# OptiMOS™- 6 Power-Transistor

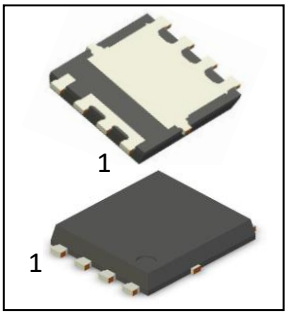
**Product Summary**

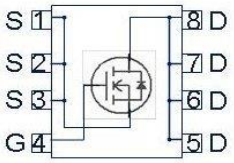
| | | |
|---|---|---|
| $V_{DS}$ | 40 | V |
| $R_{DS(on),max}$ | 0.8 | mΩ |
| $I_D$ | 120 | A |

**Features**

- OptiMOS™ - power MOSFET for automotive applications
- N-channel - Enhancement mode - Normal Level
- AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green Product (RoHS compliant)
- 100% Avalanche tested

PG-TDSON-8-43




| Type | Package | Marking |
|---|---|---|
| IAUC120N04S6N008 | PG-TDSON-8-43 | 6N04N008 |

**Maximum ratings,** at $T_j$=25 °C, unless otherwise specified

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Continuous drain current[1)] | $I_D$ | $V_{GS}$=10V, Chip Limitation[1,2)] | 314 | A |
| | | $V_{GS}$=10V, DC current[3)] | 120 | |
| | | $T_a$=85°C, $V_{GS}$=10V, $R_{thJA}$ on 2s2p[2,4)] | 43 | |
| Pulsed drain current[2)] | $I_{D,pulse}$ | $T_C$=25°C | 480 | |
| Avalanche energy, single pulse[2)] | $E_{AS}$ | $I_D$=60A, $R_{G,min}$=25Ω | 400 | mJ |
| Avalanche current, single pulse | $I_{AS}$ | $R_{G,min}$=25Ω | 60 | A |
| Gate source voltage | $V_{GS}$ | - | ±20 | V |
| Power dissipation | $P_{tot}$ | $T_C$=25°C | 150 | W |
| Operating and storage temperature | $T_j$, $T_{stg}$ | - | -55 ... +175 | °C |

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Thermal characteristics**[2] | | | | | | |
| Thermal resistance, junction - case | $R_{thJC}$ | - | - | - | 1.0 | K/W |
| Thermal resistance, junction - ambient[4] | $R_{thJA}$ | - | - | 23.3 | - | |
| **Electrical characteristics,** at $T_j$=25 °C, unless otherwise specified | | | | | | |
| **Static characteristics** | | | | | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$=0V, $I_D$= 1mA | 40 | - | - | V |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$, $I_D$=90µA | 2.2 | 2.6 | 3.0 | |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$=40V, $V_{GS}$=0V, $T_j$=25°C | - | - | 1 | µA |
| | | $V_{DS}$=40V, $V_{GS}$=0V, $T_j$=125°C[2] | - | - | 25 | |
| Gate-source leakage current | $I_{GSS}$ | $V_{GS}$=20V, $V_{DS}$=0V | - | - | 100 | nA |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS}$=7V, $I_D$=60A | - | 0.80 | 1.1 | mΩ |
| | | $V_{GS}$=10V, $I_D$=60A | - | 0.68 | 0.8 | |
| Gate resistance[2] | $R_G$ | | - | 0.9 | - | Ω |

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | min. | typ. | max. | |
| **Dynamic characteristics**[2] | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{GS}$=0V, $V_{DS}$=25V, $f$=1MHz | - | 5371 | 7150 | pF |
| Output capacitance | $C_{oss}$ | | - | 1626 | 2170 | |
| Reverse transfer capacitance | $C_{rss}$ | | - | 66 | 100 | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$=20V, $V_{GS}$=10V, $I_D$=120A, $R_G$=3.5Ω | - | 9 | - | ns |
| Rise time | $t_r$ | | - | 5 | - | |
| Turn-off delay time | $t_{d(off)}$ | | - | 22 | - | |
| Fall time | $t_f$ | | - | 11 | - | |
| **Gate Charge Characteristics**[2] | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DD}$=32V, $I_D$=120A, $V_{GS}$=0 to 10V | - | 22 | 30 | nC |
| Gate to drain charge | $Q_{gd}$ | | - | 16 | 24 | |
| Gate charge total | $Q_g$ | | - | 83 | 110 | |
| Gate plateau voltage | $V_{plateau}$ | | - | 4.1 | - | V |
| **Reverse Diode** | | | | | | |
| Diode continous forward current[2] | $I_S$ | $T_C$=25°C | - | - | 120 | A |
| Diode pulse current[2] | $I_{S,pulse}$ | | - | - | 480 | |
| Diode forward voltage | $V_{SD}$ | $V_{GS}$=0V, $I_F$=60A, $T_j$=25°C | - | 0.8 | 1.1 | V |
| Reverse recovery time[2] | $t_{rr}$ | $V_R$=20V, $I_F$=120A, $di_F/dt$=100A/µs | - | 60 | - | ns |
| Reverse recovery charge[2] | $Q_{rr}$ | | - | 73 | - | nC |

[1] Practically the current is limited by overall system design including customer specific PCB.

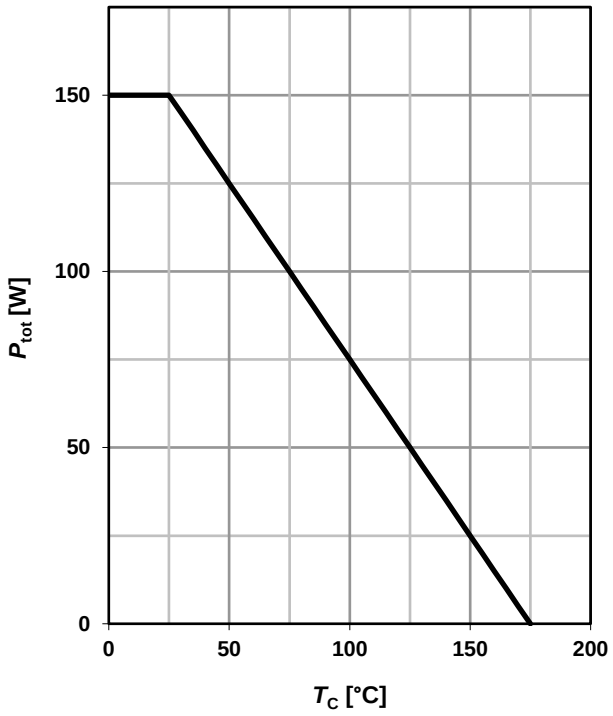
[2] The parameter is not subject to production testing - specified by design.

[3] The product can operate at specified current based on best practice to minimize electromigration at the solder joint. For rare events and inrush currents the value may be exceeded.

[4] Device on 2s2p FR4 PCB defined in accordance with JEDEC standards (JESD51-5, -7). PCB is vertical in still air.

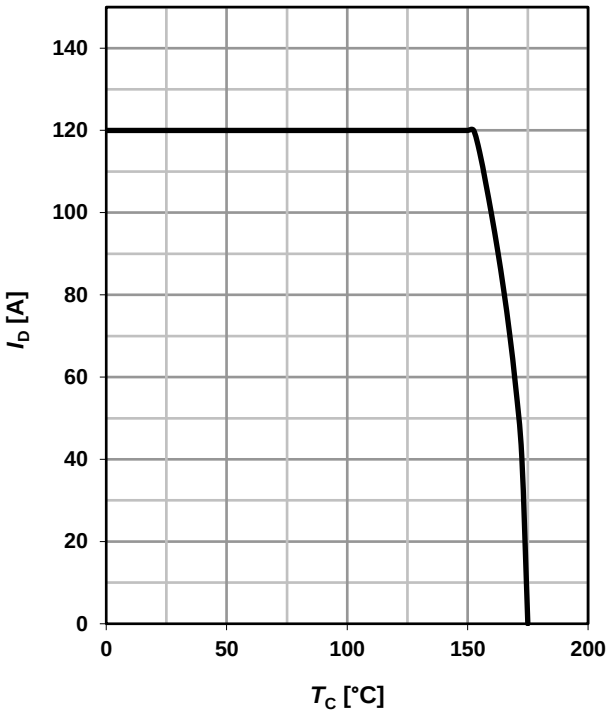
## 1 Power dissipation

$P_{tot} = f(T_C)$; $V_{GS} = 10$ V




## 2 Drain current

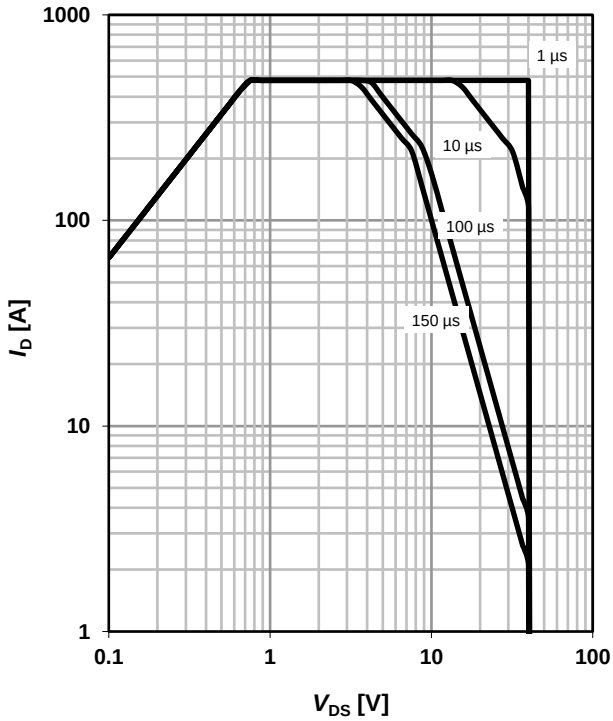
$I_D = f(T_C)$; $V_{GS} = 10$ V




## 3 Safe operating area

$I_D = f(V_{DS})$; $T_C = 25$ °C; $D = 0$

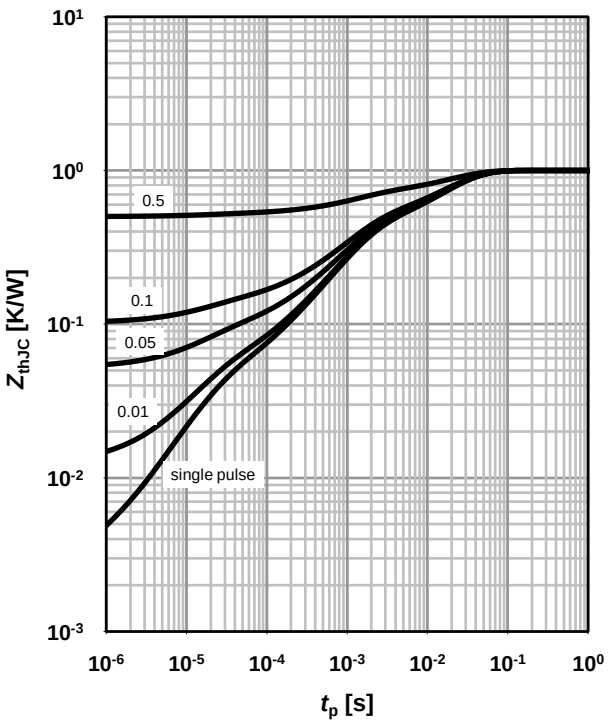
parameter: $t_p$




## 4 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$

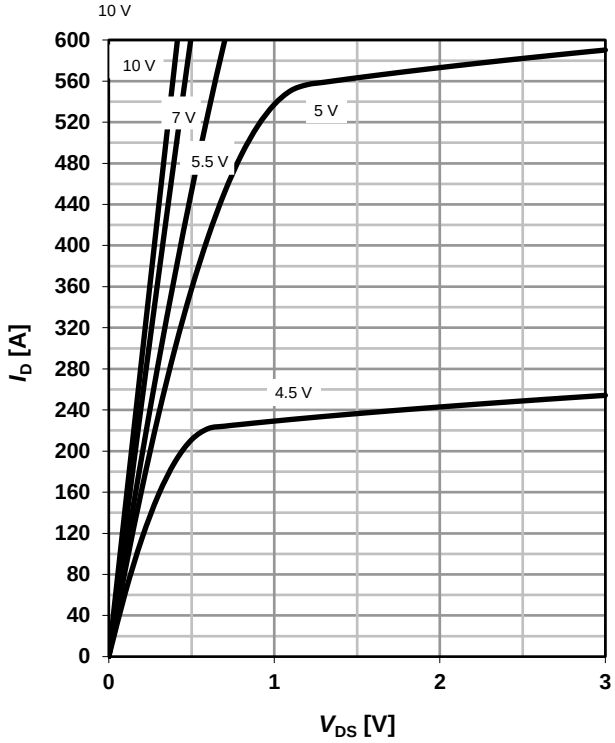
parameter: $D = t_p/T$



## 5 Typ. output characteristics

$I_D = f(V_{DS})$; $T_j = 25$ °C

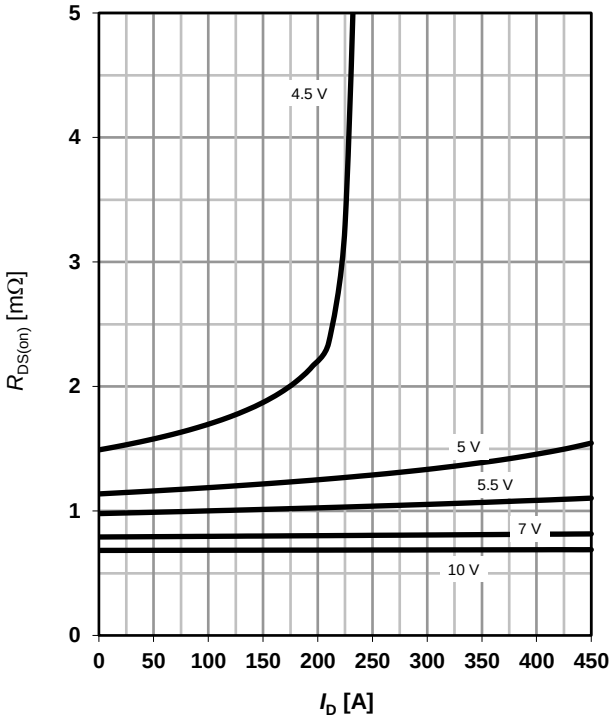
parameter: $V_{GS}$




## 6 Typ. drain-source on-state resistance

$R_{DS(on)} = f(I_D)$; $T_j = 25$ °C

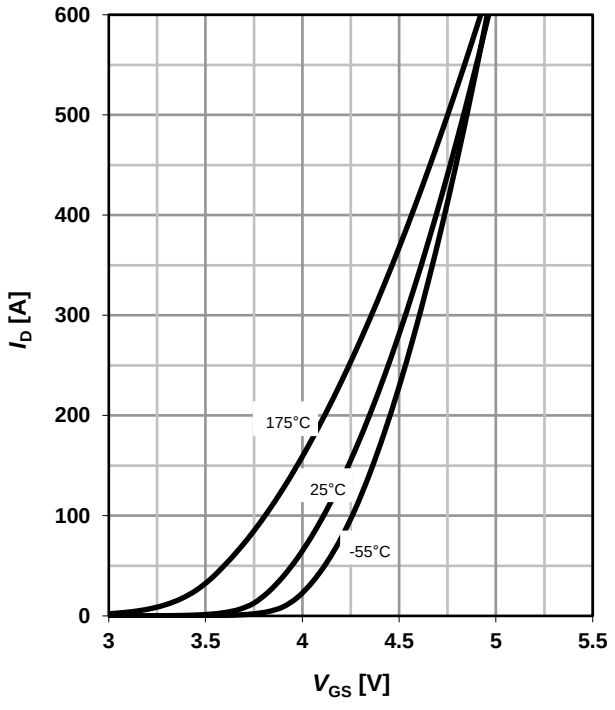
parameter: $V_{GS}$




## 7 Typ. transfer characteristics

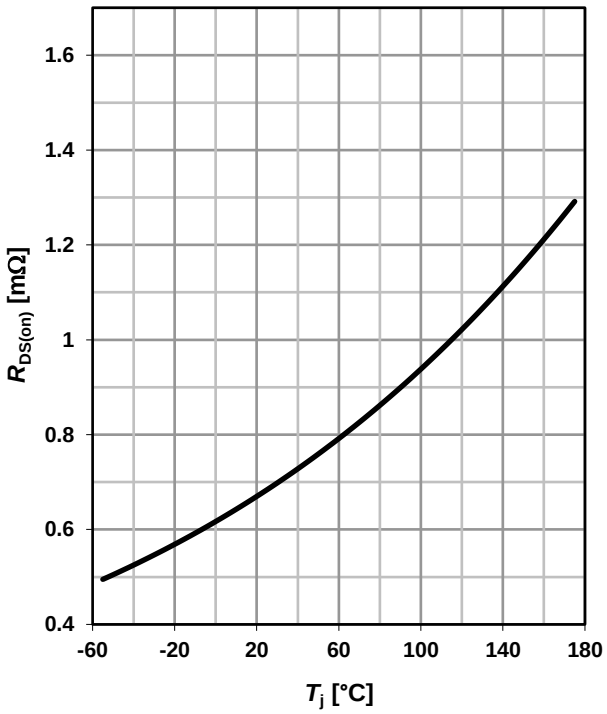
$I_D = f(V_{GS})$; $V_{DS} = 6$V

parameter: $T_j$




## 8 Typ. drain-source on-state resistance

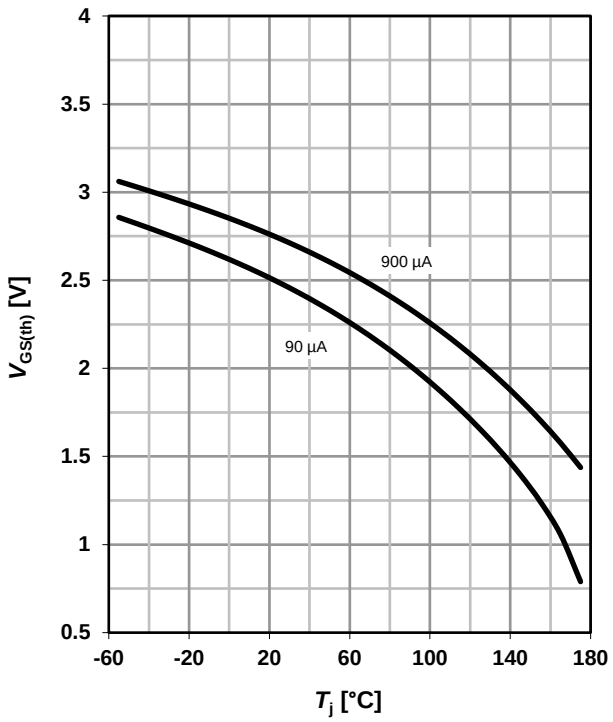
$R_{DS(on)} = f(T_j)$; $I_D = 60$ A; $V_{GS} = 10$ V



## 9 Typ. gate threshold voltage

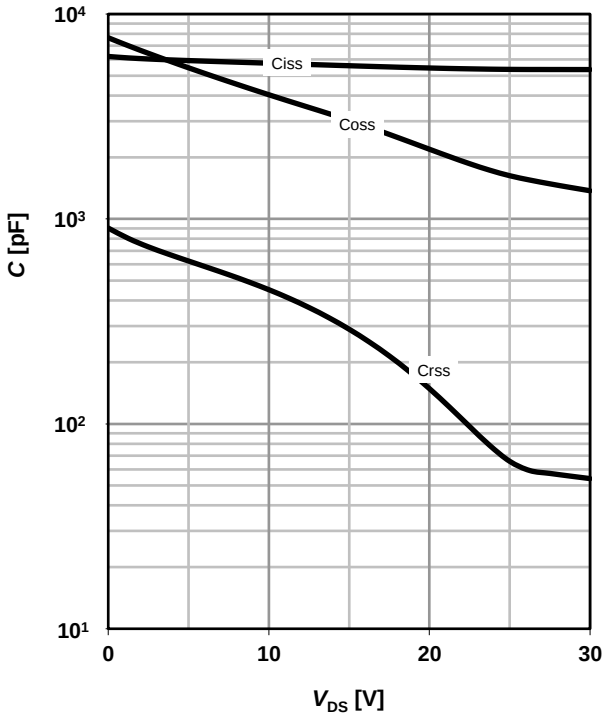
$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$

parameter: $I_D$




## 10 Typ. capacitances

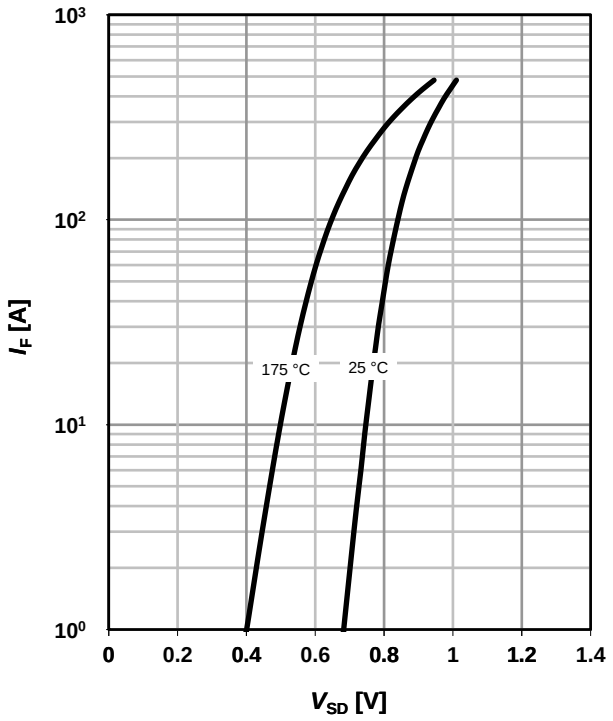
$C = f(V_{DS})$; $V_{GS} = 0$ V; $f = 1$ MHz




## 11 Typical forward diode characteristics

IF = f($V_{SD}$)

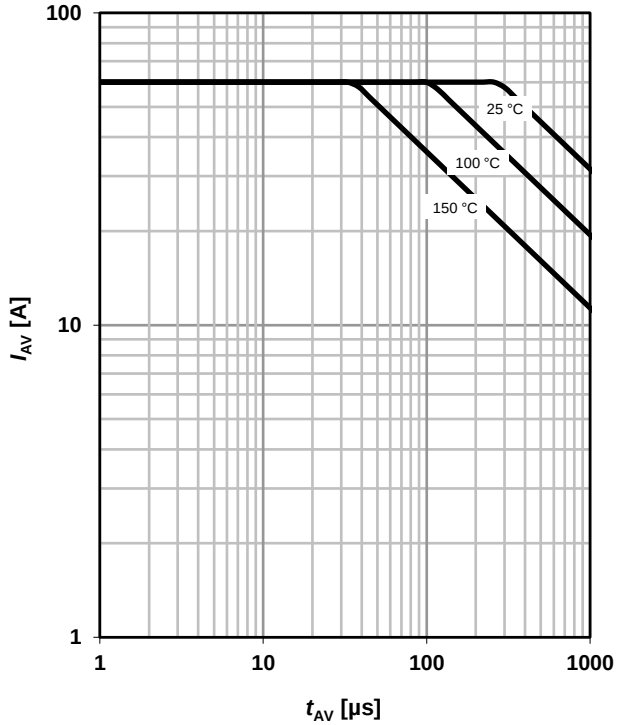
parameter: $T_j$




## 12 Avalanche characteristics

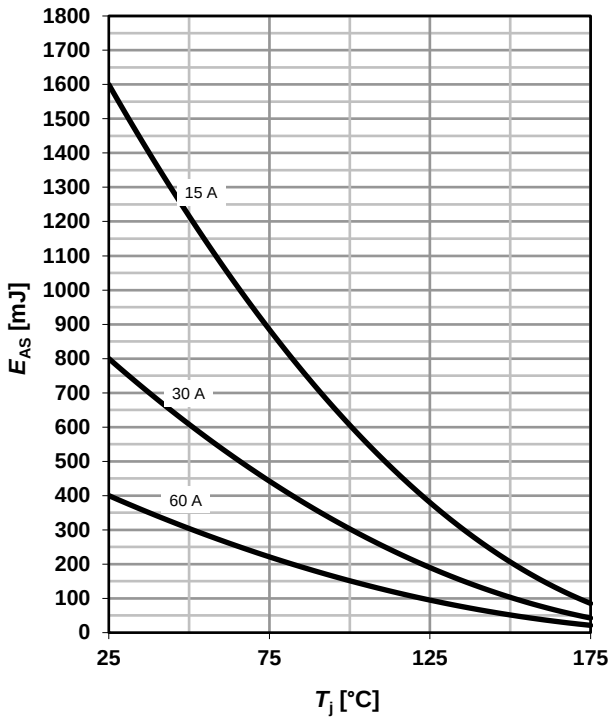
$I_{AS} = f(t_{AV})$

parameter: $T_{j(start)}$



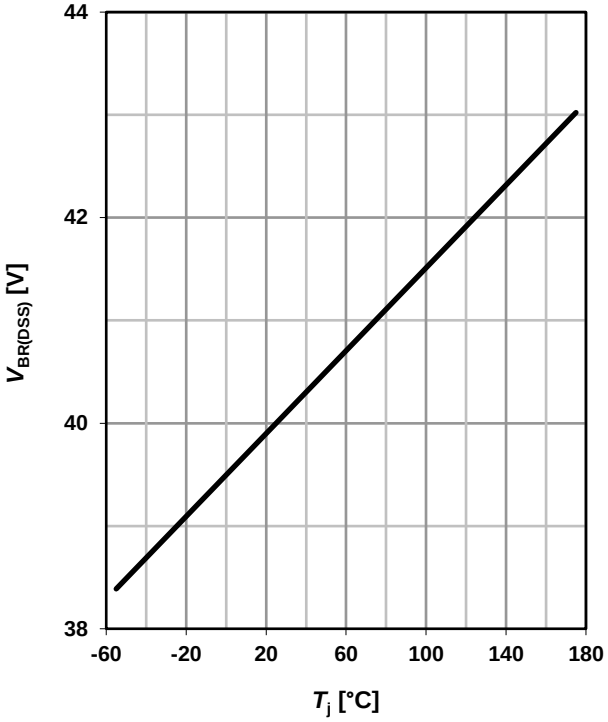
## 13 Avalanche energy

$E_{AS} = f(T_j)$




## 14 Drain-source breakdown voltage

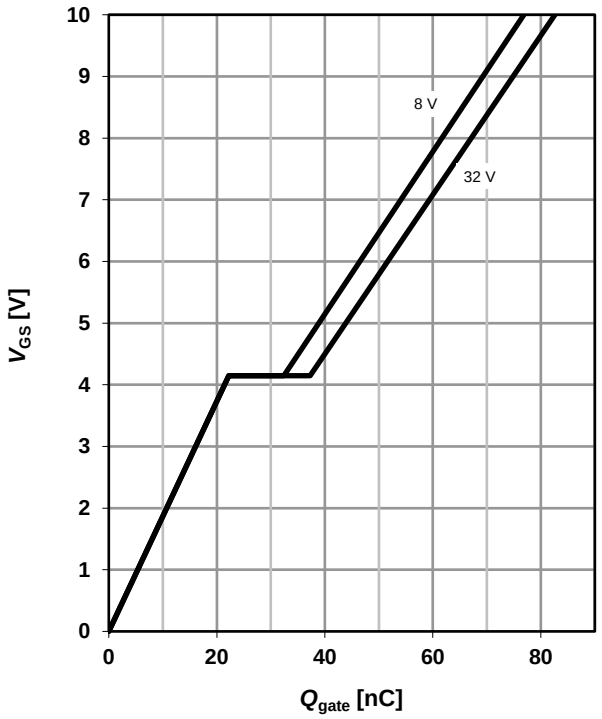
$V_{BR(DSS)} = f(T_j)$; $I_D = 1$ mA



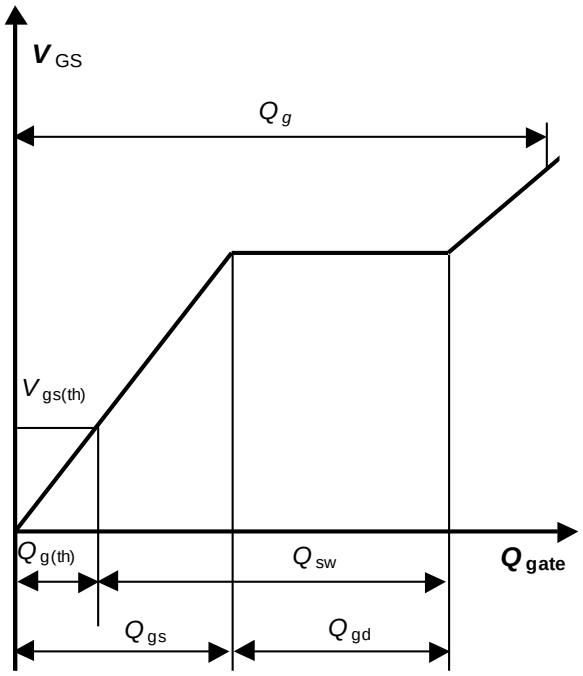

## 15 Typ. gate charge

$V_{GS} = f(Q_{gate})$; $I_D = 40$ A pulsed

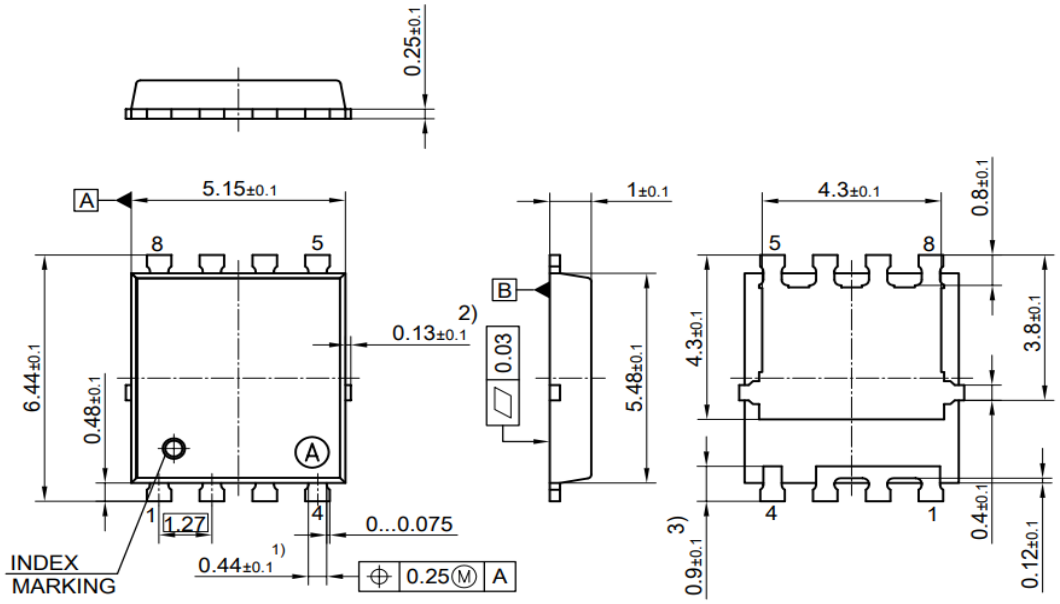
parameter: $V_{DD}$




## 16 Gate charge waveforms

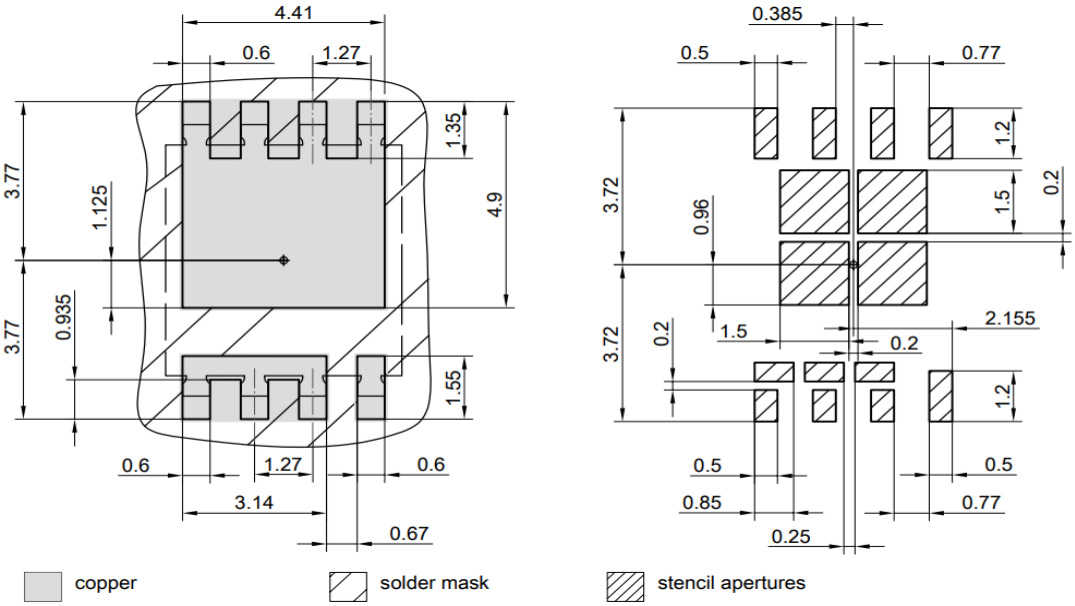


## PG-TDSON-8: Outline



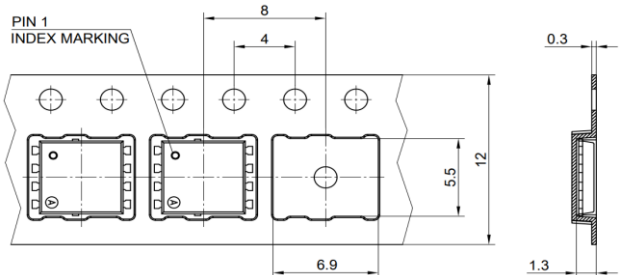

1) EXCLUDE MOLD FLASH
2) REMOVAL ON MOLD GATE, INTRUSION 0.1MM AND PROTRUSION 0.1MM
3) LEAD LENGTH UP TO ANTI FLASH LINE
4)ALL METAL SURFACE ARE PLATED, EXCEPT AREA OF CUT
ALL DIMENSIONS ARE IN UNITS MM
THE DRAWING IS IN COMPLIANCE WITH ISO 128 & PROJECTION METHOD 1 [ ]

## Footprint




Dimensions in mm

## Packaging



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If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Revision History

| **Version** | Date | Changes |
|---|---|---|
| Revision 1.0 | 24.08.2020 | Final Datasheet |