

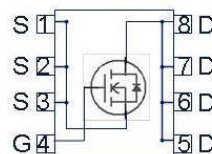
**OptiMOS™3 Power-Transistor**
**Package**

- Optimized technology for DC/DC converters
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Superior thermal resistance
- N-channel, normal level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Halogen-free according to IEC61249-2-21

**Product Summary**

$V_{DS}$	80	V
$R_{DS(on),max}$	12.3	m $\Omega$
$I_D$	40	A

<b>Type</b>	BSZ123N08NS3 G
<b>Package</b>	PG-TSDSON-8
<b>Marking</b>	123N08N


**Maximum ratings, at  $T_J=25\text{ °C}$ , unless otherwise specified**

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$V_{GS}=10\text{ V}$ , $T_C=25\text{ °C}$	40	A
		$V_{GS}=10\text{ V}$ , $T_C=100\text{ °C}$	35	
		$V_{GS}=10\text{ V}$ , $T_A=25\text{ °C}$ , $R_{thJA}=60\text{ K/W}^2$	10	
Pulsed drain current <sup>3)</sup>	$I_{D,pulse}$	$T_C=25\text{ °C}$	160	
Avalanche energy, single pulse	$E_{AS}$	$I_D=20\text{ A}$ , $R_{GS}=25\text{ }\Omega$	110	mJ
Gate source voltage	$V_{GS}$		$\pm 20$	V

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

<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 figure 3 for more detailed information

<sup>4)</sup> See figure 13 for more detailed information

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

Parameter	Symbol	Conditions	Value	Unit
Power dissipation	$P_{\text{tot}}$	$T_c=25\text{ °C}$	66	W
		$T_A=25\text{ °C}$ , $R_{\text{thJA}}=60\text{ K/W}^2$	2.1	
Operating and storage temperature	$T_j, T_{\text{stg}}$		-55 ... 150	°C
IEC climatic category; DIN IEC 68-1			55/150/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

#### Thermal characteristics

Thermal resistance, junction - case	$R_{\text{thJC}}$		-	-	1.9	K/W
Device on PCB	$R_{\text{thJA}}$	minimal footprint	-	-	-	
		6 cm <sup>2</sup> cooling area <sup>2)</sup>	-	-	60	

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

#### Static characteristics

Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}}=0\text{ V}, I_{\text{D}}=1\text{ mA}$	80	-	-	V
Gate threshold voltage	$V_{\text{GS(th)}}$	$V_{\text{DS}}=V_{\text{GS}}, I_{\text{D}}=33\text{ }\mu\text{A}$	2	2.8	3.5	
Zero gate voltage drain current	$I_{\text{DSS}}$	$V_{\text{DS}}=80\text{ V}, V_{\text{GS}}=0\text{ V}, T_j=25\text{ °C}$	-	0.1	1	$\mu\text{A}$
		$V_{\text{DS}}=80\text{ V}, V_{\text{GS}}=0\text{ V}, T_j=125\text{ °C}$	-	10	100	
Gate-source leakage current	$I_{\text{GSS}}$	$V_{\text{GS}}=20\text{ V}, V_{\text{DS}}=0\text{ V}$	-	10	100	nA
Drain-source on-state resistance	$R_{\text{DS(on)}}$	$V_{\text{GS}}=10\text{ V}, I_{\text{D}}=20\text{ A}$	-	10.3	12.3	m $\Omega$
		$V_{\text{GS}}=6\text{ V}, I_{\text{D}}=10\text{ A}$	-	13.9	24	
Gate resistance	$R_{\text{G}}$		-	2	-	$\Omega$
Transconductance	$g_{\text{fs}}$	$ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}, I_{\text{D}}=20\text{ A}$	17	34	-	S

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=40\text{ V},$ $f=1\text{ MHz}$	-	1300	1700	pF
Output capacitance	$C_{oss}$		-	350	470	
Reverse transfer capacitance	$C_{rss}$		-	15	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=40\text{ V}, V_{GS}=10\text{ V},$ $I_D=20\text{ A}, R_G=1.6\ \Omega$	-	12	-	ns
Rise time	$t_r$		-	18	-	
Turn-off delay time	$t_{d(off)}$		-	19	-	
Fall time	$t_f$		-	4	-	

**Gate Charge Characteristics<sup>5)</sup>**

Gate to source charge	$Q_{gs}$	$V_{DD}=40\text{ V}, I_D=20\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	6.3	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	3.6	-	
Gate to drain charge	$Q_{gd}$		-	3.8	-	
Switching charge	$Q_{sw}$		-	6.5	-	
Gate charge total	$Q_g$		-	19	25	
Gate plateau voltage	$V_{plateau}$		-	4.9	-	
Output charge	$Q_{oss}$	$V_{DD}=40\text{ V}, V_{GS}=0\text{ V}$	-	25	34	

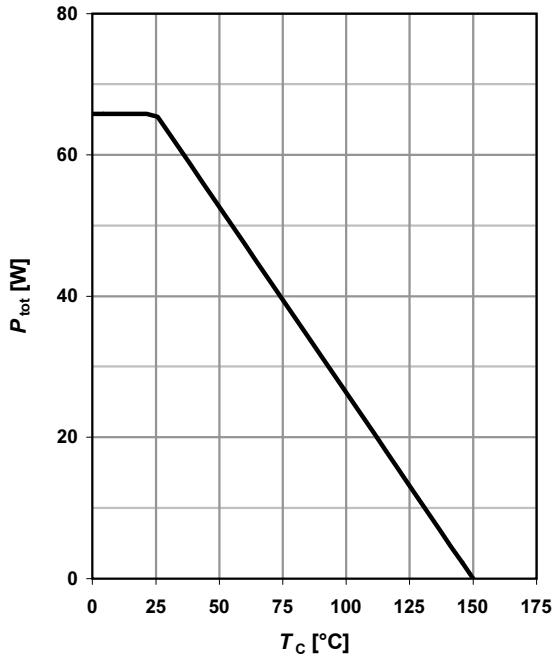
**Reverse Diode**

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	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=20\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	1.0	1.2	V
Reverse recovery time	$t_{rr}$	$V_R=40\text{ V}, I_F=20\text{ A},$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	45	-	ns
Reverse recovery charge	$Q_{rr}$		-	54	-	nC

<sup>5)</sup> See figure 16 for gate charge parameter definition

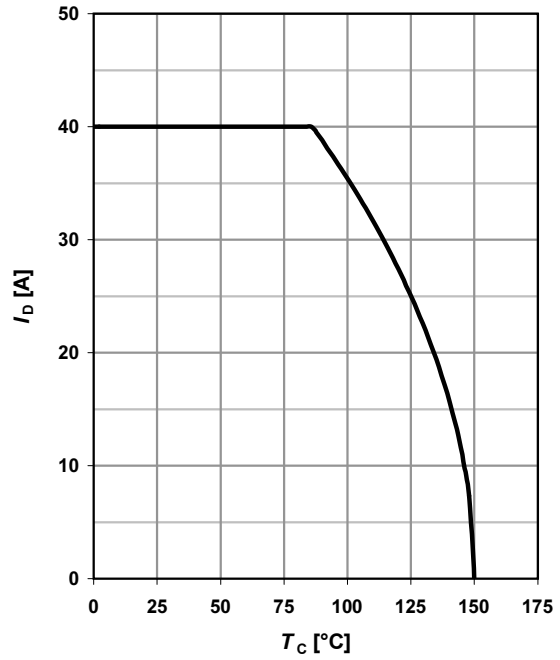
**1 Power dissipation**

$P_{tot}=f(T_C)$



**2 Drain current**

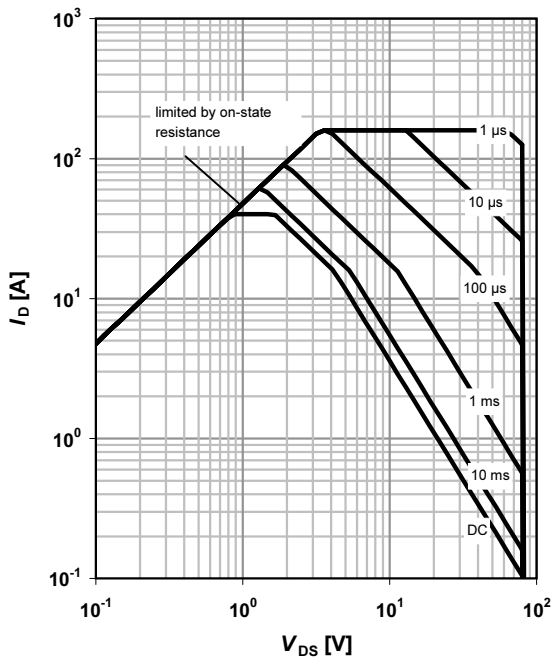
$I_D=f(T_C); V_{GS} \geq 10 V$



**3 Safe operating area**

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

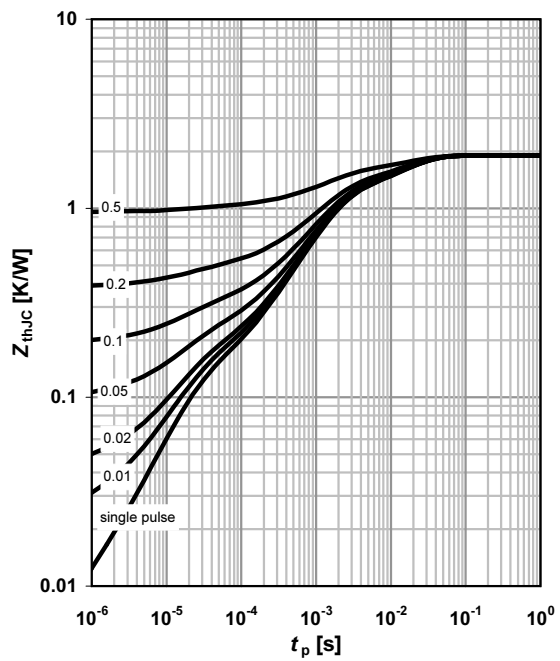
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJC}=f(t_p)$

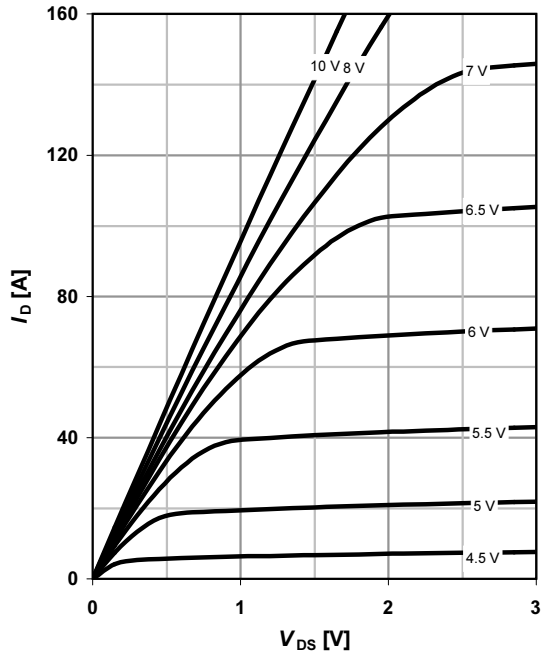
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

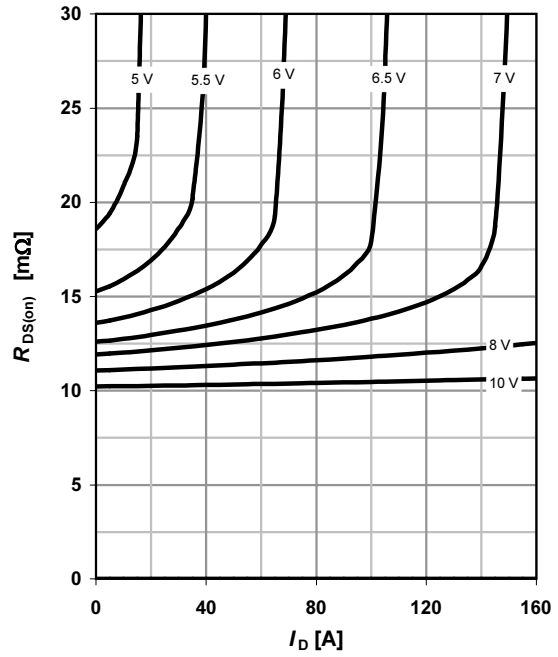
parameter:  $V_{GS}$



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

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

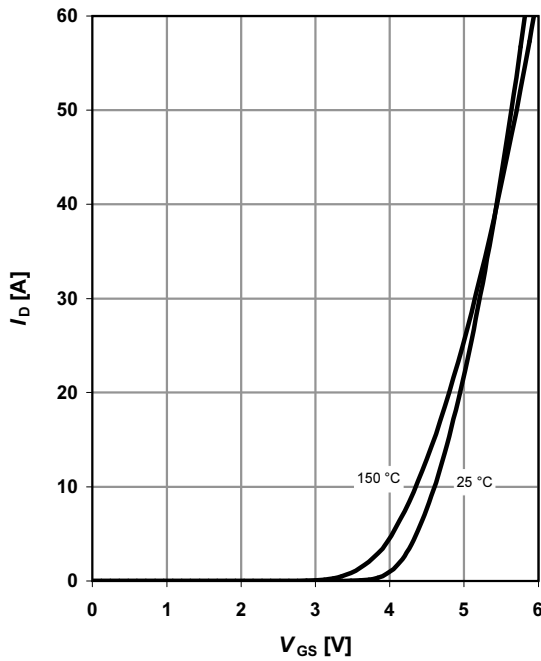
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

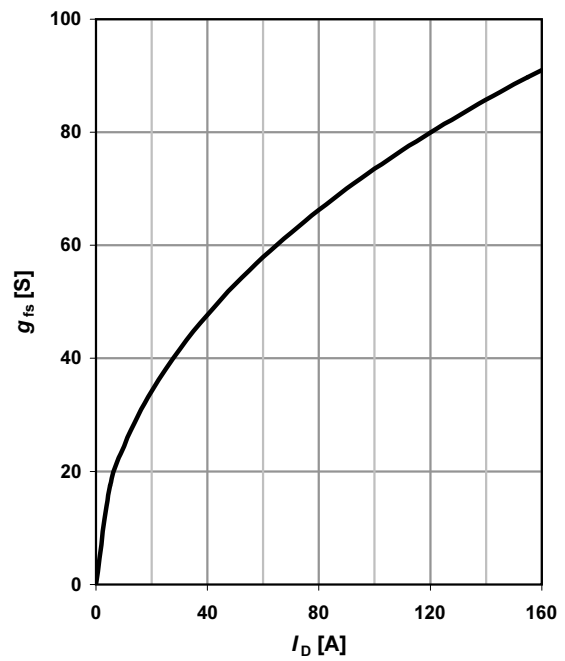
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



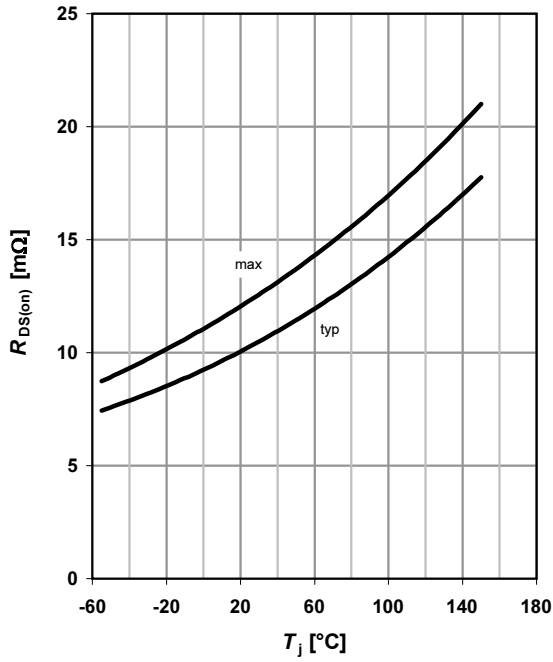
**8 Typ. forward transconductance**

$g_{fs} = f(I_D); T_j = 25\text{ °C}$



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

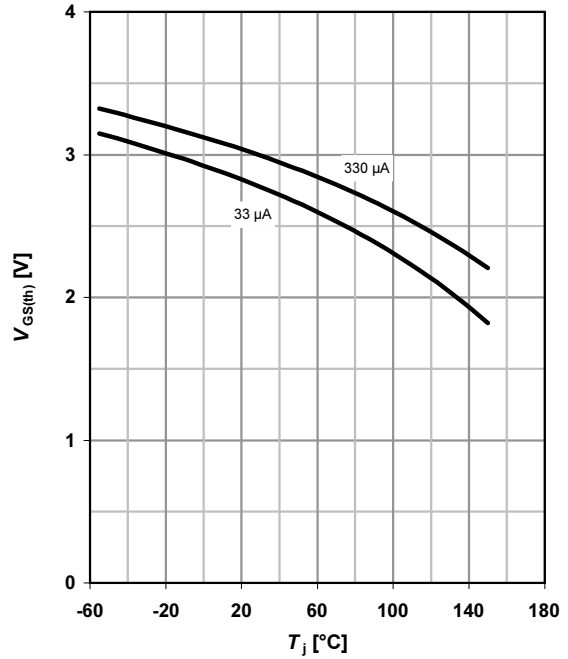
$R_{DS(on)} = f(T_j); I_D = 20 \text{ A}; V_{GS} = 10 \text{ V}$



**10 Typ. gate threshold voltage**

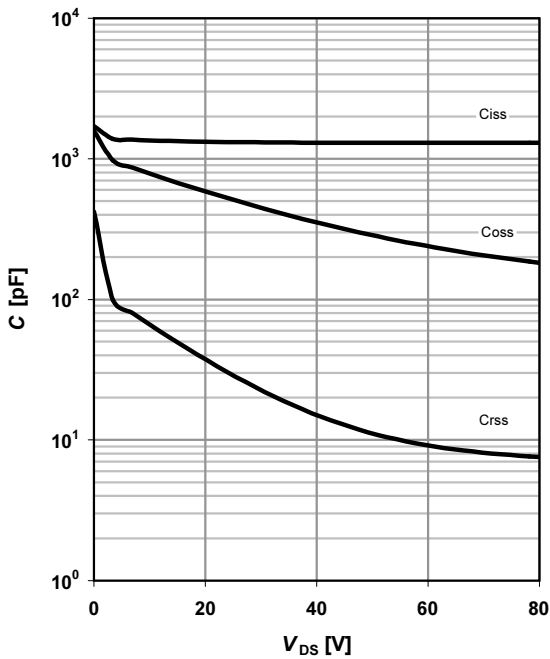
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $I_D$



**11 Typ. capacitances**

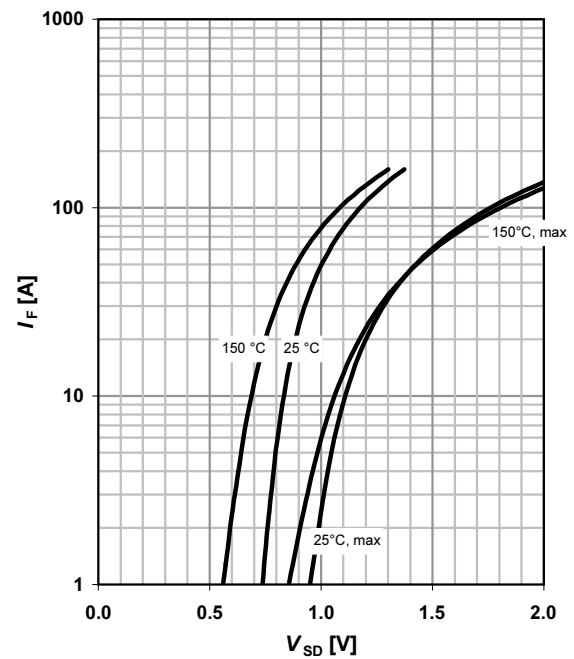
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

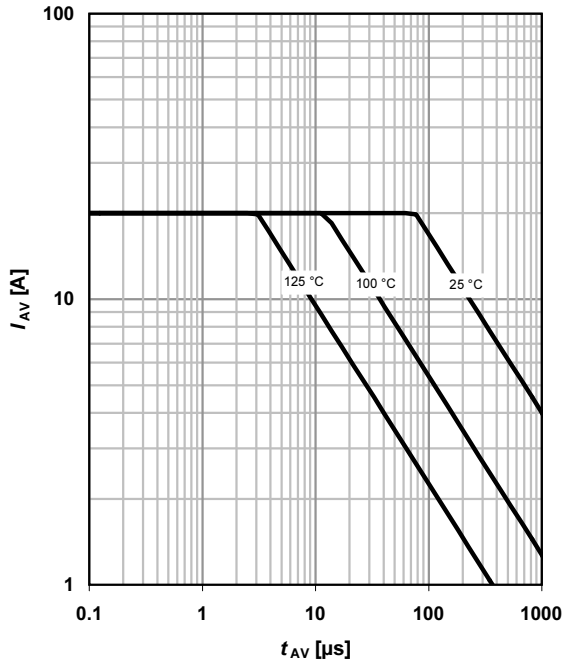
$I_F = f(V_{SD})$

parameter:  $T_j$

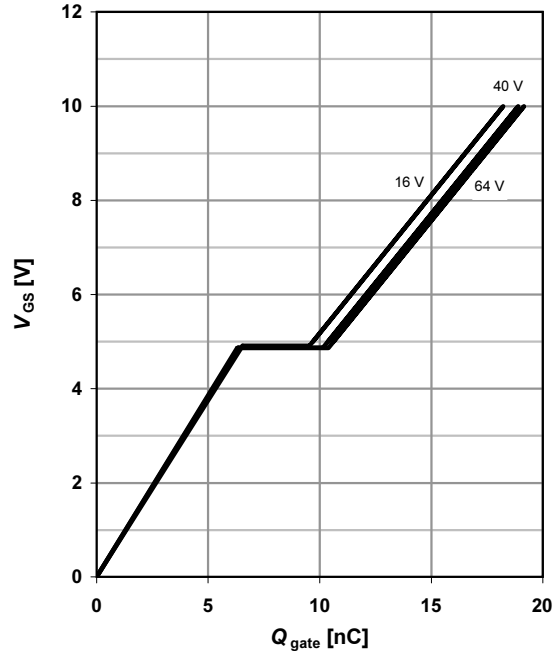


**13 Avalanche characteristics**

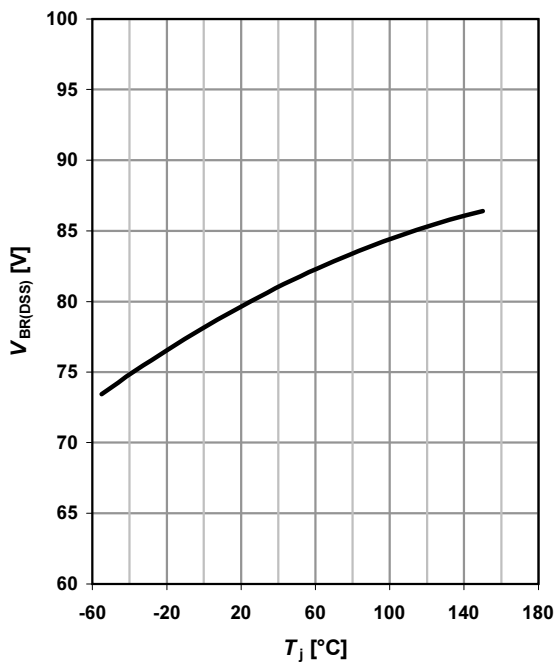
$$I_{AS} = f(t_{AV}); R_{GS} = 25 \Omega$$

 parameter:  $T_{j(\text{start})}$ 

**14 Typ. gate charge**

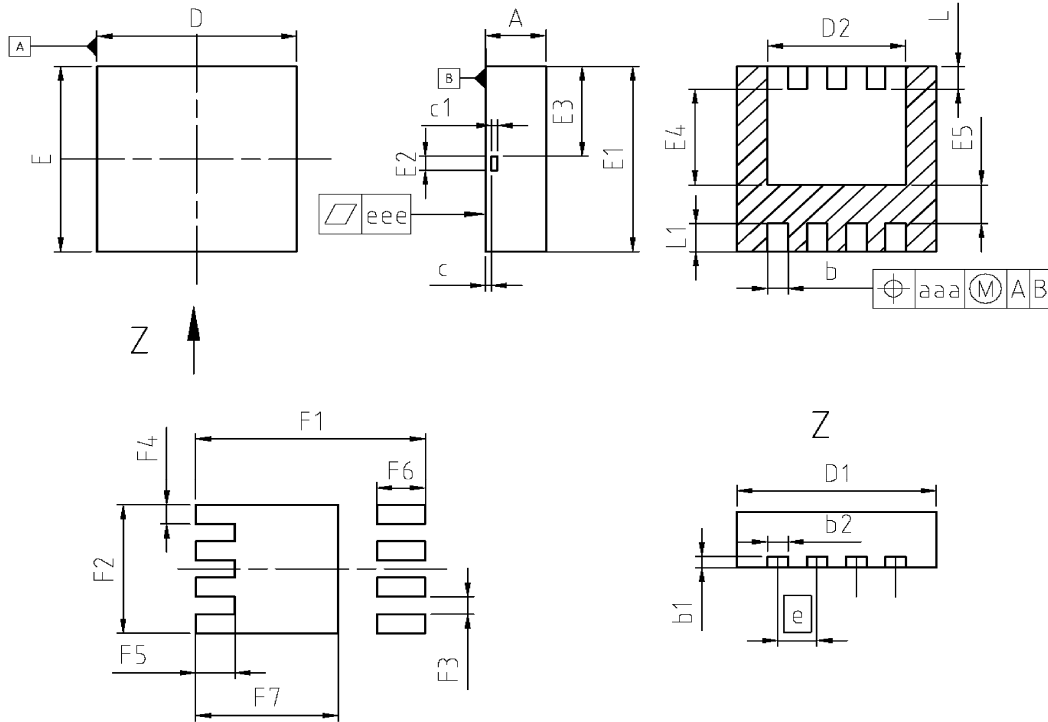
$$V_{GS} = f(Q_{\text{gate}}); I_D = 20 \text{ A pulsed}$$

 parameter:  $V_{DD}$ 

**15 Drain-source breakdown voltage**

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


**16 Gate charge waveforms**


PG-TSDSON-8 (S308)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
<b>A</b>	0.95	1.00	0.037	0.039
<b>b</b>	0.25	0.35	0.010	0.014
<b>b1</b>	0.10	0.30	0.004	0.012
<b>b2</b>	0.20	0.40	0.008	0.016
<b>c</b>	0.00	0.20	0.000	0.008
<b>D=D1</b>	3.20	3.40	0.126	0.134
<b>D2</b>	2.15	2.35	0.085	0.093
<b>E=E1</b>	3.20	3.40	0.126	0.134
<b>E2</b>	0.10	0.30	0.004	0.012
<b>E3</b>	1.35	1.55	0.053	0.061
<b>E4</b>	1.60	1.80	0.063	0.071
<b>E5</b>	0.66	0.86	0.026	0.034
<b>e</b>	0.60	0.70	0.024	0.028
<b>N</b>	8		8	
<b>L</b>	0.31	0.51	0.012	0.020
<b>L1</b>	0.33	0.53	0.013	0.021
<b>aaa</b>	0.25		0.010	
<b>eee</b>	0.05		0.002	
<b>F1</b>	3.70	3.90	0.146	0.154
<b>F2</b>	2.19	2.39	0.086	0.094
<b>F3</b>	0.21	0.41	0.008	0.016
<b>F4</b>	0.24	0.44	0.009	0.017
<b>F5</b>	0.55	0.75	0.022	0.030
<b>F6</b>	0.70	0.90	0.028	0.035
<b>F7</b>	2.26	2.46	0.089	0.097

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