## 1200V SiC N-Channel MOSFET

DESCRIPTION：

·High Speed Switching with Low Capacitances

·High Blocking Voltage with Low $R_{DS(ON)}$

·Easy to Parallel

·Simple to Drive

·RoHS compliant.

| | |
|---|---|
| $V_{DS}$ | 1200V |
| $I_D$ | 103A (Tc=25℃) |
| $R_{DS(ON)}$ | 37mΩ |



TO-263-7L

TYPICAL APPLICATIONS：

·Power Factor Correction Modules

·Switch Mode Power Supplies

·DC-AC Inverters

·High Voltage DC-DC Converters

MAXIMUM RATINGS (at $T_J$ = 25 °C, unless otherwise specified)

| Characteristic | Condition | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DS}$ | 1200 | V |
| Continuous Drain Current | Tc=25℃<br>Tc=100℃ | $I_D$ | 103<br>72 | A |
| Peak Drain Current | Pulse width tp limited by $T_{jmax}$ | $I_{DM}$ | 206 | A |
| Gate-Source Voltage | | $V_{GSmax}$ | -8/+22 | V |
| Recommend Gate-Source Voltage | | $V_{GSop}$ | -4/+18 | V |
| Power Dissipation | Tc=25℃<br>Tc=100℃ | $P_{TOT}$ | 500<br>251 | W |
| Operation Junction temperature | | Tj | -40~+175 | ℃ |
| Storage temperature | | $T_{STG}$ | -40~+175 | ℃ |

ELECTRICAL CHARATERISTICS (at $T_J$ = 25 °C, unless otherwise specified)

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage<br>VGS = 0V, ID = 100μA | $V_{(BR)DSS}$ | 1200 | | | V |
| Zero Gate Voltage Drain Current<br>VDS = 1200 V, VGS = 0 V | $I_{DSS}$ | | 1 | 5 | uA |
| Gate-Source Leakage Current<br>VGS = 18V, VDS = 0V | $I_{GSS}$ | | | 250 | nA |
| Gate-Source Threshold Voltage<br>VDS = VGS, ID = 10mA Tj=25℃<br>VDS = VGS, ID = 10mA Tj=175℃ | $V_{GS(th)}$ | 2.0 | 2.6<br>2.0 | 4.0 | V |
| Drain-Source On-State Resistance<br>VGS = 18V, ID = 40A Tj=25℃<br>VGS = 18V, ID = 40A Tj=175℃ | $R_{DS(on)}$ | | 37<br>47 | 50 | mΩ |
| Input capacitance<br>f=100KHz, VDS=1000 V, VGS=0 V | $C_{iss}$ | | 2975 | | pF |
| Output capacitance<br>f=100KHz, VDS=1000 V, VGS=0 V | $C_{oss}$ | | 119 | | pF |
| Reverse transfer capacitance<br>f=100KHz, VDS=1000 V, VGS=0 V | $C_{rss}$ | | 12 | | pF |
| Internal Gate Resistance<br>f=1MHz | $R_{G(INT)}$ | | 2.1 | | Ω |
| Total Gate Charge<br>VDS= 800V, ID= 40A,VGS= -4/18V | $Q_G$ | | 117 | | nC |
| Gate to Source Charge<br>VDS= 800V, ID= 40A,VGS= -4/18V | $Q_{GS}$ | | 38 | | nC |
| Gate to Drain Charge<br>VDS= 800V, ID= 40A,VGS= -4/18V | $Q_{GD}$ | | 27 | | nC |
| Turn-on Delay Time<br>VDD=800 V, ID=40A, VGS= -4/18V, RG=2.5Ω | td (ON) | | 37 | | ns |
| Rise Time<br>VDD=800 V, ID=40A, VGS= -4/18V, RG=2.5Ω | tr | | 21 | | ns |
| Turn-off Delay Time<br>VDD=800 V, ID=40A, VGS= -4/18V, RG=2.5Ω | td (OFF) | | 27 | | ns |
| Fall Time<br>VDD=800 V, ID=40A, VGS= -4/18V, RG=2.5Ω | tf | | 10 | | ns |
| Turn-on Switching Energy<br>VDD=800 V, ID=40A, VGS= -4/18V, RG=2.5Ω | $E_{(ON)}$ | | 1107 | | uJ |
| Turn-off Switching Energy<br>VDD=800 V, ID=40A, VGS= -4/18V, RG=2.5Ω | $E_{(OFF)}$ | | 123 | | uJ |

THERMAL CHARACTERISTICS

| Characteristic | Condition | Symbol | Typical | Unit |
|---|---|---|---|---|
| Thermal resistance, junction - case | | $R_{th(j-C)}$ | 0.3 | ℃/W |

## Body Diode

ELECTRICAL CHARATERISTICS (at $T_J$ = 25 °C, unless otherwise specified)

| Characteristic | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Diode Forward Voltage<br>VGS = -4V, ISD =20A Tj=25℃<br>VGS = -4V, ISD =20A Tj=175℃ | $V_{SD}$ | | 5.0<br>4.4 | 6.6 | V |
| Continuous Diode Forward Current<br>VGS = -4V, Tc=25℃<br>VGS = -4V, Tc=100℃ | $I_S$ | | 81<br>47 | | A |
| Revers Recovery Time<br>VR=800 V, ISD=40A, VGS= -4V,di/dt = 4000A/us | Trr | | 19 | | ns |
| Revers Recovery Charge<br>VR=800 V, ISD=40A, VGS= -4V,di/dt = 4000A/us | Qrr | | 338 | | nC |
| Peak Revers Recovery Current<br>VR=800 V, ISD=40A, VGS= -4V,di/dt = 4000A/us | $I_{rrm}$ | | 14 | | A |

## Typical Characteristics

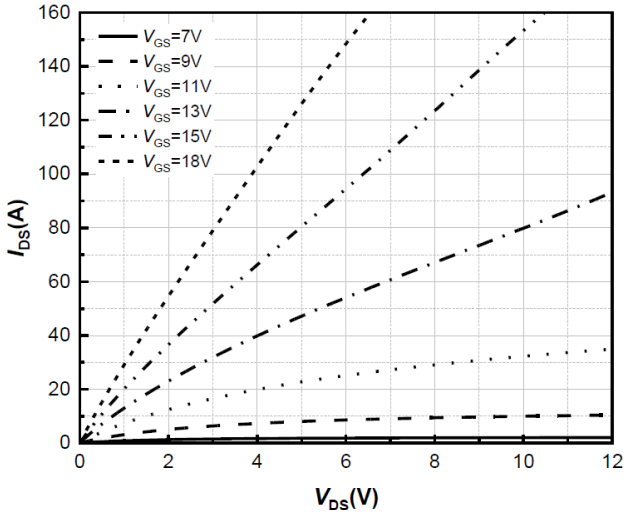



Figure 1. Output Characteristics (Tj=-40℃)

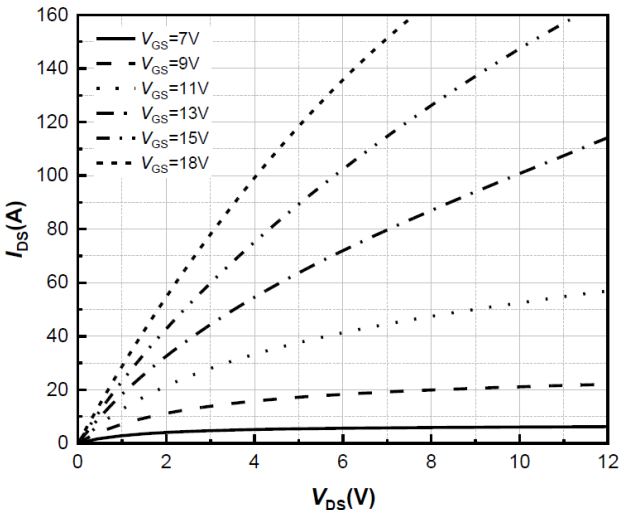



Figure 2. Output Characteristics (Tj=25℃)

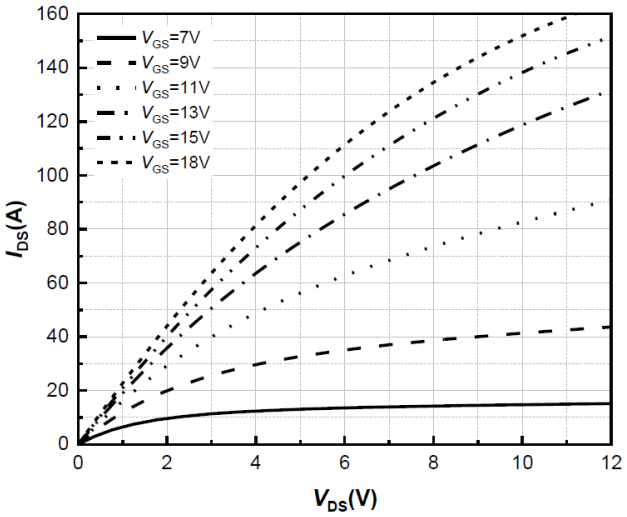



Figure 3. Output Characteristics(Tj=175℃)

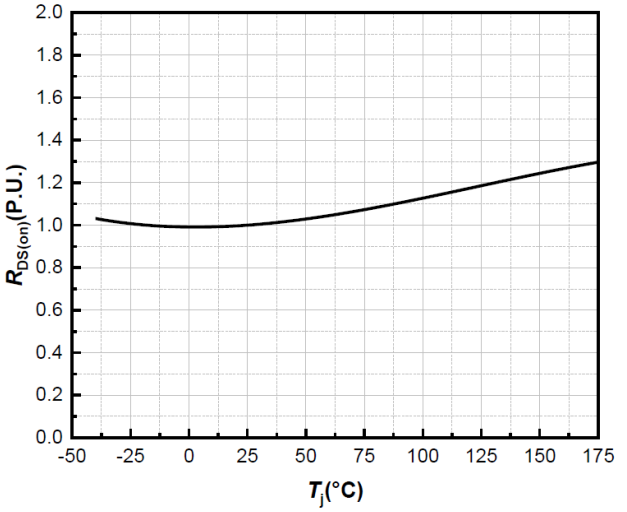



Figure 4. Normalized On-Resistance vs. Temperature

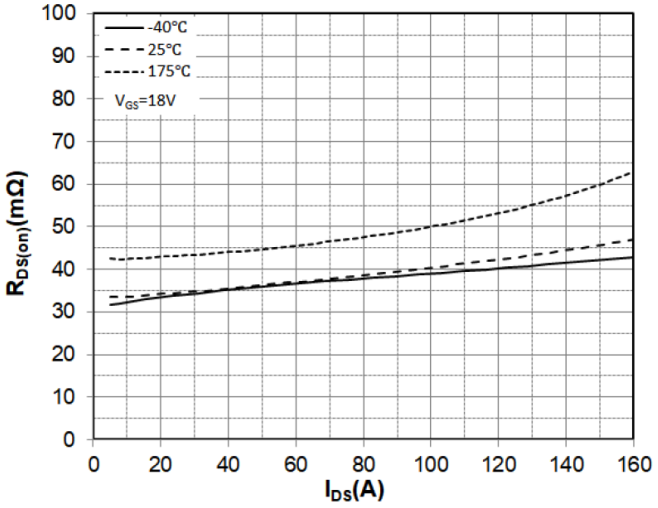



Figure 5. On-Resistance vs. Drain Current For Various Temperatures

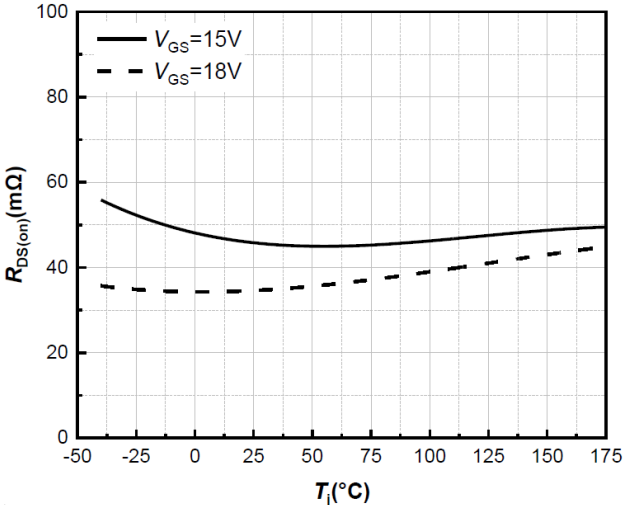



Figure 6. On-Resistance vs. Temperature For Various Gate Voltage

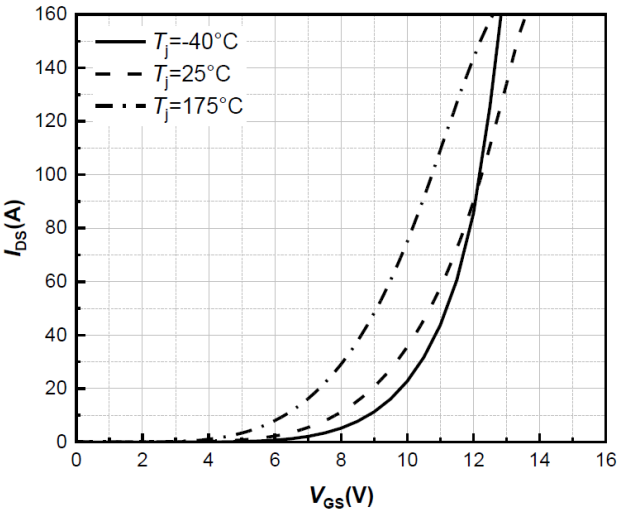



Figure 7. Transfer Characteristic for Various Junction Temperatures

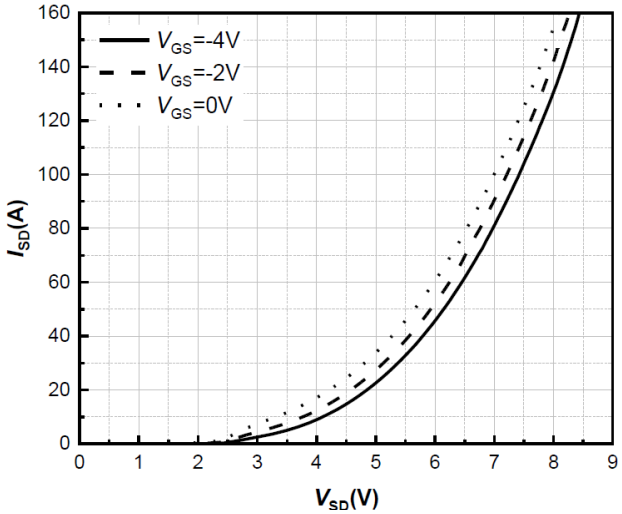



Figure 8. Body Diode Characteristic Tj=-40°C

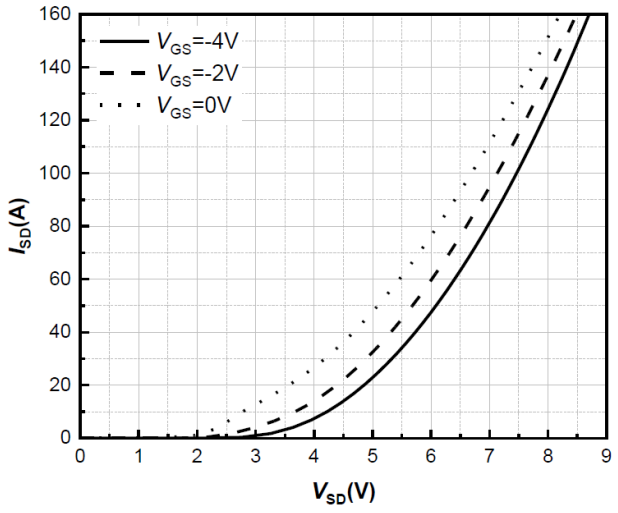



Figure 9. Body Diode Characteristic (Tj=25°C)

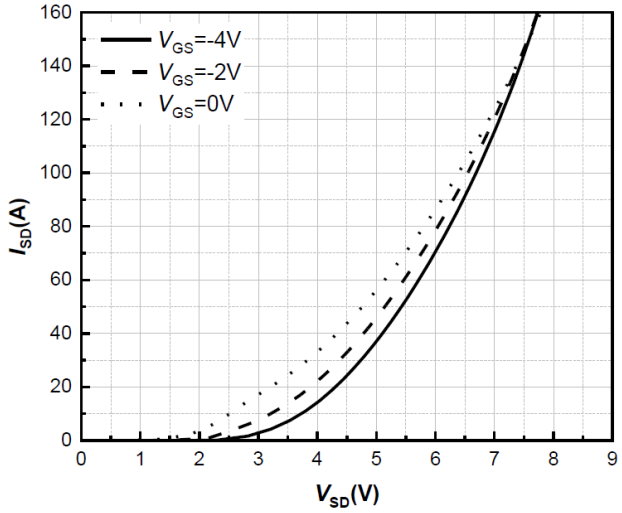



Figure 10. Body Diode Characteristic (Tj=175°C)

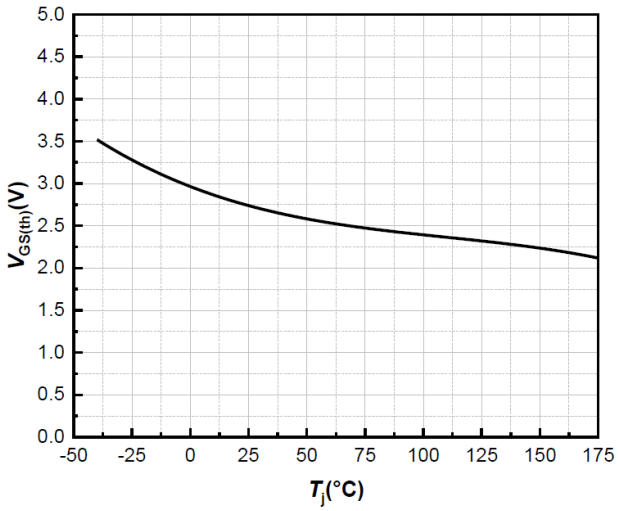



Figure 11. Threshold Voltage vs.Temperature

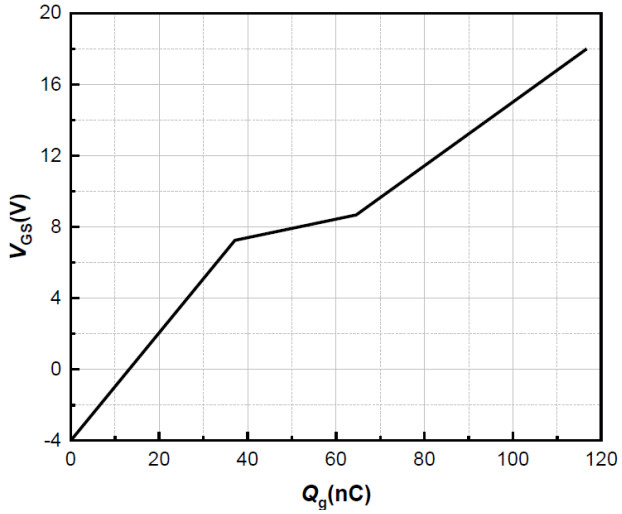



Figure 12. Gate Charge Characteristics

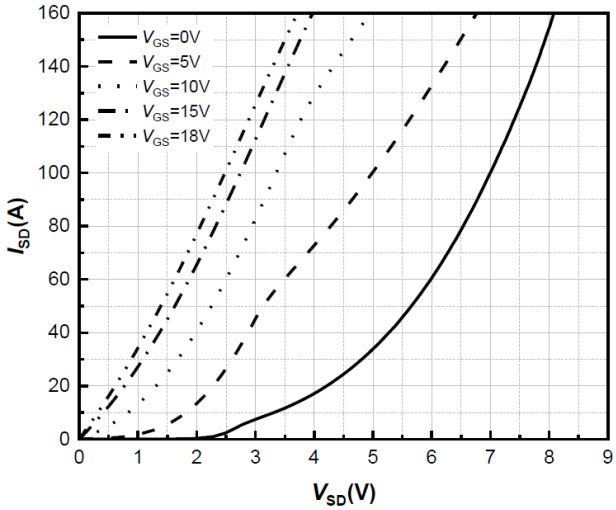



Figure 13. 3rd Quadrant Characteristic (Tj=-40°C)

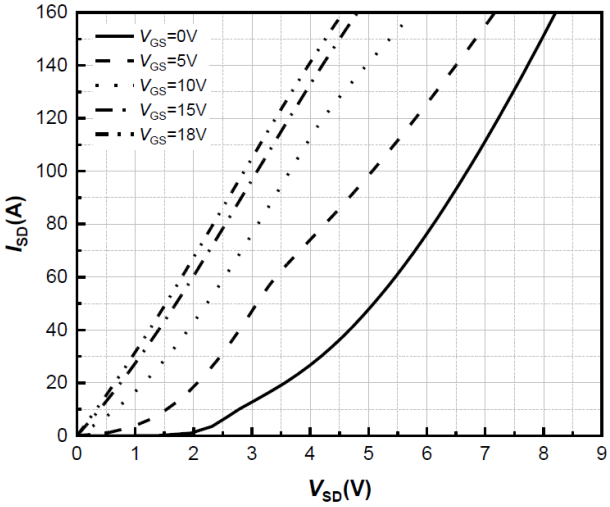



Figure 14. 3rd Quadrant Characteristic (Tj=25°C)

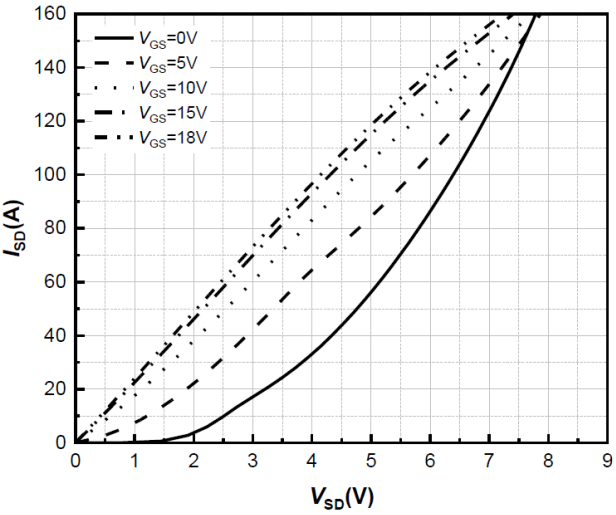



Figure 15. 3rd Quadrant Characteristic (Tj=175°C)

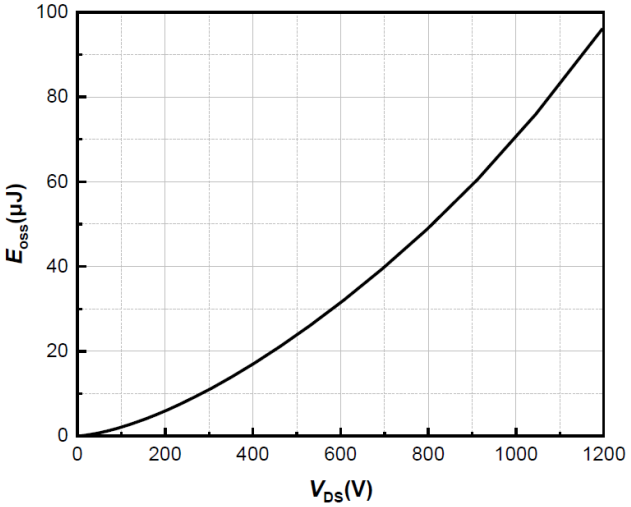



Figure 16. Output Capacitor Stored Energy

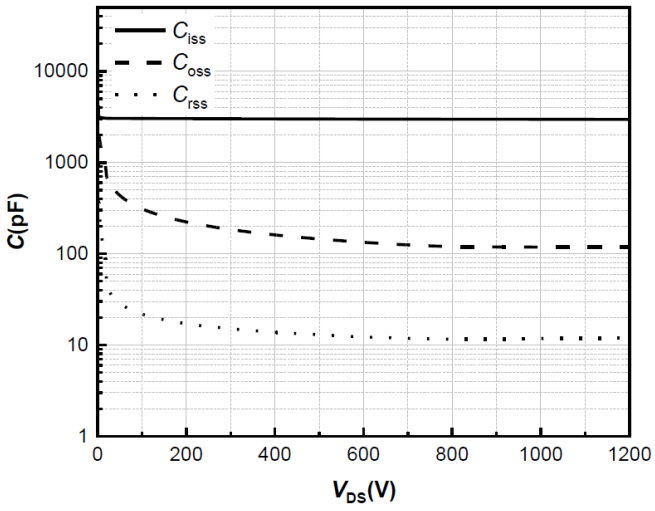



Figure 17. Capacitances vs. Drain-Source

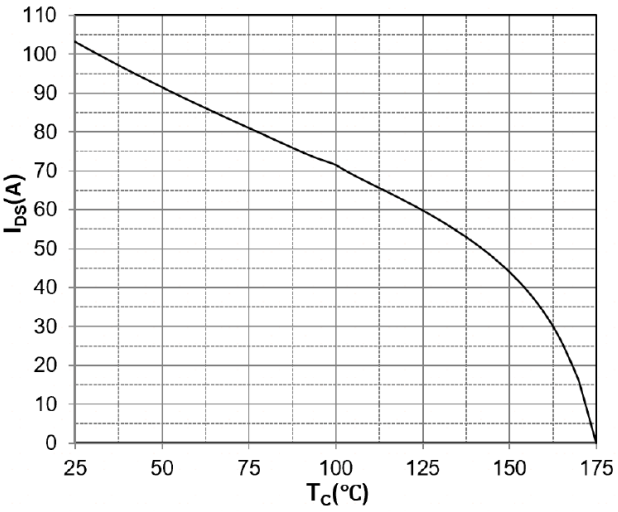



Figure 18. Continuous Drain Current Derating vs. Case Temperature

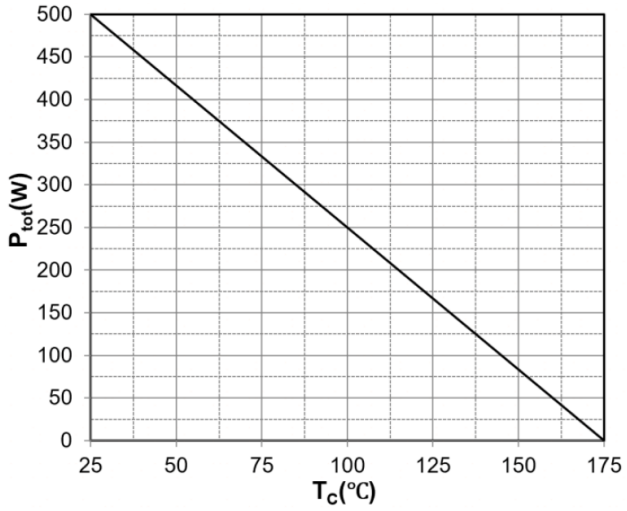



Figure 19. Maximum Power Dissipation Derating vs. Case Temperature

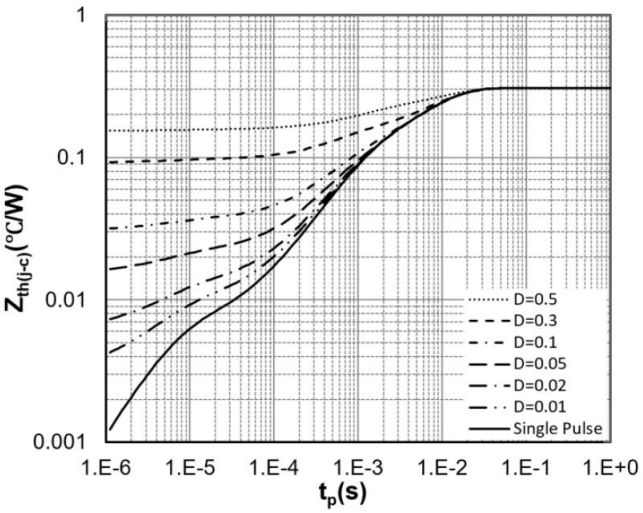



Figure 20. Transient Thermal Impedance

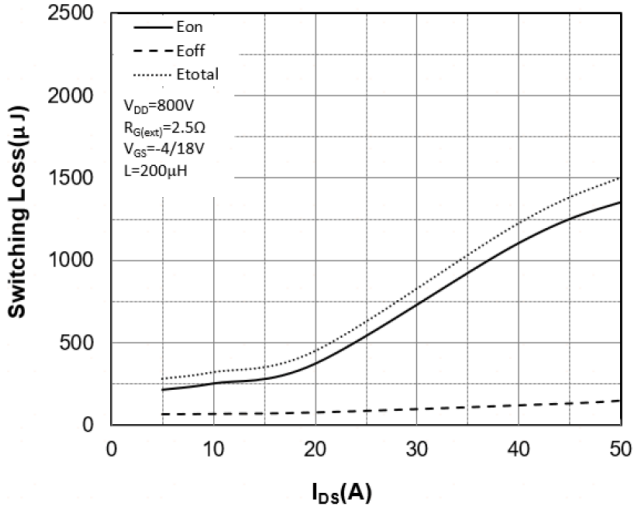



Figure 21. Clamped Inductive Switching Energy vs. Drain Current

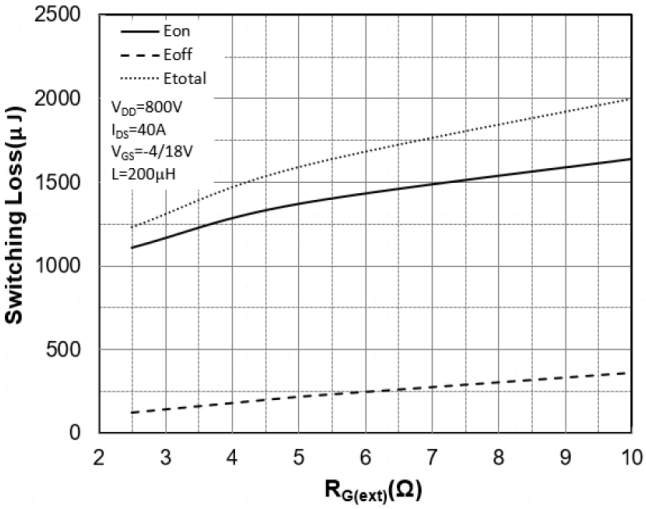



Figure 22. Clamped Inductive Switching Energy vs. RG

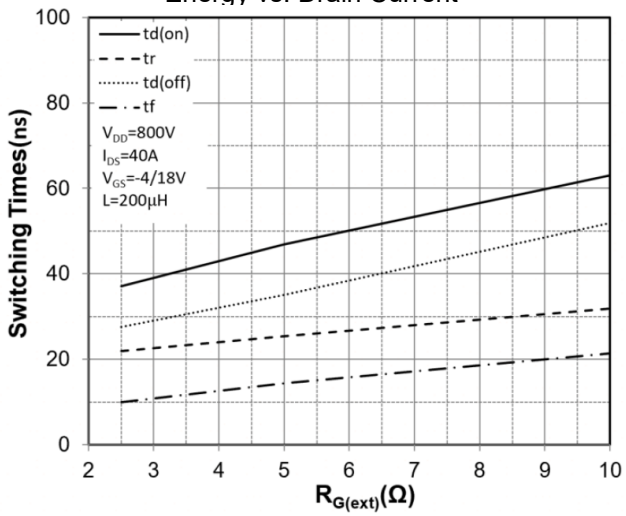



Figure 23. Switching Times vs. RG

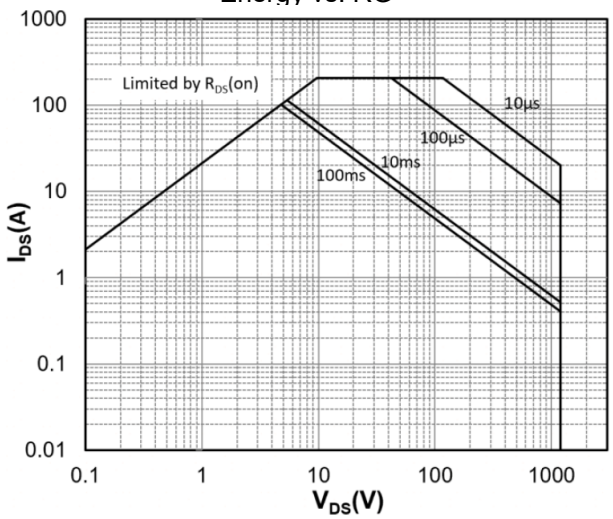
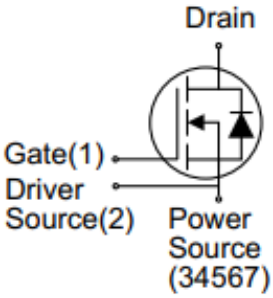
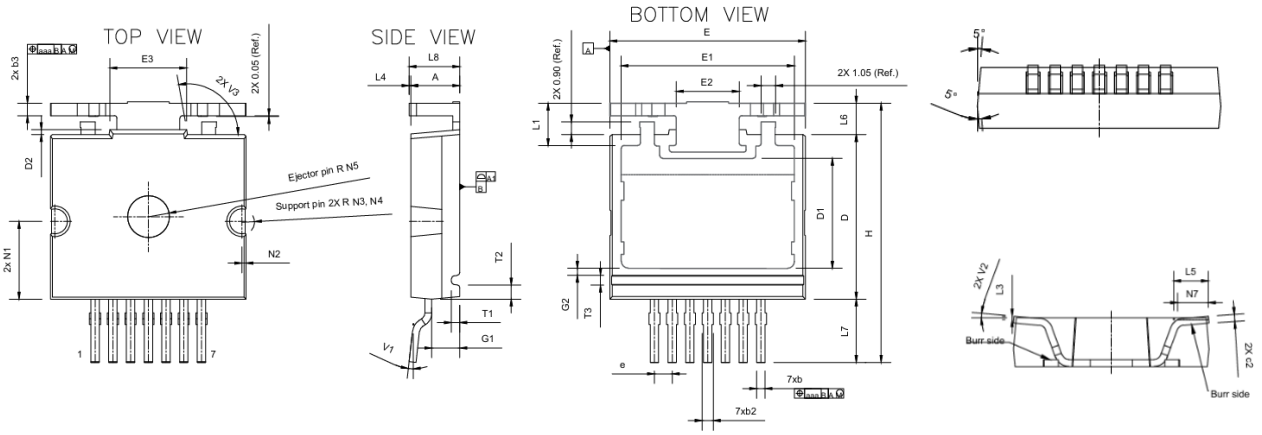



Figure 24. Safe Operating Area

·Circuit diagram




·TO-263-7L Package outlines : Dimensions in (mm)




| SYMBOL | Unit: mm | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 3.40 | 3.50 | 3.60 |
| A1 | | 0.05 | |
| b | 0.50 | 0.60 | 0.70 |
| b2 | 0.70 | 0.80 | 0.90 |
| b3 | 0.80 | 0.90 | 0.98 |
| c2 | 0.40 | 0.50 | 0.60 |
| D | 11.70 | 11.80 | 11.90 |
| D1 | 7.78 | 7.88 | 7.98 |
| D2 | 0.24 | 0.34 | 0.44 |
| E | 13.90 | 14.00 | 14.10 |
| E1 | 12.30 | 12.40 | 12.50 |
| E2 | 4.45 | 4.50 | 4.55 |
| E3 | 5.45 | 5.50 | 5.55 |
| e | | 1.27 | |
| H | 18.00 | 18.58 | 19.00 |
| L1 | | 3.04 | |
| L5 | 2.38 | 2.48 | 2.58 |
| L6 | 2.14 | 2.24 | 2.34 |
| L7 | 4.44 | 4.54 | 4.64 |
| L8 | 3.475 | 3.625 | 3.775 |
| N1 | 5.46 | 5.56 | 5.66 |
| N2 | 0.25 | 0.30 | 0.35 |
| N3 | 0.80 | 0.90 | 1.00 |
| N4 | 1.00 | 1.10 | 1.20 |
| N5 | 1.40 | 1.50 | 1.60 |
| N7 | 2.10 | 2.20 | 2.30 |
| G1 | 1.90 | 2.00 | 2.10 |
| G2 | 0.41 | 0.51 | 0.61 |
| T1 | | 0.60 | |
| T2 | | 1.00 | |
| T3 | 0.60 | 0.70 | 0.80 |
| V1 | 0° | 5° | 8° |
| V2 | 0° | 6° | 8° |
| V3 | | 100° | |
| aaa | | 0.1 | |

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