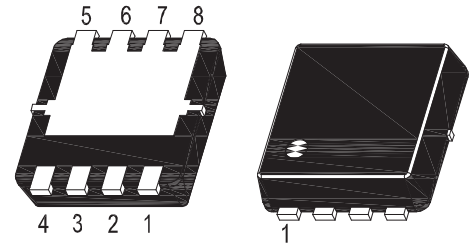
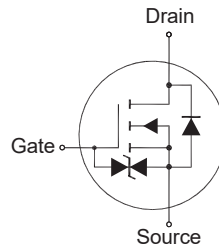


**N-Channel Enhancement Mode MOSFET**
**Features**

- AEC-Q101 Qualified
- Surface-mounted package
- Halogen and Antimony Free(HAF), RoHS compliant
- Built-in G-S Protection Diode
- Typical ESD Protection HBM Class 2



1. Source 2. Source 3. Source 4. Gate  
5. Drain 6. Drain 7. Drain 8. Drain  
DFN3030 Plastic Package

| Classification | Voltage Range(V) |
|----------------|------------------|
| 0A             | < 125            |
| 0B             | 125 to < 250     |
| 1A             | 250 to < 500     |
| 1B             | 500 to < 1000    |
| 1C             | 1000 to < 2000   |
| 2              | 2000 to < 4000   |
| 3A             | 4000 to < 8000   |
| 3B             | ≥ 8000           |

**Key Parameters**

| Parameter        | Value                        | Unit      |
|------------------|------------------------------|-----------|
| $BV_{DS}$        | 100                          | V         |
| $R_{DS(ON)}$ Max | 68 @ $V_{GS} = 10\text{ V}$  | $m\Omega$ |
|                  | 92 @ $V_{GS} = 4.5\text{ V}$ |           |
| $V_{GS(th)}$ typ | 1.9                          | V         |
| $Q_g$ typ        | 9 @ $V_{GS} = 10\text{ V}$   | nC        |

**Absolute Maximum Ratings(at  $T_a = 25^\circ\text{C}$  unless otherwise specified)**

| Parameter                                                           | Symbol         | Value         | Unit             |
|---------------------------------------------------------------------|----------------|---------------|------------------|
| Drain-Source Voltage                                                | $V_{DS}$       | 100           | V                |
| Gate-Source Voltage                                                 | $V_{GS}$       | ± 20          | V                |
| Drain Current $T_c = 25^\circ\text{C}$<br>$T_c = 100^\circ\text{C}$ | $I_D$          | 14<br>9       | A                |
| Peak Drain Current, Pulsed <sup>1)</sup>                            | $I_{DM}$       | 45            | A                |
| Avalanche Current                                                   | $I_{AS}$       | 4.9           | A                |
| Single Pulse Avalanche Energy <sup>2)</sup>                         | $E_{AS}$       | 6             | mJ               |
| Power Dissipation $T_c = 25^\circ\text{C}$                          | $P_D$          | 18.9          | W                |
| Operating Junction and Storage Temperature Range                    | $T_J, T_{stg}$ | - 55 to + 150 | $^\circ\text{C}$ |

**Thermal Characteristics**

| Parameter                                                 | Symbol          | Max. | Unit               |
|-----------------------------------------------------------|-----------------|------|--------------------|
| Thermal Resistance from Junction to Case                  | $R_{\theta JC}$ | 6.6  | $^\circ\text{C/W}$ |
| Thermal Resistance from Junction to Ambient <sup>3)</sup> | $R_{\theta JA}$ | 60   | $^\circ\text{C/W}$ |

<sup>1)</sup> Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%, Repetitive rating, pulse width limited by junction temperature  $T_{J(MAX)} = 150^\circ\text{C}$ .

<sup>2)</sup> Limited by  $T_{J(MAX)}$ , starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.5\text{ mH}$ ,  $R_g = 25\ \Omega$ ,  $I_{AS} = 4.9\text{ A}$ ,  $V_{GS} = 10\text{ V}$ .

<sup>3)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.

Characteristics at  $T_a = 25^\circ\text{C}$  unless otherwise specified

| Parameter                                                                                                                                                                        | Symbol       | Min.   | Typ.     | Max.     | Unit             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------|----------|----------|------------------|
| <b>STATIC PARAMETERS</b>                                                                                                                                                         |              |        |          |          |                  |
| Drain-Source Breakdown Voltage<br>at $I_D = 250\ \mu\text{A}$                                                                                                                    | $BV_{DSS}$   | 100    | -        | -        | V                |
| Drain-Source Leakage Current<br>at $V_{DS} = 100\ \text{V}$                                                                                                                      | $I_{DSS}$    | -      | -        | 1        | $\mu\text{A}$    |
| Gate Leakage Current<br>at $V_{GS} = \pm 20\ \text{V}$                                                                                                                           | $I_{GSS}$    | -      | -        | $\pm 10$ | $\mu\text{A}$    |
| Gate-Source Threshold Voltage<br>at $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$                                                                                                 | $V_{GS(th)}$ | 1.7    | -        | 2.5      | V                |
| Drain-Source On-State Resistance<br>at $V_{GS} = 10\ \text{V}$ , $I_D = 10\ \text{A}$<br>at $V_{GS} = 4.5\ \text{V}$ , $I_D = 8\ \text{A}$                                       | $R_{DS(on)}$ | -<br>- | 53<br>-  | 68<br>92 | $\text{m}\Omega$ |
| <b>DYNAMIC PARAMETERS</b>                                                                                                                                                        |              |        |          |          |                  |
| Forward Transconductance<br>at $V_{DS} = 5\ \text{V}$ , $I_D = 8\ \text{A}$                                                                                                      | $g_{fs}$     | -      | 9.9      | -        | S                |
| Gate Resistance<br>at $V_{GS} = 0\ \text{V}$ , $V_{DS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                                                                                      | $R_g$        | -      | 0.7      | -        | $\Omega$         |
| Input Capacitance<br>at $V_{GS} = 0\ \text{V}$ , $V_{DS} = 50\ \text{V}$ , $f = 1\ \text{MHz}$                                                                                   | $C_{iss}$    | -      | 317      | -        | pF               |
| Output Capacitance<br>at $V_{GS} = 0\ \text{V}$ , $V_{DS} = 50\ \text{V}$ , $f = 1\ \text{MHz}$                                                                                  | $C_{oss}$    | -      | 61       | -        | pF               |
| Reverse Transfer Capacitance<br>at $V_{GS} = 0\ \text{V}$ , $V_{DS} = 50\ \text{V}$ , $f = 1\ \text{MHz}$                                                                        | $C_{rss}$    | -      | 7        | -        | pF               |
| Gate charge total<br>at $V_{DS} = 50\ \text{V}$ , $V_{GS} = 10\ \text{V}$ , $I_D = 10\ \text{A}$<br>at $V_{DS} = 50\ \text{V}$ , $V_{GS} = 4.5\ \text{V}$ , $I_D = 10\ \text{A}$ | $Q_g$        | -<br>- | 9<br>4.7 | -<br>-   | nC               |
| Gate to Source Charge<br>at $V_{DS} = 50\ \text{V}$ , $V_{GS} = 10\ \text{V}$ , $I_D = 10\ \text{A}$                                                                             | $Q_{gs}$     | -      | 1.7      | -        | nC               |
| Gate to Drain Charge<br>at $V_{DS} = 50\ \text{V}$ , $V_{GS} = 10\ \text{V}$ , $I_D = 10\ \text{A}$                                                                              | $Q_{gd}$     | -      | 3        | -        | nC               |
| Turn-On Delay Time<br>at $V_{DS} = 50\ \text{V}$ , $V_{GS} = 10\ \text{V}$ , $I_D = 10\ \text{A}$ , $R_g = 3.3\ \Omega$                                                          | $t_{d(on)}$  | -      | 6        | -        | ns               |
| Turn-On Rise Time<br>at $V_{DS} = 50\ \text{V}$ , $V_{GS} = 10\ \text{V}$ , $I_D = 10\ \text{A}$ , $R_g = 3.3\ \Omega$                                                           | $t_r$        | -      | 8        | -        | ns               |
| Turn-Off Delay Time<br>at $V_{DS} = 50\ \text{V}$ , $V_{GS} = 10\ \text{V}$ , $I_D = 10\ \text{A}$ , $R_g = 3.3\ \Omega$                                                         | $t_{d(off)}$ | -      | 6        | -        | ns               |
| Turn-Off Fall Time<br>at $V_{DS} = 50\ \text{V}$ , $V_{GS} = 10\ \text{V}$ , $I_D = 10\ \text{A}$ , $R_g = 3.3\ \Omega$                                                          | $t_f$        | -      | 1.4      | -        | ns               |
| <b>Body-Diode PARAMETERS</b>                                                                                                                                                     |              |        |          |          |                  |
| Drain-Source Diode Forward Voltage<br>at $I_S = 1\ \text{A}$ , $V_{GS} = 0\ \text{V}$                                                                                            | $V_{SD}$     | -      | -        | 1.2      | V                |
| Body-Diode Continuous Current                                                                                                                                                    | $I_S$        | -      | -        | 14       | A                |
| Body-Diode Continuous Current, Pulsed                                                                                                                                            | $I_{SM}$     | -      | -        | 45       | A                |
| Body Diode Reverse Recovery Time<br>at $I_S = 10\ \text{A}$ , $di/dt = 100\ \text{A} / \mu\text{s}$                                                                              | $t_{rr}$     | -      | 38       | -        | ns               |
| Body Diode Reverse Recovery Charge<br>at $I_S = 10\ \text{A}$ , $di/dt = 100\ \text{A} / \mu\text{s}$                                                                            | $Q_{rr}$     | -      | 24       | -        | nC               |

## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

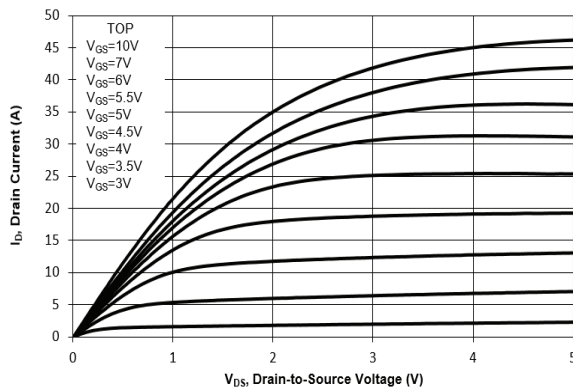


Fig. 2 Typical Transfer Characteristics

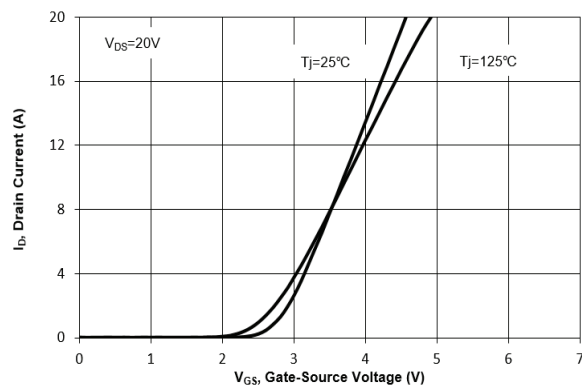


Fig. 3 On-Resistance vs. Drain Current

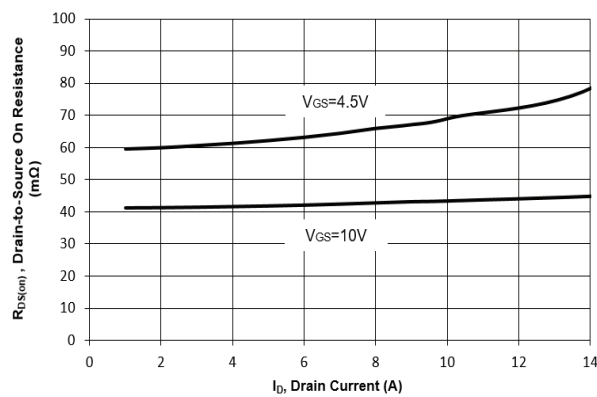


Fig. 4 On-Resistance vs. Gate to Source Voltage

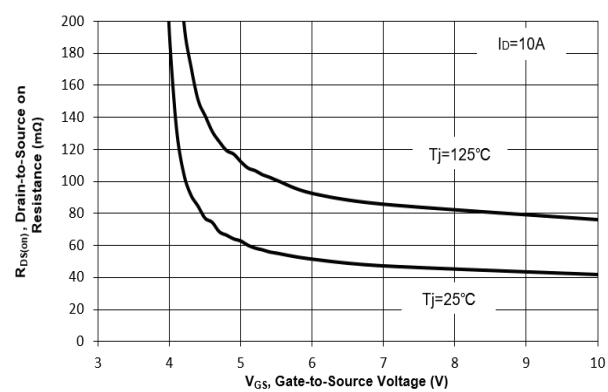


Fig. 5 On-Resistance vs.  $T_J$

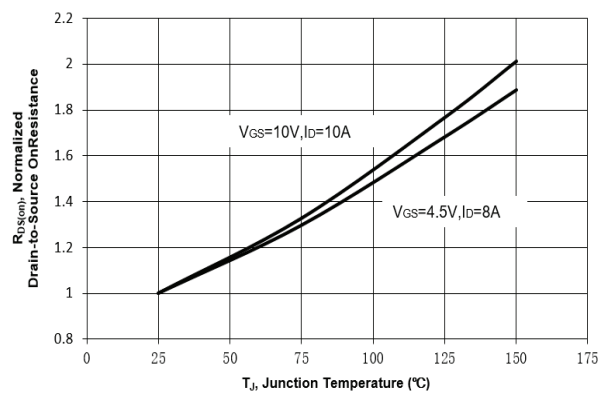
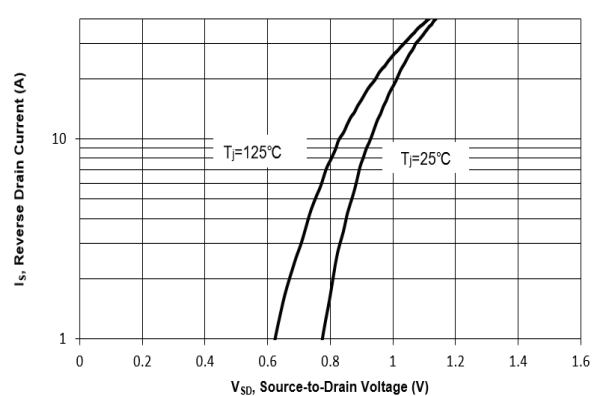


Fig. 6 Typical Body-Diode Forward Characteristics



## Electrical Characteristics Curves

Fig. 13 Normalized Maximum Transient Thermal Impedance( $Z_{\theta JC}$ )

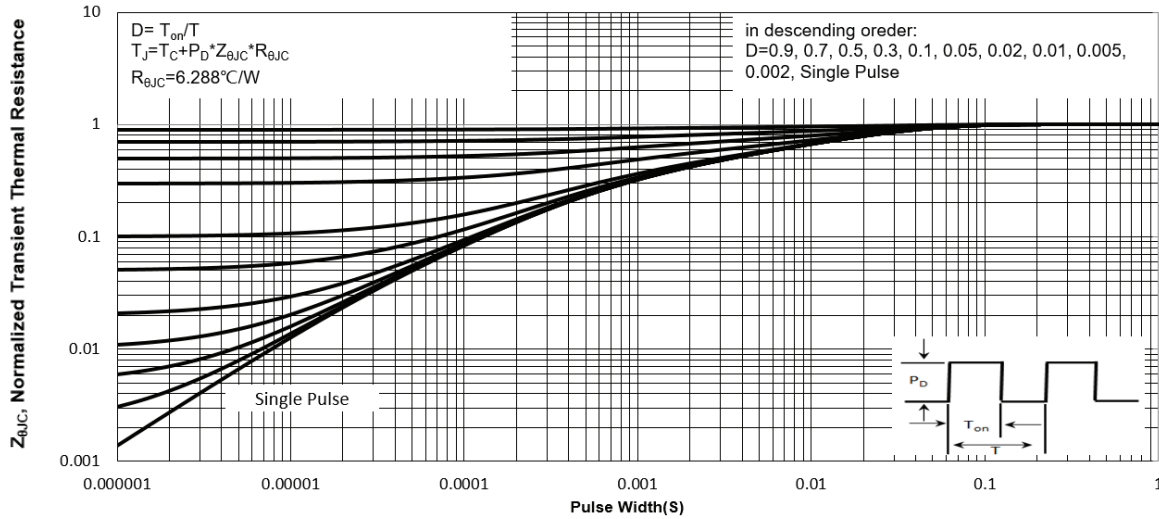


Fig. 14 Normalized Maximum Transient Thermal Impedance( $Z_{\theta JA}$ )

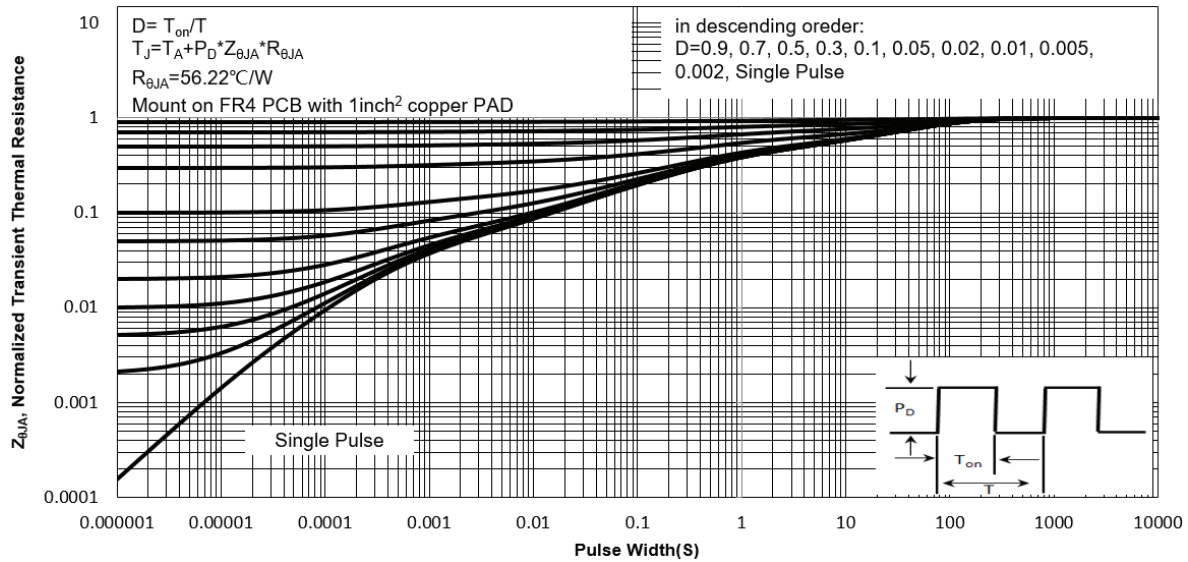


Fig. 7 Typical Junction Capacitance

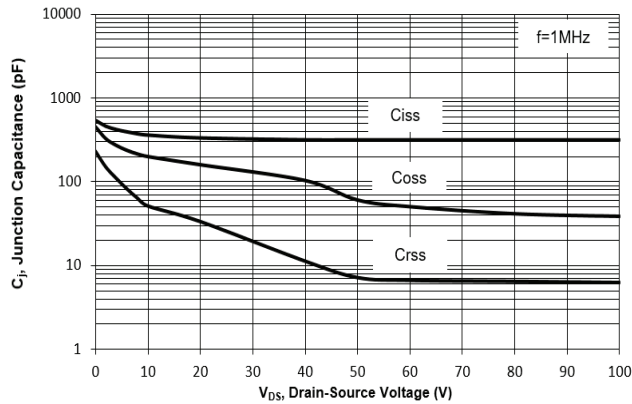


Fig. 8 Drain-Source Leakage Current vs.  $T_J$

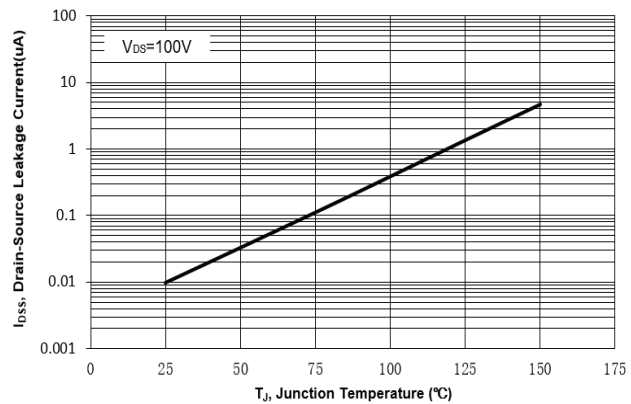


Fig. 9  $V_{(BR)DSS}$  vs. Junction Temperature

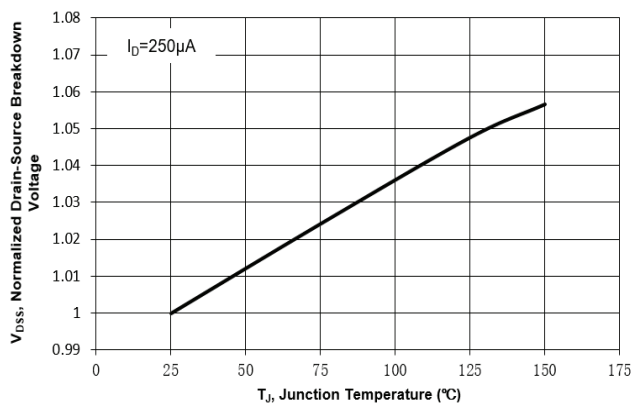


Fig. 10 Gate Threshold Variation vs.  $T_J$

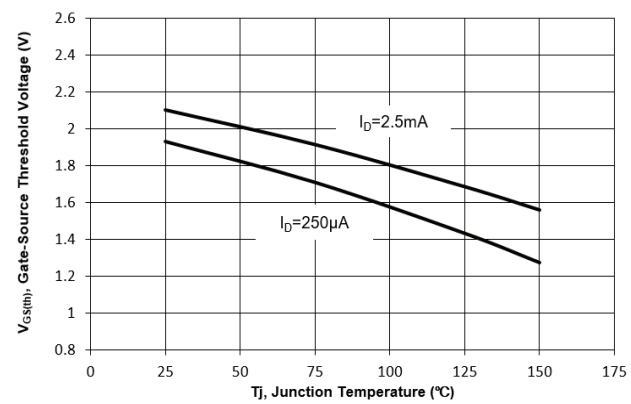


Fig. 11 Gate Charge

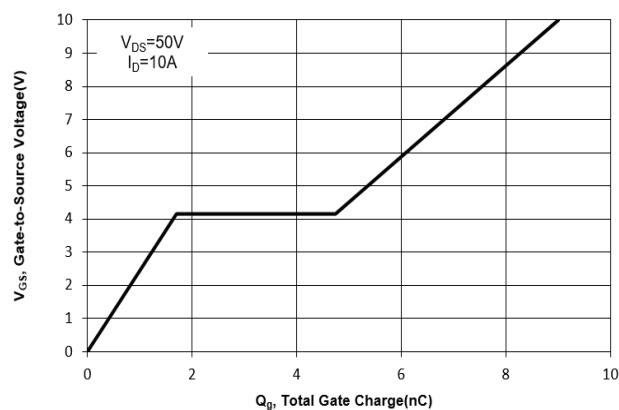
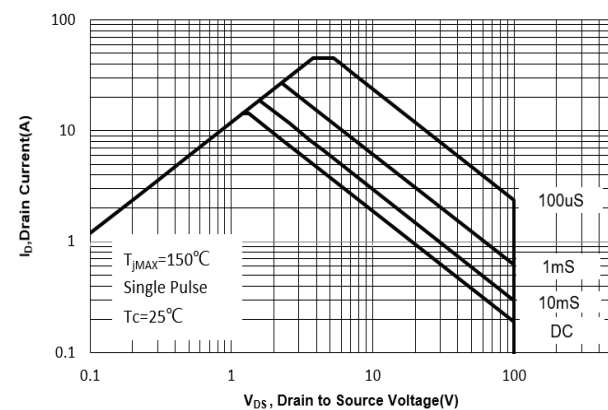
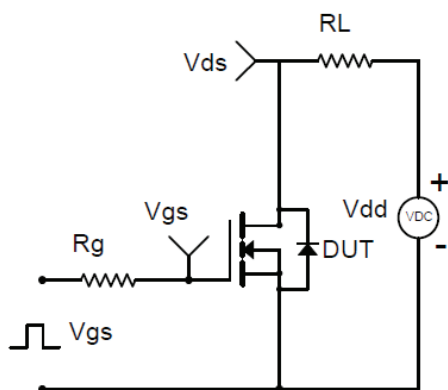
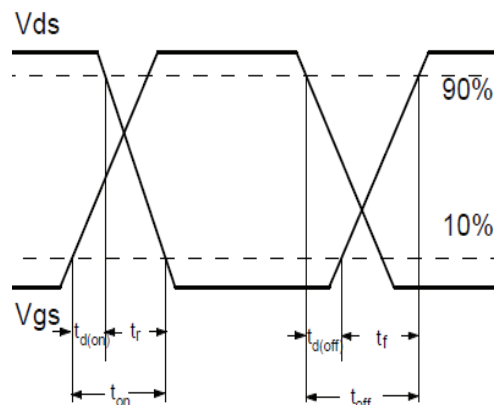
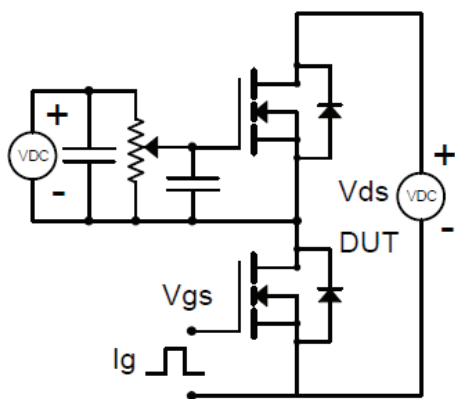
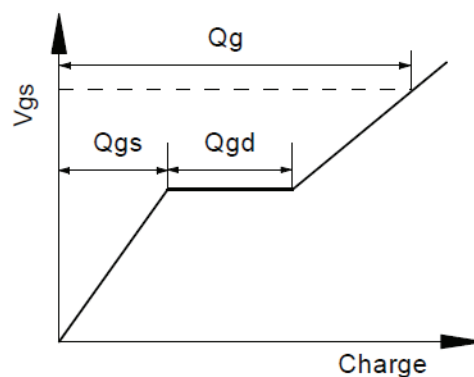
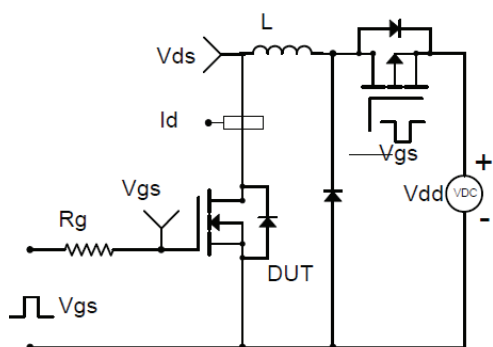
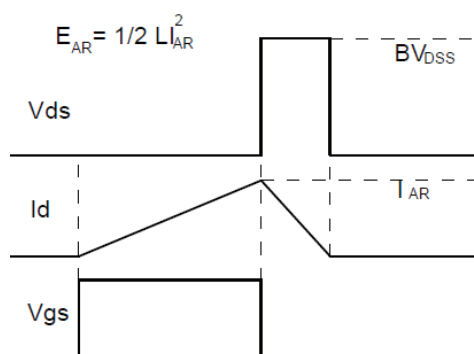
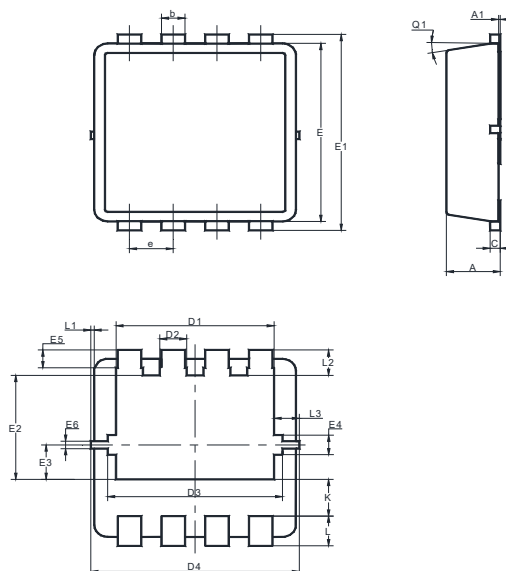


Fig. 12 Safe Operation Area



**Test Circuits**
**Fig.1-1 Switching times test circuit**

**Fig.1-2 Switching Waveform**

**Fig.2-1 Gate charge test circuit**

**Fig.2-2 Gate charge waveform**

**Fig.3-1 Avalanche test circuit**

**Fig.3-2 Avalanche waveform**


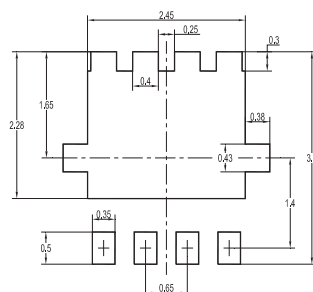
### Package Outline Dimensions (Units: mm)

**DFN3030**

| UNIT | A   | A1   | b    | c    | D1  | D2  | D3  | D4  | E   | E1  | E2   | E3   | E4   |
|------|-----|------|------|------|-----|-----|-----|-----|-----|-----|------|------|------|
| mm   | 0.9 | 0.05 | 0.35 | 0.25 | 2.6 | 0.5 | 2.7 | 3.2 | 3.1 | 3.3 | 1.85 | 0.68 | 0.43 |
|      | 0.7 | 0    | 0.24 | 0.1  | 2.4 | 0.3 | 2.5 | 3   | 2.9 | 3.1 | 1.65 | 0.48 | 0.23 |

| UNIT | E5  | E6   | e   | K    | L   | L1  | L2   | L3    | $\theta 1$ |
|------|-----|------|-----|------|-----|-----|------|-------|------------|
| mm   | 0.4 | 0.25 | 0.7 | 0.72 | 0.5 | 0.1 | 0.53 | 0.475 | 12°        |
|      | 0.2 | 0.15 | 0.6 | 0.52 | 0.3 | 0   | 0.33 | 0.275 | 0°         |

### Recommended Soldering Footprint



## Packing information

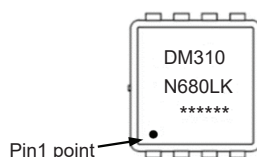
| Package | Tape Width<br>(mm) | Pitch   |               | Reel Size |      | Per Reel Packing Quantity |
|---------|--------------------|---------|---------------|-----------|------|---------------------------|
|         |                    | mm      | inch          | mm        | inch |                           |
| DFN3030 | 12                 | 8 ± 0.1 | 0.315 ± 0.004 | 330       | 13   | 5,000                     |

### Marking information

" DM310N680LK " = Part No.

" \*\*\*\*\* " = Date Code Marking

Font type: Arial



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