

## 1.Features

- $V_{DS(V)}=30V$
- $R_{DS(ON)}<5.8m\Omega(V_{GS}=10V)$
- $R_{DS(ON)}<8m\Omega(V_{GS}=4.5V)$

## 3.Applications

- High Frequency Isolated DC-DC Converters with Synchronous Rectification for Telecom and Industrial Use

## 2.Benefits

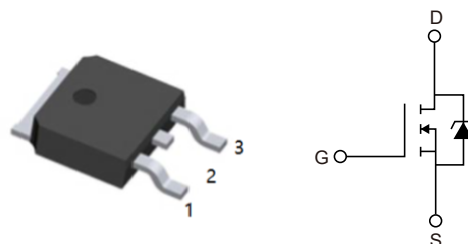
- Very Low  $R_{DS(ON)}$  at 4.5V  $V_{GS}$
- Ultra-Low Gate Impedance
- Fully Characterized Avalanche Voltage and Current

- High Frequency Synchronous Buck Converters for Computer Processor Power

## 4.Pinning information

| Pin | Symbol | Description |
|-----|--------|-------------|
| 1   | G      | GATE        |
| 3   | S      | SOURCE      |
| 2   | D      | DRAIN       |

TO-252(DPAK)  
top view



## 5.Absolute Maximum Ratings

| Parameter                                        |                    | Symbol         | Rating                | Units          |
|--------------------------------------------------|--------------------|----------------|-----------------------|----------------|
| Drain- Source Voltage                            |                    | $V_{DS}$       | 30                    | V              |
| Gate-to-Source Voltage                           |                    | $V_{GS}$       | $\pm 20$              | V              |
| Continuous Drain Current, $V_{GS}=10V$           | $T_C=25^{\circ}C$  | $I_D$          | 86 ④                  | A              |
| Continuous Drain Current, $V_{GS}=10V$           | $T_C=100^{\circ}C$ |                | 61 ④                  | A              |
| Pulsed Drain Current ①                           |                    | $I_{DM}$       | 340                   | A              |
| Maximum Power Dissipation ⑥                      | $T_C=25^{\circ}C$  | $P_D$          | 75                    | W              |
| Maximum Power Dissipation ⑥                      | $T_C=100^{\circ}C$ |                | 38                    | W              |
| Linear Derating Factor                           |                    |                | 0.5                   | W/ $^{\circ}C$ |
| Operating Junction and Storage Temperature Range |                    | $T_J, T_{STG}$ | -55 to 175            | $^{\circ}C$    |
| Soldering Temperature, for 10 seconds            |                    |                | 300 (1.6mm from case) | $^{\circ}C$    |



## 6. Thermal resistance rating

| Parameter                           | Symbol          | Typ | Max | Units |
|-------------------------------------|-----------------|-----|-----|-------|
| Junction-to-Case ⑥                  | $R_{\theta JC}$ |     | 2   | °C/W  |
| Junction-to-Ambient (PCB Mounted) ⑤ | $R_{\theta JA}$ |     | 50  | °C/W  |
| Junction-to-Ambient                 | $R_{\theta JL}$ |     | 110 | °C/W  |

### Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting  $T_J=25^{\circ}\text{C}$ ,  $L=10.605\text{mH}$ ,  $R_G=25\Omega$ ,  $I_{AS}=-20\text{A}$ .
- ③ Pulse width  $\leq 400\mu\text{s}$ ; duty cycle  $\leq 2\%$ .
- ④ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 50A.
- ⑤ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.
- ⑥  $R_{\theta}$  is measured at  $T_J$ , approximately at  $90^{\circ}\text{C}$ .



## 7. Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

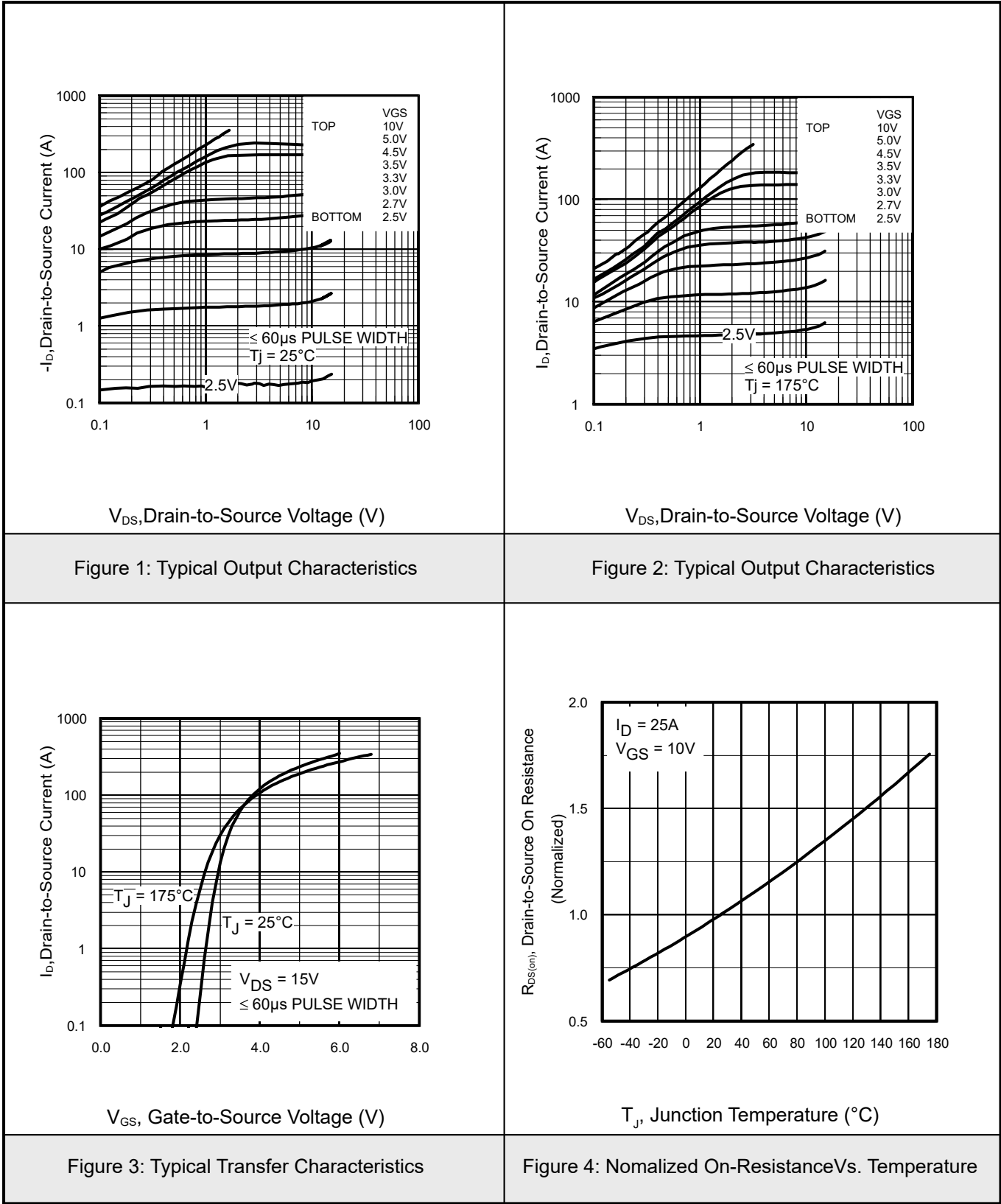
| Parameter                            | Symbol                         | Conditions                                                                                       | Min  | Typ  | Max  | Units                |
|--------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------|------|------|------|----------------------|
| <b>Static</b>                        |                                |                                                                                                  |      |      |      |                      |
| Drain-Source Breakdown Voltage       | $BV_{DSS}$                     | $I_D=250\mu\text{A}$ , $V_{GS}=0\text{V}$                                                        | 30   |      |      | V                    |
| Breakdown Voltage Temp. Coefficient  | $\Delta BV_{DSS}/\Delta T_J$   | $I_D=1\text{mA}$ , Reference to $25^\circ\text{C}$                                               |      | 20   |      | mV/ $^\circ\text{C}$ |
| Static Drain-to-Source On-Resistance | $R_{DS(ON)}$                   | $V_{GS}=10\text{V}$ , $I_D=25\text{A}$ ③                                                         |      | 4    | 5.8  | m $\Omega$           |
|                                      |                                | $V_{GS}=4.5\text{V}$ , $I_D=20\text{A}$ ③                                                        |      | 5.8  | 8    |                      |
| Gate Threshold Voltage               | $V_{GS(th)}$                   | $V_{DS}=V_{GS}$ , $I_D=50\mu\text{A}$                                                            | 1.35 | 1.8  | 2.35 | V                    |
| Gate Threshold Voltage Coefficient   | $\Delta V_{GS(th)}/\Delta T_J$ |                                                                                                  |      | -8.6 |      | mV/ $^\circ\text{C}$ |
| Drain-to-Source Leakage Current      | $I_{DSS}$                      | $V_{DS}=24\text{V}$ , $V_{GS}=0\text{V}$                                                         |      |      | 1    | $\mu\text{A}$        |
|                                      |                                | $V_{DS}=24\text{V}$ , $V_{GS}=0\text{V}$ , $T_J=125^\circ\text{C}$                               |      |      | 150  | $\mu\text{A}$        |
| Gate-to-Source Forward Leakage       | $I_{GSS}$                      | $V_{GS}=20\text{V}$                                                                              |      |      | 100  | nA                   |
| Gate-to-Source Reverse Leakage       |                                | $V_{GS}=-20\text{V}$                                                                             |      |      | -100 | nA                   |
| Forward Transconductance             | $g_{FS}$                       | $V_{DS}=15\text{V}$ , $I_D=20\text{A}$                                                           | 73   |      |      | S                    |
| Total Gate Charge                    | $Q_g$                          | $V_{DS}=15\text{V}$ , $V_{GS}=4.5\text{V}$<br>$I_D=20\text{A}$ , See Fig. 15                     |      | 15   | 23   | nC                   |
| Pre-Vth Gate-to-Source Charge        | $Q_{gs1}$                      |                                                                                                  |      | 3.7  |      | nC                   |
| Post-Vth Gate-to-Source Charge       | $Q_{gs2}$                      |                                                                                                  |      | 1.9  |      | nC                   |
| Gate-to-Drain Charge                 | $Q_{gd}$                       |                                                                                                  |      | 5.7  |      | nC                   |
| Gate Charge Overdrive                | $Q_{gdor}$                     |                                                                                                  |      | 3.7  |      | nC                   |
| Switch Charge ( $Q_{gs2} + Q_{gd}$ ) | $Q_{sw}$                       |                                                                                                  |      | 7.6  |      | nC                   |
| Output Charge                        | $Q_{oss}$                      | $V_{DS}=15\text{V}$ , $V_{GS}=0\text{V}$                                                         |      | 10   |      | nC                   |
| Gate Resistance                      | $R_g$                          |                                                                                                  |      | 2    | 3.5  | $\Omega$             |
| Turn-On Delay Time                   | $t_{D(on)}$                    | $V_{DD}=15\text{V}$ , $V_{GS}=4.5\text{V}$ ③<br>$I_D=20\text{A}$ , $R_G=1.8\Omega$<br>See Fig.13 |      | 12   |      | ns                   |
| Rise Time                            | $t_r$                          |                                                                                                  |      | 49   |      | ns                   |
| Turn-Off Delay Time                  | $t_{D(off)}$                   |                                                                                                  |      | 15   |      | ns                   |
| Fall Time                            | $t_f$                          |                                                                                                  |      | 16   |      | ns                   |
| Input Capacitance                    | $C_{iss}$                      | $V_{GS}=4.5\text{V}$ , $V_{DS}=15\text{V}$<br>$f = 1.0\text{MHz}$                                |      | 2150 |      | pF                   |
| Output Capacitance                   | $C_{oss}$                      |                                                                                                  |      | 480  |      | pF                   |
| Reverse Transfer Capacitance         | $C_{rss}$                      |                                                                                                  |      | 205  |      | pF                   |



|                                           |          |                                                                         |  |    |     |    |
|-------------------------------------------|----------|-------------------------------------------------------------------------|--|----|-----|----|
| <b>Avalanche Characteristics</b>          |          |                                                                         |  |    |     |    |
| Single Pulse Avalanche Energy ②           | $E_{AS}$ |                                                                         |  |    | 120 | mJ |
| Avalanche Current ①                       | $I_{AR}$ |                                                                         |  |    | 20  | A  |
| <b>Diode Characteristics</b>              |          |                                                                         |  |    |     |    |
| Continuous Source Current<br>(Body Diode) | $I_S$    | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode. |  |    | 86④ | A  |
| Pulsed Source Current<br>(Body Diode) ①   | $I_{SM}$ |                                                                         |  |    | 340 |    |
| Diode Forward Voltage                     | $V_{SD}$ | $T_J=25^{\circ}\text{C}, I_S=20\text{A}, V_{GS}=0\text{V}$ ③            |  |    | 1   | V  |
| Reverse Recovery Time                     | $t_{rr}$ | $T_J=25^{\circ}\text{C}, I_F=20\text{A}, V_{DD}=15\text{V}$             |  | 24 | 36  | ns |
| Reverse Recovery Charge                   | $Q_{rr}$ | $di/dt=300\text{A}/\mu\text{s}$ ③                                       |  | 52 | 78  | nC |

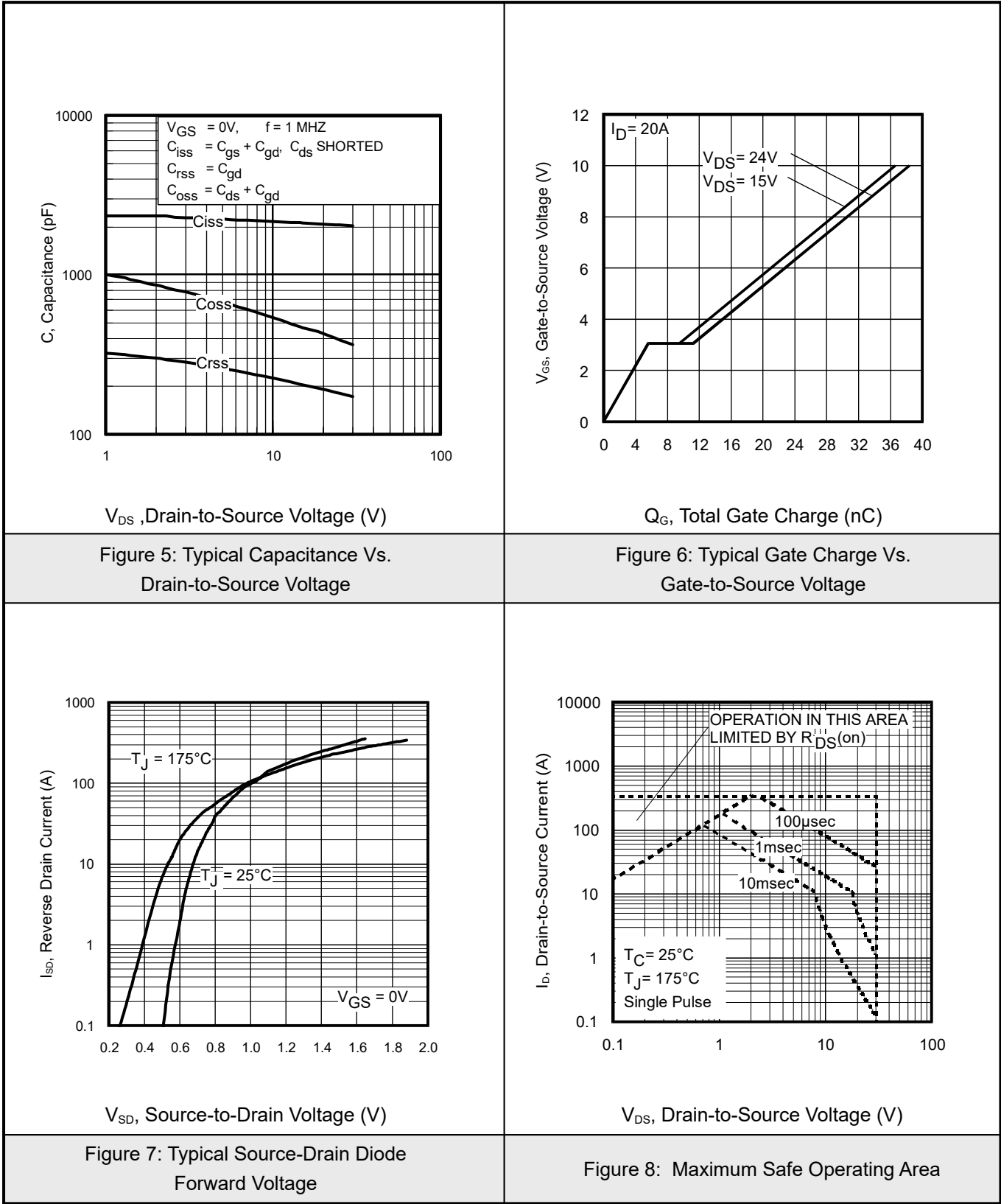


8.1 Typical Characteristics





8.2Typical Characteristics





8.3Typical Characteristics

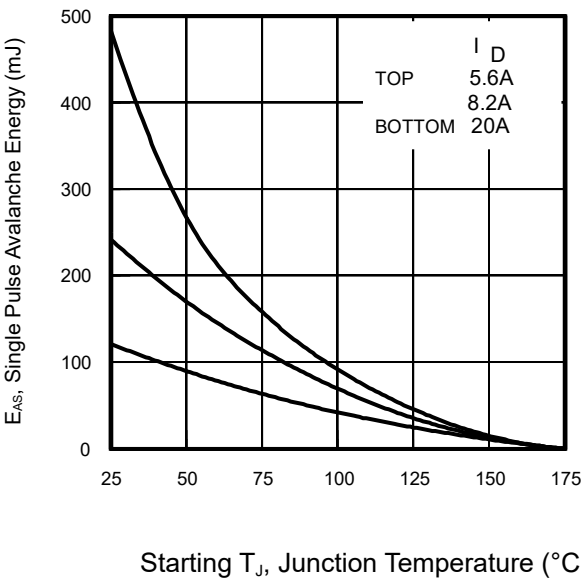


Figure 9: Maximum Avalanche Energy Vs. Drain Current

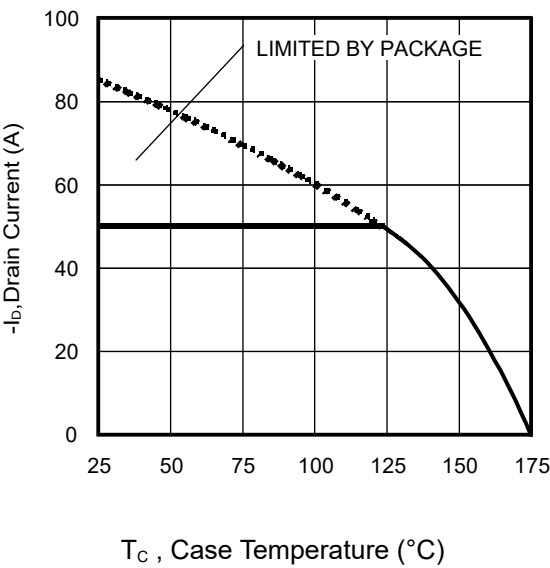


Figure 10: Maximum Drain Current vs. Case Temperature

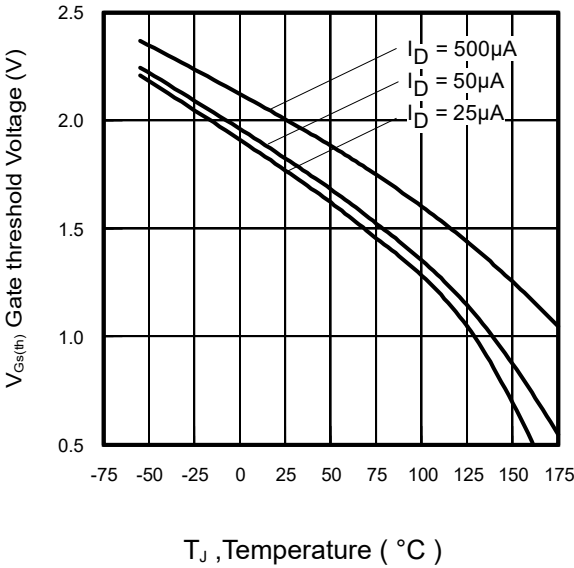


Figure 11: Threshold Voltage vs. Temperature



## 8.4 Typical Characteristics

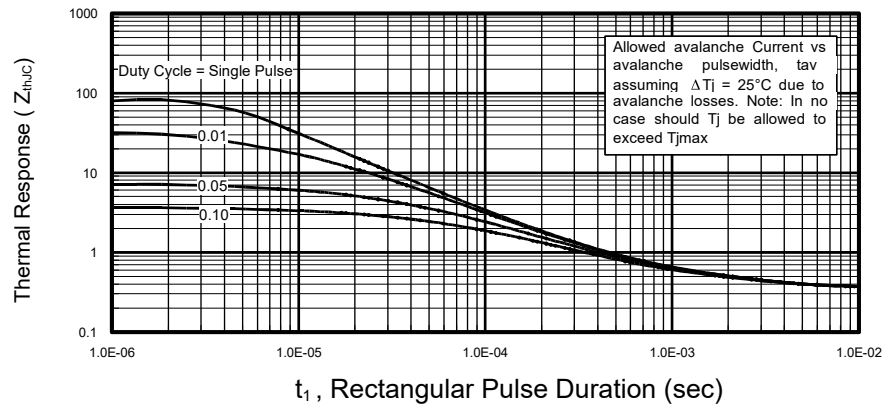


Figure 12: Maximum Effective Transient Thermal Impedance, Junction-to-Case

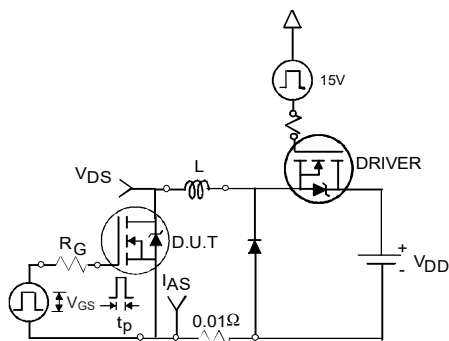


Figure 13: Unclamped Inductive Test Circuit

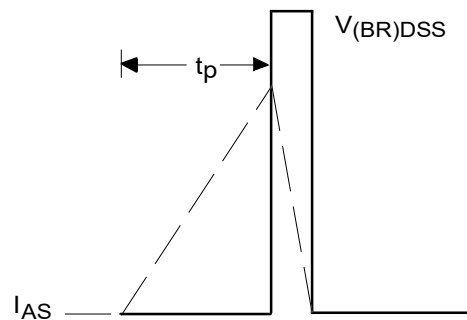


Figure 14: Unclamped Inductive Waveforms

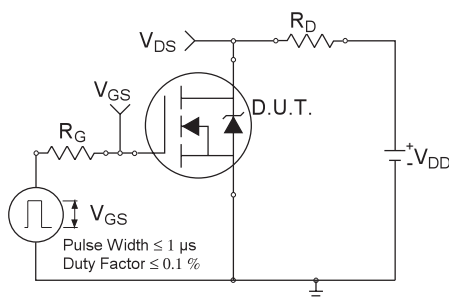


Figure 15: Switching Time Test Circuit

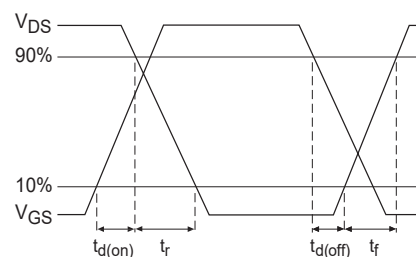
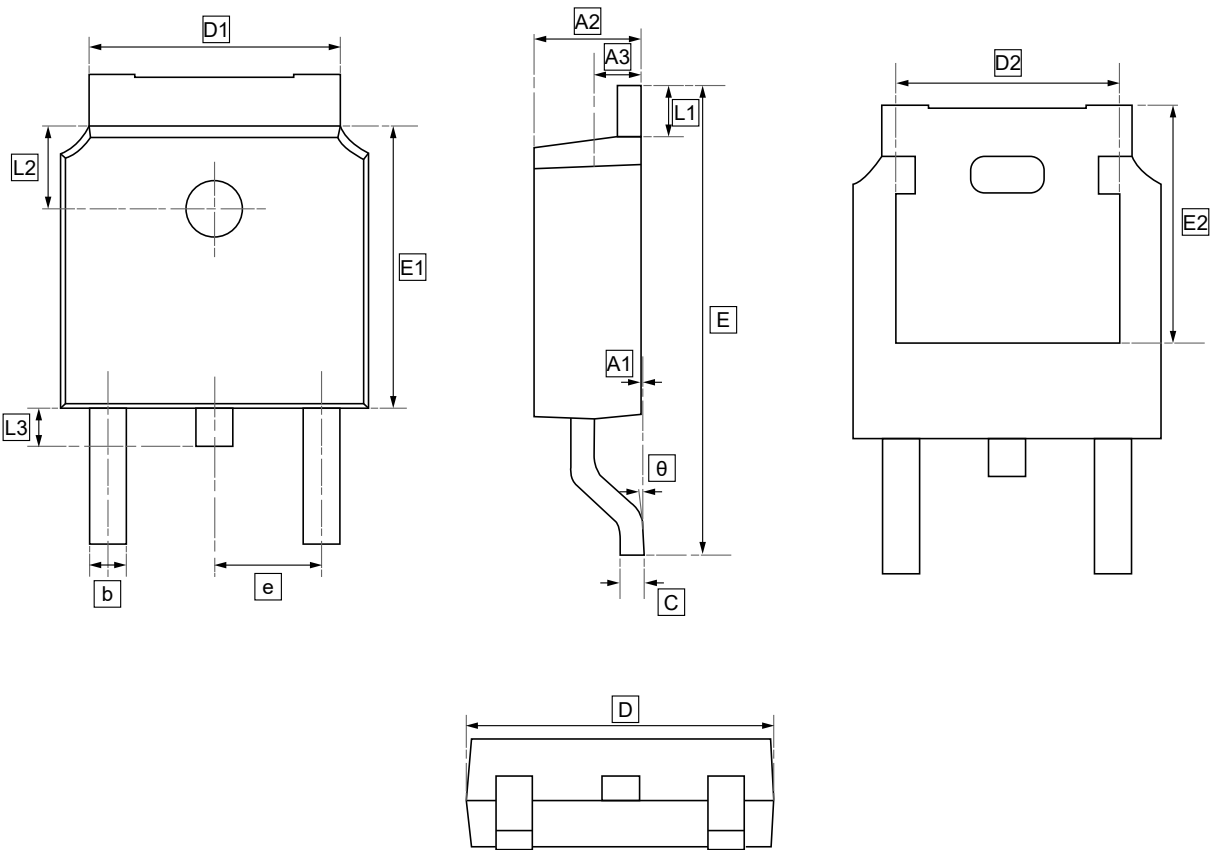


Figure 16: USwitching Time Waveforms



9.TO-252 Package Outline Dimensions

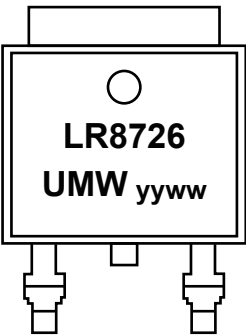


DIMENSIONS (mm are the original dimensions)

| Symbol | A1   | A2   | A3   | b    | c    | D    | D1   | D2   | E     | E1   | E2   | e            | L1   | L2   | L3   | θ    |
|--------|------|------|------|------|------|------|------|------|-------|------|------|--------------|------|------|------|------|
| Min    | 0.00 | 2.18 | 0.90 | 0.65 | 0.46 | 6.35 | 4.95 | 4.32 | 9.40  | 5.97 | 5.21 | 2.286<br>BSC | 0.89 | 1.70 | 0.60 | 0.00 |
| Max    | 0.13 | 2.39 | 1.10 | 0.85 | 0.61 | 6.73 | 5.46 | 4.90 | 10.41 | 6.22 | 5.38 |              | 1.27 | 1.90 | 1.00 | 8.00 |



10.Ordering information



yy: Year Code  
ww: Week Code

| Order Code     | Package | Base QTY | Delivery Mode |
|----------------|---------|----------|---------------|
| UMW IRLR8726TR | TO-252  | 2500     | Tape and reel |



## 11.Disclaimer

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