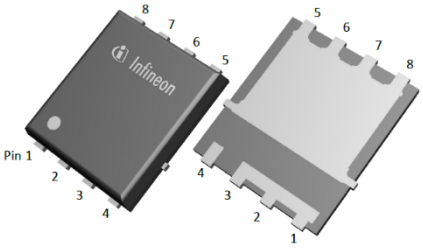
# 英飞凌MOSFET

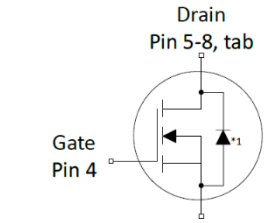
## OptiMOS™ 7 功率晶体管，40 V

PG-TDSON-8




## 特性

- N沟道，标准电平
- 增强型SOA
- 驱动优化
- 卓越的热阻
- 100% 雪崩测试
- 无铅镀层；符合 RoHS 标准
- 符合 IEC61249-2-21 标准的无卤素




## 产品验证

符合 JEDEC JESD47, JESD22 和 J-STD-020 相关测试的工业应用要求。

**表 1　　主要性能参数**

| Parameter | Value | Unit |
|---|---|---|
| $V_{DS}$ | 40 | V |
| $R_{DS(on),max}$ | 0.99 | mΩ |
| $I_D$ | 284 | A |
| $Q_{OSS}$ | 85 | nC |
| $Q_G(0V..10V)$ | 68 | nC |
| $Q_{rr}(100A/\mu s)$ | 38 | nC |

| Part number | Package | Marking | Related links |
|---|---|---|---|
| ISCH99N04NM7V | PG-TDSON-8 | 99N04NM7 | - |

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# 目录

描述 ..... 1
最大额定值 ..... 3
热特性 ..... 4
电气特性 ..... 5
电气特性图 ..... 7
封装外形 ..... 11
修订记录 ..... 14
商标 ..... 15
免责声明 ..... 15

# 1 最大额定值

除非另有规定，$T_A$ =25 °C

**表 2 最大额定值**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Continuous drain current [1] | $I_D$ | - | - | 284 | A | $V_{GS}$=10 V, $T_C$=25 °C |
| | | | | 201 | | $V_{GS}$=10 V, $T_C$=100 °C |
| | | | | 211 | | $V_{GS}$=15 V, $T_C$=100 °C |
| | | | | 40 | | $V_{GS}$=10 V, $T_A$=25 °C, $R_{THJA}$=50 °C/W [2] |
| Pulsed drain current [3] | $I_{D,pulse}$ | - | - | 1136 | A | $T_C$=25 °C |
| Avalanche energy, single pulse [4] | $E_{AS}$ | - | - | 234 | mJ | $I_D$=50 A, $R_{GS}$=25 Ω |
| Gate source voltage | $V_{GS}$ | -20 | - | 20 | V | - |
| Power dissipation | $P_{tot}$ | - | - | 150 | W | $T_C$=25 °C |
| | | | | 3.0 | | $T_A$=25 °C, $R_{thJA}$=50 °C/W [2] |
| Operating and storage temperature | $T_j$, $T_{stg}$ | -55 | - | 175 | °C | - |

1) 额定值指产品仅具有数据手册指定的绝对最大值，保持外壳温度符合规定要求。其他外壳温度请参见图 2。需要根据实际环境条件降低额定值。

2) 器件置于40 mm × 40 mm × 1.5 mm 环氧树脂 PCB FR4 上，配有6 $cm^2$（单层，70 µm厚）铜层面积用于漏极连接。PCB在静止空气中垂直放置。

3) 详细信息请参见图 3

4) 详细信息请参见图 13

# 2 热特性

**表 3 热特性**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Thermal resistance, junction - case, bottom | $R_{thJC}$ | - | - | 1 | °C/W | - |
| Thermal resistance, junction - case, top | $R_{thJC}$ | | | 20 | | |
| Thermal resistance, junction - ambient, 6 $cm^2$ cooling area [5)] | $R_{thJA}$ | | | 50 | | |

5) 器件置于40 mm × 40 mm × 1.5 mm 环氧树脂 PCB FR4 上，配有6 $cm^2$（单层，70 µm厚）铜层面积用于漏极连接。PCB在静止空气中垂直放置。

# 3 电气特性

除非另有规定，$T_j$ = 25°C

**表 4 静态特性**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Drain-source breakdown voltage | $V_{(BR)DSS}$ | 40 | - | - | V | $V_{GS}$=0 V, $I_D$=1 mA |
| Gate threshold voltage | $V_{GS(th)}$ | 2.4 | 2.75 | 3.2 | V | $V_{DS}$=$V_{GS}$, $I_D$=66 µA |
| Zero gate voltage drain current | $I_{DSS}$ | - | 0.1 | 1 | µA | $V_{DS}$=40 V, $V_{GS}$=0 V, $T_j$=25 °C |
| | | | 10 | 100 | | $V_{DS}$=40 V, $V_{GS}$=0 V, $T_j$=125 °C |
| Gate-source leakage current | $I_{GSS}$ | - | 10 | 100 | nA | $V_{GS}$=20 V, $V_{DS}$=0 V |
| Drain-source on-state resistance | $R_{DS(on)}$ | - | 0.77 | 0.9 | mΩ | $V_{GS}$=15 V, $I_D$=50 A |
| | | | 0.85 | 0.99 | | $V_{GS}$=10 V, $I_D$=50 A |
| Gate resistance | $R_G$ | - | 1 | - | Ω | - |
| Transconductance | $g_{fs}$ | - | 150 | - | S | $\|V_{DS}\|\geq 2\|I_D\|R_{DS(on)max}$, $I_D$=50 A |

**表 5 动态特性**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Input capacitance [6] | $C_{iss}$ | - | 4400 | - | pF | $V_{GS}$=0 V, $V_{DS}$=20 V, $f$=1 MHz |
| Output capacitance [6] | $C_{oss}$ | | 2300 | | | |
| Reverse transfer capacitance [6] | $C_{rss}$ | | 52 | | | |
| Turn-on delay time | $t_{d(on)}$ | - | 14 | - | ns | $V_{DD}$=20 V, $V_{GS}$=10 V, $I_D$=50 A, $R_{G,ext}$=1.6 Ω |
| Rise time | $t_r$ | | 4.9 | | | |
| Turn-off delay time | $t_{d(off)}$ | | 24 | | | |
| Fall time | $t_f$ | | 7.5 | | | |

[6] 由设计指定，未经过生产测试。

**表 6　　栅极电荷特性**[7)]

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Gate to source charge | $Q_{gs}$ | - | 21 | - | nC | $V_{DD}$=20 V, $I_D$=50 A, $V_{GS}$=0 to 10 V |
| Gate charge at threshold | $Q_{g(th)}$ | | 12 | - | nC | |
| Gate to drain charge | $Q_{gd}$ | | 14.5 | - | nC | |
| Switching charge | $Q_{sw}$ | | 24 | - | nC | |
| Gate charge total [8)] | $Q_g$ | | 68 | 85 | nC | |
| Gate plateau voltage | $V_{plateau}$ | | 4.8 | - | V | |
| Gate charge total, sync. FET | $Q_{g(sync)}$ | - | 61 | - | nC | $V_{DS}$=0.1 V, $V_{GS}$=0 to 10 V |
| Output charge | $Q_{oss}$ | - | 85 | - | nC | $V_{DS}$=20 V, $V_{GS}$=0 V |

7)　参数定义请参数见“栅极电荷波形”

8)　由设计指定，未经过生产测试。

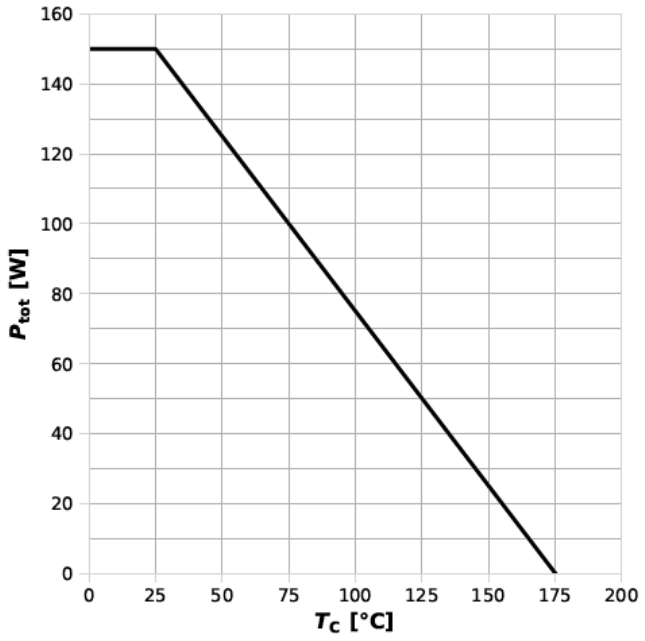
**表 7　　反向二极管**

| Parameter | Symbol | Values | | | Unit | Note / Test condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Diode continuous forward current | $I_S$ | - | - | 141 | A | $T_C$=25 °C |
| Diode pulse current | $I_{S,pulse}$ | | | 1136 | | |
| Diode forward voltage | $V_{SD}$ | - | 0.81 | 1.0 | V | $V_{GS}$=0 V, $I_F$=50 A, $T_j$=25 °C |
| Reverse recovery time [9)] | $t_{rr}$ | - | 41 | - | ns | $V_R$=20 V, $I_F$=50 A, d$i_F$/d$t$=100 A/µs |
| Reverse recovery charge [9)] | $Q_{rr}$ | | 38 | | nC | |

9)　由设计指定，未经过生产测试。

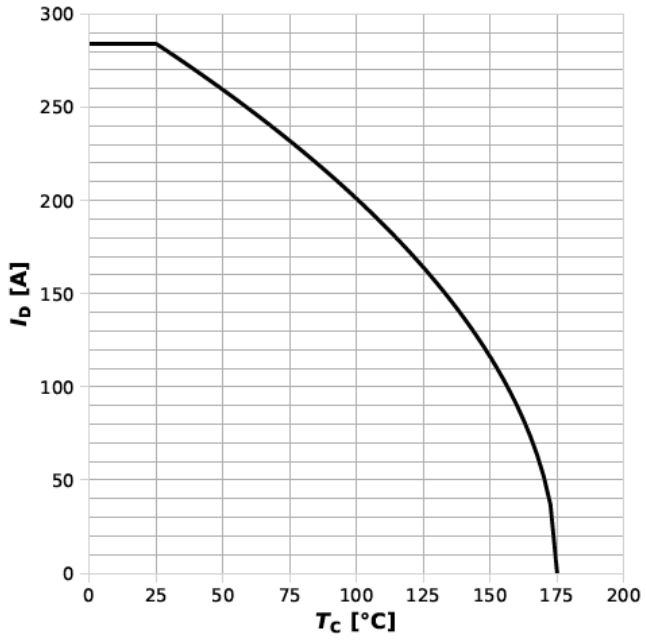
# 4 电气特性图

**Diagram 1: Power dissipation**



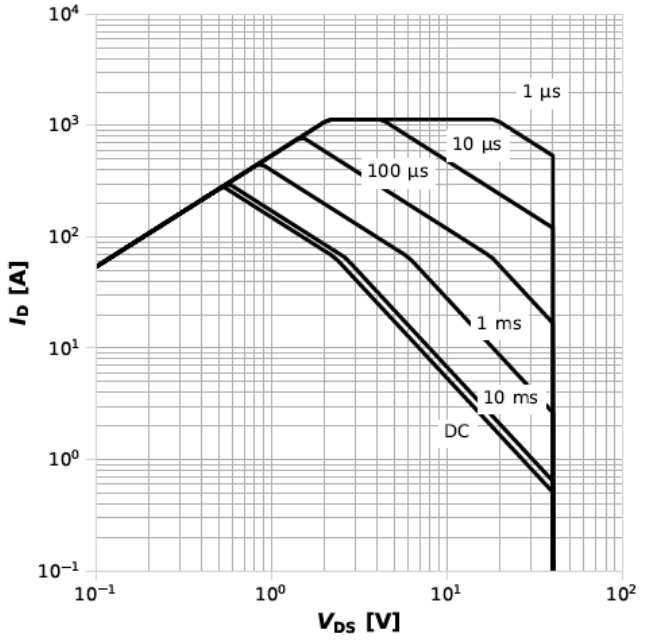

$P_{tot}=f(T_C)$

**Diagram 2: Drain current**



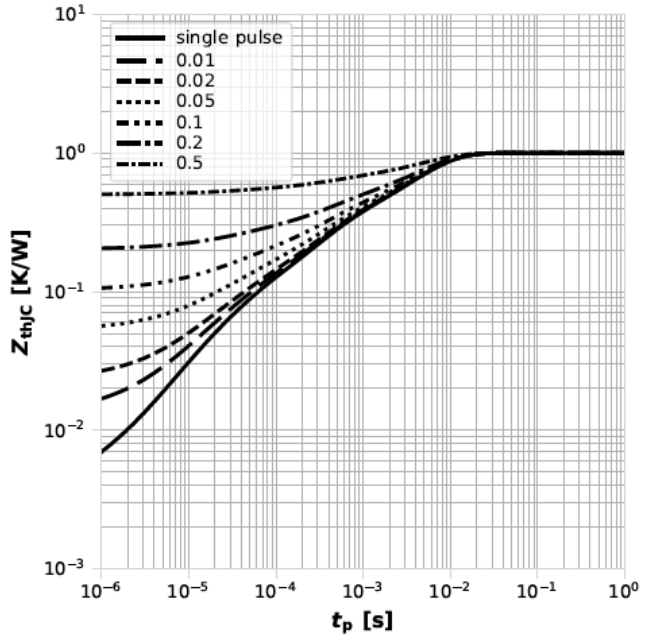

$I_D=f(T_C)$; $V_{GS}\geq 10$ V

**Diagram 3: Safe operating area**

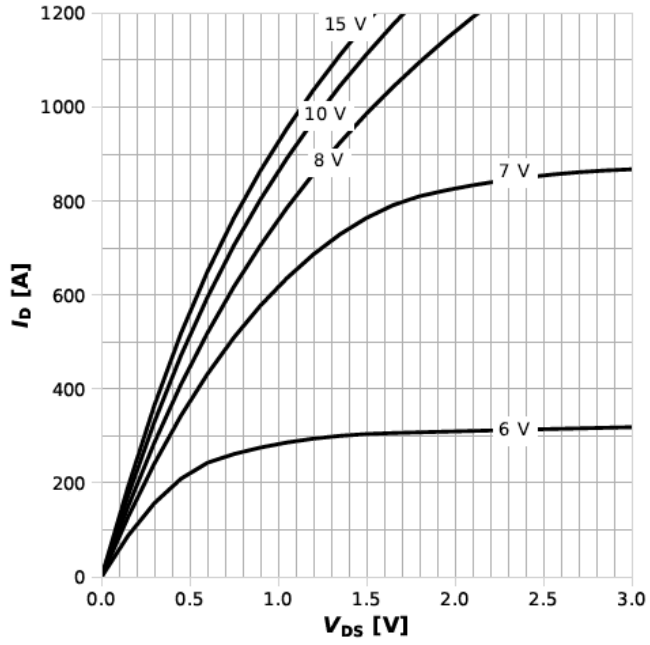
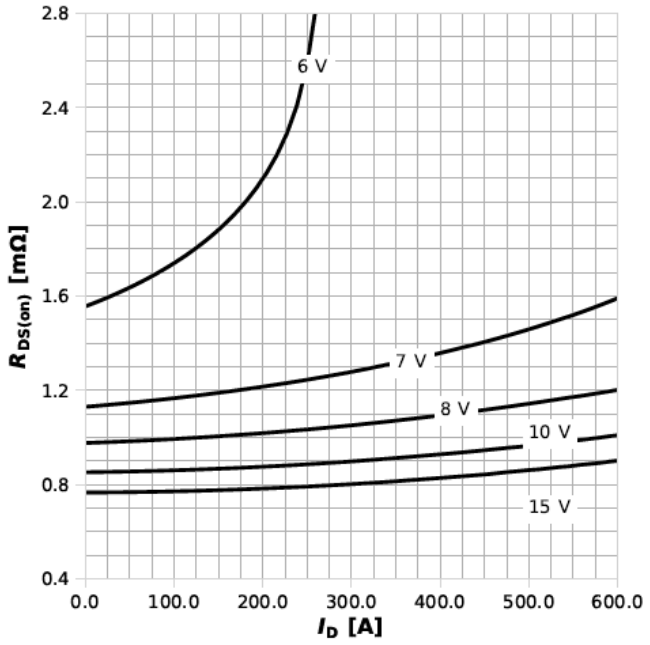



$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$; parameter: $t_p$

**Diagram 4: Max. transient thermal impedance**




$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

| Diagram 5: Typ. output characteristics | Diagram 6: Typ. drain-source on resistance |
|---|---|
|  |  |
| $I_D$=f($V_{DS}$), $T_j$=25 °C; parameter: $V_{GS}$ | $R_{DS(on)}$=f($I_D$), $T_j$=25 °C; parameter: $V_{GS}$ |

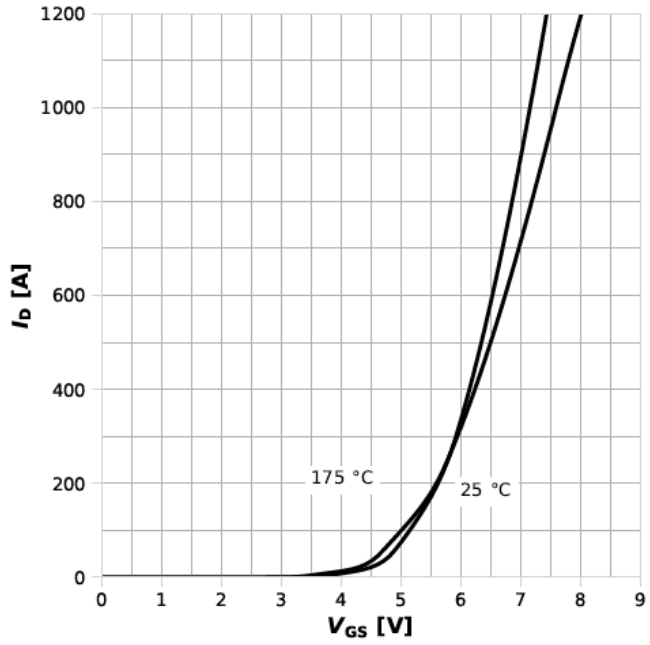
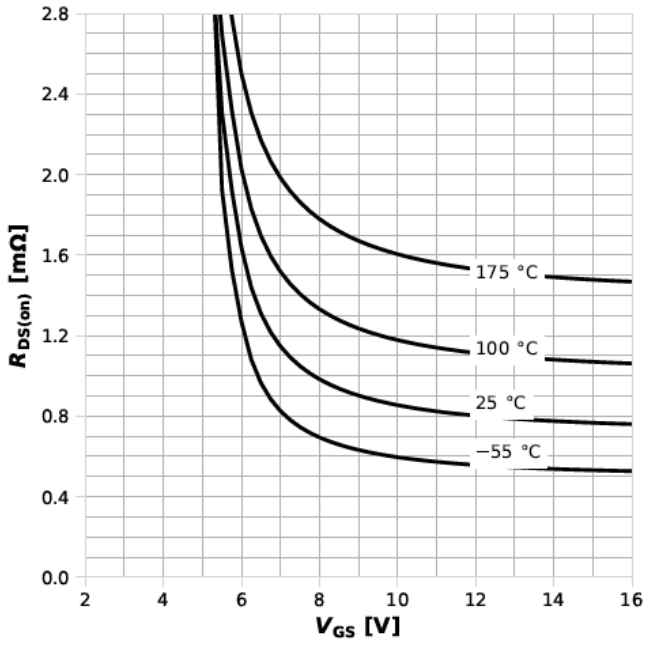
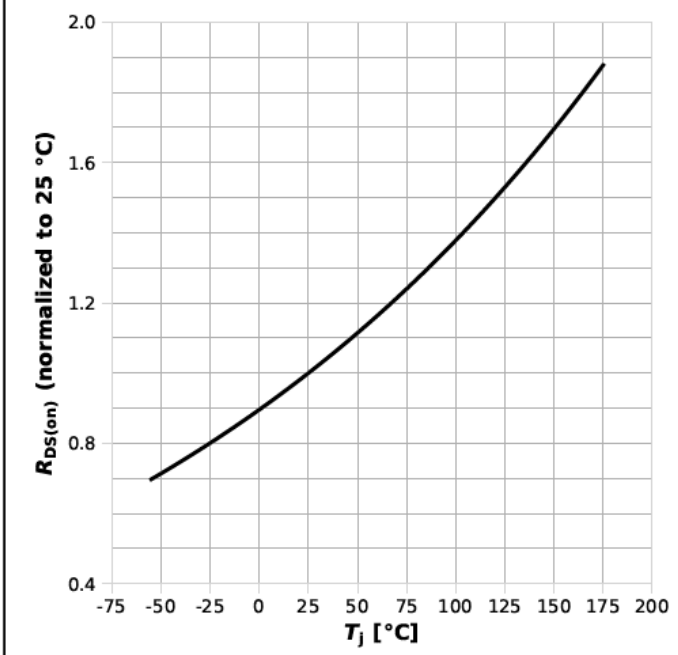
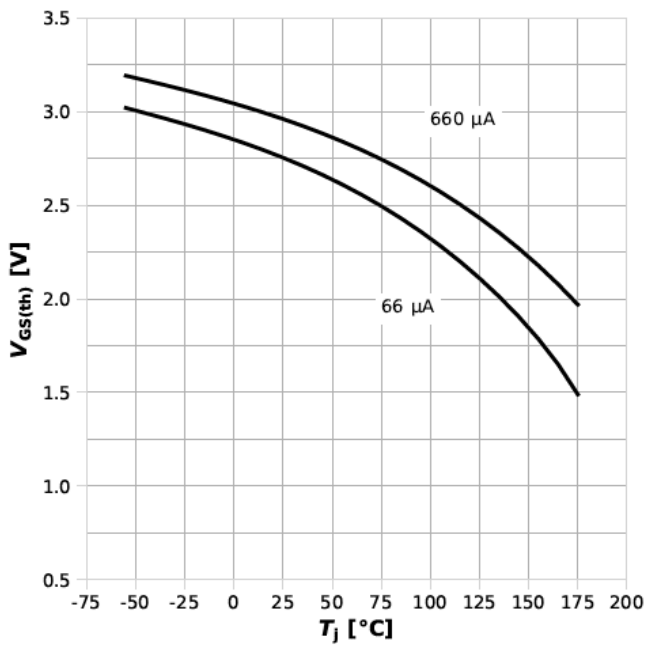
| Diagram 7: Typ. transfer characteristics | Diagram 8: Typ. drain-source on resistance |
|---|---|
|  |  |
| $I_D$=f($V_{GS}$), \|$V_{DS}$\|>2\|$I_D$\|$R_{DS(on)max}$; parameter: $T_j$ | $R_{DS(on)}$=f($V_{GS}$), $I_D$=50 A; parameter: $T_j$ |

**Diagram 9: Normalized drain-source on resistance**



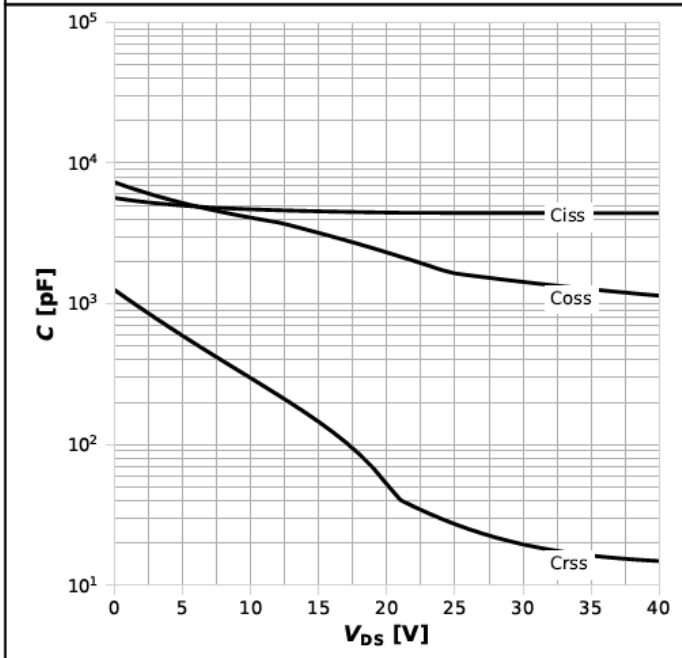

$R_{DS(on)}$=f($T_j$), $I_D$=50 A, $V_{GS}$=10 V

**Diagram 10: Typ. gate threshold voltage**



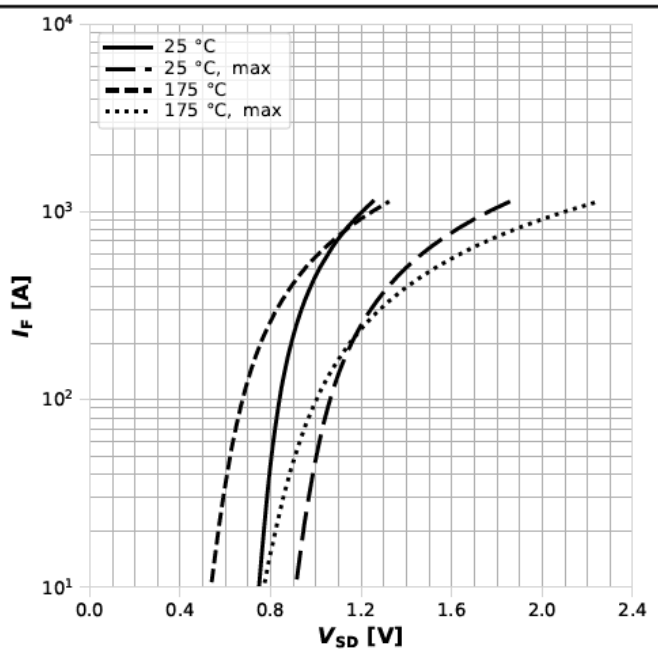

$V_{GS(th)}$=f($T_j$), $V_{GS}$=$V_{DS}$; parameter: $I_D$

**Diagram 11: Typ. capacitances**

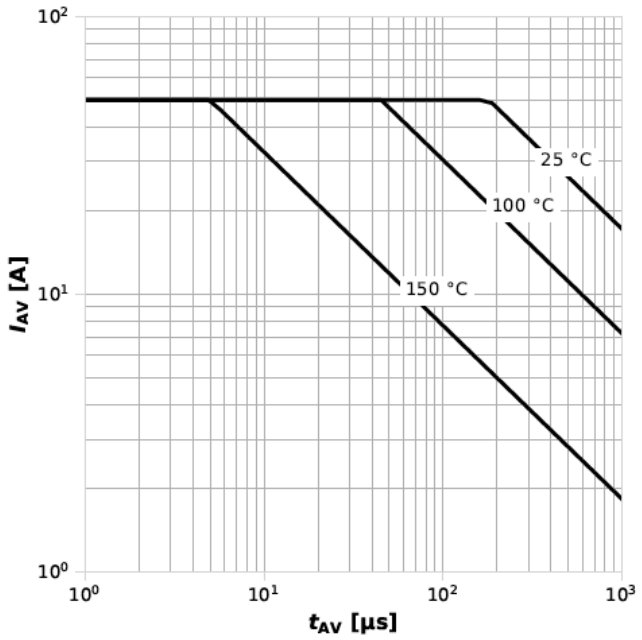
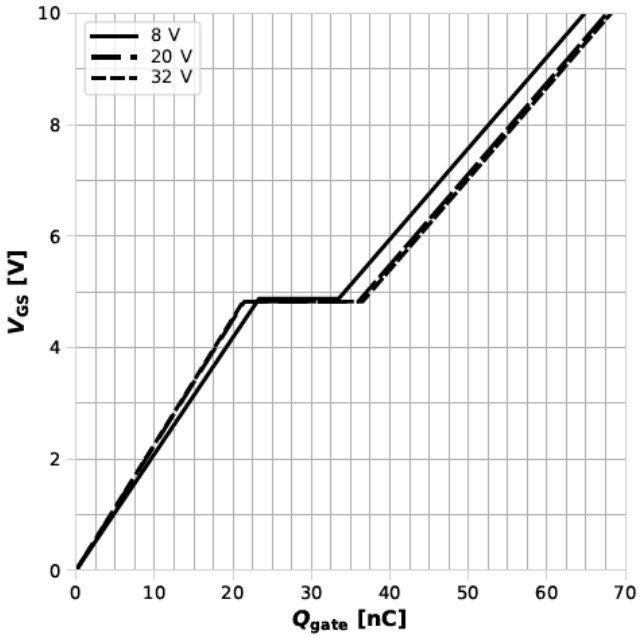


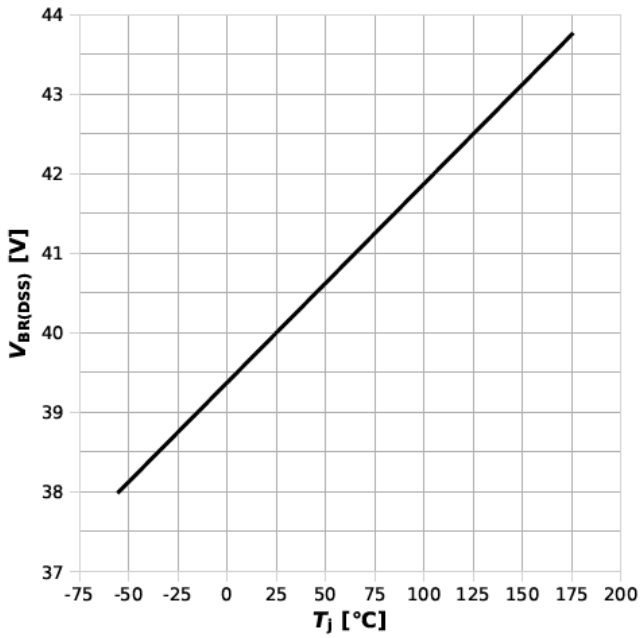
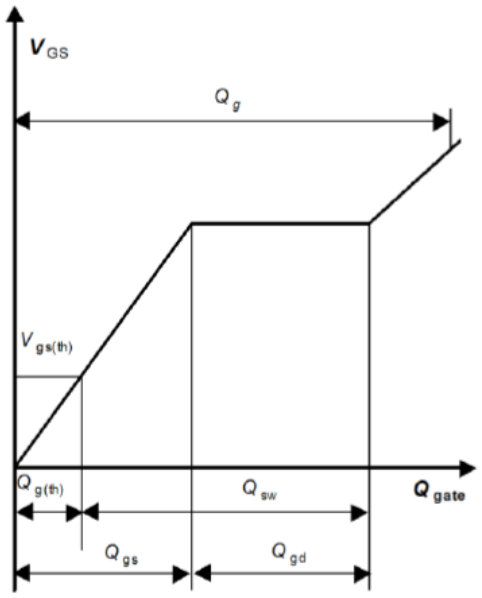

$C$=f($V_{DS}$); $V_{GS}$=0 V; $f$=1 MHz

**Diagram 12: Forward characteristics of reverse diode**

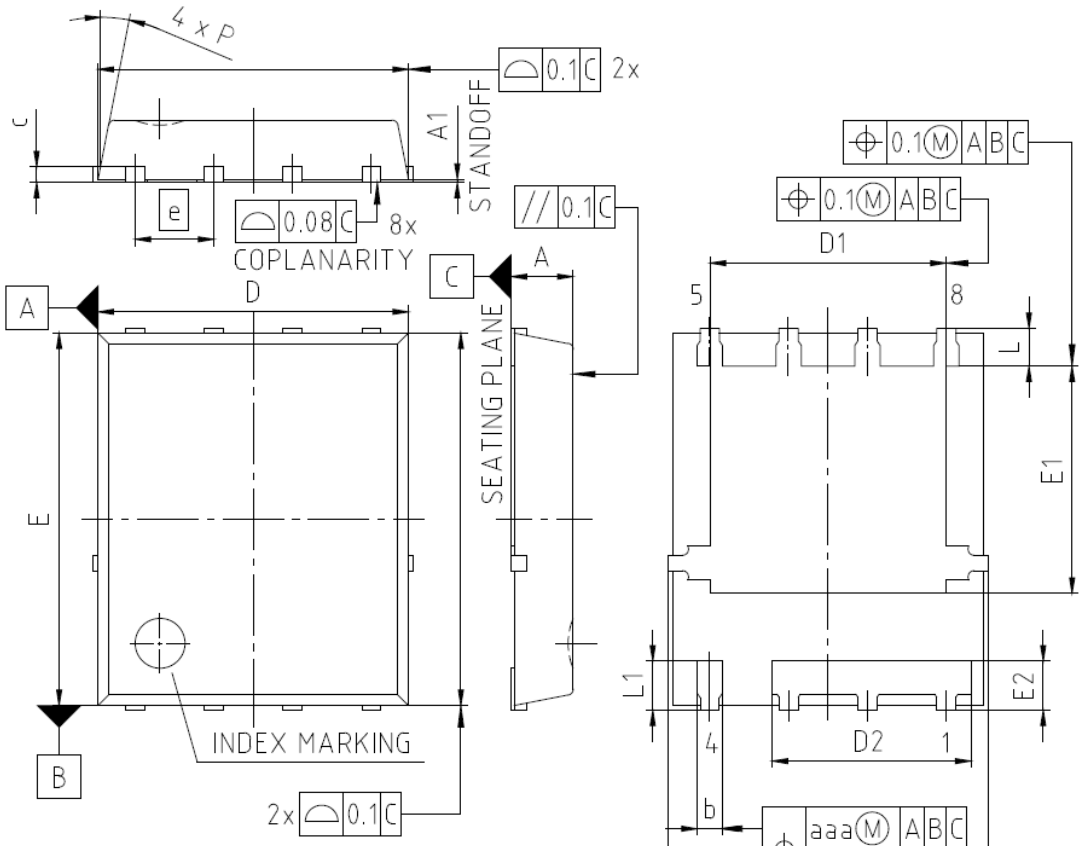



$I_F$=f($V_{SD}$); parameter: $T_j$

| Diagram 13: Avalanche characteristics | Diagram 14: Typ. gate charge |
|---|---|
|  |  |
| $I_{AS}$=f($t_{AV}$); $R_{GS}$=25 Ω; parameter: $T_{j,start}$ | $V_{GS}$=f($Q_{gate}$), $I_D$=50 A pulsed, $T_j$=25 °C; parameter: $V_{DD}$ |

| Diagram 15: Min. drain-source breakdown voltage | Gate charge waveforms |
|---|---|
|  |  |
| $V_{BR(DSS)}$=f($T_j$); $I_D$=1 mA | - |

# 5 封装外形




| PACKAGE - GROUP NUMBER: | PG-TDSON-8-U04 | |
|---|---|---|
| DIMENSIONS | MILLIMETERS | |
| | MIN. | MAX. |
| A | 0.90 | 1.20 |
| A1 | 0 | 0.05 |
| b | 0.26 | 0.54 |
| c | 0.15 | 0.35 |
| D | 4.80 | 5.35 |
| D1 | 3.70 | 4.40 |
| D2 | 2.94 | 3.25 |
| D3 | 4.80 | 5.15 |
| E | 5.70 | 6.10 |
| E1 | 3.40 | 3.76 |
| E2 | 0.69 | 0.90 |
| e | 1.27 | |
| L | 0.45 | 0.72 |
| L1 | 0.69 | 0.90 |
| aaa | 0.10 | 0.25 |
| P | 8° | 12° |

1) EXCLUDING MOLD FLASH
2) REMOVAL ON MOLD GATE
   INTRUSION 0.1 MM
   PROTRUSION 0.1 MM
3) LEAD LENGTH UP TO ANTI FLASH LINE
4) ALL METAL SURFACES ARE PLATED,
   EXCEPT AREA OF CUT

**图 1　　PG-TDSON-8 封装外形，尺寸单位为毫米**

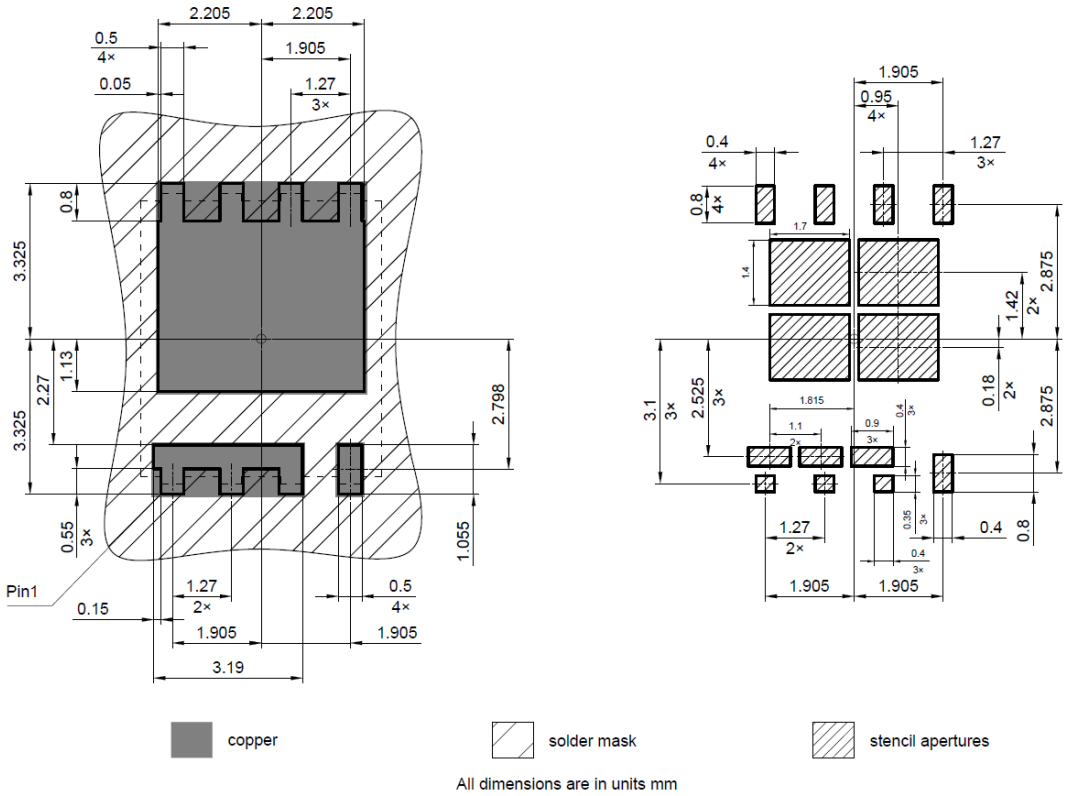



**图 2　　PG-TDSON-8 封装图，尺寸单位为毫米**

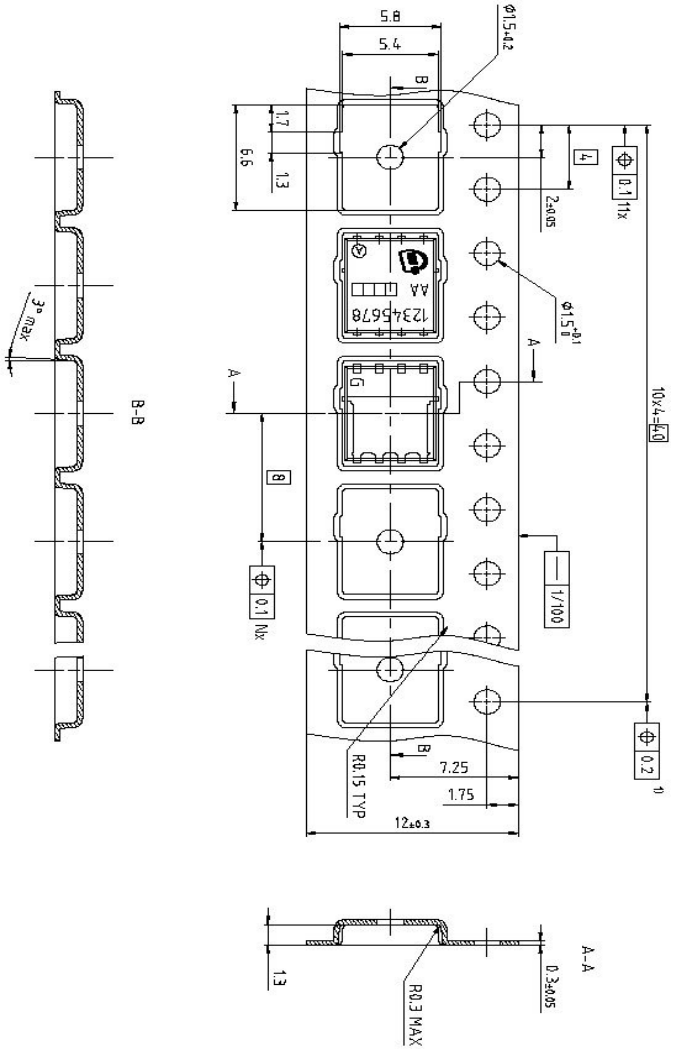



**图 3　　PG-TDSON-8 封装变体，尺寸单位为毫米**

## 修订记录

ISCH99N04NM7V

### Revision 2025-05-05, Rev. 1. 1

Previous revisions

| Revision | Date | Subjects (major changes since last revision) |
|---|---|---|
| 1.0 | 2025-04-22 | Release of final version |
| 1.1 | 2025-05-05 | Update threshold voltage range |

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