

MOSFET

OptiMOS™ 5 Linear FET, 60 V

Features

- Ideal for hot-swap, battery protection and e-fuse applications
- Very low on-resistance $R_{DS(on)}$
- Wide safe operating area SOA
- N-channel, normal level
- 100% avalanche tested
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21

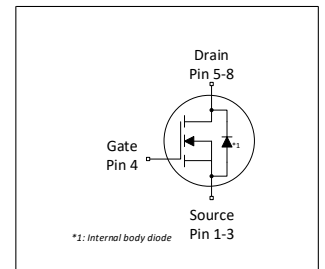
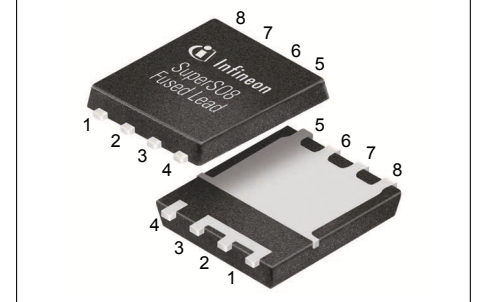
Product validation

Fully qualified according to JEDEC for Industrial Applications

Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS}	60	V
$R_{DS(on),max}$	1.55	m Ω
I_D	275	A
$I(V_{DS}=30\text{ V}, t_p=10\text{ ms})$	8.3	A

TDSON-8 FL (enlarged source interconnection)



RoHS

Type / Ordering Code	Package	Marking	Related Links
ISC015N06NM5LF	PG-TDSON-8 FL	015N06LF	-

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1 Maximum ratings

at $T_A=25\text{ °C}$, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D	-	-	275 195 32	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$ $V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$ $V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=50\text{ °C/W}^2)$
Pulsed drain current ³⁾	$I_{D,pulse}$	-	-	1100	A	$T_C=25\text{ °C}$
Avalanche energy, single pulse ⁴⁾	E_{AS}	-	-	580	mJ	$I_D=50\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	217 3.0	W	$T_C=25\text{ °C}$ $T_A=25\text{ °C}$, $R_{thJA}=50\text{ °C/W}^2)$
Operating and storage temperature	T_j , T_{stg}	-55	-	175	°C	-

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case, bottom	R_{thJC}	-	-	0.7	°C/W	-
Thermal resistance, junction - case, top	R_{thJC}	-	-	20	°C/W	-
Thermal resistance, junction - ambient, 6 cm ² cooling area ²⁾	R_{thJA}	-	-	50	°C/W	-

¹⁾ Rating refers to the product only with datasheet specified absolute maximum values, maintaining case temperature as specified. For other case temperatures please refer to Diagram 2. De-rating will be required based on the actual environmental conditions.

²⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

³⁾ See Diagrams 3 and 4 for more detailed information

⁴⁾ See Diagram 14 for more detailed information

3 Electrical characteristics

at $T_j=25\text{ °C}$, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	-	-	V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2.25	3.0	3.45	V	$V_{DS}=V_{GS}$, $I_D=120\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1 10	1 100	μA	$V_{DS}=60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$ $V_{DS}=60\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	1.3	1.55	m Ω	$V_{GS}=10\text{ V}$, $I_D=50\text{ A}$
Gate resistance	R_G	-	2.0	2.6	Ω	-
Transconductance ¹⁾	g_{fs}	28	56	-	S	$ V_{DS} \geq 2 I_D R_{DS(on)max}$, $I_D=50\text{ A}$

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance ¹⁾	C_{iss}	-	6900	9000	pF	$V_{GS}=0\text{ V}$, $V_{DS}=30\text{ V}$, $f=1\text{ MHz}$
Output capacitance ¹⁾	C_{oss}	-	1300	1700	pF	$V_{GS}=0\text{ V}$, $V_{DS}=30\text{ V}$, $f=1\text{ MHz}$
Reverse transfer capacitance ¹⁾	C_{rss}	-	55	96	pF	$V_{GS}=0\text{ V}$, $V_{DS}=30\text{ V}$, $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	17	-	ns	$V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Rise time	t_r	-	16	-	ns	$V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	31	-	ns	$V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$
Fall time	t_f	-	15	-	ns	$V_{DD}=30\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=50\text{ A}$, $R_{G,ext}=1.6\text{ }\Omega$

Table 6 Gate charge characteristics²⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	41	-	nC	$V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	21	-	nC	$V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge ¹⁾	Q_{gd}	-	16	24	nC	$V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Switching charge	Q_{sw}	-	36	-	nC	$V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total ¹⁾	Q_g	-	90	113	nC	$V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	5.9	-	V	$V_{DD}=30\text{ V}$, $I_D=50\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Output charge ¹⁾	Q_{oss}	-	91	121	nC	$V_{DS}=30\text{ V}$, $V_{GS}=0\text{ V}$

¹⁾ Defined by design. Not subject to production test.

²⁾ See "Gate charge waveforms" for parameter definition

Table 7 Reverse diode

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	I_S	-	-	163	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	1100	A	$T_C=25\text{ °C}$
Diode forward voltage	V_{SD}	-	0.82	1.2	V	$V_{GS}=0\text{ V}, I_F=50\text{ A}, T_j=25\text{ °C}$
Reverse recovery time ¹⁾	t_{rr}	-	39	78	ns	$V_R=30\text{ V}, I_F=50\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge ¹⁾	Q_{rr}	-	42	84	nC	$V_R=30\text{ V}, I_F=50\text{ A}, di_F/dt=100\text{ A}/\mu\text{s}$

¹⁾ Defined by design. Not subject to production test.

4 Electrical characteristics diagrams

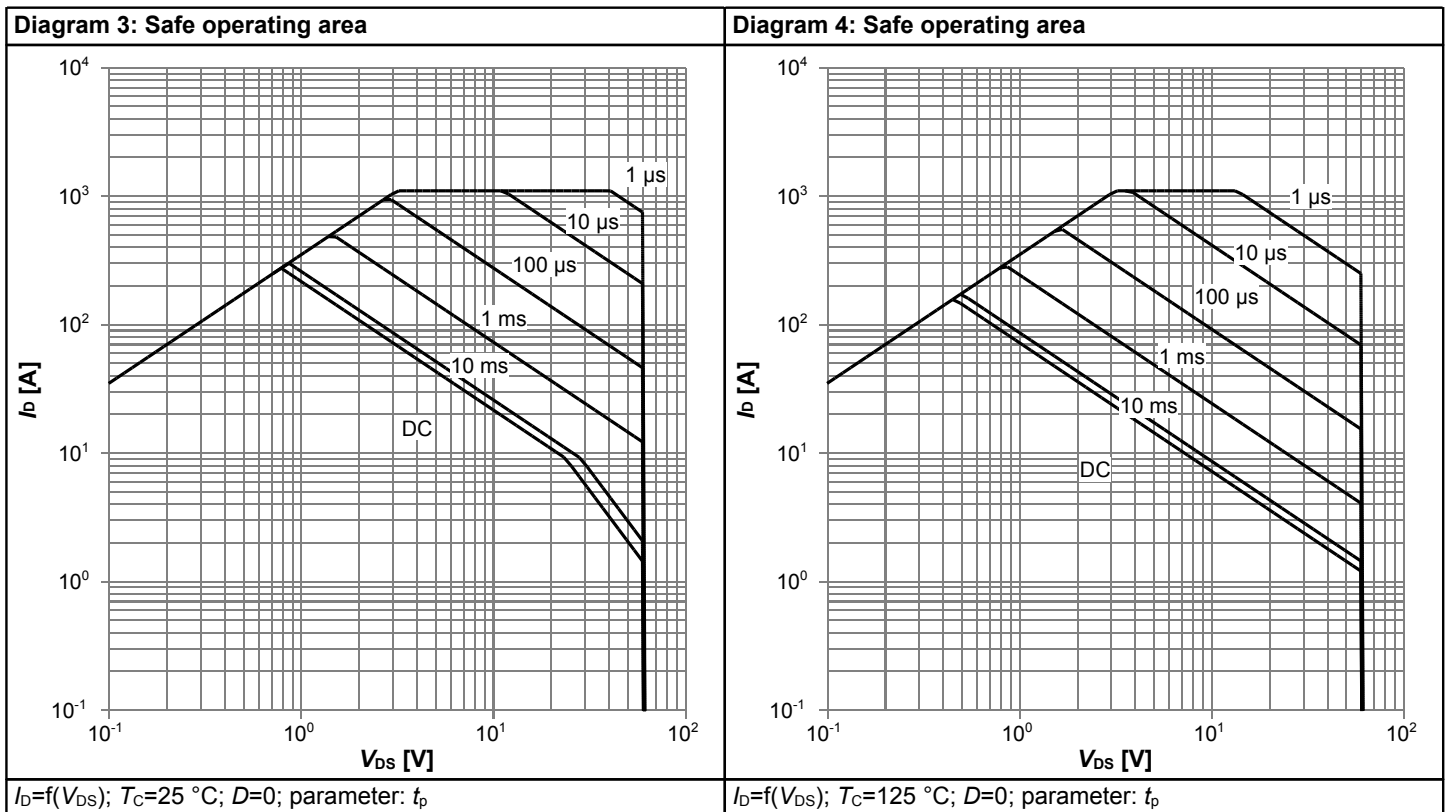
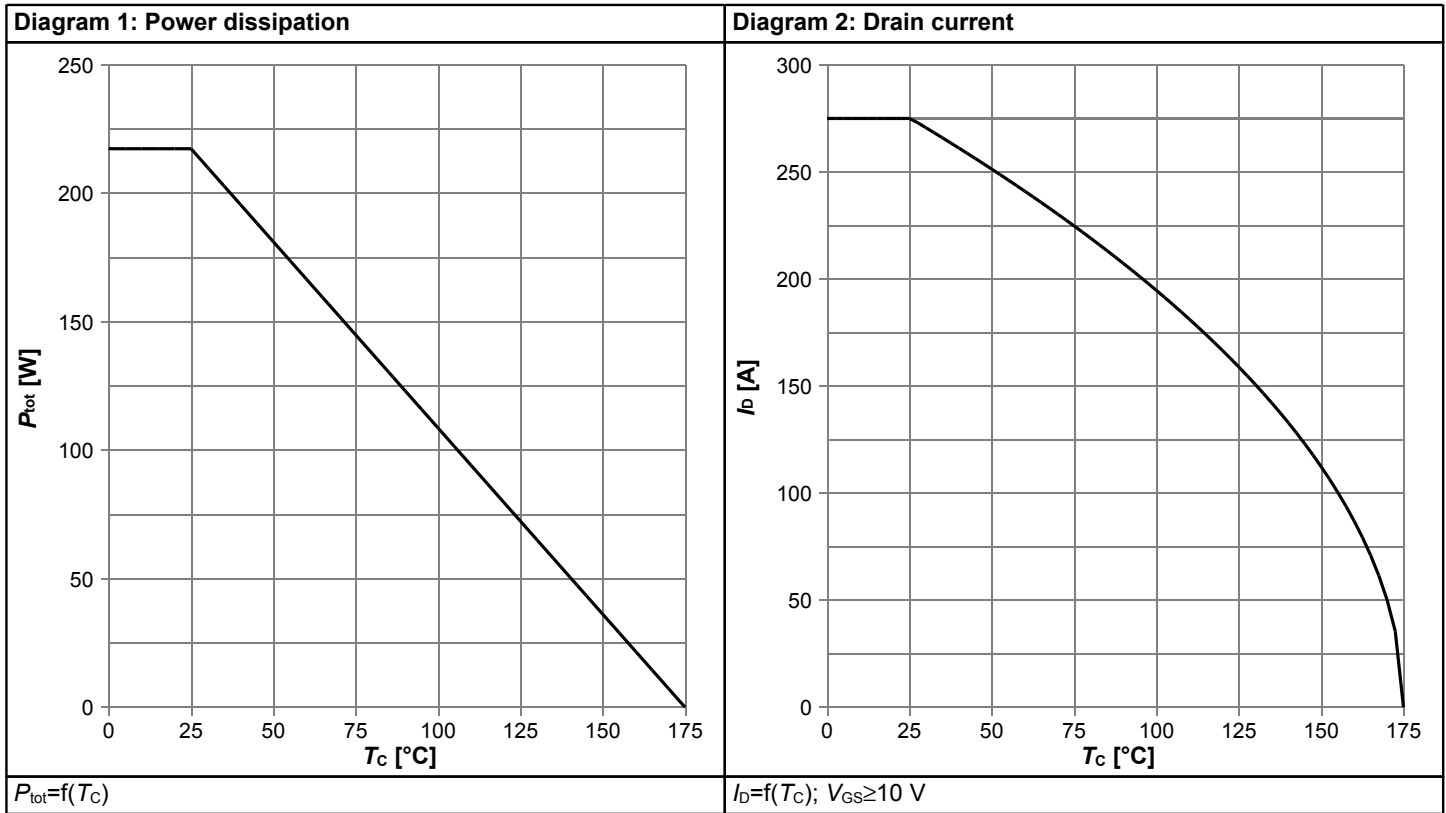
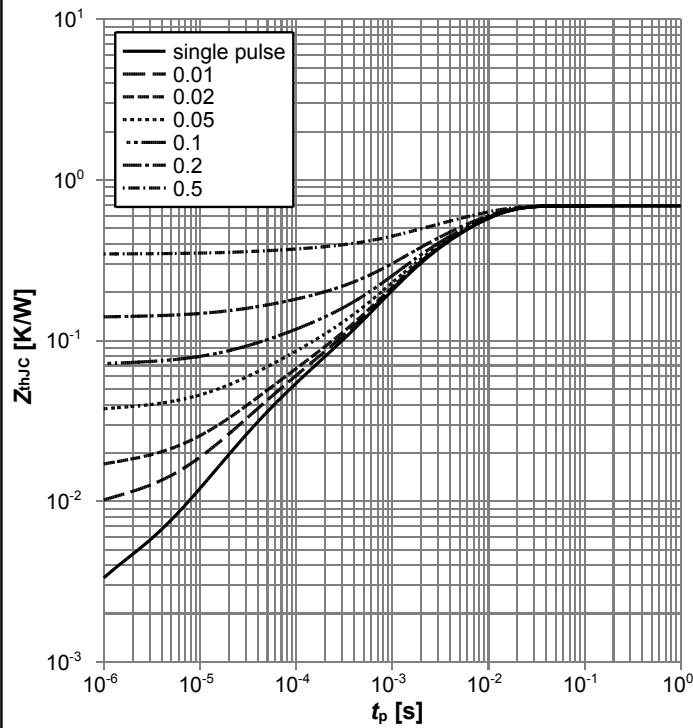
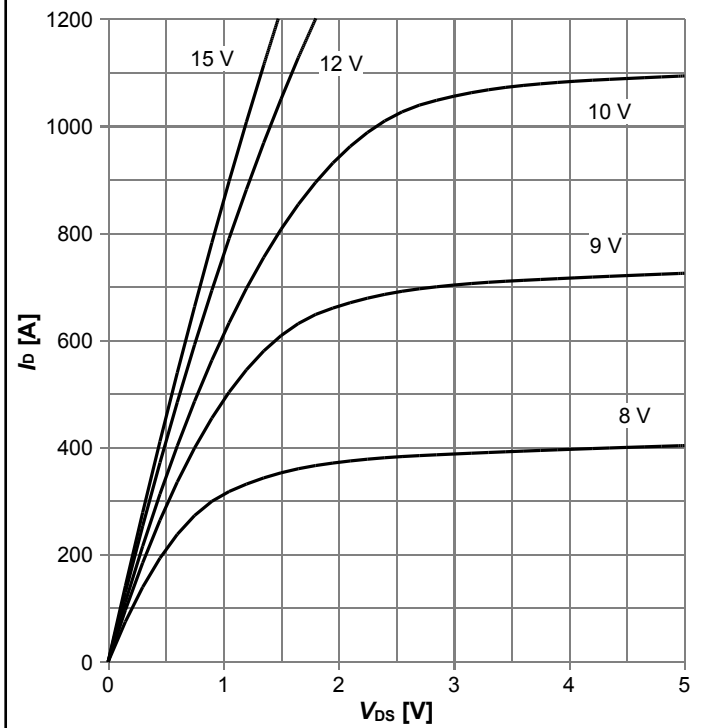


Diagram 5: Max. transient thermal impedance



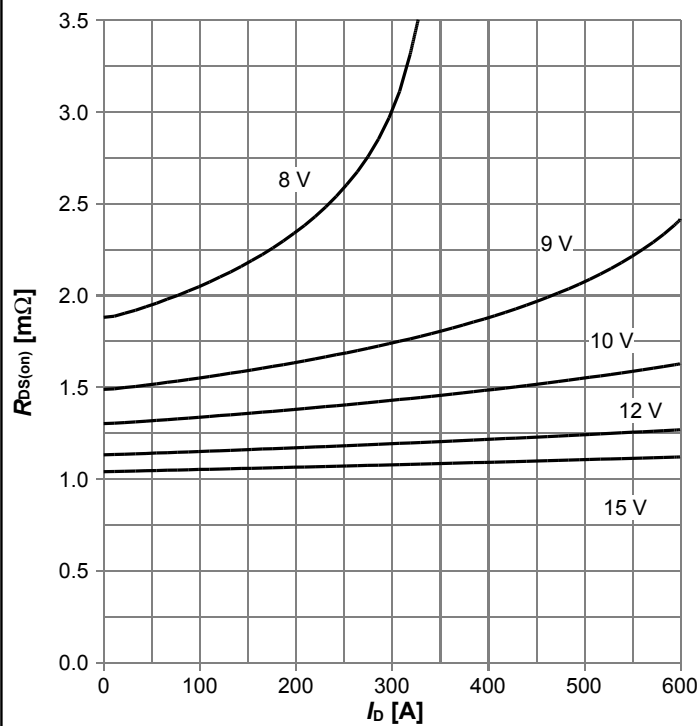
$Z_{thJC}=f(t_p)$; parameter: $D=t_p/T$

Diagram 6: Typ. output characteristics



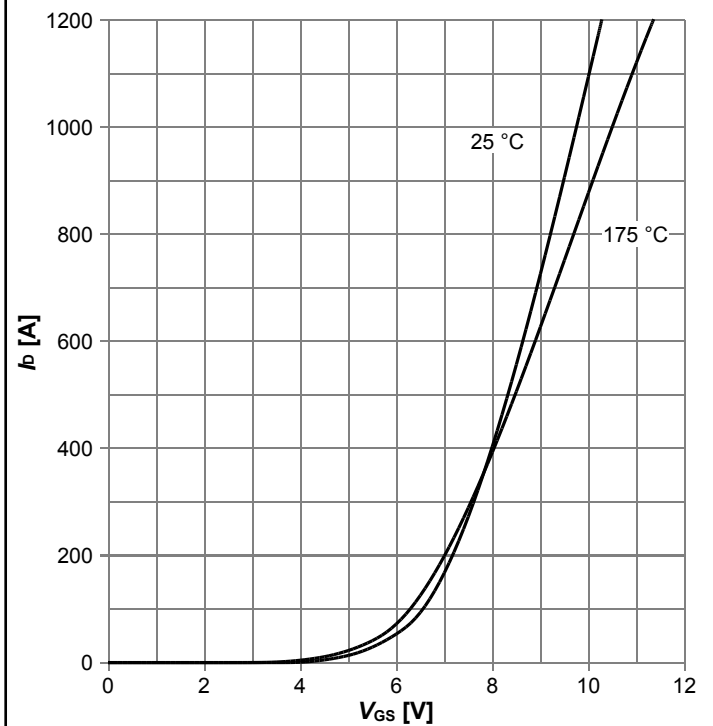
$I_D=f(V_{DS}, T_j=25\text{ }^\circ\text{C})$; parameter: V_{GS}

Diagram 7: Typ. drain-source on resistance



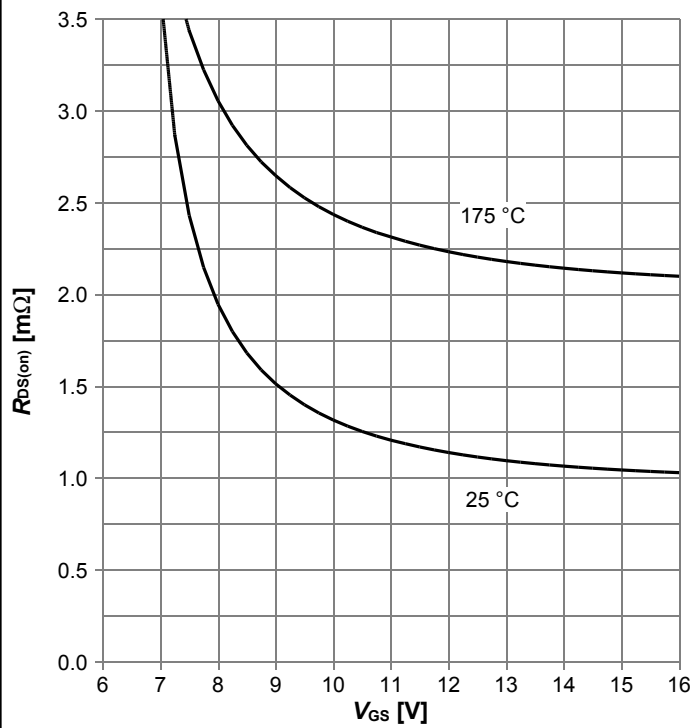
$R_{DS(on)}=f(I_D, T_j=25\text{ }^\circ\text{C})$; parameter: V_{GS}

Diagram 8: Typ. transfer characteristics



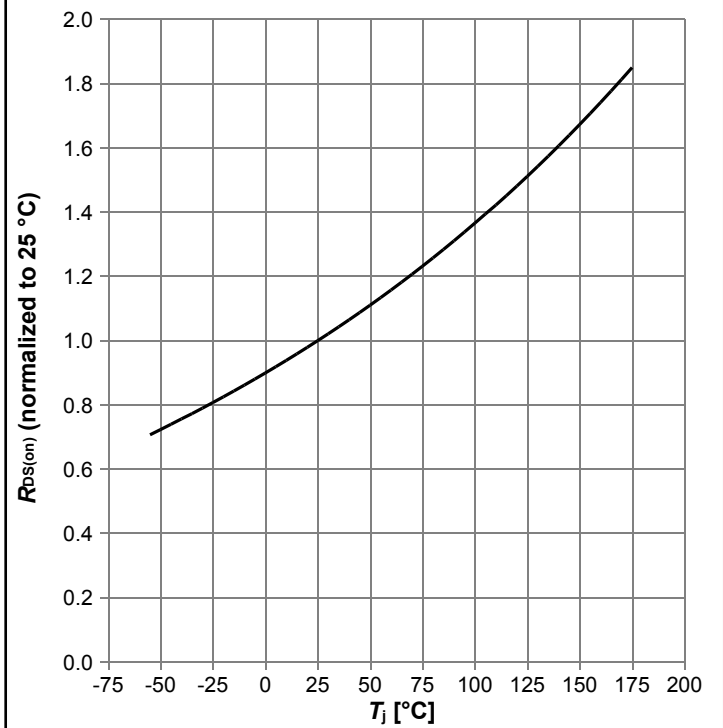
$I_D=f(V_{GS}, |V_{DS}|>2|I_D|R_{DS(on)max}, T_j)$

Diagram 9: Typ. drain-source on resistance



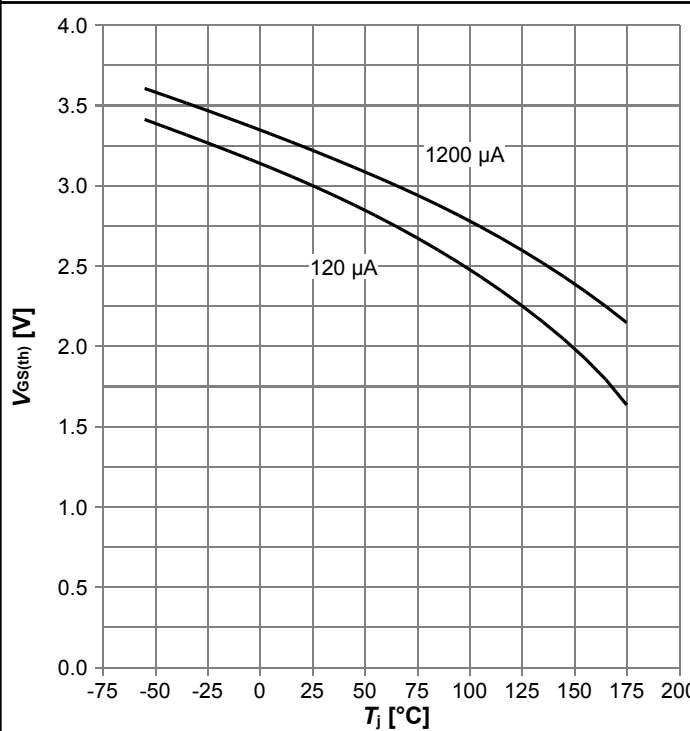
$R_{DS(on)}=f(V_{GS}), I_D=50\text{ A}; \text{parameter: } T_j$

Diagram 10: Normalized drain-source on resistance



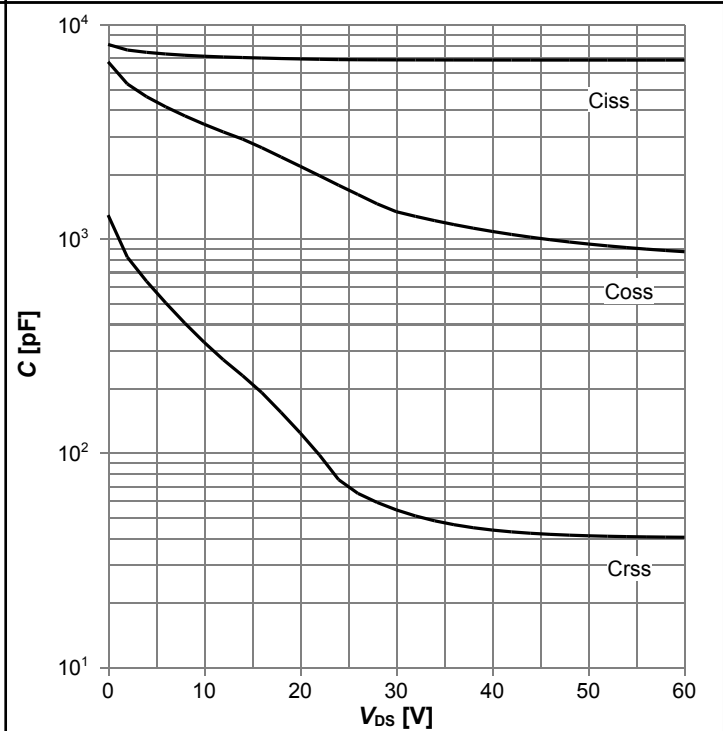
$R_{DS(on)}=f(T_j), I_D=50\text{ A}, V_{GS}=10\text{ V}$

Diagram 11: Typ. gate threshold voltage



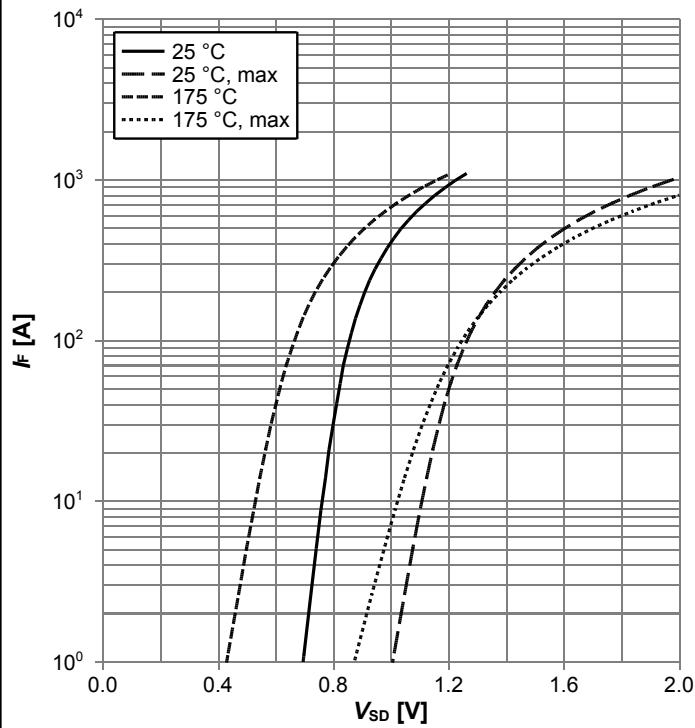
$V_{GS(th)}=f(T_j), V_{GS}=V_{DS}; \text{parameter: } I_D$

Diagram 12: Typ. capacitances



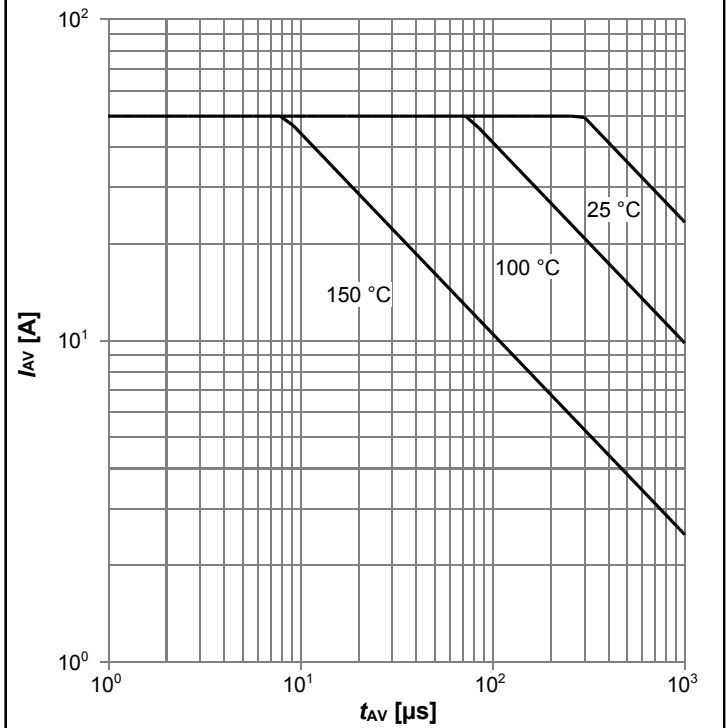
$C=f(V_{DS}); V_{GS}=0\text{ V}; f=1\text{ MHz}$

Diagram 13: Forward characteristics of reverse diode



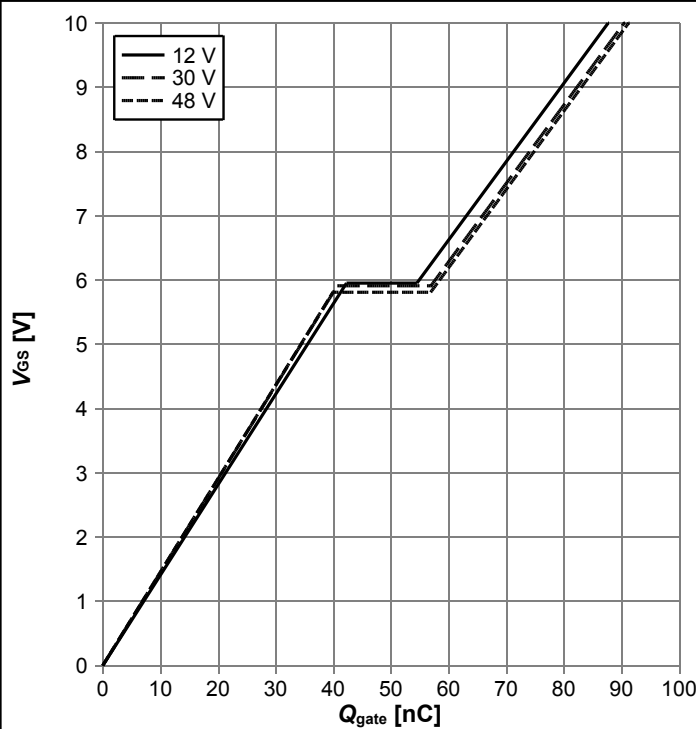
$I_F = f(V_{SD})$; parameter: T_j

Diagram 14: Avalanche characteristics



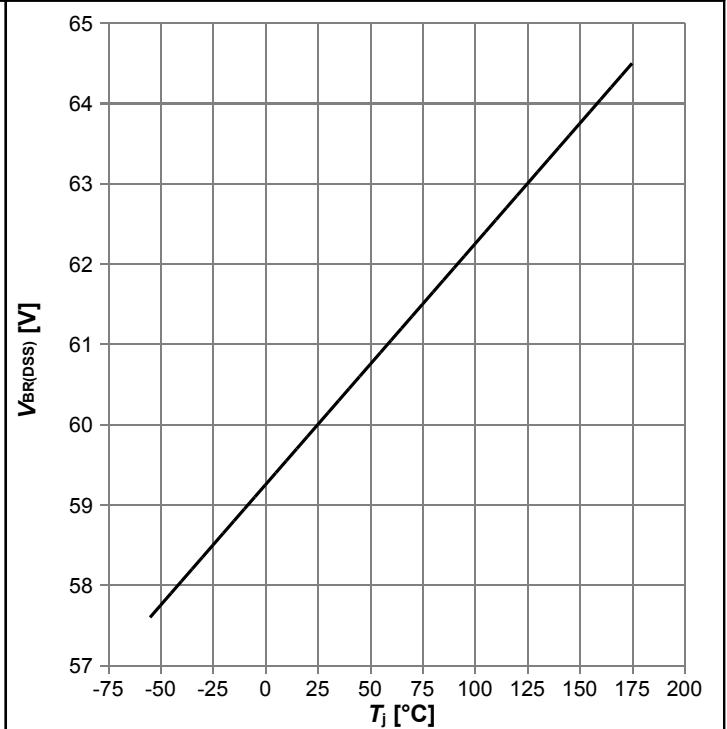
$I_{AS} = f(t_{AV})$; $R_{GS} = 25 \Omega$; parameter: $T_{j,start}$

Diagram 15: Typ. gate charge



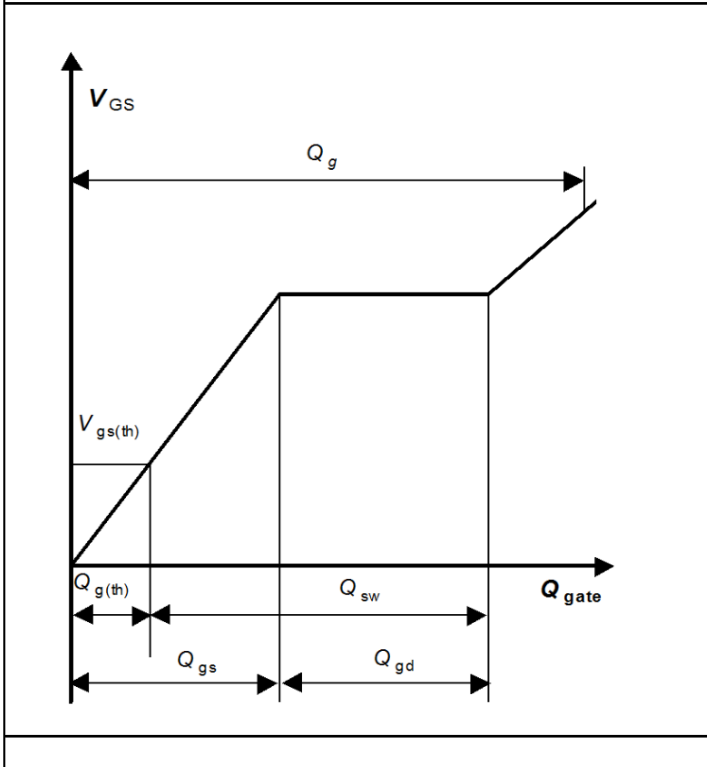
$V_{GS} = f(Q_{gate})$, $I_D = 50 \text{ A}$ pulsed, $T_j = 25 \text{ °C}$; parameter: V_{DD}

Diagram 16: Drain-source breakdown voltage

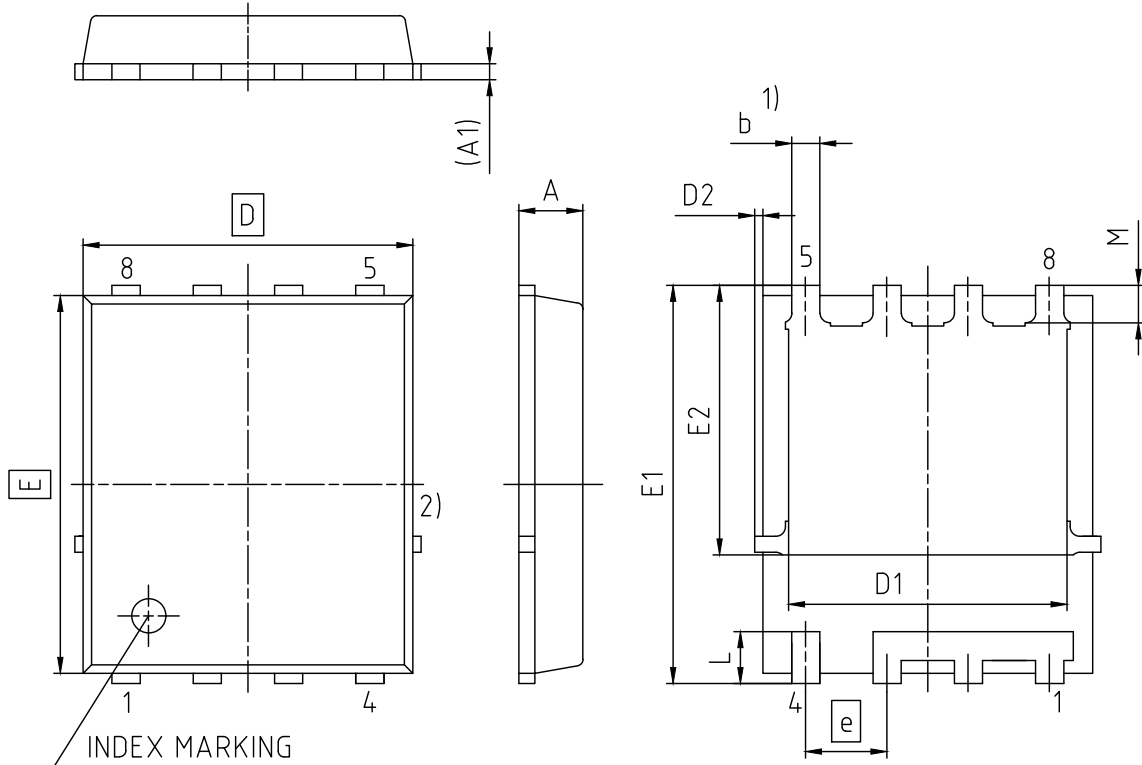


$V_{BR(DSS)} = f(T_j)$; $I_D = 1 \text{ mA}$

Diagram Gate charge waveforms



5 Package Outlines



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

DIMENSION	MILLIMETERS	
	MIN.	MAX.
A	0.90	1.20
A1	0.15	0.35
b	0.26	0.54
D	4.80	5.35
D1	3.70	4.40
D2	0.00	0.23
E	5.70	6.10
E1	5.90	6.42
E2	3.88	4.42
e	1.27	
L	0.69	0.90
M	0.45	0.69

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Figure 1 Outline PG-TDSON-8 FL, dimensions in mm

Revision History

ISC015N06NM5LF

Revision: 2023-06-06, Rev. 2.0

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2023-06-06	Release of final version

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