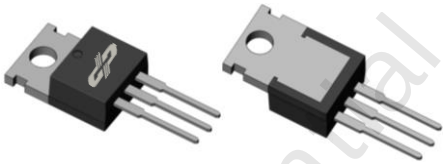
# DPM065R160P3G1

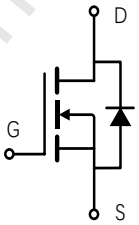
*N-Channel Silicon Carbide MOSFET*

## Product Summary

| Part # | $V_{DS}$ | $R_{DS(on)}$ | $I_D$ ($T_{vj}$=25℃) |
|---|---|---|---|
| DPM065R160P3G1 | 650V | 175mΩ | 20A |

TO-220






## Features

- High Speed Switching with Low Capacitances
- High Blocking Voltage with Low $R_{DS(on)}$
- Easy to parallel
- RoHS Compliant

## Applications

- General purpose drives
- Energy storage systems
- String inverter
- Uninterruptible power supplies

## Package Marking and Ordering Information

| Part # | Marking | Package | Packing |
|---|---|---|---|
| DPM065R160P3G1 | M065R160P3 | TO-220 | Tube |

HAL Halogen-Free

## Absolute Maximum Ratings

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-source voltage | $V_{DS}$ | 650 | V |
| Continuous drain current<br>$T_C$ = 25°C<br>$T_C$ = 100°C | $I_D$ | <br>20<br>15 | A |
| Pulsed drain current ($T_C$ = 25°C, $t_p$ limited by $T_{jmax}$) | $I_{D\ pulse}$ | 80 | A |
| Gate-source voltage, max. transient voltage | $V_{GSmax}$ | -8/+22 | V |
| Gate-source voltage, max. static voltage | $V_{GSop}$ | -4/+18 | V |
| Gate-Source voltage | $V_{GS}$ | ±20 | V |
| Power dissipation ($T_C$ = 25°C)<br>Power dissipation ($T_C$ = 100°C) | $P_{tot}$ | 96<br>38 | W |
| Operating junction temperature | $T_j$ | -40...+175 | °C |
| Storage temperature | $T_{stg}$ | -40...+150 | °C |

## Thermal Resistance

| Parameter | Symbol | Max | Unit |
|---|---|---|---|
| Thermal resistance, junction – case. Max | $R_{thMB}$ | 1.3 | °C/W |
| Thermal resistance, junction – ambient(min. footprint) | $R_{thJA}$ | 65 | |

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

| Parameter | Symbol | Value | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| **Static Characteristic** | | | | | | |
| Drain-source breakdown voltage | $BV_{DSS}$ | 650 | - | - | V | $V_{GS}$=0V, $I_D$=250uA |
| Gate threshold voltage | $V_{GS(th)}$ | 2 | 2.7<br>2.0 | 4 | V | $V_{DS}$=$V_{GS}$,$I_D$=2.5mA<br>$T_j$=25°C<br>$T_j$=175°C |
| Zero gate voltage drain current | $I_{DSS}$ | - | 1 | 10 | μA | $V_{DS}$=650V,$V_{GS}$=0V<br>$T_j$=25°C |
| Gate-source leakage current | $I_{GSS}$ | - | - | 250 | nA | $V_{GS}$=18V,$V_{DS}$=0V |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 175<br>188 | 220 | mΩ | $V_{GS}$=18V, $I_D$=10A<br>$T_j$=25°C<br>$T_j$=175°C |
| Gate resistance | $R_g$ | - | 4 | - | Ω | $V_{GS}$=0V, $V_{DS}$=0V, f=1MHz |
| **Dynamic Characteristic**[2] | | | | | | |
| Input Capacitance | $C_{iss}$ | - | 310 | - | pF | $V_{GS}$=0V, $V_{DS}$=600V, f=1MHz |
| Output Capacitance | $C_{oss}$ | - | 32 | - | | |
| Reverse Transfer Capacitance | $C_{rss}$ | - | 4.4 | - | | |
| Gate Total Charge | $Q_g$ | - | 16 | - | nC | $V_{GS}$=-4/18V, $V_{DS}$=400V, $I_D$=10A, f=1MHz |
| Gate-Source charge | $Q_{gs}$ | - | 3 | - | | |
| Gate-Drain charge | $Q_{gd}$ | - | 4.2 | - | | |
| Turn-on delay time | $t_{d(on)}$ | - | 5 | - | ns | $V_{GS}$=-4/18V, $V_{DD}$=400V, $R_{G\_ext}$=2.5Ω L=200μH |
| Rise time | $t_r$ | - | 14 | - | | |
| Turn-off delay time | $t_{d(off)}$ | - | 9 | - | | |
| Fall time | $t_f$ | - | 5 | - | | |
| Turn-On Energy | $E_{on}$ | - | 46 | - | μJ | |
| Turn-Off Energy | $E_{off}$ | - | 8 | - | | |

## Body Diode Characteristic

| Parameter | Symbol | Value | | | Unit | Test Condition |
|---|---|---|---|---|---|---|
| | | min. | typ. | max. | | |
| Body Diode Forward Voltage | $V_{SD}$ | - | 4.2<br>3.9 | 5.5 | V | $V_{GS}$=-4V,$I_{SD}$=5A<br>$T_j$=25°C<br>$T_j$=175°C |
| Diode continuous forward current | $I_s$ | | 17<br>15 | -<br>- | A | $V_{GS}$=-4V<br>$T_C$ = 25°C<br>$T_C$ = 100°C |
| Diode Peak reverse recovery Current | $I_{rrm}$ | - | 6.5 | - | A | VGS=-4V,$V_R$=400V<br>$I_{SD}$=5A, dI/dt=1000A/μs |
| Body Diode Reverse Recovery Time[2] | $t_{rr}$ | - | 9 | - | ns | |
| Body Diode Reverse Recovery Charge[2] | $Q_{rr}$ | - | 33 | - | nC | |

[2]. Defined by design. Not subject to production test

## Typical Performance Characteristics

Fig 1: Output Characteristics
Tj=-40 ℃

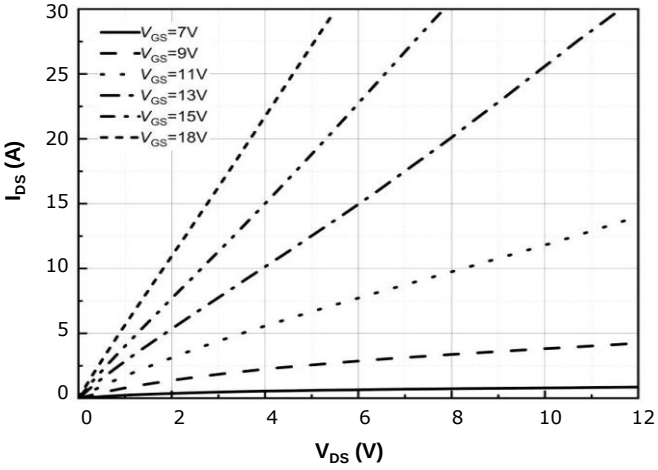



Fig 2: Output Characteristics
Tj=25℃

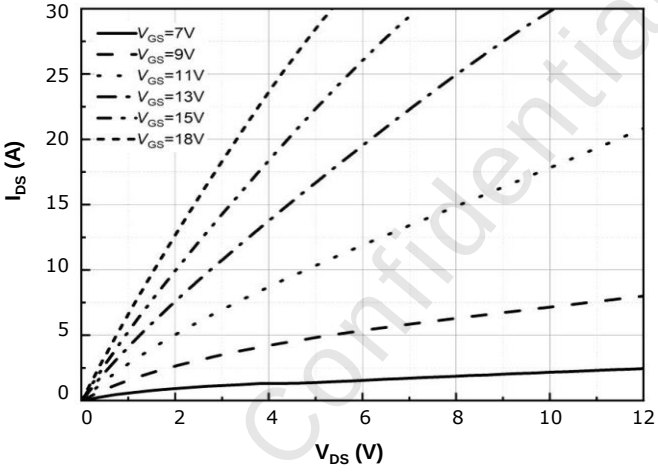



Fig 3: Output Characteristics
Tj=175℃

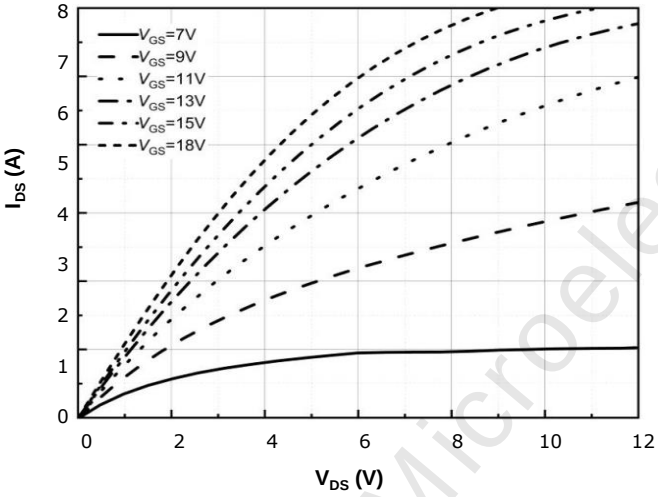



Fig 4: Rds(on) vs Drain Current for various Temperature

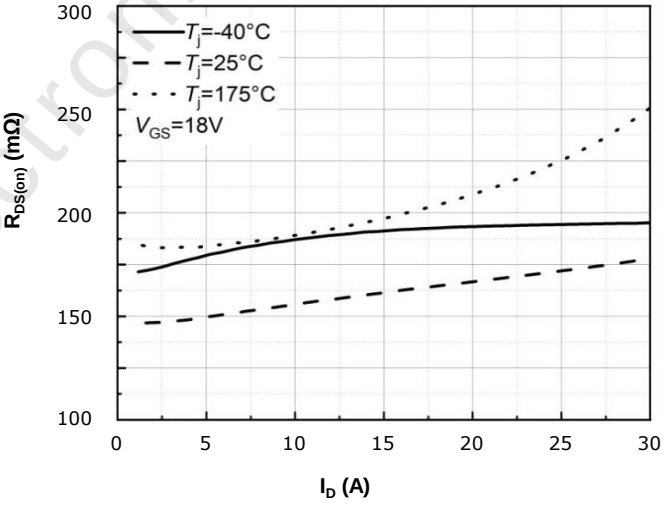



Fig 5: Rds(on) vs. Temperature

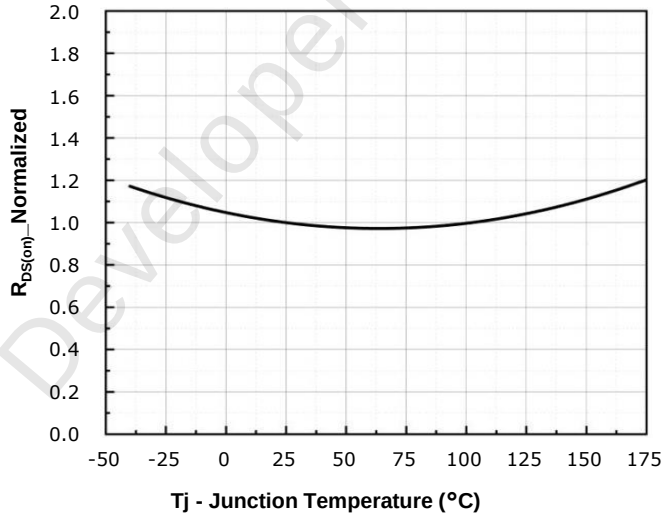
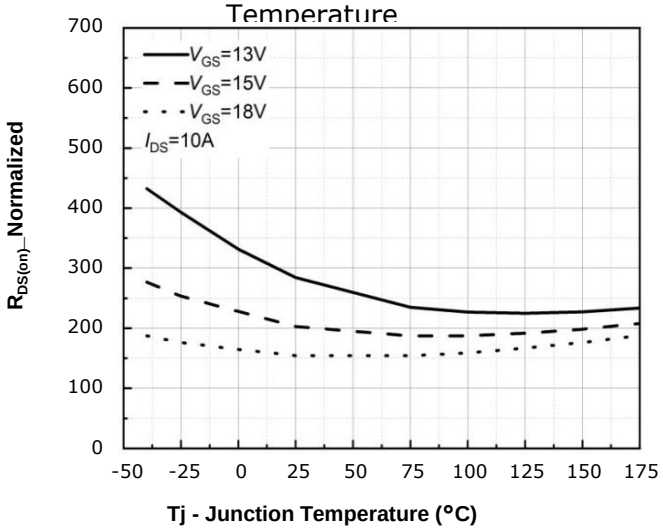



Fig 6: Rds(on) vs. Gate Voltage at Temperature



## Typical Performance Characteristics

Fig 7: Transfer Characteristics

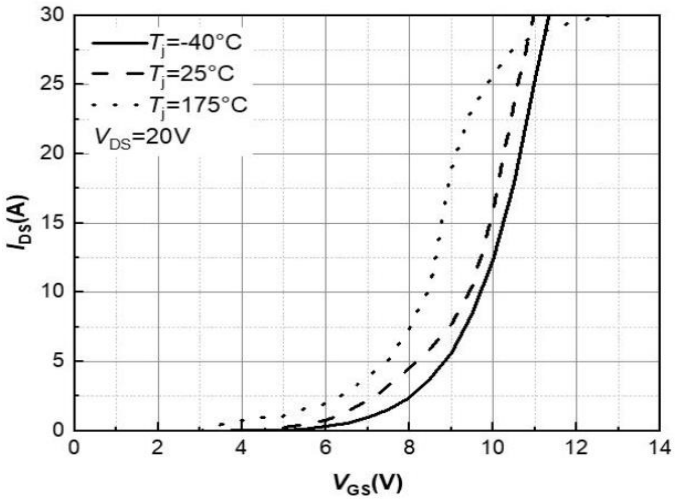



Fig 8: Body Diode Characteristic Tj=-40℃

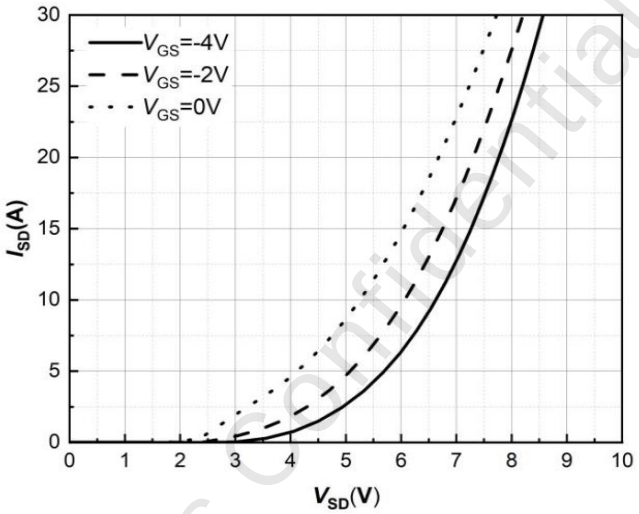



Fig 9: Body Diode Characteristic Tj=25℃

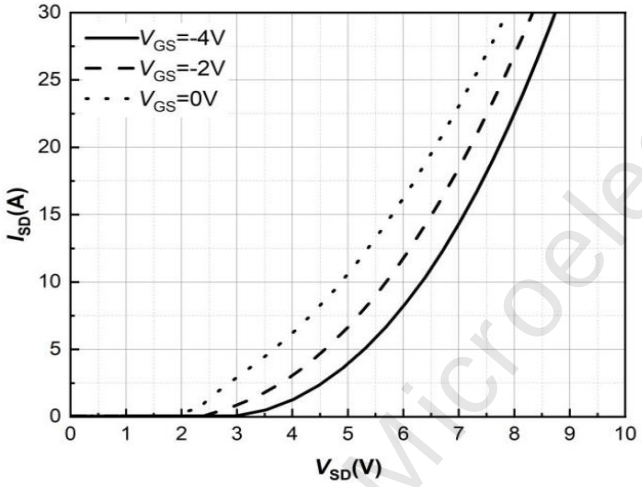



Fig 10: Body Diode Characteristic Tj=175℃

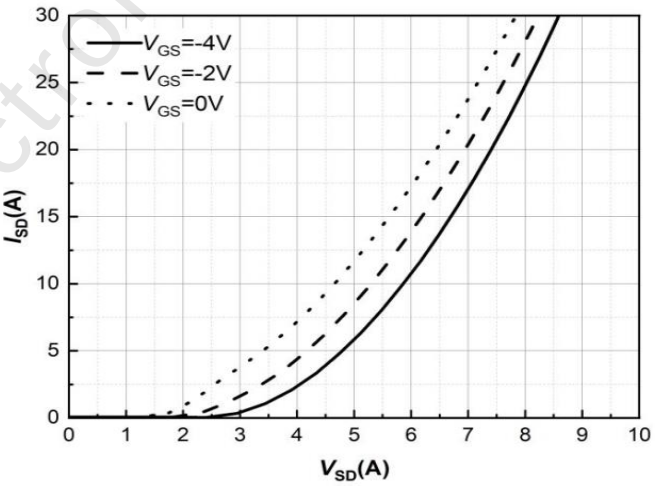



Fig 11: Threshold Voltage vs. Temperature

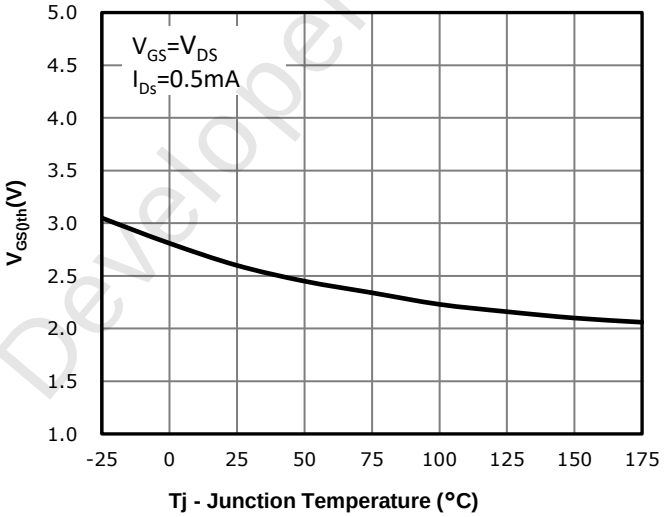



Fig 12: Capacitance Characteristics

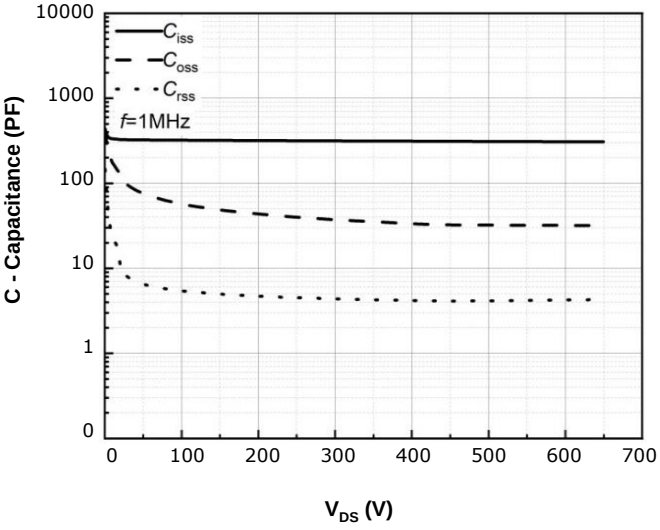


Fig 13: Gate Charge Characteristics

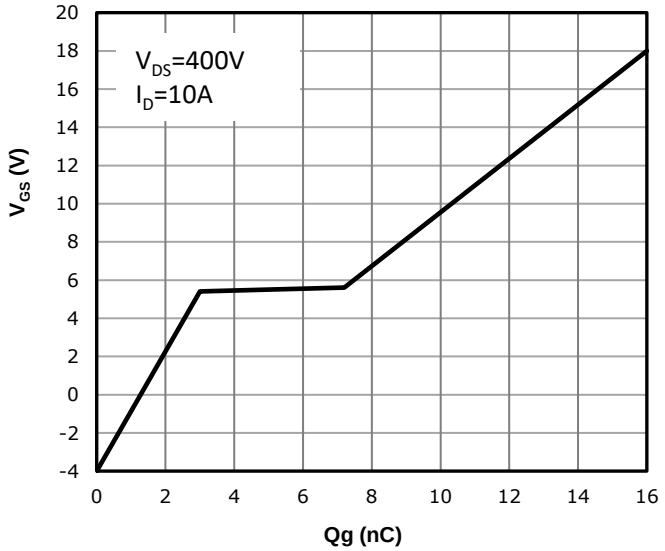



Fig 14: Clamped Inductive Switching energy vs Rg

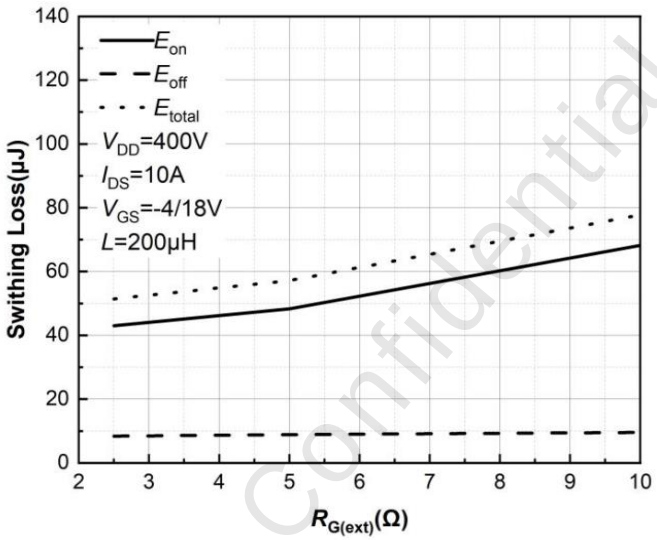



Fig 15: Power Dissipation

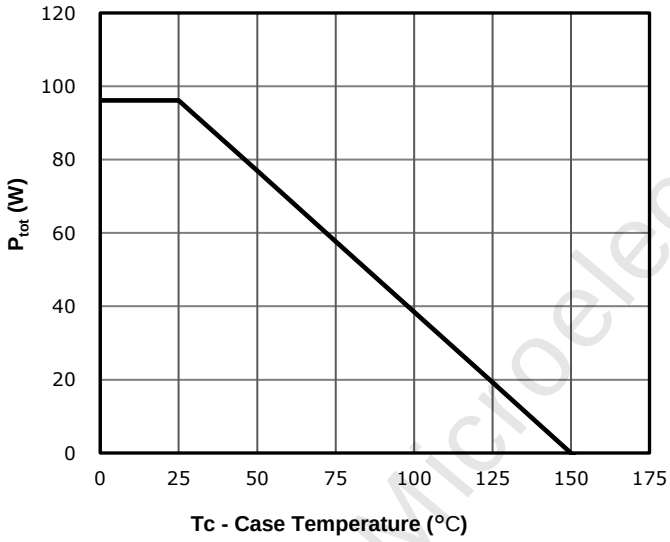



Fig 16: Drain Current Derating

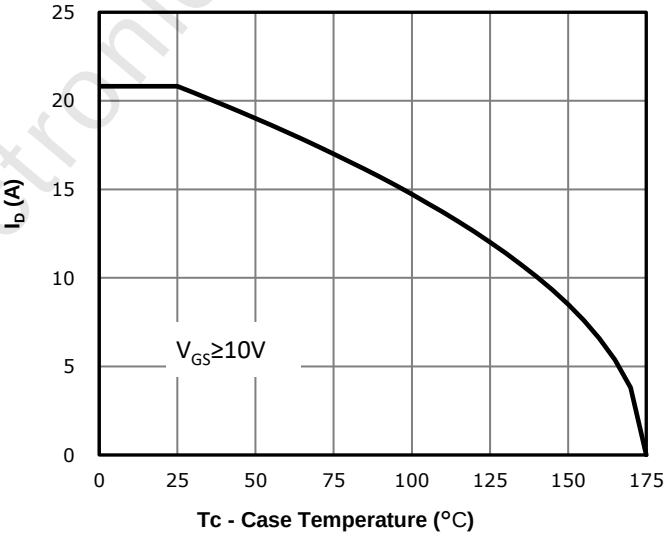



Fig 17: Safe Operating Area

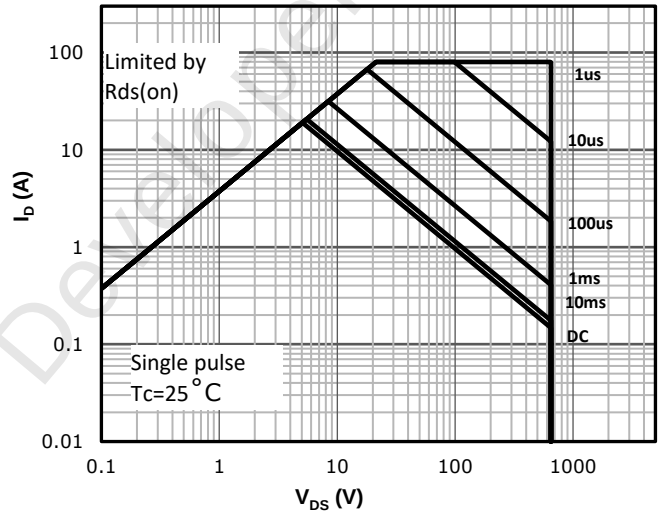
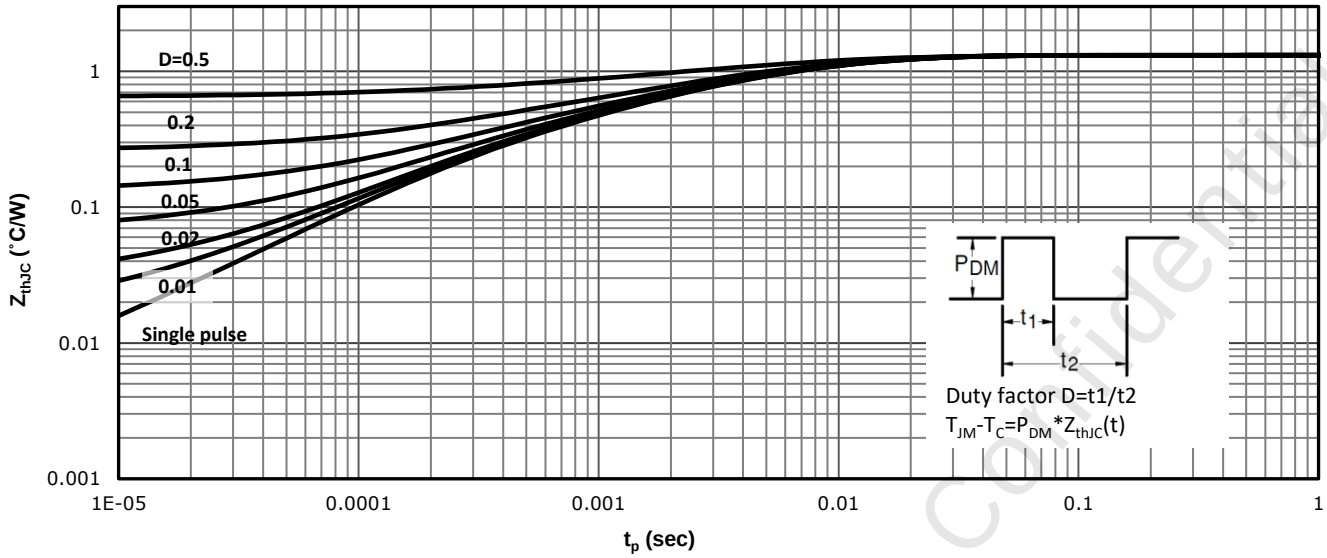
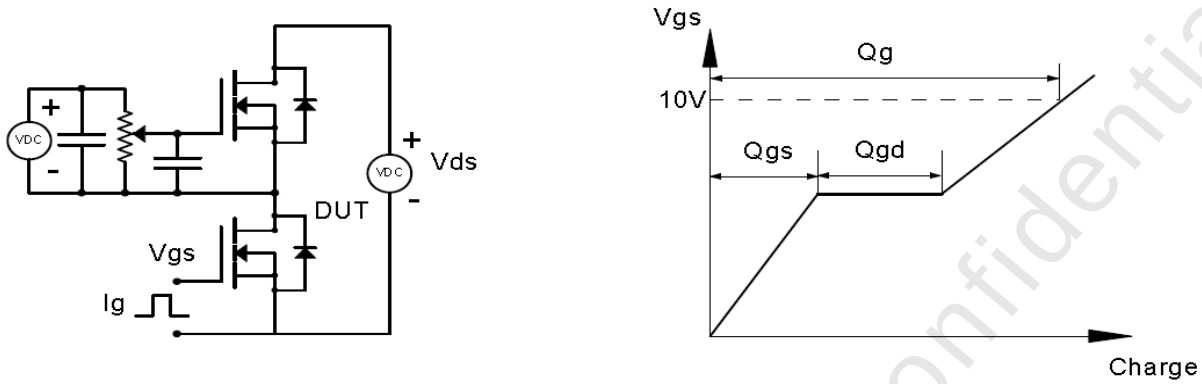


Fig 18: Max. Transient Thermal Impedance

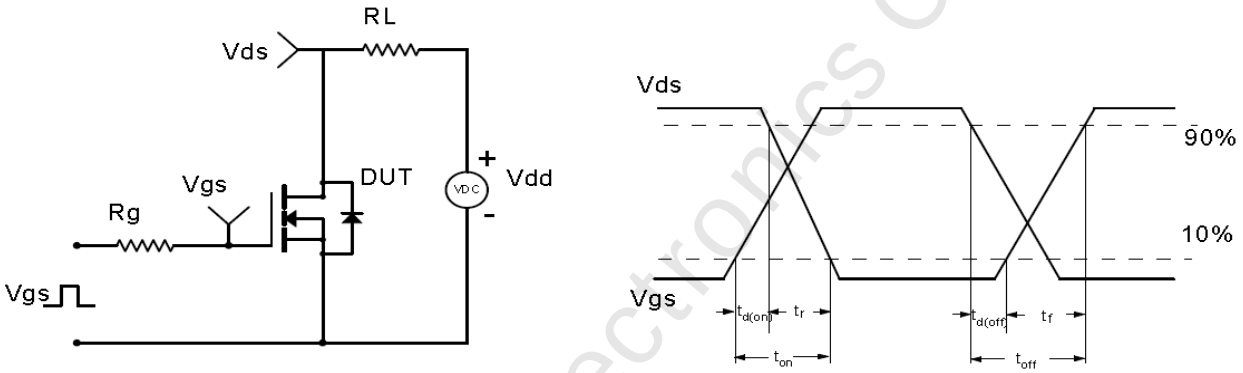


## Test Circuit & Waveform

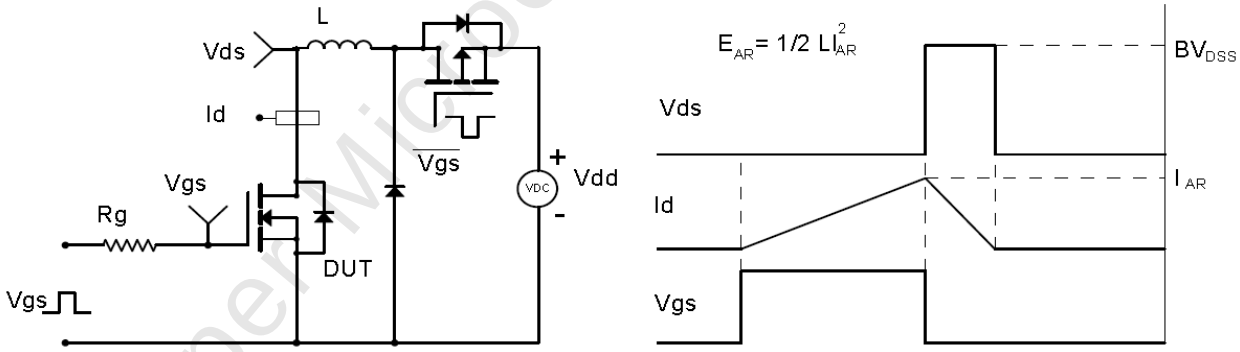
Gate Charge Test Circuit & Waveform



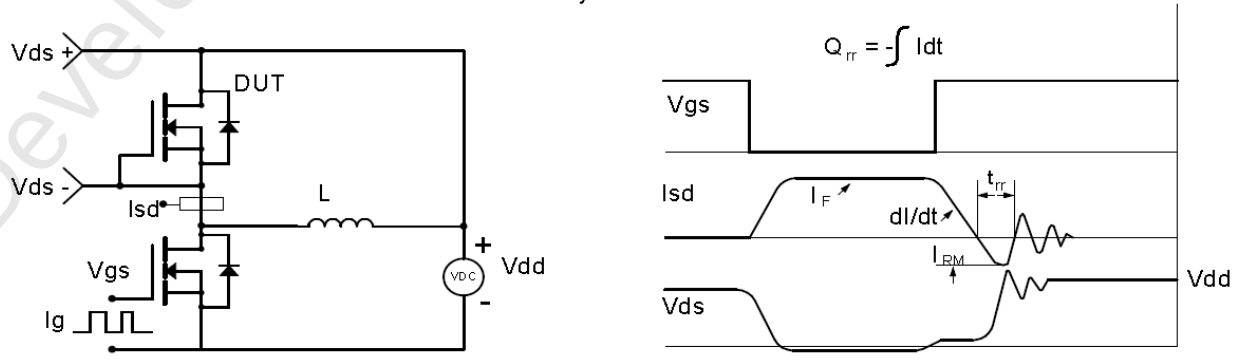

Resistive Switching Test Circuit & Waveforms



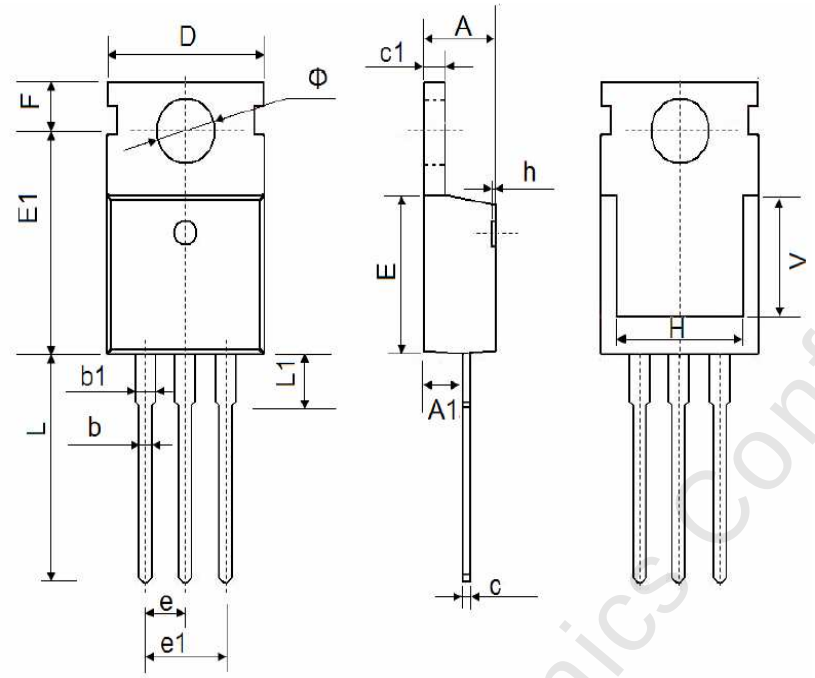

Unclamped Inductive Switching (UIS) Test Circuit & Waveforms




Diode Recovery Test Circuit & Waveforms

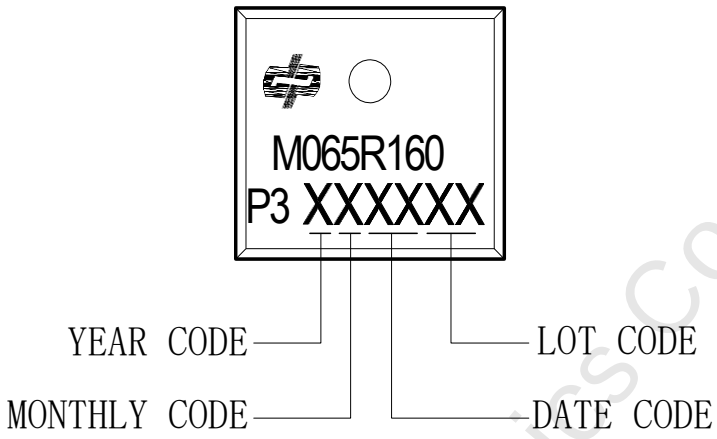


## Package Outline: TO-220-3L




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 4.30 | 4.70 | 0.169 | 0.185 |
| A1 | 2.25 | 2.55 | 0.089 | 0.100 |
| b | 0.71 | 0.91 | 0.028 | 0.036 |
| b1 | 1.17 | 1.37 | 0.046 | 0.054 |
| c | 0.33 | 0.65 | 0.013 | 0.026 |
| c1 | 1.20 | 1.40 | 0.047 | 0.055 |
| D | 9.91 | 10.25 | 0.390 | 0.404 |
| E | 8.95 | 9.75 | 0.352 | 0.384 |
| E1 | 12.65 | 12.95 | 0.498 | 0.510 |
| e | 2.54 BSC. | | 0.100 BSC. | |
| e1 | 4.98 | 5.18 | 0.196 | 0.204 |
| F | 2.65 | 2.95 | 0.104 | 0.116 |
| H | 7.90 | 8.10 | 0.311 | 0.319 |
| h | 0.00 | 0.30 | 0.000 | 0.012 |
| L | 12.90 | 13.40 | 0.508 | 0.528 |
| L1 | 2.85 | 3.25 | 0.112 | 0.128 |
| V | 7.500 Ref. | | 0.295 Ref. | |
| Φ | 3.400 | 3.800 | 0.134 | 0.150 |

## Part Marking Information



## Revision History

| Revison | Major changes |
|---|---|
| 1.25 | Release for formal version |



## 重要声明Important Notice

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