**N-Ch 120V Fast Switching MOSFETs**

Green

### Features

- Split Gate Trench MOSFET technology
- Excellent package for heat dissipation
- High density cell design for low $R_{DS(ON)}$

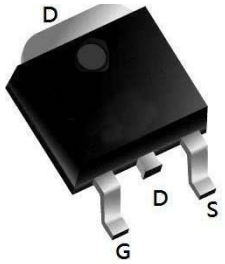
### Product Summary

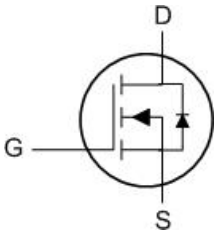
| BVDSS | RDSON | ID |
|---|---|---|
| 120V | 6.0 mΩ | 120A |

### Applications

- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

### TO252 Pin Configuration




## Absolute Maximum Ratings:

| Symbol | Parameter | | Value | Units |
|---|---|---|---|---|
| $V_{DSS}$ | Drain-to-Source Voltage | | 120 | V |
| $I_D$ | Continuous Drain Current | $T_C$ = 25 °C | 120 | A |
| | Continuous Drain Current | $T_C$ = 100 °C | 79 | A |
| $I_{DM}$[a1] | Pulsed Drain Current | | 500 | A |
| $E_{AS}$[a2] | Single pulse avalanche energy | | 326 | mJ |
| $V_{GS}$ | Gate-to-Source Voltage | | ±20 | V |
| $P_D$ | Power Dissipation | | 227 | W |
| $T_J$, $T_{STG}$ | Operating Junction and Storage Temperature Range | | 150, –55 to 150 | ℃ |
| $T_L$ | Maximum Temperature for Soldering | | 260 | ℃ |

## Thermal Characteristics:

| Symbol | Parameter | Value | Units |
|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 0.55 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 60 | ℃/W |

## Electrical Characteristics (Tc= 25℃ unless otherwise specified):

| Static Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | Parameter | Test Conditions | Value | | | Units |
| | | | Min. | Typ. | Max. | |
| $V_{DSS}$ | Drain to Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250μA | 120 | -- | -- | V |
| $I_{DSS}$ | Drain to Source Leakage Current | $V_{DS}$ = 120V, $V_{GS}$= 0V | -- | -- | 1 | μA |
| $I_{GSS(F)}$ | Gate to Source Forward Leakage | $V_{GS}$ =+20V | -- | -- | 100 | nA |
| $I_{GSS(R)}$ | Gate to Source Reverse Leakage | $V_{GS}$ =-20V | -- | -- | -100 | nA |
| $V_{GS(TH)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$ = 250μA | 2.5 | 3 | 3.5 | V |
| $R_{DS(ON)}$ | Drain-to-Source On-Resistance | $V_{GS}$=10V, $I_D$=20A | -- | 6 | 7.5 | mΩ |

| Dynamic Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | Parameter | Test Conditions | Value | | | Units |
| | | | Min. | Typ. | Max. | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0V<br>$V_{DS}$ = 60V<br>f = 1.0MHz | -- | 3614 | -- | pF |
| $C_{oss}$ | Output Capacitance | | -- | 423 | -- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | -- | 12 | -- | |
| $R_g$ | Gate resistance | | -- | 0.84 | -- | Ω |

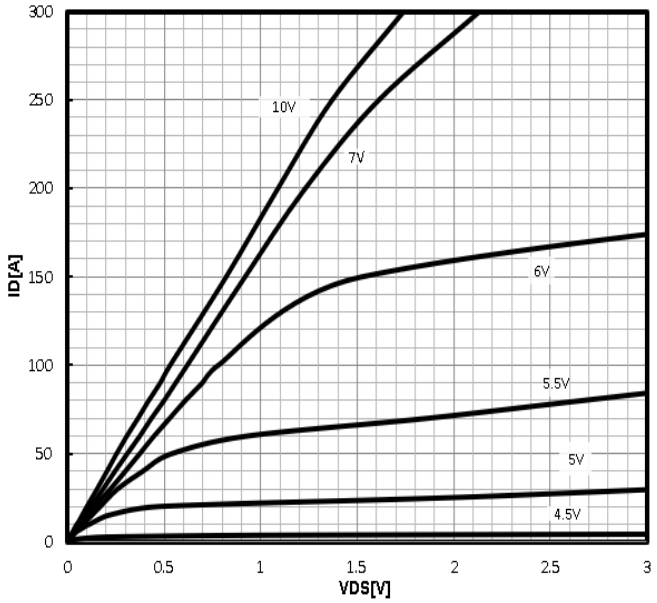
| Resistive Switching Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | Parameter | Test Conditions | Value | | | Units |
| | | | Min. | Typ. | Max. | |
| $t_{d(ON)}$ | Turn-on Delay Time | $I_D$ =20A<br>$V_{DS}$ = 60V<br>$V_{GS}$ = 10V<br>$R_G$ = 5Ω | -- | 20 | -- | ns |
| tr | Rise Time | | -- | 65 | -- | |
| $t_{d(OFF)}$ | Turn-Off Delay Time | | -- | 32 | -- | |
| $t_f$ | Fall Time | | -- | 49 | -- | |
| $Q_g$ | Total Gate Charge | $V_{GS}$ =0~10V<br>$V_{DS}$ = 90V<br>$I_D$ =20A | -- | 60.8 | -- | nC |
| $Q_{gs}$ | Gate Source Charge | | -- | 18.8 | -- | |
| $Q_{gd}$ | Gate Drain Charge | | -- | 14.7 | -- | |

| Source-Drain Diode Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| Symbol | Parameter | Test Conditions | Value | | | Units |
| | | | Min. | Typ. | Max. | |
| $I_S$ | Diode Forward Current | $T_C$ =25 °C | -- | -- | 120 | A |
| $V_{SD}$ | Diode Forward Voltage | $I_S$=20A, $V_{GS}$=0V | -- | 0.83 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery time | $I_S$=40A,<br>dI/dt=100A/μs | -- | 70 | -- | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | -- | 129 | -- | nC |

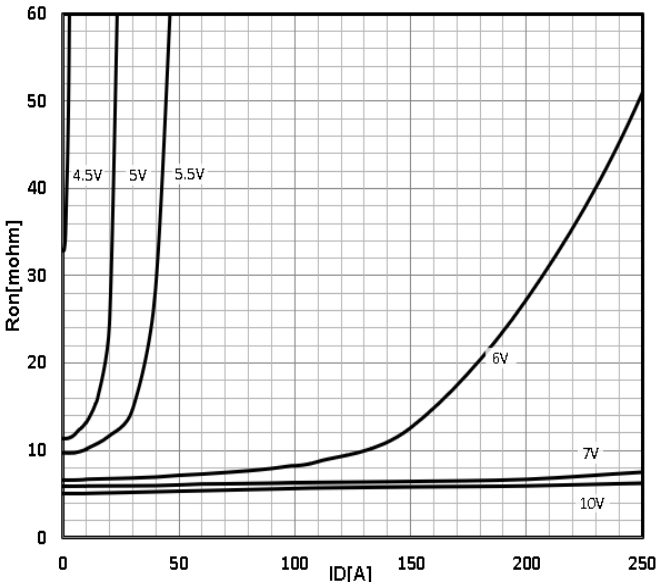
[a1]: Repetitive rating; pulse width limited by maximum junction temperature
[a2]: VDD=60V, L=0.5mH, Rg=25Ω, Starting TJ=25 ℃

## Characteristics Curve:

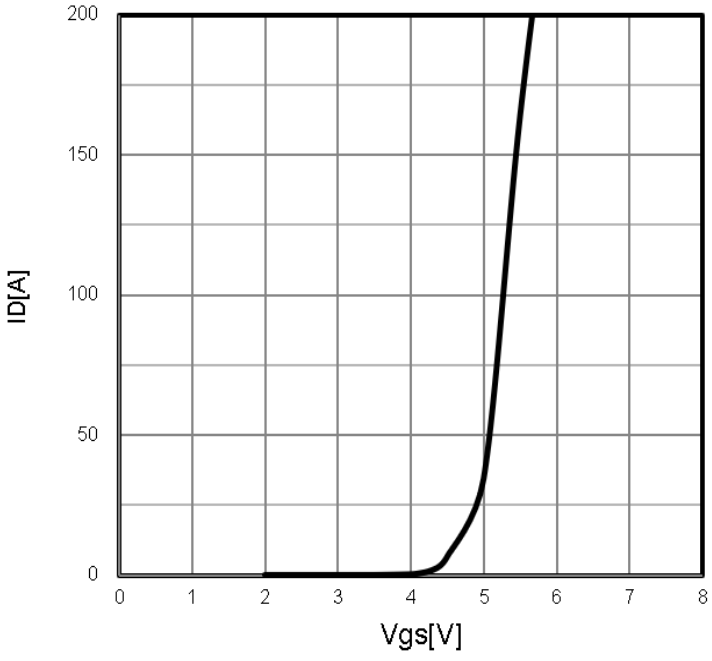
**Typ. output characteristics**
$I_D=f(V_{DS})$



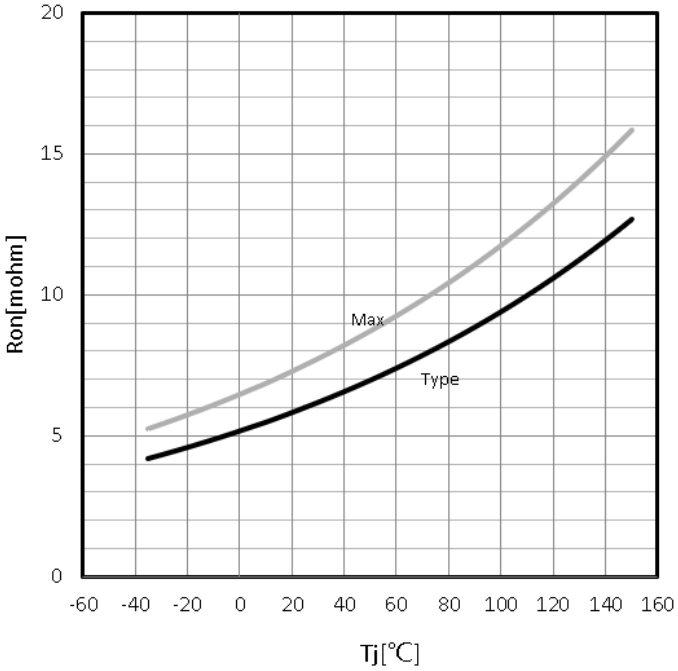

**Typ. drain-source on resistance**
$R_{DS(on)}=f(I_D)$



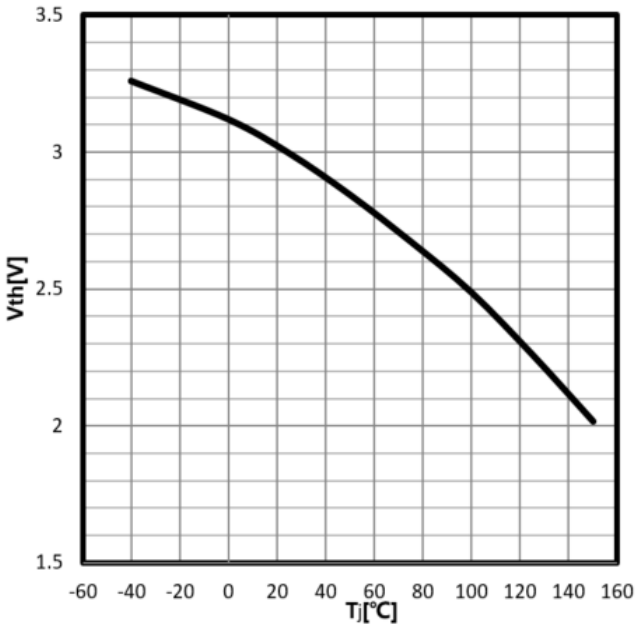

**Typ. transfer characteristics**
$I_D=f(V_{GS})$



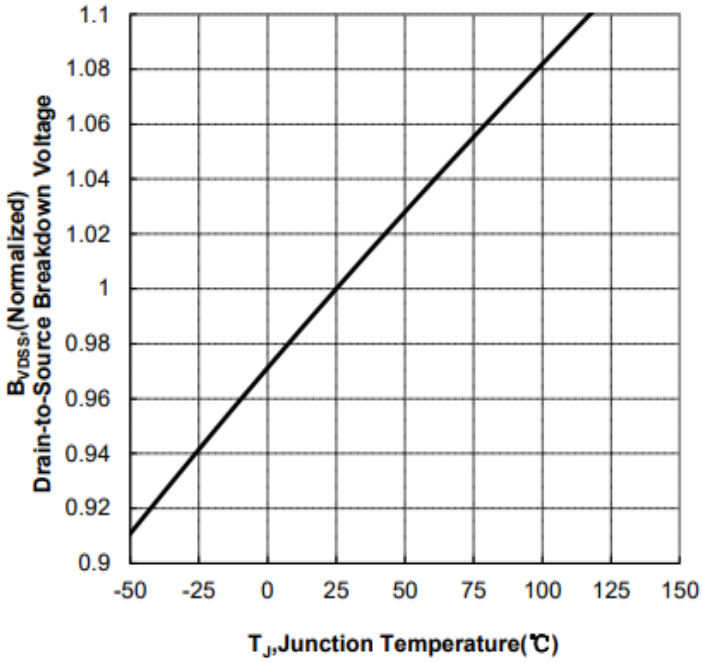

**Drain-source on-state resistance**
$R_{DS(on)}=f(T_j)$; $I_D$=20A; $V_{GS}$=10V



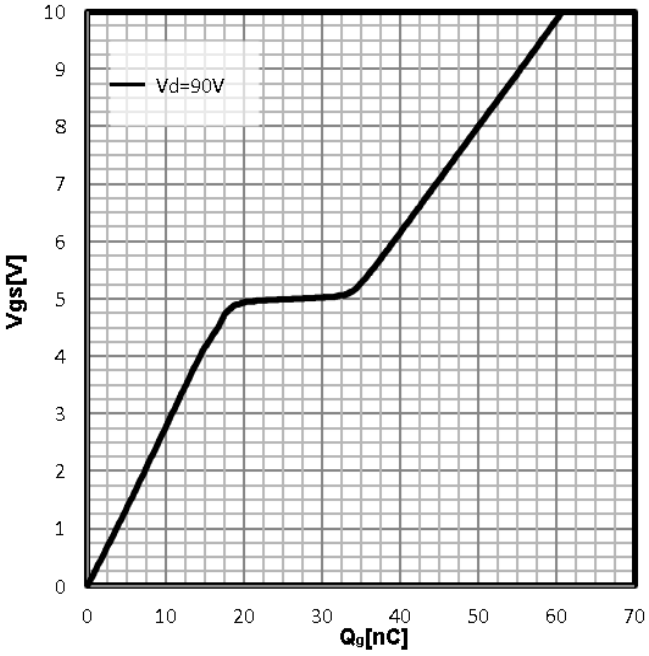
**Gate Threshold Voltage**
$V_{TH}=f(T_j)$; $I_D=250uA$



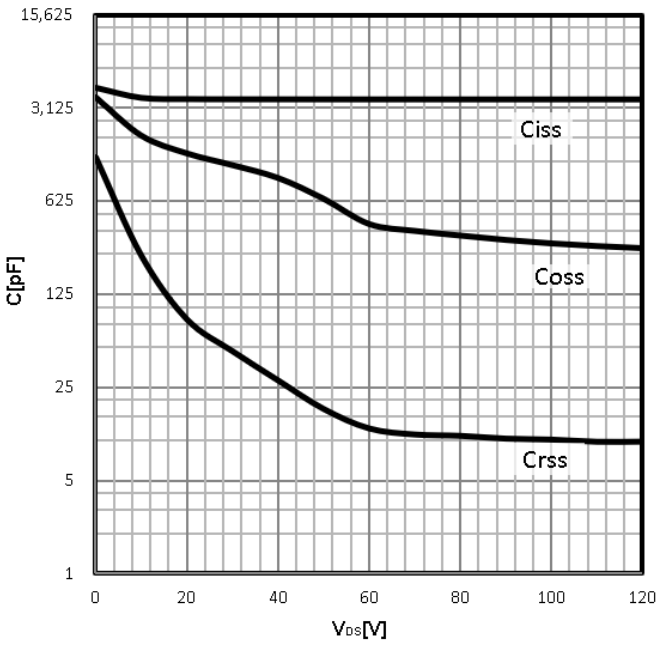

**Drain-source breakdown voltage**
$V_{BR(DSS)}=f(T_j)$; $I_D=250uA$



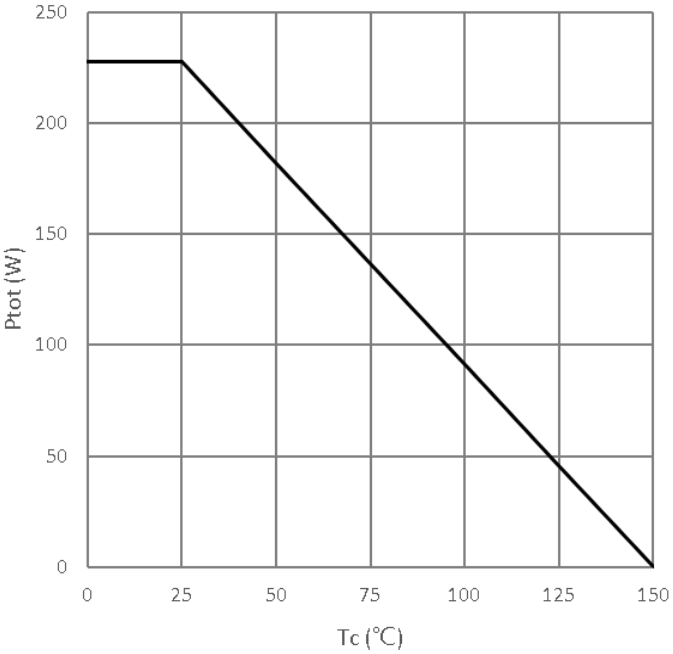

**Typ. gate charge**
$V_{GS}=f(Q_{gate})$



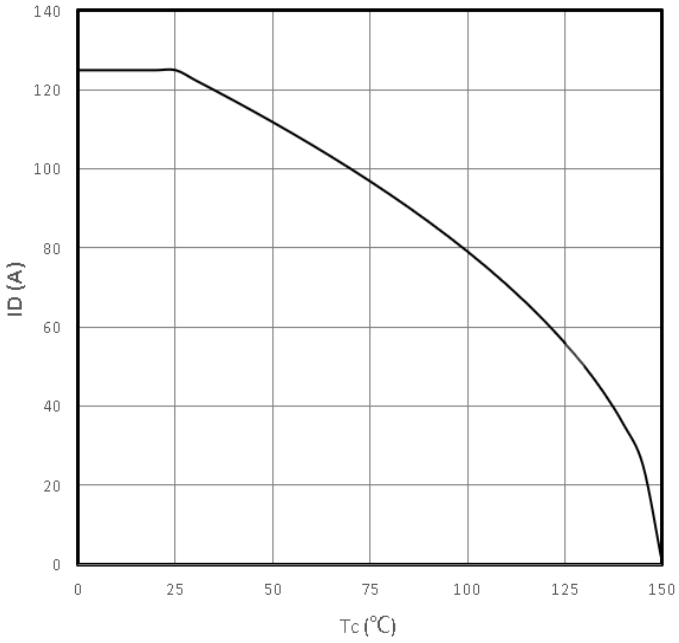

**Typ. capacitances**
$C=f(V_{DS})$; $V_{GS}=0V$; $f=1MHz$



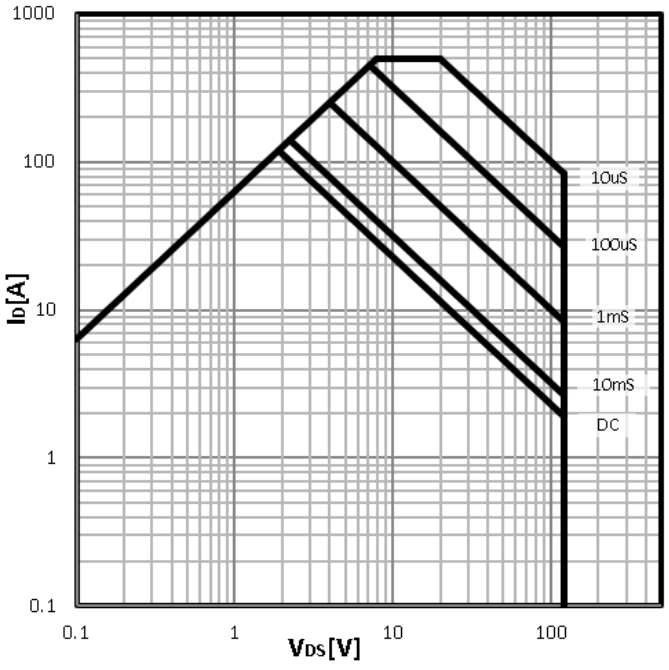
**Power Dissipation**
$P_{tot}=f(T_j)$



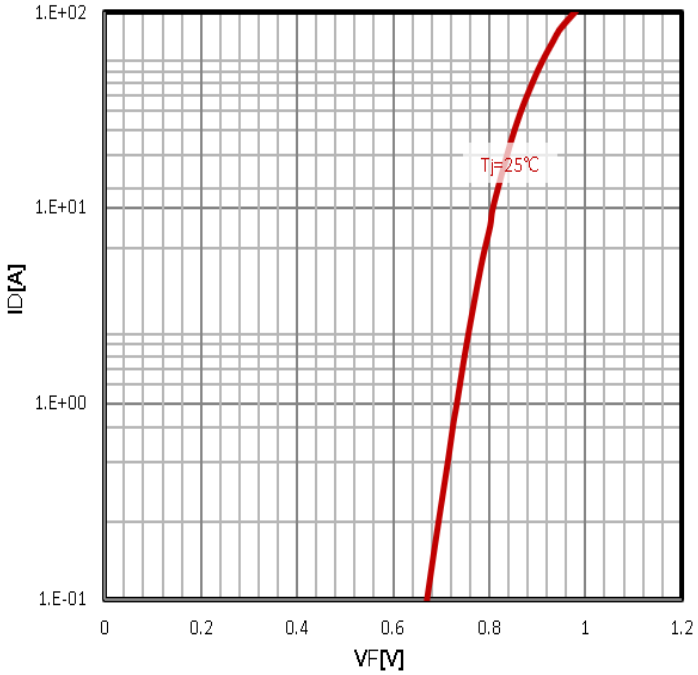

**Maximum Drain Current**
$I_D=f(T_C)$




**Safe operating area**
$I_D=f(V_{DS})$

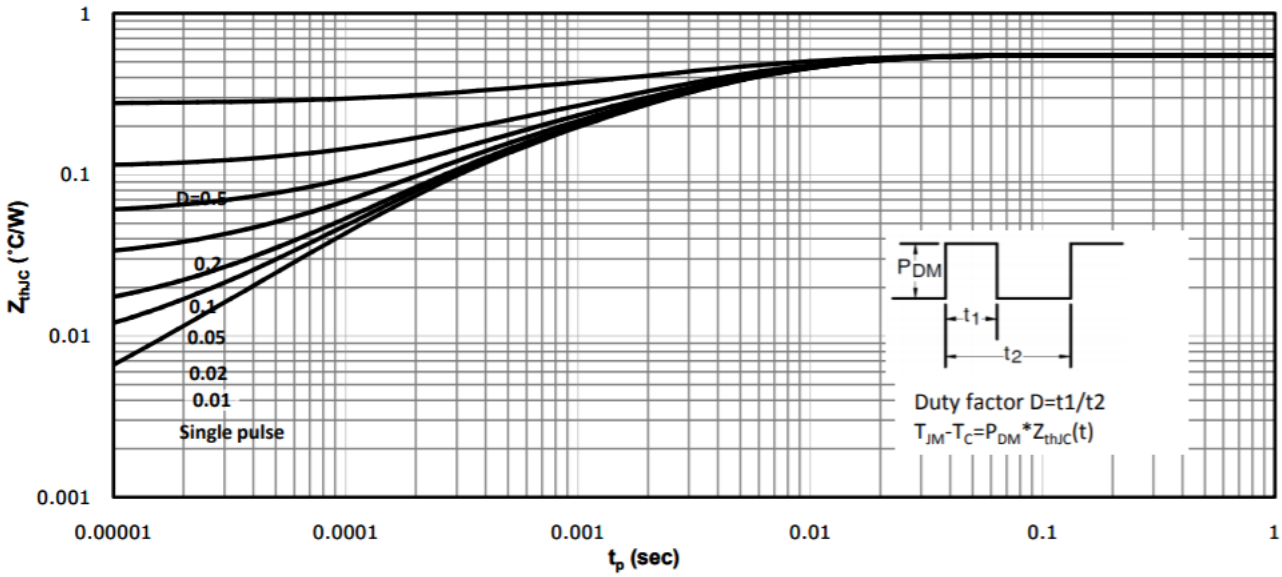



**Body Diode Forward Voltage Variation**
$I_F=f(V_{GS})$



**Max. transient thermal impedance**

$Z_{thJC}=f(t_p)$



## Test Circuit

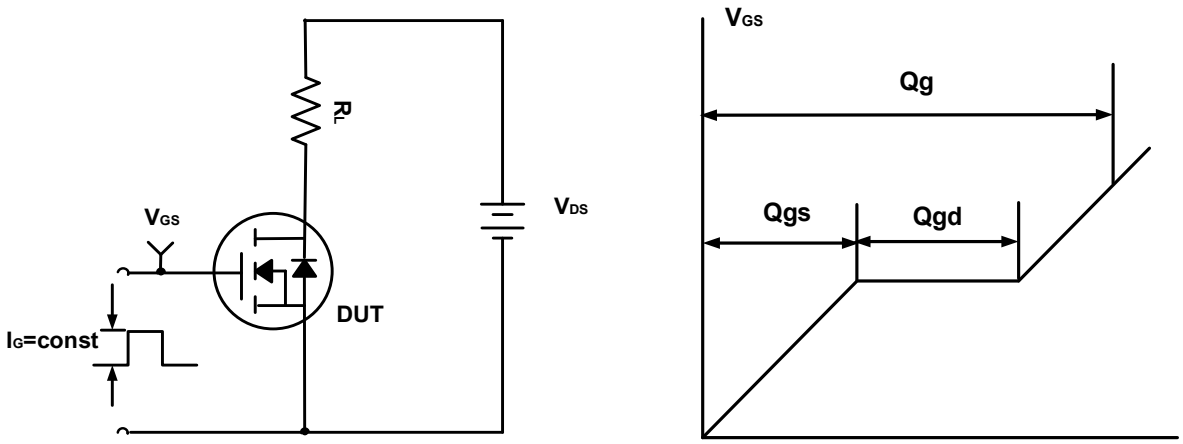



**Figure A. Gate Charge Test Circuit & Waveforms**

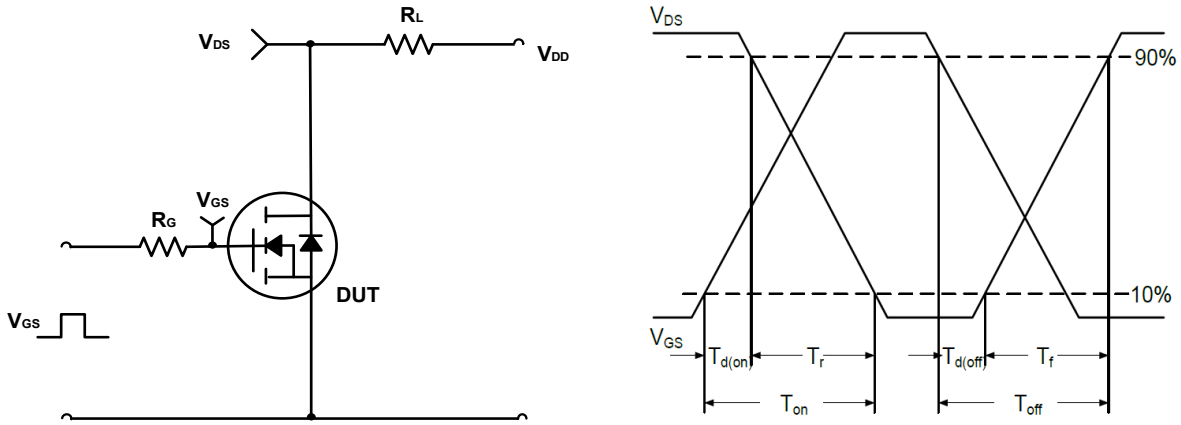



**Figure B. Switching Test Circuit & Waveforms**

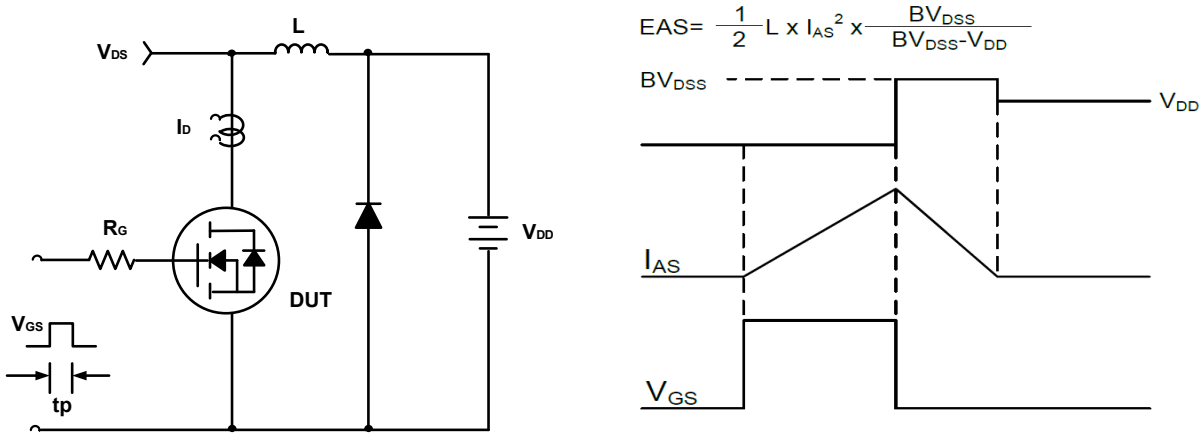
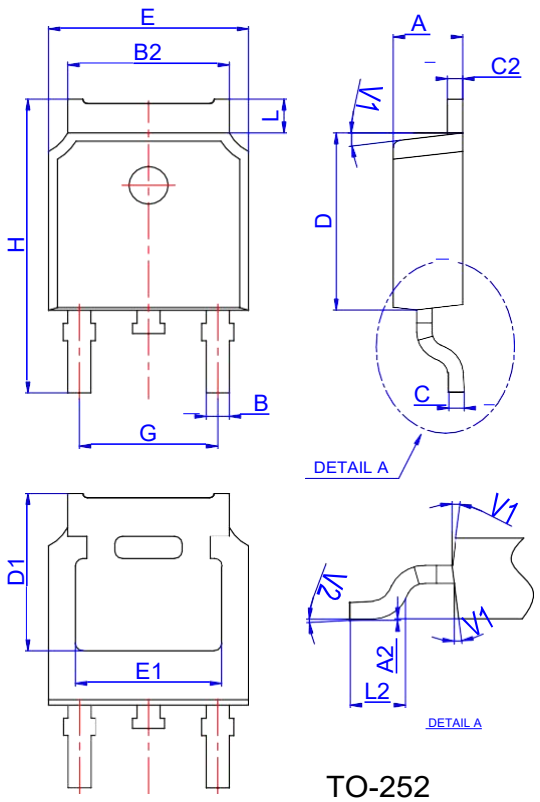



**Figure C. Unclamped Inductive Switching Circuit & Waveforms**

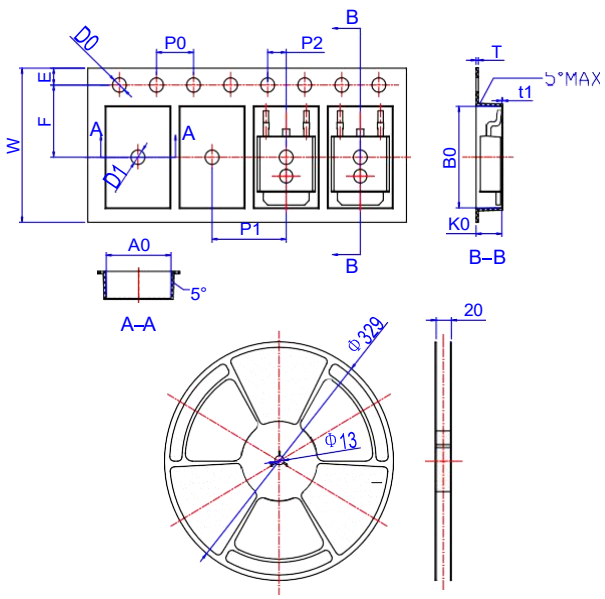
## Package Mechanical Data TO 252




TO-252

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.10 | | 2.50 | 0.083 | | 0.098 |
| A2 | 0 | | 0.10 | 0 | | 0.004 |
| B | 0.66 | | 0.86 | 0.026 | | 0.034 |
| B2 | 5.18 | | 5.48 | 0.202 | | 0.216 |
| C | 0.40 | | 0.60 | 0.016 | | 0.024 |
| C2 | 0.44 | | 0.58 | 0.017 | | 0.023 |
| D | 5.90 | | 6.30 | 0.232 | | 0.248 |
| D1 | 5.30REF | | | 0.209REF | | |
| E | 6.40 | | 6.80 | 0.252 | | 0.268 |
| E1 | 4.63 | | | 0.182 | | |
| G | 4.47 | | 4.67 | 0.176 | | 0.184 |
| H | 9.50 | | 10.70 | 0.374 | | 0.421 |
| L | 1.09 | | 1.21 | 0.043 | | 0.048 |
| L2 | 1.35 | | 1.65 | 0.053 | | 0.065 |
| V1 | | 7° | | | 7° | |
| V2 | 0° | | 6° | 0° | | 6° |

## Reel Spectification-TO-252-4R




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| W | 15.90 | 16.00 | 16.10 | 0.626 | 0.630 | 0.634 |
| E | 1.65 | 1.75 | 1.85 | 0.065 | 0.069 | 0.073 |
| F | 7.40 | 7.50 | 7.60 | 0.291 | 0.295 | 0.299 |
| D0 | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| D1 | 1.40 | 1.50 | 1.60 | 0.055 | 0.059 | 0.063 |
| P0 | 3.90 | 4.00 | 4.10 | 0.154 | 0.157 | 0.161 |
| P1 | 7.90 | 8.00 | 8.10 | 0.311 | 0.315 | 0.319 |
| P2 | 1.90 | 2.00 | 2.10 | 0.075 | 0.079 | 0.083 |
| A0 | 6.85 | 6.90 | 7.00 | 0.270 | 0.271 | 0.276 |
| B0 | 10.45 | 10.50 | 10.60 | 0.411 | 0.413 | 0.417 |
| K0 | 2.68 | 2.78 | 2.88 | 0.105 | 0.109 | 0.113 |
| T | 0.24 | | 0.27 | 0.009 | | 0.011 |
| t1 | 0.10 | | | 0.004 | | |
| 10P0 | 39.80 | 40.00 | 40.20 | 1.567 | 1.575 | 1.583 |