

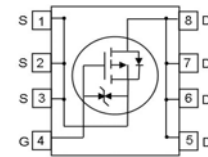
**OptiMOS™ P3 Power-Transistor**
**Features**

- single P-Channel in S3O8
- Qualified according JEDEC<sup>1)</sup> for target applications
- 150 °C operating temperature
- $V_{GS}=25$  V, specially suited for notebook applications
- Pb-free; RoHS compliant
- ESD protected
- applications: battery management, load switching
- Halogen-free according to IEC61249-2-21


**Product Summary**

$V_{DS}$	-30	V
$R_{DS(on),max}$	12	m $\Omega$
$I_D$	-40	A

PG-TSDSON-8



Type	Package	Marking	Lead free	Halogen free	Packing
BSZ120P03NS3E G	PG-TSDSON-8	120P3NE	Yes	Yes	non-dry

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_C=25$ °C	-40.0	A
		$T_C=70$ °C	-40	
		$T_A=25$ °C <sup>2)</sup>	-11.0	
Pulsed drain current	$I_{D,pulse}$	$T_C=25$ °C <sup>3)</sup>	-160	
Avalanche energy, single pulse	$E_{AS}$	$I_D=-20$ A, $R_{GS}=25$ $\Omega$	73	mJ
Gate source voltage	$V_{GS}$		$\pm 25$	V
Power dissipation	$P_{tot}$	$T_A=25$ °C	52	W
		$T_A=25$ °C <sup>2)</sup>	2.1	
Operating and storage temperature	$T_j, T_{stg}$		-55 ... 150	°C
ESD class		JESD22-A114 HBM	class 2 (> 2 kV)	
Soldering temperature			260	°C
IEC climatic category; DIN IEC 68-1			55/150/56	

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - case	$R_{thJC}$		-	-	2.4	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	6 cm <sup>2</sup> cooling area <sup>2)</sup>	-	-	60	

**Electrical characteristics, at  $T_j=25\text{ }^\circ\text{C}$ , unless otherwise specified**
**Static characteristics**

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=-250\text{ }\mu\text{A}$	-30	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-73\text{ }\mu\text{A}$	-3.1	-2.5	-1.9	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=-30\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ }^\circ\text{C}$	-	-	-1	$\mu\text{A}$
		$V_{DS}=-30\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ }^\circ\text{C}$	-	-	-100	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=-25\text{ V}, V_{DS}=0\text{ V}$	-	-	-10	$\mu\text{A}$
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-6\text{ V}, I_D=-20\text{ A}$	-	12.0	20.0	m $\Omega$
		$V_{GS}=-10\text{ V}, I_D=-20\text{ A}$	-	9.0	12.0	
Gate resistance	$R_G$		-	2.2	-	$\Omega$
Transconductance	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=-20\text{ A}$	22	36	-	S

<sup>2)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  thick) copper area for drain connection. PCB is vertical in still air.

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=-15\text{ V},$ $f=1\text{ MHz}$	-	2240	3360	pF
Output capacitance	$C_{oss}$		-	1090	1635	
Reverse transfer capacitance	$C_{rss}$		-	74	111	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=-15\text{ V}, V_{GS}=-10\text{ V}, I_D=-20\text{ A},$ $R_G=6\ \Omega$	-	13	20	ns
Rise time	$t_r$		-	11	17	
Turn-off delay time	$t_{d(off)}$		-	23	35	
Fall time	$t_f$		-	5	8	

**Gate Charge Characteristics<sup>3)</sup>**

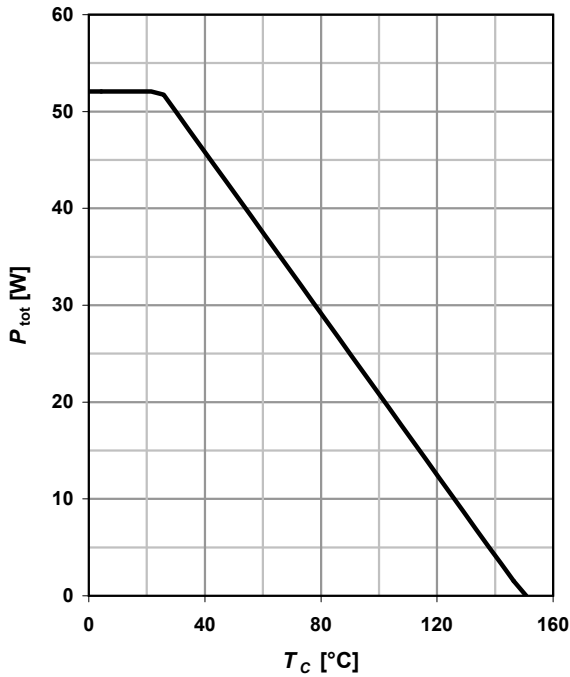
Gate to source charge	$Q_{gs}$	$V_{DD}=-15\text{ V}, I_D=20\text{ A},$ $V_{GS}=0\text{ to }-10\text{ V}$	-	11	17	nC
Gate charge at threshold	$Q_{g(th)}$		-	4	6	
Gate to drain charge	$Q_{gd}$		-	5	8	
Switching charge	$Q_{sw}$		-	13	20	
Gate charge total	$Q_g$		-	30	45	
Gate plateau voltage	$V_{plateau}$	-	4.6	-	V	
Output charge	$Q_{oss}$	$V_{DD}=-15\text{ V}, V_{GS}=0\text{ V}$	-	25	38	nC

**Reverse Diode**

Diode continuous forward current	$I_S$	$T_C=25\text{ }^\circ\text{C}$	-	-	40	A
Diode pulse current	$I_{S,pulse}$		-	-	160	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=-20\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	-	-1.1	V
Reverse recovery time	$t_{rr}$	$V_R=15\text{ V}, I_F= I_S ,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	47	-	ns
Reverse recovery charge	$Q_{rr}$		-	55	-	nC

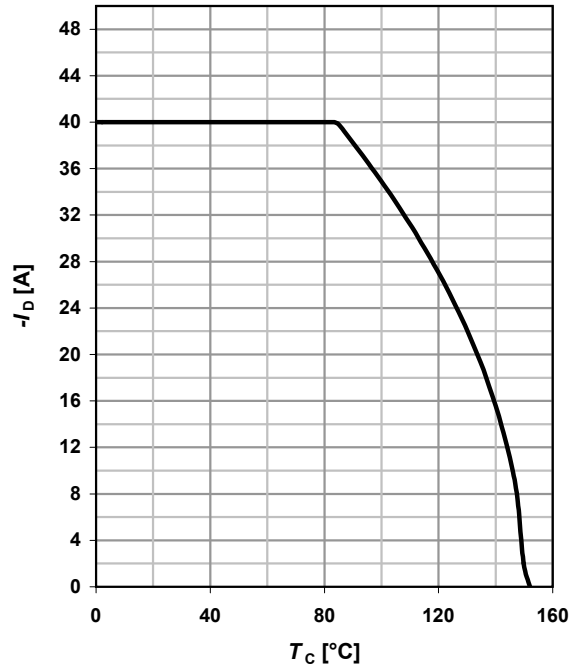
**1 Power dissipation**

$P_{tot}=f(T_C); t_p \leq 10 \text{ s}$



**2 Drain current**

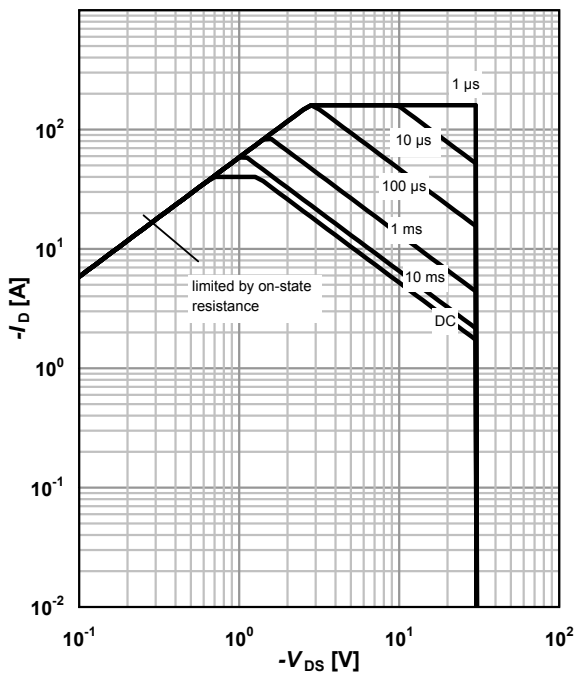
$I_D=f(T_C); |V_{GS}| \geq 10 \text{ V}; t_p \leq 10 \text{ s}$



**3 Safe operating area**

$I_D=f(V_{DS}); T_C=25 \text{ }^\circ\text{C}^1; D=0$

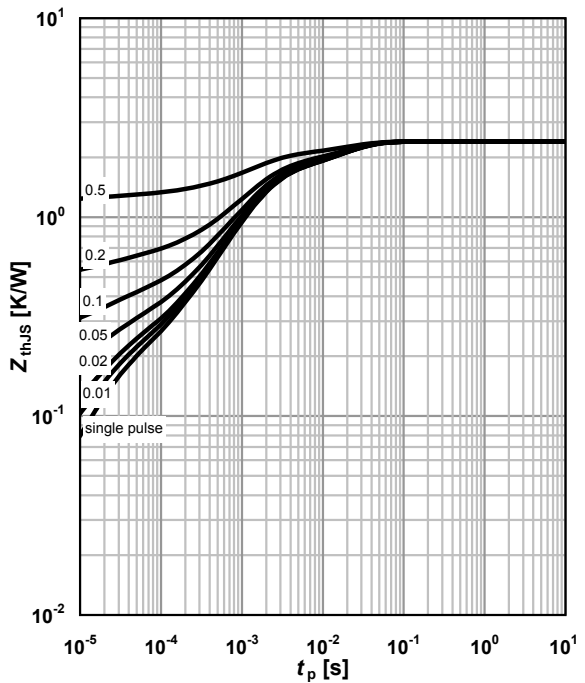
parameter:  $t_p$



**4 Max. transient thermal impedance**

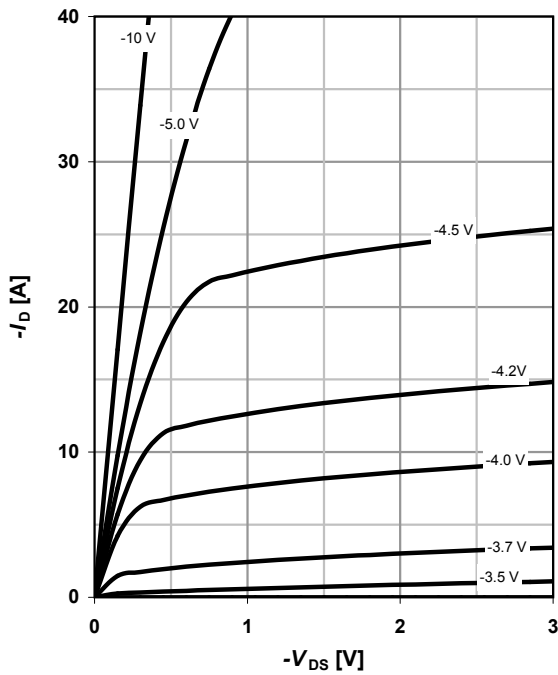
$Z_{thJS}=f(t_p)$

parameter:  $D=t_p/T$

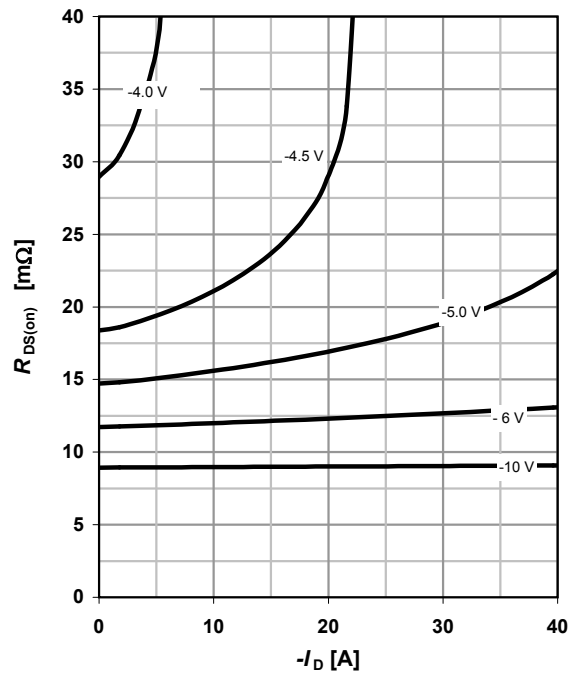


**5 Typ. output characteristics**

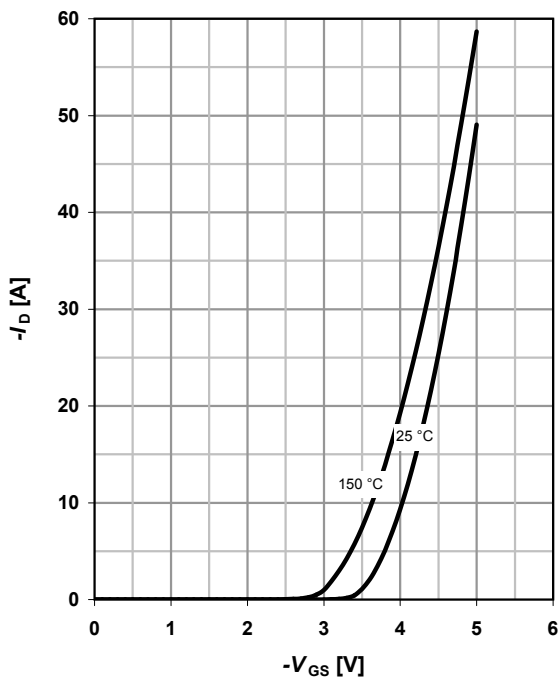
$$I_D = f(V_{DS}); T_j = 25\text{ °C}$$

 parameter:  $V_{GS}$ 

**6 Typ. drain-source on resistance**

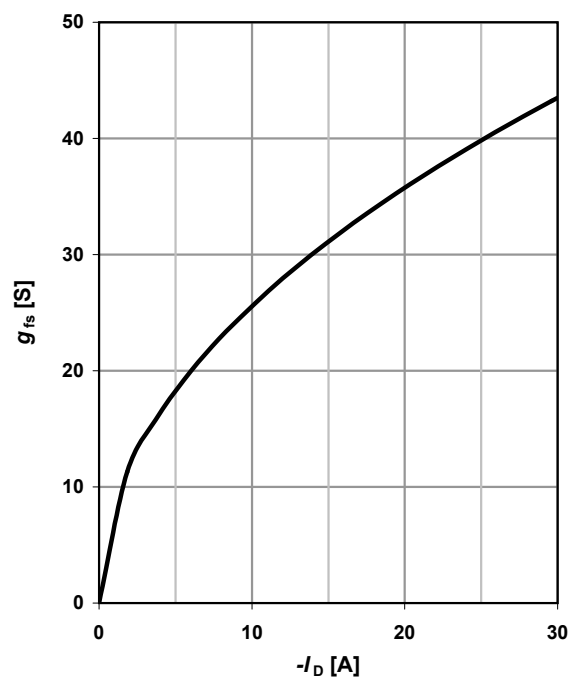
$$R_{DS(on)} = f(I_D); T_j = 25\text{ °C}$$

 parameter:  $V_{GS}$ 

**7 Typ. transfer characteristics**

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

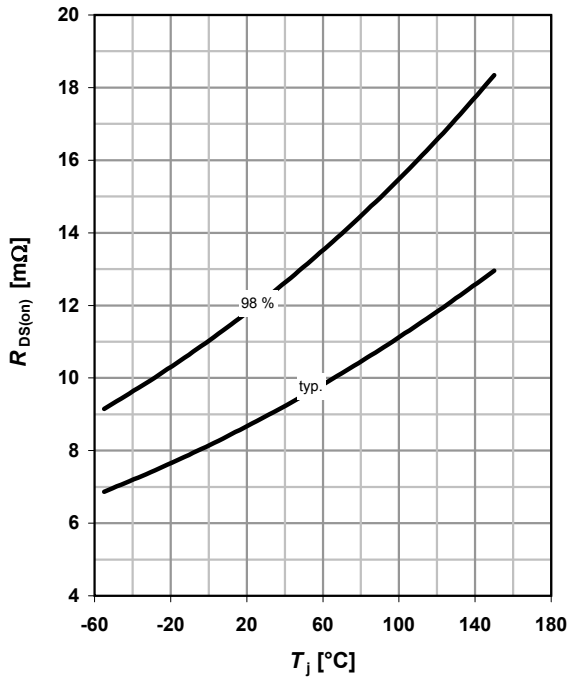
 parameter:  $T_j$ 

**8 Typ. forward transconductance**

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



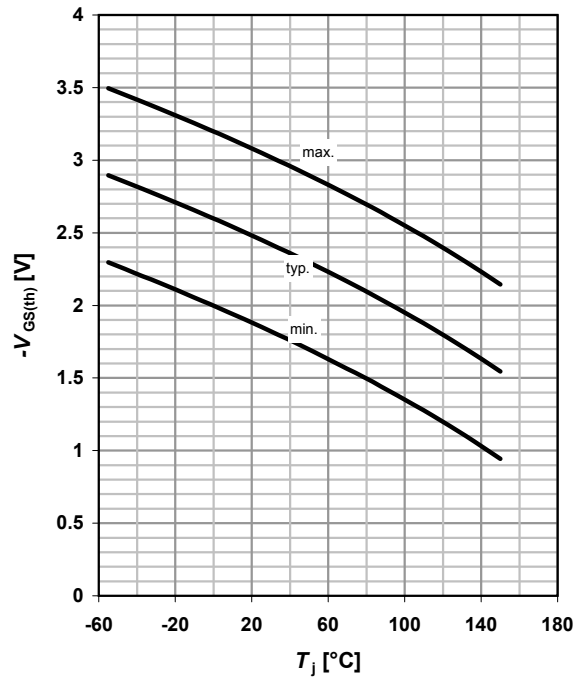
**9 Drain-source on-state resistance**

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



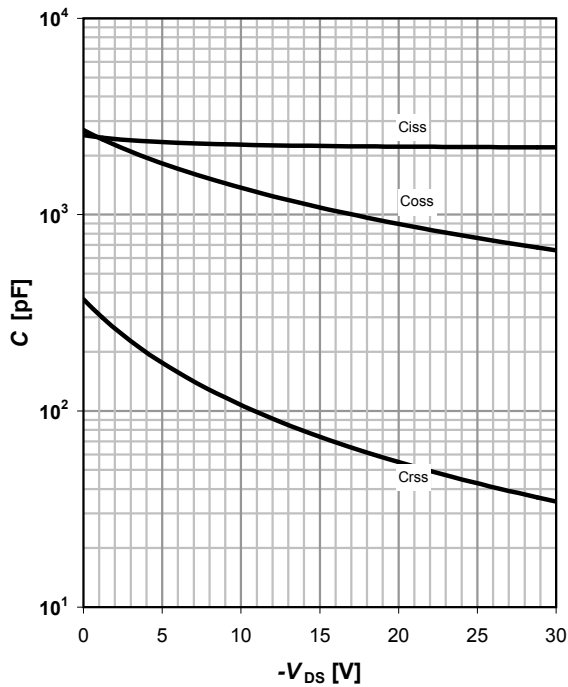
**10 Typ. gate threshold voltage**

$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = -73 \mu\text{A}$



**11 Typ. capacitances**

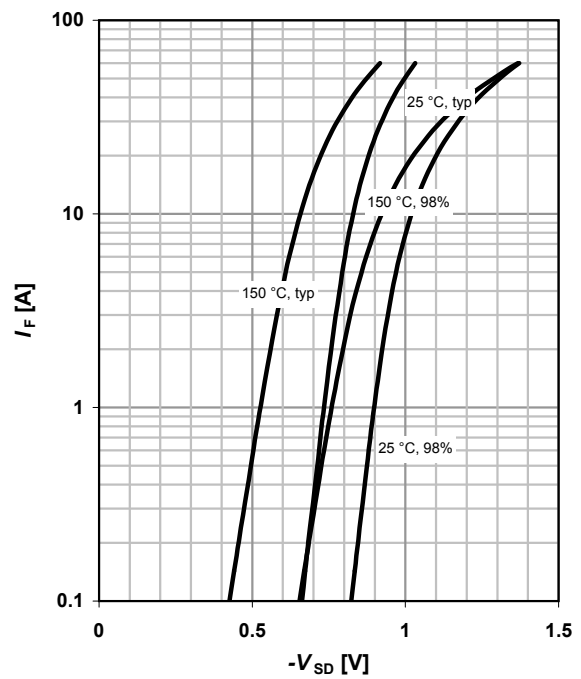
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

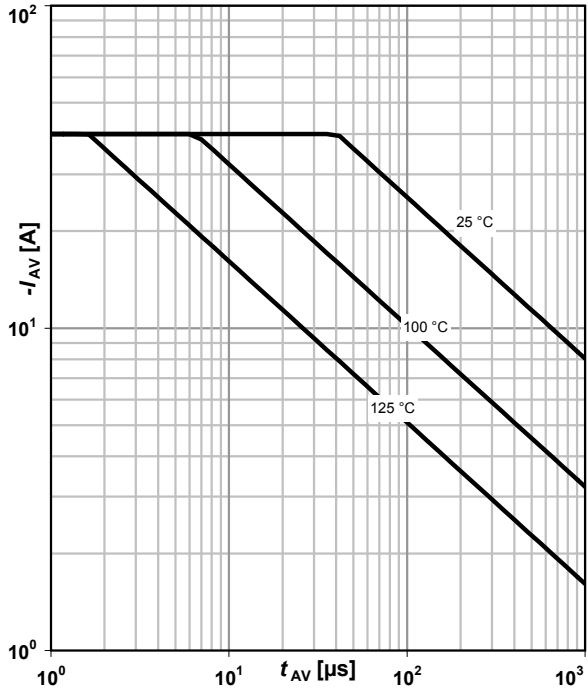
parameter:  $T_j$



**13 Avalanche characteristics**

$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$

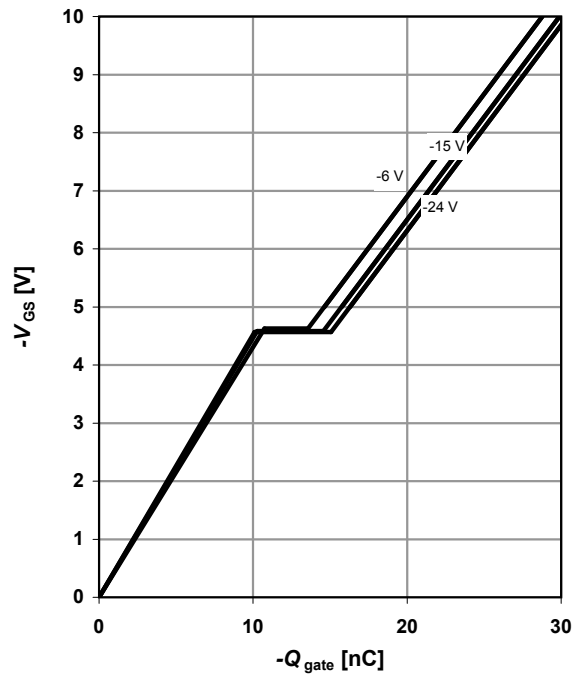
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

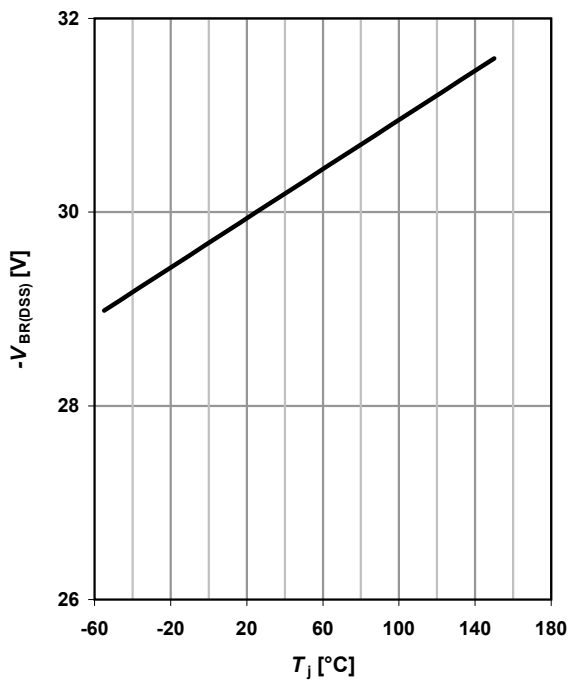
$V_{GS}=f(Q_{gate}); I_D=-20$  A pulsed

parameter:  $V_{DD}$



**15 Drain-source breakdown voltage**

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

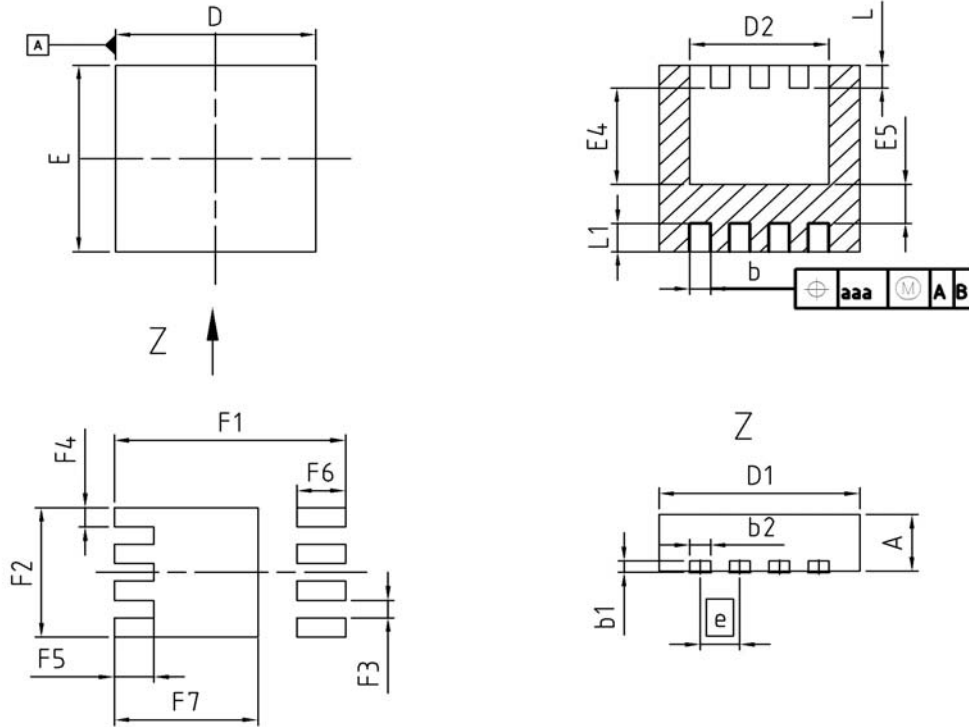


**16 Gate charge waveforms**



Package Outline

PG-TSDSON-8



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	

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