



**THE DATASHEET OF  
BSZ086P03NS3GATMA1**

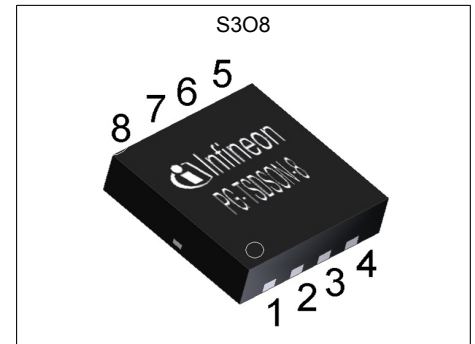


## MOSFET

### OptiMOS™ P3 Power-Transistor, -30 V

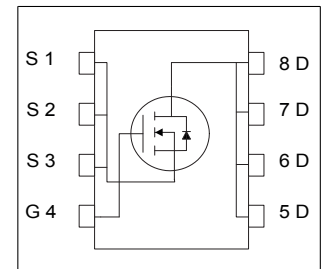
#### Features

- single P-Channel in S308
- Qualified according JEDEC<sup>1)</sup> for target applications
- 150 °C operating temperature
- $V_{GS}=25\text{ V}$ , specially suited for notebook applications
- Pb-free; RoHS compliant
- applications: battery management, load switching
- Halogen-free according to IEC61249-2-21



**Table 1 Key Performance Parameters**

Parameter	Value	Unit
$V_{DS}$	-30	V
$R_{DS(on),max}$	8.6	m $\Omega$
$I_D$	-40	A



Type / Ordering Code	Package	Marking	Related Links
BSZ086P03NS3 G	PG-TSDSON-8	086P3N	-

<sup>1)</sup> J-STD20 and JESD22

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## 1 Maximum ratings

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

**Table 2 Maximum ratings**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	$I_D$	-	-	-40 -40 -13.5	A	$T_C=25\text{ °C}$ $T_C=70\text{ °C}$ $T_A=25\text{ °C}^{1)}$
Pulsed drain current	$I_{D,pulse}$	-	-	-160	A	$T_C=25\text{ °C}^{2)}$
Avalanche energy, single pulse	$E_{AS}$	-	-	105	mJ	$I_D=-20\text{ A}$ , $R_{GS}=25\text{ }\Omega$
Gate source voltage	$V_{GS}$	-25	-	25	V	-
Power dissipation	$P_{tot}$	-	-	69 2.1	-	$T_A=25\text{ °C}$ $T_A=25\text{ °C}^{1)}$
Operating and storage temperature	$T_j, T_{stg}$	-55	-	150	°C	IEC climatic category; DIN IEC 68-1: 55/150/56
ESD class	-	-	1C	-	-	(1kV-2kV), JESD22-A114 HBM
Soldering temperature	-	-	260	-	°C	-

## 2 Thermal characteristics

**Table 3 Thermal characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	$R_{thJC}$	-	-	1.8	K/W	-
Thermal resistance, junction - ambient, 6 cm <sup>2</sup> cooling area <sup>1)</sup>	$R_{thJA}$	-	-	60	K/W	-

<sup>1)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

<sup>2)</sup> See Fig. 3 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	$V_{(BR)DSS}$	-30	-	-	V	$V_{GS}=0\text{ V}$ , $I_D=-250\text{ A}$
Gate threshold voltage	$V_{GS(th)}$	-3.1	-2.5	-1.9	V	$V_{DS}=V_{GS}$ , $I_D=-105\text{ }\mu\text{A}$
Zero gate voltage drain current	$I_{DSS}$	-	-	-1 -10	$\mu\text{A}$	$V_{DS}=-30\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=25\text{ °C}$ $V_{DS}=-30\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_j=125\text{ °C}$
Gate-source leakage current	$I_{GSS}$	-	-	-100	nA	$V_{GS}=-25\text{ V}$ , $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	6.5 8.7	8.6 13.4	m $\Omega$	$V_{GS}=-10\text{ V}$ , $I_D=-20\text{ A}$ $V_{GS}=-6\text{ V}$ , $I_D=-20\text{ A}$
Gate resistance	$R_G$	-	2.2	-	$\Omega$	-
Transconductance	$g_{fs}$	30	43	-	S	$ V_{DS} >2 I_D R_{DS(on)max}$ , $I_D=-20\text{ A}$

**Table 5 Dynamic characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	$C_{iss}$	-	3190	4785	pF	$V_{GS}=0\text{ V}$ , $V_{DS}=-15\text{ V}$ , $f=1\text{ MHz}$
Output capacitance	$C_{oss}$	-	1520	2280	pF	$V_{GS}=0\text{ V}$ , $V_{DS}=-15\text{ V}$ , $f=1\text{ MHz}$
Reverse transfer capacitance	$C_{rss}$	-	110	165	pF	$V_{GS}=0\text{ V}$ , $V_{DS}=-15\text{ V}$ , $f=1\text{ MHz}$
Turn-on delay time	$t_{d(on)}$	-	16	24	ns	$V_{DD}=-15\text{ V}$ , $V_{GS}=-10\text{ V}$ , $I_D=-20\text{ A}$ , $R_{G,ext}=6\text{ }\Omega$
Rise time	$t_r$	-	46	69	ns	$V_{DD}=-15\text{ V}$ , $V_{GS}=-10\text{ V}$ , $I_D=-20\text{ A}$ , $R_{G,ext}=6\text{ }\Omega$
Turn-off delay time	$t_{d(off)}$	-	35	53	ns	$V_{DD}=-15\text{ V}$ , $V_{GS}=-10\text{ V}$ , $I_D=-20\text{ A}$ , $R_{G,ext}=6\text{ }\Omega$
Fall time	$t_f$	-	8	12	ns	$V_{DD}=-15\text{ V}$ , $V_{GS}=-10\text{ V}$ , $I_D=-20\text{ A}$ , $R_{G,ext}=6\text{ }\Omega$

**Table 6 Gate charge characteristics<sup>1)</sup>**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	$Q_{gs}$	-	16.1	21.4	nC	$V_{DD}=-15\text{ V}$ , $I_D=-20\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$
Gate charge at threshold	$Q_{g(th)}$	-	5.0	6.7	nC	$V_{DD}=-15\text{ V}$ , $I_D=-20\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$
Gate to drain charge	$Q_{gd}$	-	7.4	11.1	nC	$V_{DD}=-15\text{ V}$ , $I_D=-20\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$
Switching charge	$Q_{sw}$	-	18.4	25.7	nC	$V_{DD}=-15\text{ V}$ , $I_D=-20\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$
Gate charge total	$Q_g$	-	43.2	57.5	nC	$V_{DD}=-15\text{ V}$ , $I_D=-20\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$
Gate plateau voltage	$V_{plateau}$	-	-4.5	-	V	$V_{DD}=-15\text{ V}$ , $I_D=-20\text{ A}$ , $V_{GS}=0\text{ to }-10\text{ V}$
Output charge	$Q_{oss}$	-	34.9	46.4	nC	$V_{DD}=-15\text{ V}$ , $V_{GS}=0\text{ V}$

<sup>1)</sup> See Fig. 3 for more detailed information

**Table 7 Reverse diode**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	$I_S$	-	-	-40	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	-160	A	$T_C=25\text{ °C}$
Diode forward voltage	$V_{SD}$	-	-	-1.1	V	$V_{GS}=0\text{ V}, I_F=-40\text{ A}, T_j=25\text{ °C}$
Reverse recovery time	$t_{rr}$	-	39	-	ns	$V_R=15\text{ V}, I_F= I_S , di_F/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	$Q_{rr}$	-	34	-	nC	$V_R=15\text{ V}, I_F= I_S , di_F/dt=100\text{ A}/\mu\text{s}$

### 4 Electrical characteristics diagrams

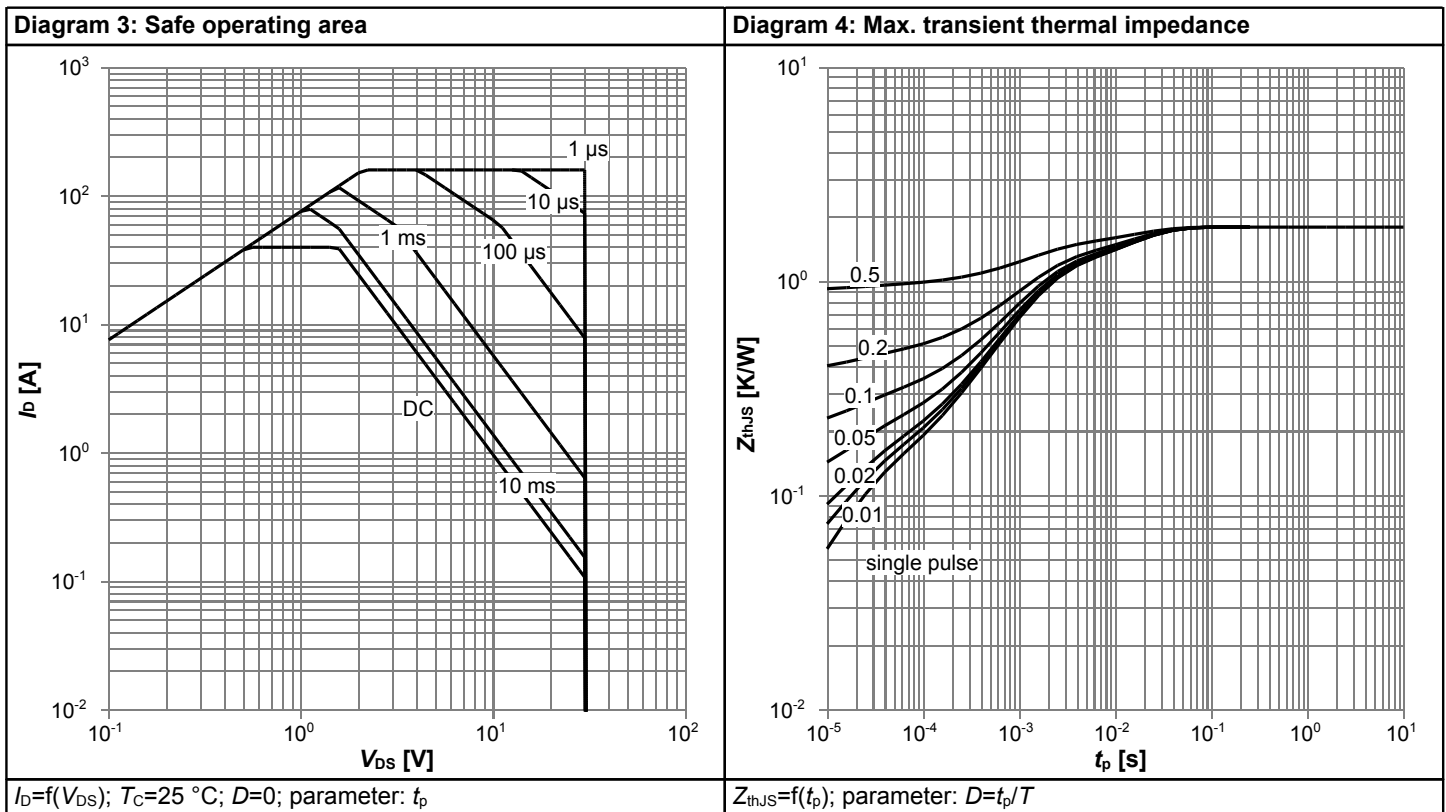
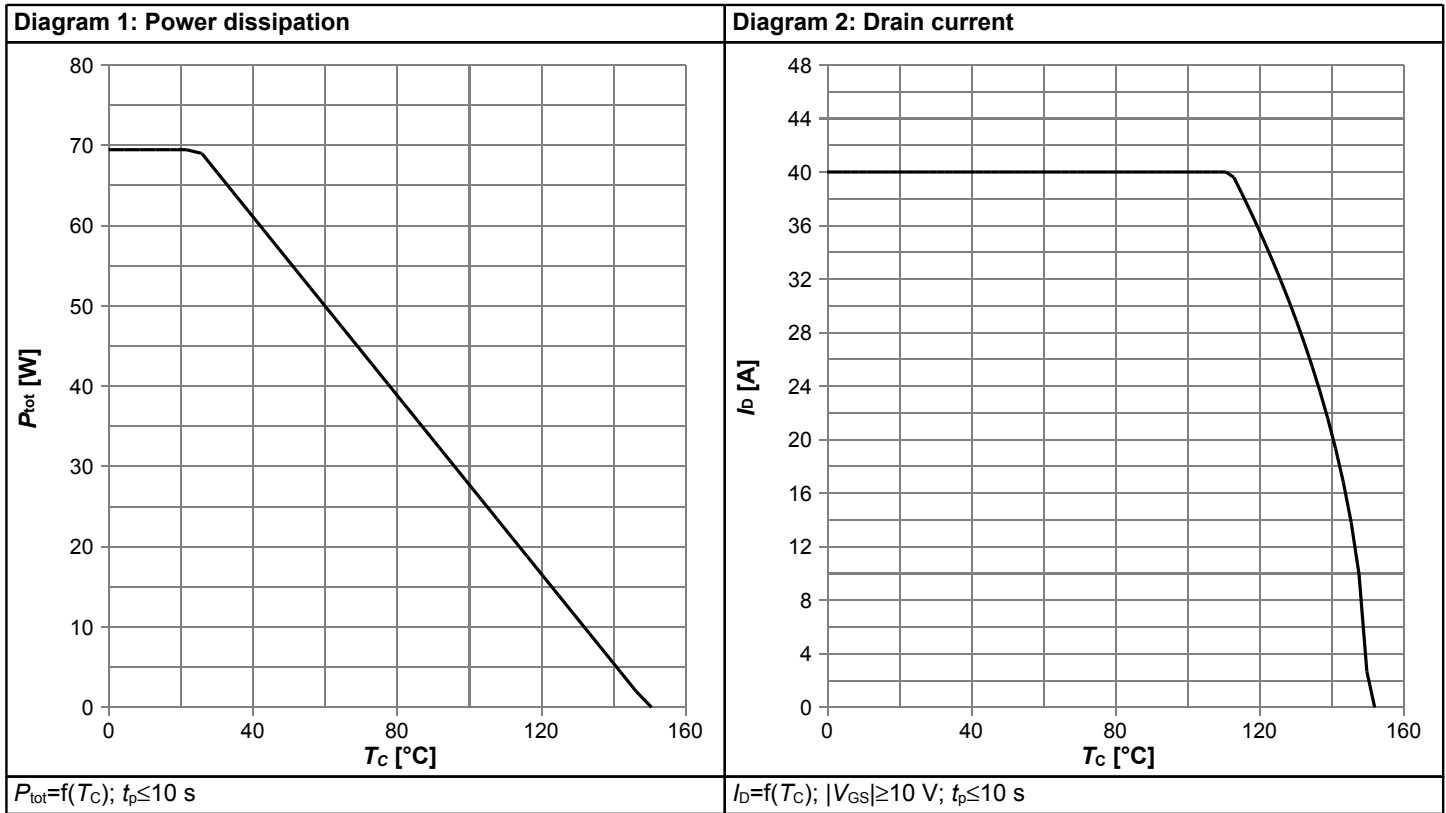
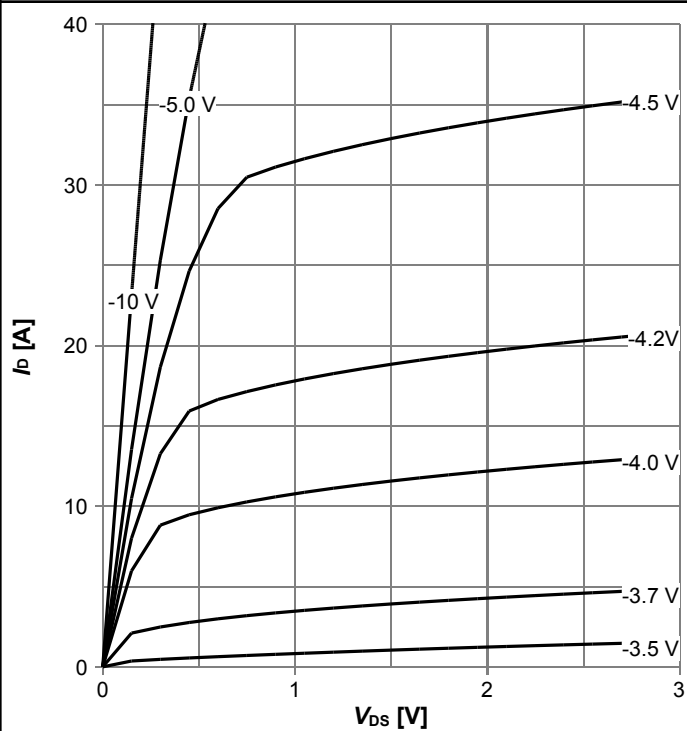
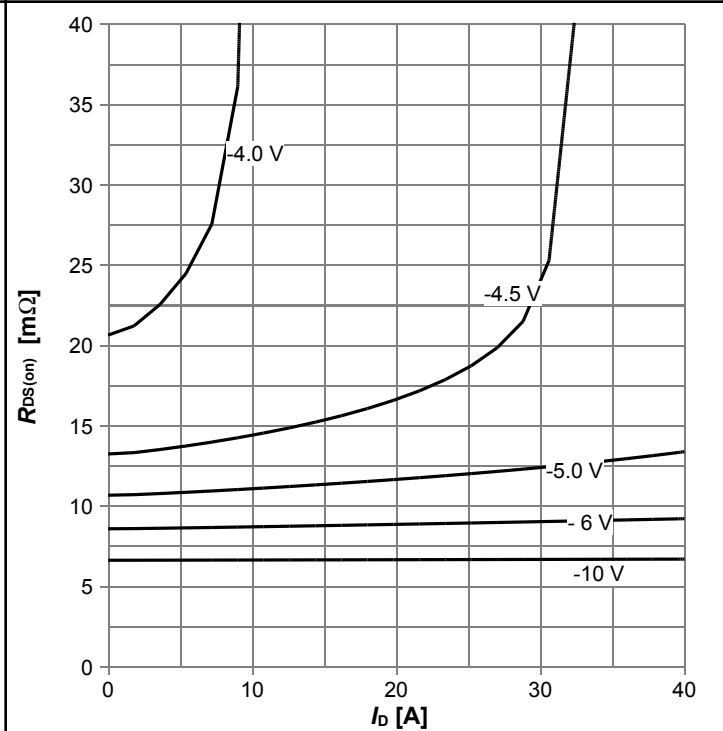


Diagram 5: Typ. output characteristics



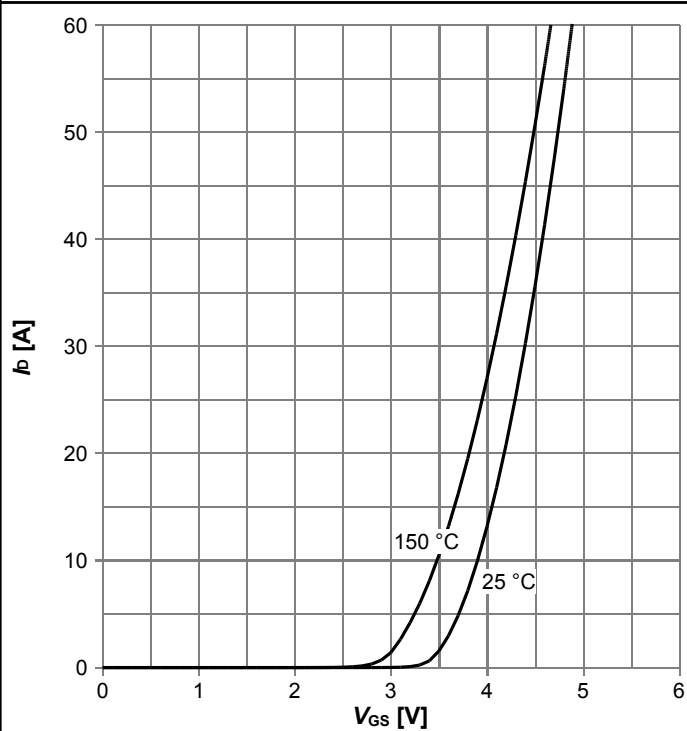
$I_D = f(V_{DS}); T_j = 25\text{ °C};$  parameter:  $V_{GS}$

Diagram 6: Typ. drain-source on resistance



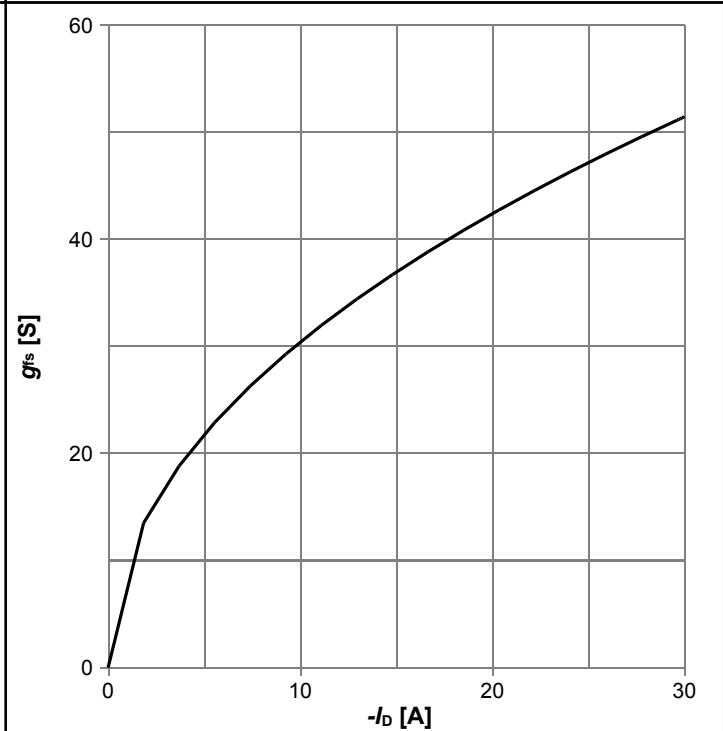
$R_{DS(on)} = f(I_D); T_j = 25\text{ °C};$  parameter:  $V_{GS}$

Diagram 7: Typ. transfer characteristics



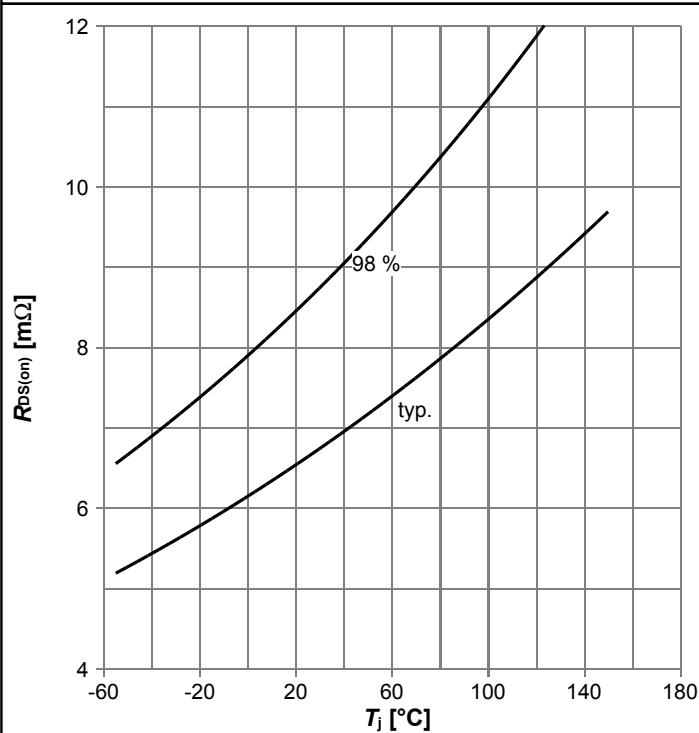
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max};$  parameter:  $T_j$

Diagram 8: Typ. forward transconductance



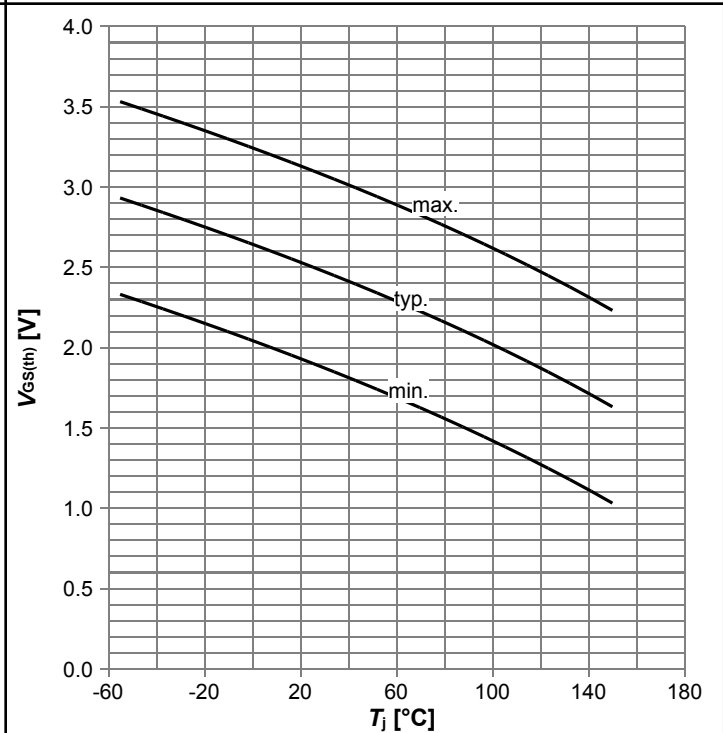
$g_{fs} = f(I_D); T_j = 25\text{ °C}$

Diagram 9: Drain-source on-state resistance



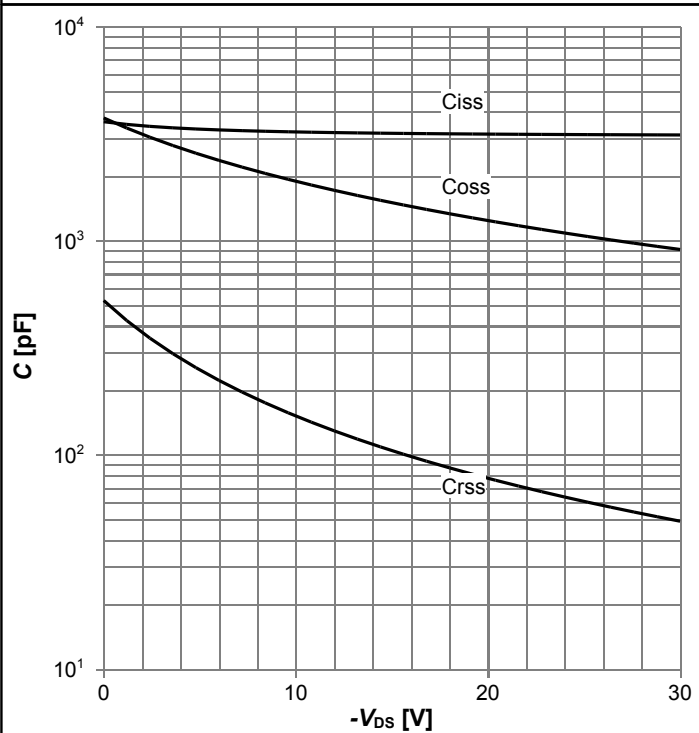
$R_{DS(on)}=f(T_j)$ ;  $I_D=-20$  A;  $V_{GS}=-10$  V

Diagram 10: Typ. gate threshold voltage



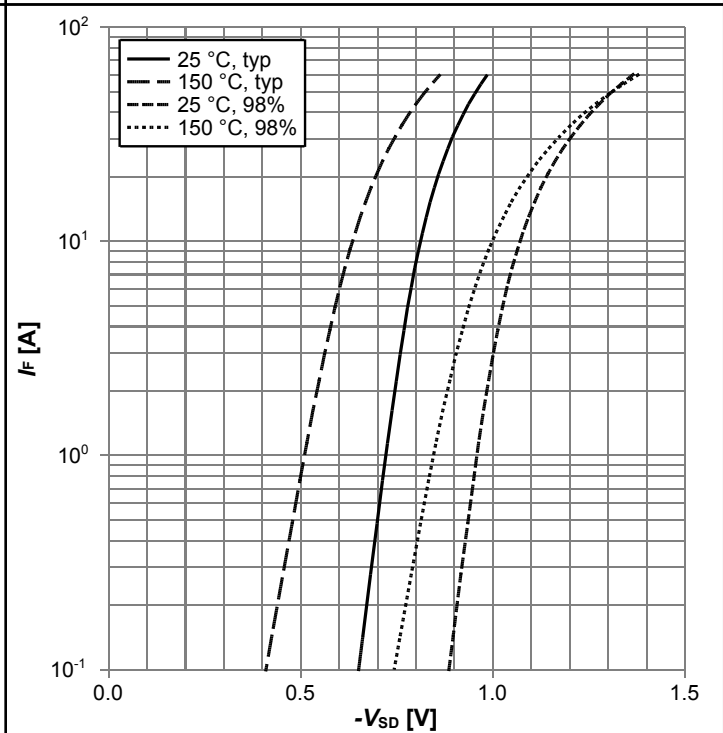
$V_{GS(th)}=f(T_j)$ ;  $V_{GS}=V_{DS}$ ;  $I_D=-105$   $\mu$ A

Diagram 11: Typ. capacitances



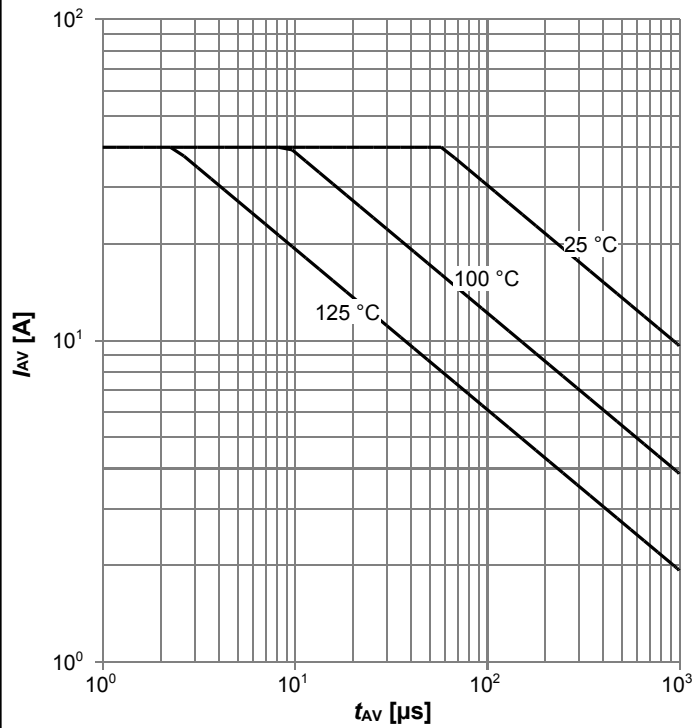
$C=f(V_{DS})$ ;  $V_{GS}=0$  V;  $f=1$  MHz

Diagram 12: Forward characteristics of reverse diode



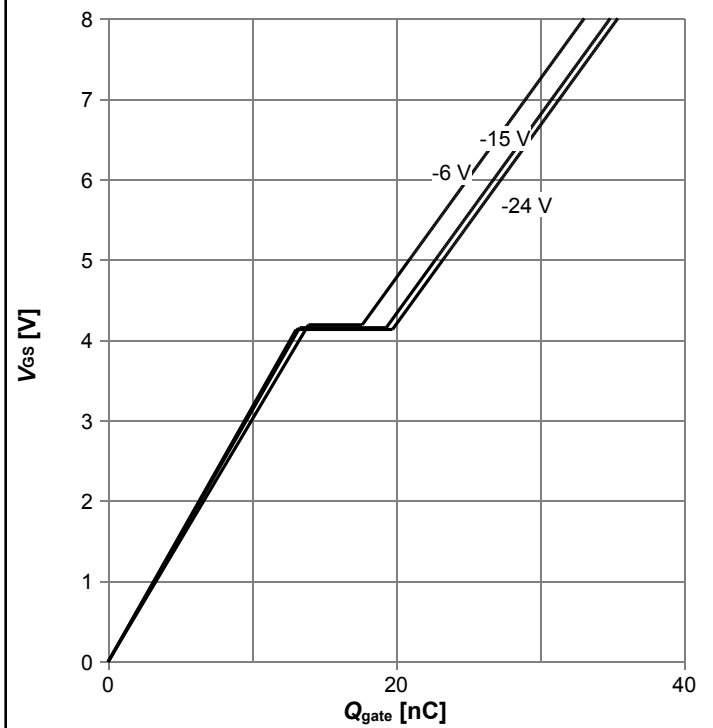
$I_F=f(V_{SD})$ ; parameter:  $T_j$

**Diagram 13: Avalanche characteristics**



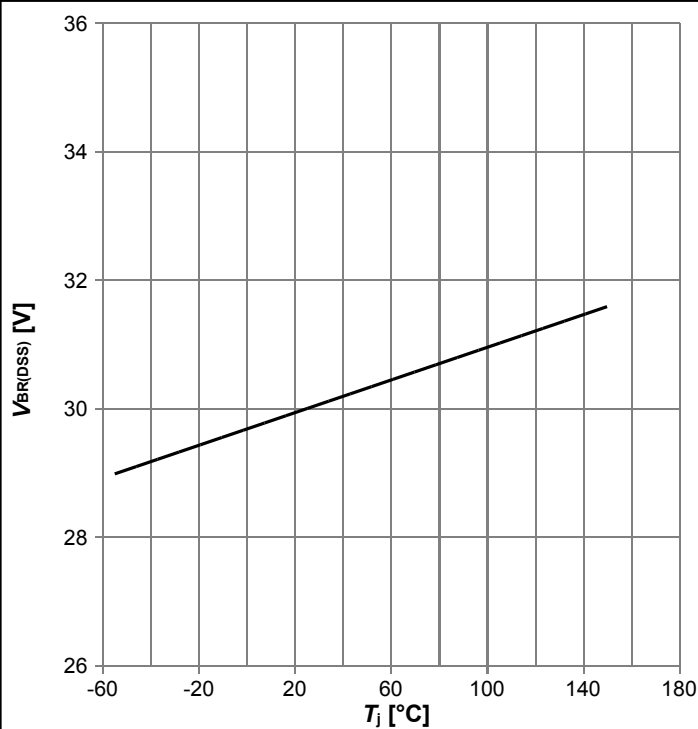
$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega; \text{parameter: } T_{j(\text{start})}$

**Diagram 14: Typ. gate charge**



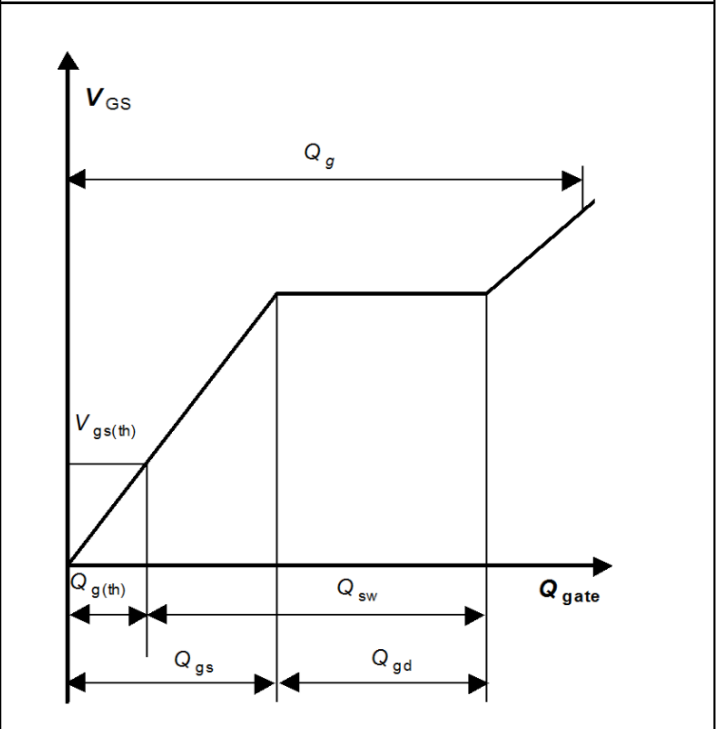
$V_{GS}=f(Q_{\text{gate}}); I_D=-20 \text{ A pulsed}; \text{parameter: } V_{DD}$

**Diagram 15: Drain-source breakdown voltage**

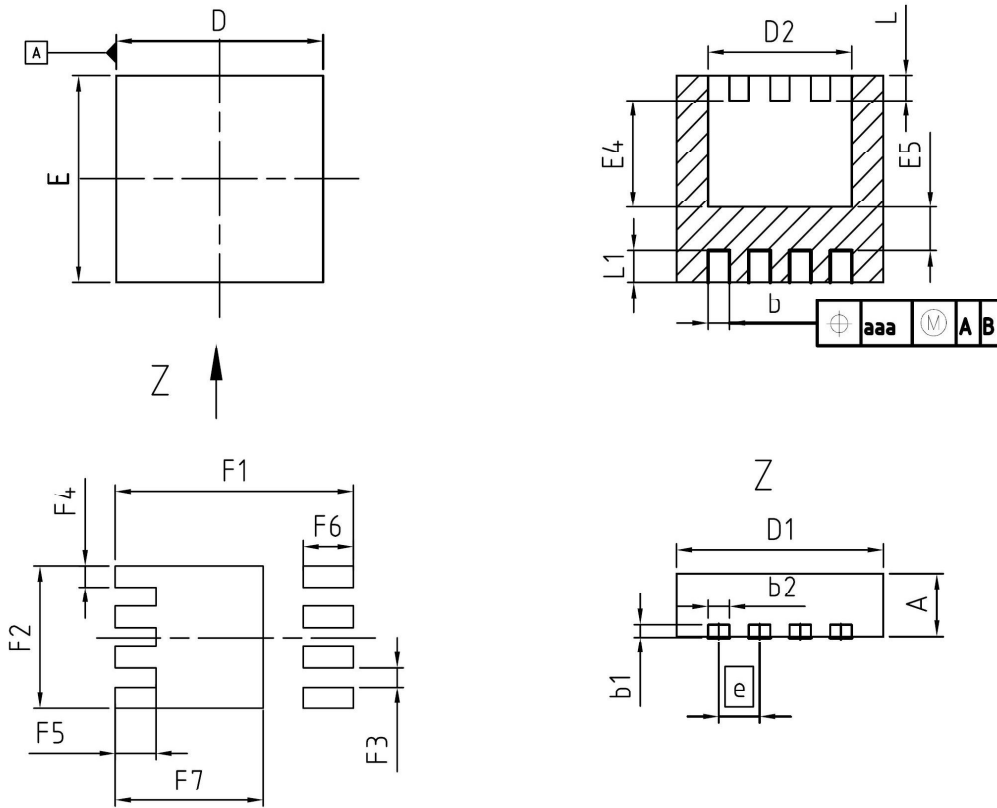


$V_{BR(DSS)}=f(T_j); I_D=-250 \mu\text{A}$

**Diagram Gate charge waveforms**



### 5 Package Outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.10	0.035	0.043
b	0.24	0.44	0.009	0.017
b1	0.10	0.30	0.004	0.012
b2	0.20	0.44	0.008	0.017
D=D1	3.20	3.40	0.126	0.134
D2	2.15	2.45	0.085	0.096
E	3.20	3.40	0.126	0.134
E4	1.60	1.81	0.063	0.071
E5	0.59	0.86	0.023	0.034
e	0.65		0.026	
N	8		8	
L	0.30	0.56	0.012	0.022
L1	0.33	0.60	0.013	0.024
aaa	0.25		0.010	
F1	3.80		0.150	
F2	2.29		0.090	
F3	0.31		0.012	
F4	0.34		0.013	
F5	0.65		0.026	
F6	0.80		0.031	
F7	2.36		0.093	

DOCUMENT NO.  
Z8B00131645

SCALE

EUROPEAN PROJECTION

ISSUE DATE  
17-09-2008

REVISION  
02

Figure 1 Outline PG-TSDSON-8, dimensions in mm/inches

## Revision History

BSZ086P03NS3 G

**Revision: 2019-12-03, Rev. 2.4**

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.4	2019-12-03	Update SOA Diagram

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