.60 |
| A1 | 1.27 | 1.30 | 1.33 |
| A2 | 2.30 | 2.40 | 2.50 |
| b | 0.70 | - | 0.90 |
| b1 | 1.27 | - | 1.40 |
| c | 0.45 | 0.50 | 0.60 |
| D | 15.30 | 15.70 | 16.10 |
| D1 | 9.10 | 9.20 | 9.30 |
| D2 | 13.10 | - | 13.70 |
| E | 9.70 | 9.90 | 10.20 |
| E1 | 7.80 | 8.00 | 8.20 |
| e | 2.54BSC | | |
| e1 | 5.08BSC | | |
| H1 | 6.30 | 6.50 | 6.70 |
| L | 12.78 | 13.08 | 13.38 |
| L1 | - | - | 3.50 |
| L2 | 4.60REF | | |
| φP | 3.55 | 3.60 | 3.65 |
| Q | 2.73 | - | 2.87 |
| θ1 | 1° | 3° | 5° |



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