

MOSFET Silicon N-Channel MOS



1. Applications

Single-ended flyback or two-transistor forward topologies.
PC power, PD Adaptor, LCD & PDP TV and LED lighting.

2. Features

Low drain-source on-resistance: $R_{DS(ON)} = 19m\Omega$ (typ.)
Easy to control Gate switching
Enhancement mode: $V_{th} = 2.8$ to 4.2 V

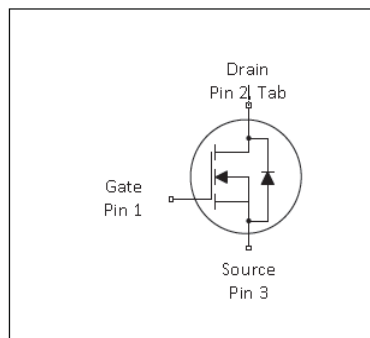
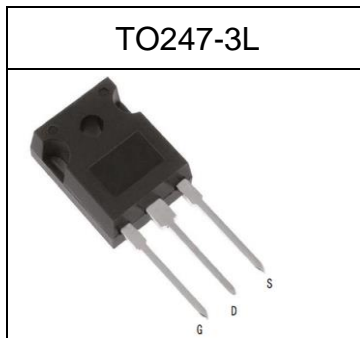


Table 1 Key Performance Parameters

| Parameter | Value | Unit |
|----------------------|-------|------------|
| $V_{DS} @ T_{j,max}$ | 700 | V |
| $R_{DS(on),max}$ | 22 | m Ω |
| $Q_{g,typ}$ | 223 | nC |
| $I_{D,pulse}$ | 327 | A |
| Body diode dv/dt | 50 | V/ns |

3. Packaging and Internal Circuit

| Part Name | Package | Marking |
|--------------|----------|--------------|
| ASW65R022EFD | TO247-3L | ASW65R022EFD |



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1 Maximum ratings

at $T_j = 25^\circ\text{C}$, unless otherwise specified

Table 2 Maximum ratings

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|---------------|--------|------|------|------------------|--|
| | | Min. | Typ. | Max. | | |
| Continuous drain current ¹⁾ | I_D | | - | 109 | A | $T_C=25^\circ\text{C}$ |
| Pulsed drain current ²⁾ | $I_{D,pulse}$ | - | - | 327 | A | $T_C=25^\circ\text{C}$ |
| Avalanche energy, single pulse | E_{AS} | - | - | 1186 | mJ | $T_C=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $I_{av}=15.4\text{A}$, $L=10\text{mH}$, $R_G=25\Omega$ |
| Avalanche current, single pulse | I_{AR} | - | - | 15.4 | A | $T_C=25^\circ\text{C}$, $V_{DD}=50\text{V}$, $L=10\text{mH}$, $R_G=25\Omega$ |
| MOSFET dv/dt ruggedness | dv/dt | - | - | 50 | V/ns | $V_{DS}=0\dots400\text{V}$ |
| Gate source voltage (static) | V_{GS} | -20 | - | 20 | V | static; |
| Gate source voltage (dynamic) | V_{GS} | -30 | - | 30 | V | AC ($f>1\text{ Hz}$) |
| Power dissipation | P_{tot} | - | - | 500 | W | $T_C=25^\circ\text{C}$ |
| Storage temperature | T_{stg} | -55 | - | 150 | $^\circ\text{C}$ | |
| Operating junction temperature | T_j | -55 | - | 150 | $^\circ\text{C}$ | |
| Soldering Temperature Distance of 1.6mm from case for 10s | T_L | | | 260 | $^\circ\text{C}$ | |
| Reverse diode dv/dt ³⁾ | dv/dt | - | - | 15 | V/ns | $V_{DS}=0\dots400\text{V}$, $I_{SD}\leq 58\text{A}$, $T_j=25^\circ\text{C}$ |

¹⁾Limited by $T_{j,max}$. Maximum Duty Cycle $D = 0.50$

²⁾Pulse width t_p limited by $T_{j,max}$

³⁾Identical low side and high side switch with identical R_G

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2 Thermal characteristics

Thermal characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|--|------------|--------|------|------|------|----------------------------------|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case | R_{thJC} | - | - | 0.25 | °C/W | - |
| Thermal resistance, junction - ambient | R_{thJA} | - | - | 43 | °C/W | device on PCB, minimal footprint |

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3 Electrical characteristics

at $T_j=25^\circ\text{C}$, unless otherwise specified

Table 4 Static characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|----------------------------------|---------------|--------|------|------|------------|--|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 650 | - | - | V | $V_{GS}=0V, I_D=250\mu A$ |
| Gate threshold voltage | $V_{(GS)th}$ | 2.8 | | 4.2 | V | $V_{DS}=V_{GS}, I_D=250\mu A$ |
| Zero gate voltage drain current | I_{DSS} | - | - | 5 | μA | $V_{DS}=650V, V_{GS}=0V, T_j=25^\circ C$ |
| Gate-source leakage current | I_{GSS} | - | - | 100 | nA | $V_{GS}=30V, V_{DS}=0V$ |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 19 | 22 | m Ω | $V_{GS}=10V, I_D=5.5A, T_j=25^\circ C$ |
| Gate resistance (Intrinsic) | R_G | - | 3.5 | - | Ω | $f=1\text{MHz}$, open drain |

Table 5 Dynamic characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|------------------------------|--------------|--------|-------|------|------|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance | C_{iss} | - | 11747 | - | pF | $V_{GS}=0V, V_{DS}=50V, f=1\text{MHz}$ |
| Output capacitance | C_{oss} | - | 326 | - | pF | $V_{GS}=0V, V_{DS}=50V, f=1\text{MHz}$ |
| Reverse transfer capacitance | C_{rss} | - | 5.14 | - | pF | $V_{GS}=0V, V_{DS}=50V, f=1\text{MHz}$ |
| Turn-on delay time | $t_{d(on)}$ | - | 42.5 | - | ns | $V_{DD}=400V, V_{GS}=10V, I_D=50A, R_G=2\Omega$ |
| Rise time | t_r | - | 61.5 | - | ns | $V_{DD}=400V, V_{GS}=10V, I_D=50A, R_G=2\Omega$ |
| Turn-off delay time | $t_{d(off)}$ | - | 165 | - | ns | $V_{DD}=400V, V_{GS}=10V, I_D=50A, R_G=2\Omega$ |
| Fall time | t_f | - | 6 | - | ns | $V_{DD}=400V, V_{GS}=10V, I_D=50A, R_G=2\Omega$ |

Table 6 Gate charge characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|-----------------------|---------------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | Q_{gs} | - | 64.4 | - | nC | $V_{DD}=400V, I_D=50A, V_{GS}=0 \text{ to } 10V$ |
| Gate to drain charge | Q_{gd} | - | 87.3 | - | nC | $V_{DD}=400V, I_D=50A, V_{GS}=0 \text{ to } 10V$ |
| Gate charge total | Q_g | - | 223 | - | nC | $V_{DD}=400V, I_D=50A, V_{GS}=0 \text{ to } 10V$ |
| Gate plateau voltage | $V_{plateau}$ | - | 6.4 | - | V | $V_{DD}=400V, I_D=50A, V_{GS}=0 \text{ to } 10V$ |

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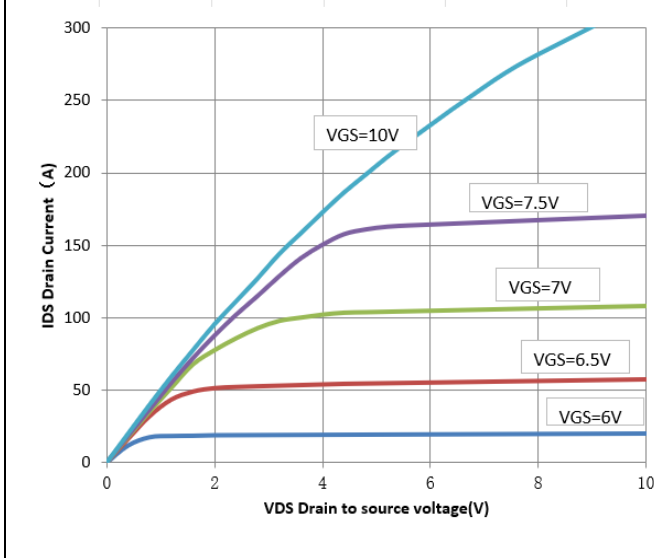
Table 7 Reverse diode characteristics

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|-------------------------------|-----------|--------|-------|------|---------|---|
| | | Min. | Typ. | Max. | | |
| Diode forward voltage | V_{SD} | - | 0.6 | - | V | $V_{GS}=0V, I_F=1A, T_J=25^{\circ}C$ |
| Reverse recovery time | t_{rr} | - | 204.5 | - | ns | $V_R=400V, I_F=40A, di_F/dt=100A/\mu s$ |
| Reverse recovery charge | Q_{rr} | - | 2.21 | - | μC | $V_R=400V, I_F=40A, di_F/dt=100A/\mu s$ |
| Peak reverse recovery current | I_{rrm} | - | 19.25 | - | A | $V_R=400V, I_F=40A, di_F/dt=100A/\mu s$ |

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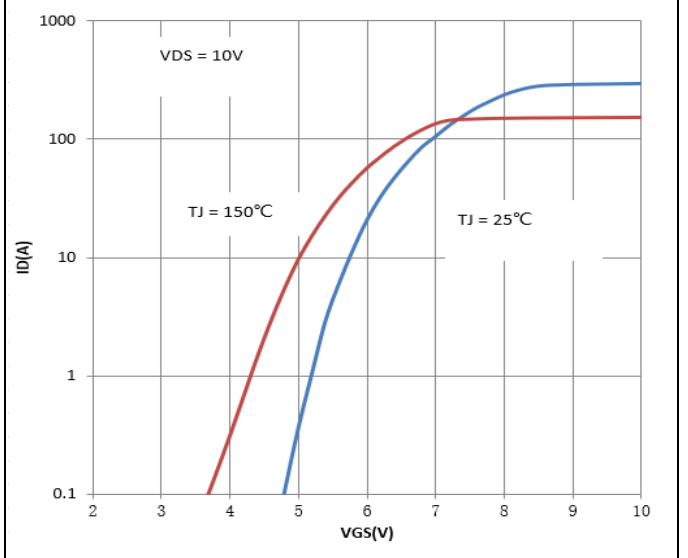
4 Electrical characteristics diagram

Diagram 1: Typ. Output characteristics



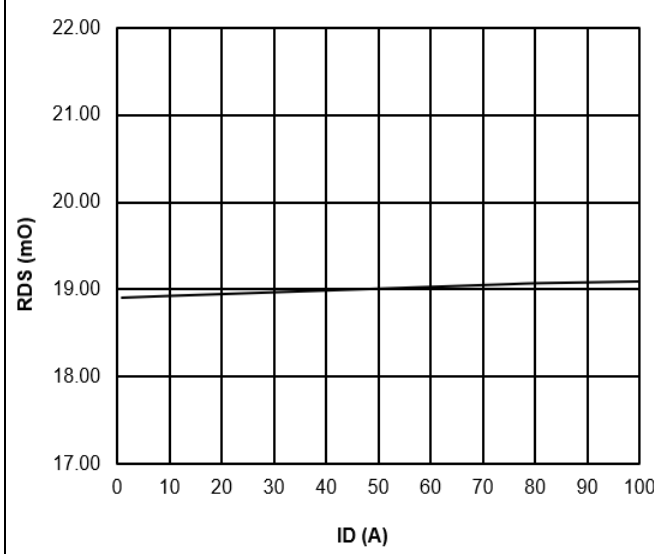
$I_D=f(V_{DS}); T_J=25^\circ\text{C};$ parameter: V_{GS}

Diagram 2: Typ. transfer characteristics



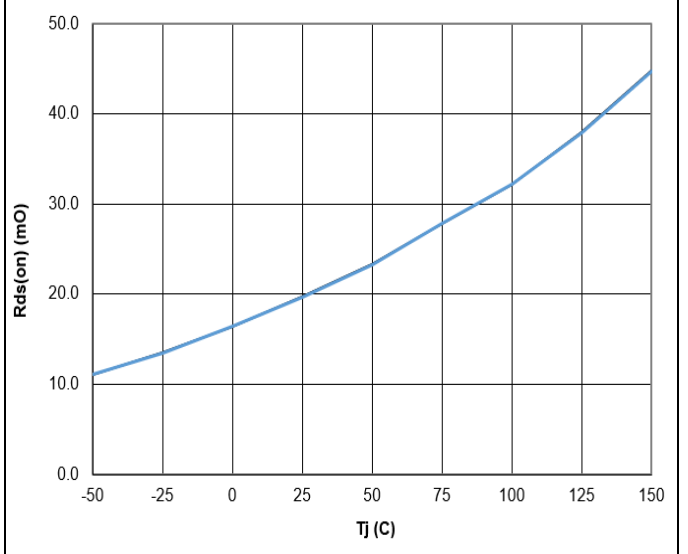
$I_D=f(V_{GS}); V_{DS}=10\text{V};$ parameter: T_J

Diagram 3: Typ. On-Resistance vs. ID



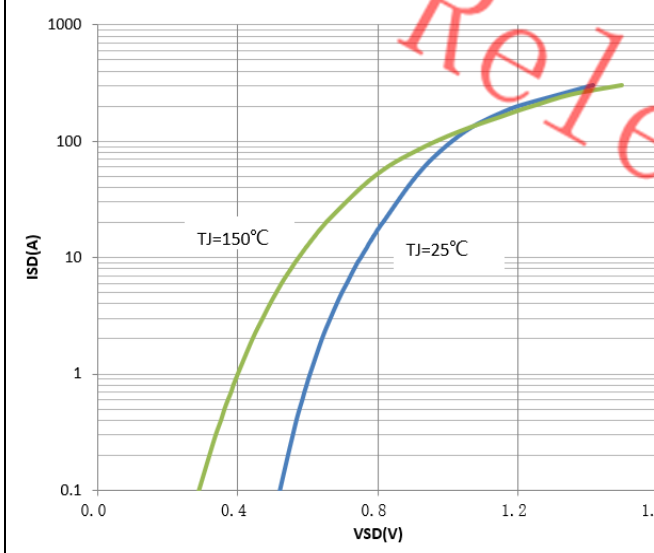
$R_{DS(on)}=f(I_D); T_J=25^\circ\text{C};$ parameter: $V_{GS}=10\text{V}$

Diagram 4: Typ. Rdson – Junction Temperature



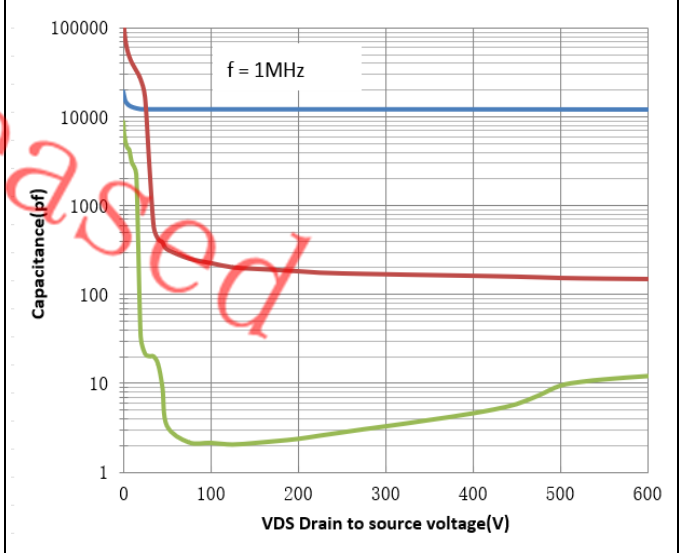
$R_{DS(on)}=f(T_J); V_{GS}=10\text{V}/I_D=5.5\text{A}$

Diagram 5: Typ. Body-Diode Characteristics



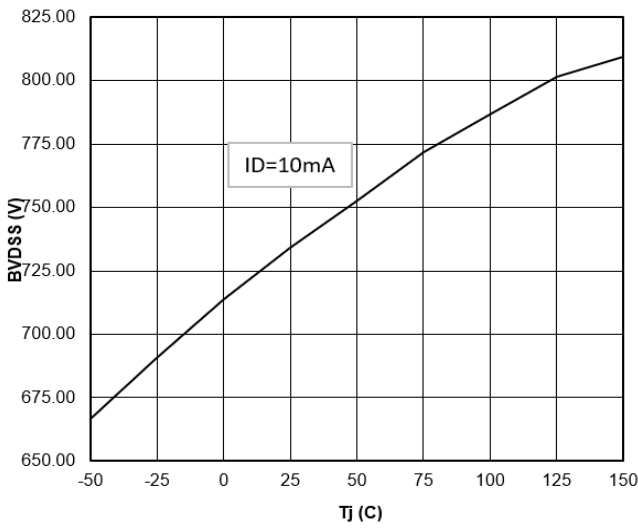
$I_F=f(V_{DS});$ parameter: T_J

Diagram 6: Typ. Capacitance vs. Vds



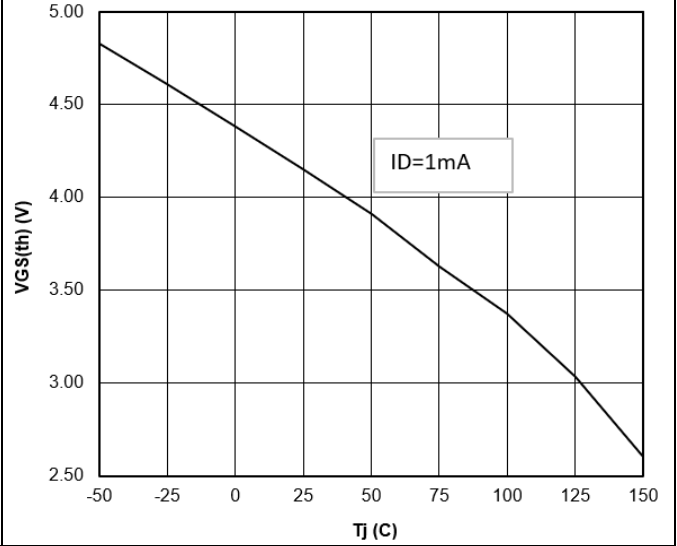
$C=f(V_{DS}); V_{GS}=0\text{V}; f=1\text{MHz}$

Diagram 7: Typ. Drain-source breakdown voltage



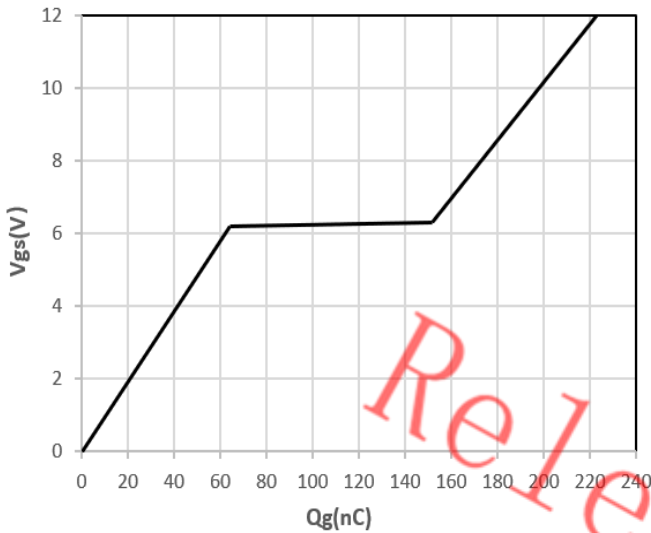
$V_{BR(DSS)}=f(T_j); I_D=10mA$

Diagram 8: Typ. Threshold voltage



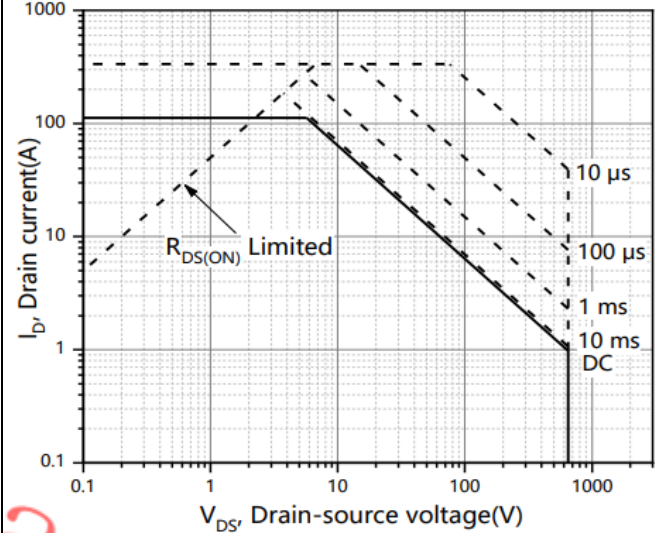
$V_{th}=f(T_C);$

Diagram 9: Typ. Gate charge



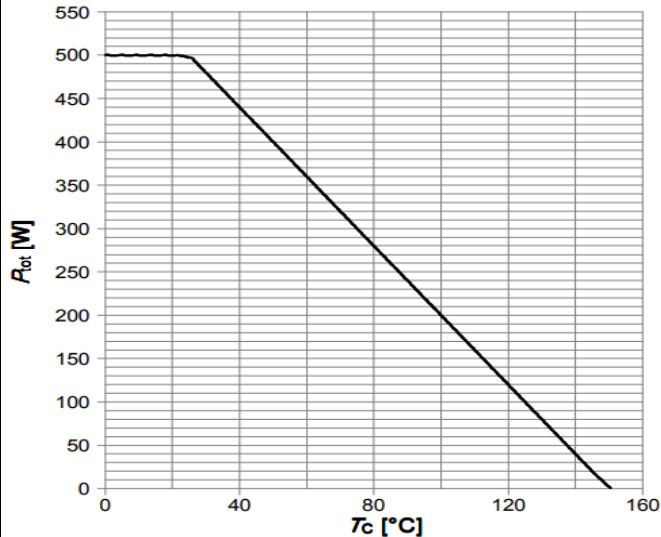
$V_{GS}=f(Q_{gate}); I_D=50A$ pulsed; parameter: V_{DD}

Diagram 10: Typ. Maximum Safe Operating Area



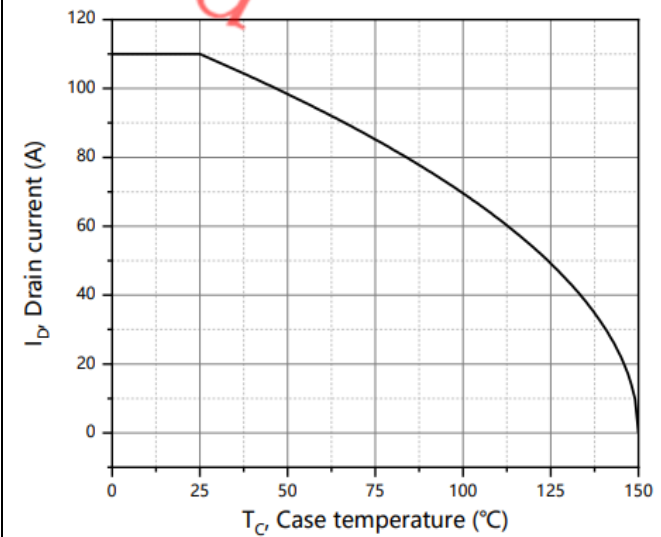
$I_D=f(V_{DS}); T_C=25^\circ C; D=0$; parameter t_p

Diagram 11: Typ. Power Dissipation



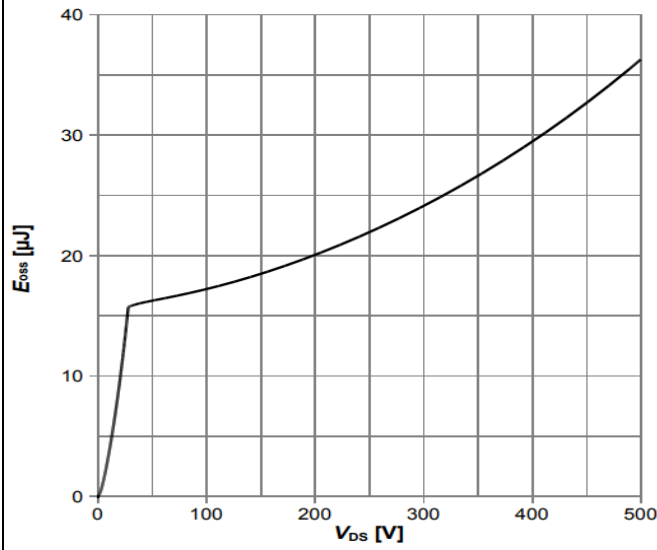
$P_{tot}=f(T_C);$

Diagram 12: Typ. Drain Current De-rating



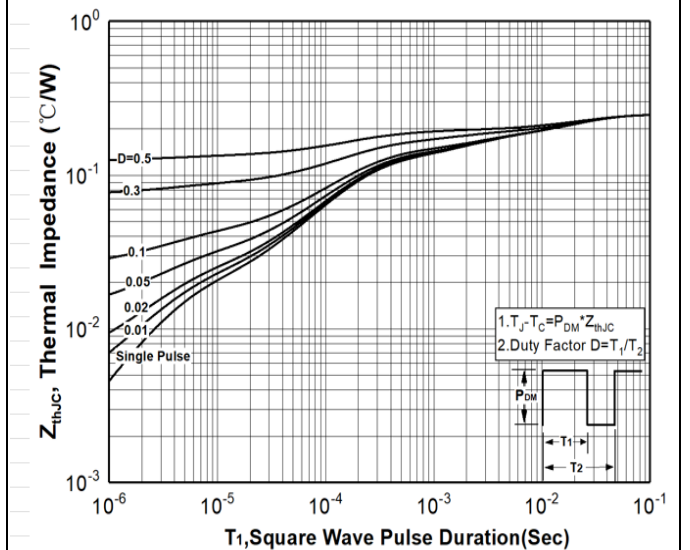
$I_D=f(T_C);$

Diagram 13: Typ. Coss stored energy



$E_{coss}=f(V_{DS})$

Diagram 14: Typ. Max. transient thermal impedance



$Z_{thJC} = f(t_p)$; parameter: $D = t_p / T$

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5 Test Circuits

Table 8 Diode characteristics

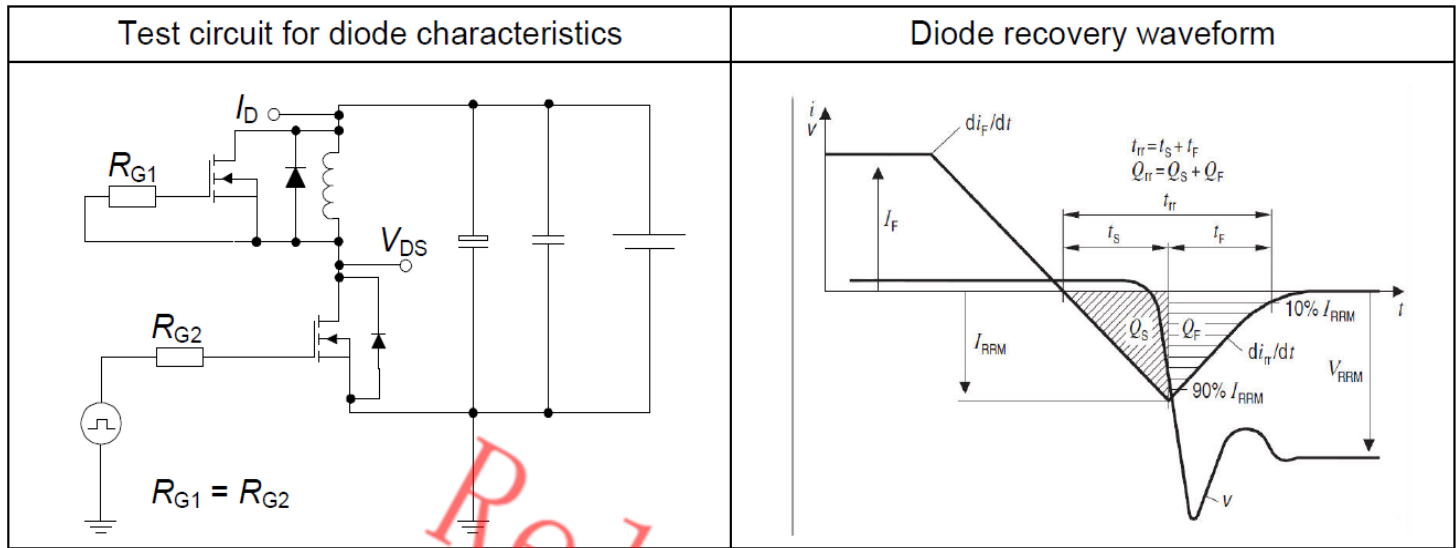


Table 9 Switching times

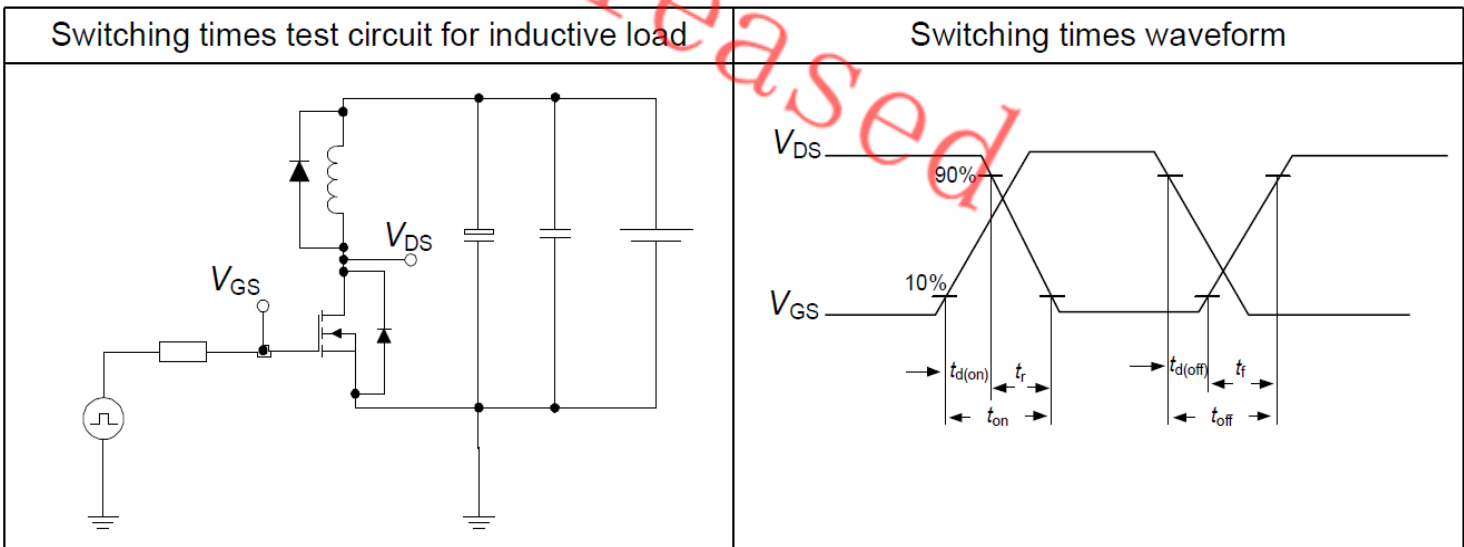
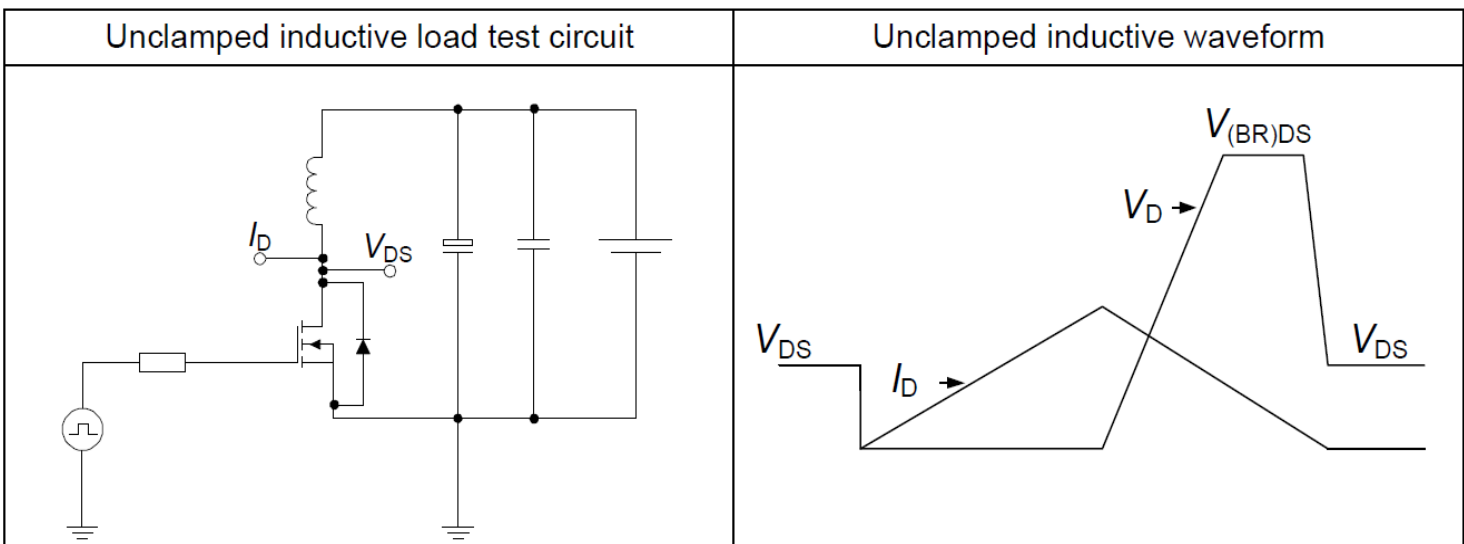
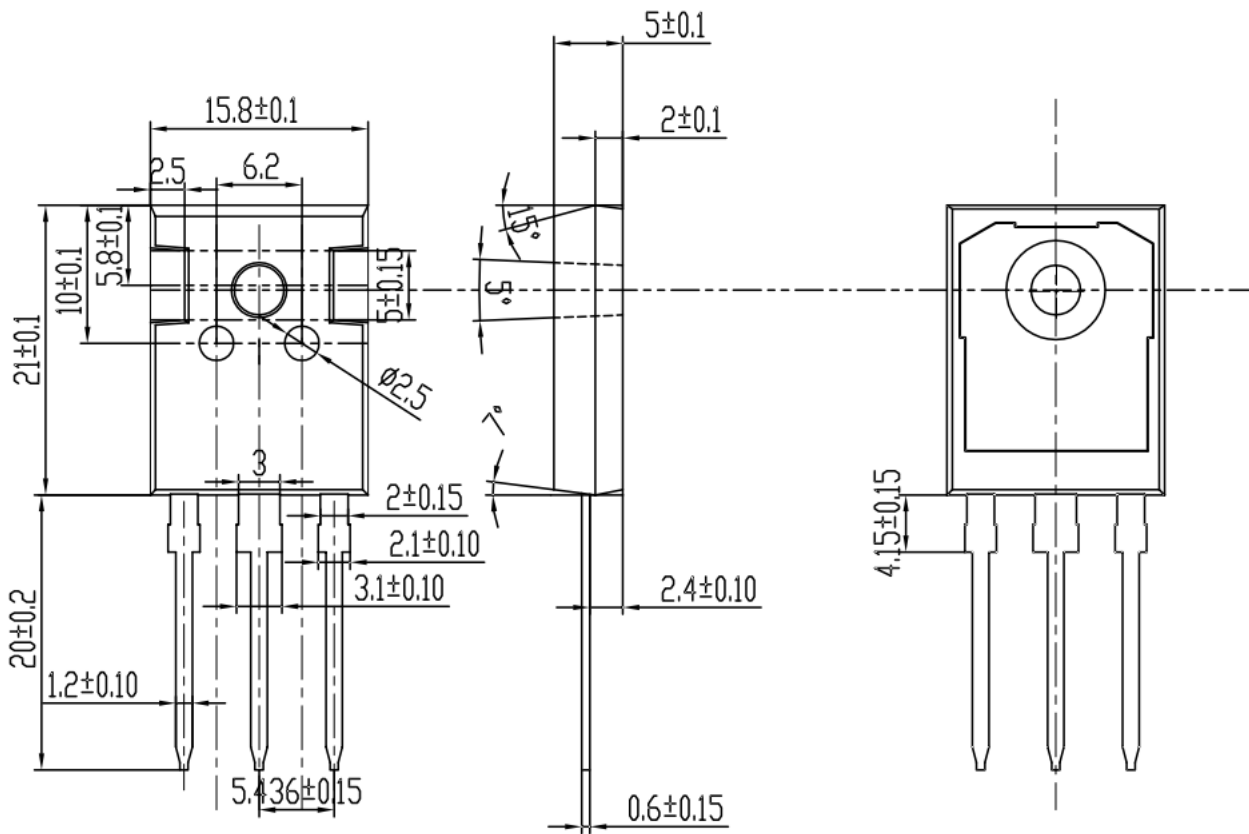


Table 10 Unclamped inductive load



6 Package Outlines



Outline PG-T0247-3L(HT)

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Revision History

| Revision | Date | Subjects (major changes since last revision) |
|----------|------------|--|
| 1.0 | 2023-11-07 | Preliminary version |

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