

**OptiMOS™ 3 M-Series Power-MOSFET**
**Features**

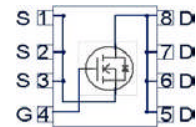
- Optimized for 5V driver application (Notebook, VGA, POL)
- Low FOM<sub>SW</sub> for High Frequency SMPS
- 100% Avalanche tested
- N-channel
- Very low on-resistance  $R_{DS(on)}$  @  $V_{GS}=4.5\text{ V}$
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Qualified for consumer level application
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21



Type	Package	Marking
BSO051N03MS G	PG-DSO-8	051N03MS

**Product Summary**

$V_{DS}$	30	V
$R_{DS(on),max}$	$V_{GS}=10\text{ V}$	5.1 mΩ
	$V_{GS}=4.5\text{ V}$	6.2
$I_D$	18	A

**PG-DSO-8**

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

Parameter	Symbol	Conditions	Value		Unit
			10 secs	steady state	
Continuous drain current <sup>1)</sup>	$I_D$	$V_{GS}=10\text{ V}, T_A=25\text{ °C}$	18	14	A
		$V_{GS}=10\text{ V}, T_A=90\text{ °C}$	12.3	9.7	
		$V_{GS}=4.5\text{ V}, T_A=25\text{ °C}$	16	13	
		$V_{GS}=4.5\text{ V}, T_A=90\text{ °C}$	11	8.8	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_A=25\text{ °C}$	126		
Avalanche current, single pulse <sup>3)</sup>	$I_{AS}$	$T_A=25\text{ °C}$	18		
Avalanche energy, single pulse	$E_{AS}$	$I_D=18\text{ A}, R_{GS}=25\text{ }\Omega$	100		mJ
Gate source voltage	$V_{GS}$		$\pm 20$		V
Power dissipation <sup>1)</sup>	$P_{tot}$	$T_A=25\text{ °C}$	2.5	1.56	W
Operating and storage temperature	$T_j, T_{stg}$		-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 - soldering point	$R_{thJS}$		-	-	35	K/W
Thermal resistance, junction - ambient	$R_{thJA}$	minimal footprint, $t_p \leq 10$ s	-	-	110	
		minimal footprint, steady state	-	-	150	
		6 cm <sup>2</sup> cooling area <sup>1)</sup> , $t_p \leq 10$ s	-	-	50	
		6 cm <sup>2</sup> cooling area <sup>1)</sup> , steady state	-	-	80	

**Electrical characteristics, at  $T_j=25$  °C, unless otherwise specified**
**Static characteristics**

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0$ V, $I_D=1$ mA	30	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}$ , $I_D=250$ $\mu$ A	1	-	2	
Zero gate voltage drain current	$I_{DSS}$	$V_{DS}=30$ V, $V_{GS}=0$ V, $T_j=25$ °C	-	0.1	10	$\mu$ A
		$V_{DS}=30$ V, $V_{GS}=0$ V, $T_j=125$ °C	-	10	100	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=16$ V, $V_{DS}=0$ V	-	10	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=4.5$ V, $I_D=16$ A	-	5.0	6.2	m $\Omega$
		$V_{GS}=10$ V, $I_D=18$ A	-	4.3	5.1	
Gate resistance	$R_G$		0.7	1.5	2.6	$\Omega$
Transconductance	$g_{fs}$	$ V_{DS}  > 2 I_D  R_{DS(on)max}$ , $I_D=18$ A	30	61	-	S

<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  $\mu$ m thick) copper area for drain connection. PCB is vertical in still air.

<sup>2)</sup> See figure 3 for more detailed information

<sup>3)</sup> See figure 13 for more detailed information

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=15\text{ V},$ $f=1\text{ MHz}$	-	3200	4300	pF
Output capacitance	$C_{oss}$		-	940	1300	
Reverse transfer capacitance	$C_{rss}$		-	66	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15\text{ V}, V_{GS}=4.5\text{ V},$ $I_D=18\text{ A}, R_G=1.6\ \Omega$	-	15	-	ns
Rise time	$t_r$		-	7.6	-	
Turn-off delay time	$t_{d(off)}$		-	20	-	
Fall time	$t_f$		-	8	-	

**Gate Charge Characteristics<sup>4)</sup>**

Gate to source charge	$Q_{gs}$	$V_{DD}=15\text{ V}, I_D=18\text{ A},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	8.7	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	5.1	-	
Gate to drain charge	$Q_{gd}$		-	4.4	-	
Switching charge	$Q_{sw}$		-	8	-	
Gate charge total	$Q_g$		-	20	27	
Gate plateau voltage	$V_{plateau}$		-	2.7	-	
Gate charge total	$Q_g$	$V_{DD}=15\text{ V}, I_D=18\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	41	55	nC
Gate charge total, sync. FET	$Q_{g(sync)}$	$V_{DS}=0.1\text{ V},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	17	23	
Output charge	$Q_{oss}$	$V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$	-	25	33	

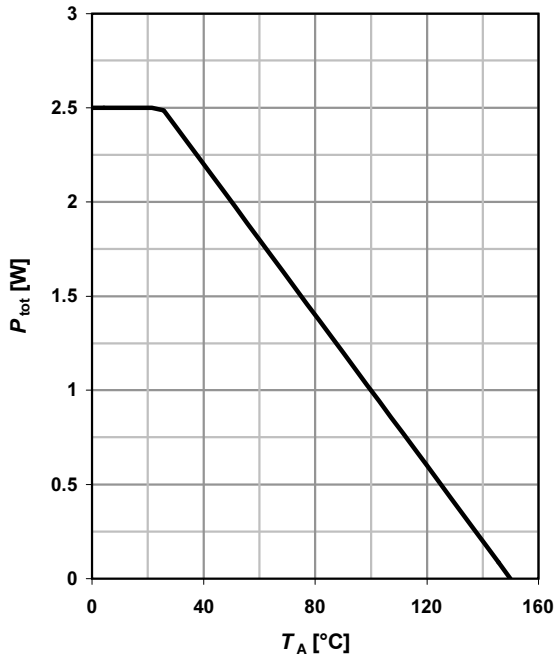
**Reverse Diode**

Diode continuous forward current	$I_S$	$T_A=25\text{ }^\circ\text{C}$	-	-	3	A
Diode pulse current	$I_{S,pulse}$		-	-	126	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=18\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	0.84	1.1	V
Reverse recovery charge	$Q_{rr}$	$V_R=15\text{ V}, I_F=I_S,$ $di_F/dt=400\text{ A}/\mu\text{s}$	-	-	15	nC

<sup>4)</sup> See figure 16 for gate charge parameter definition

**1 Power dissipation**

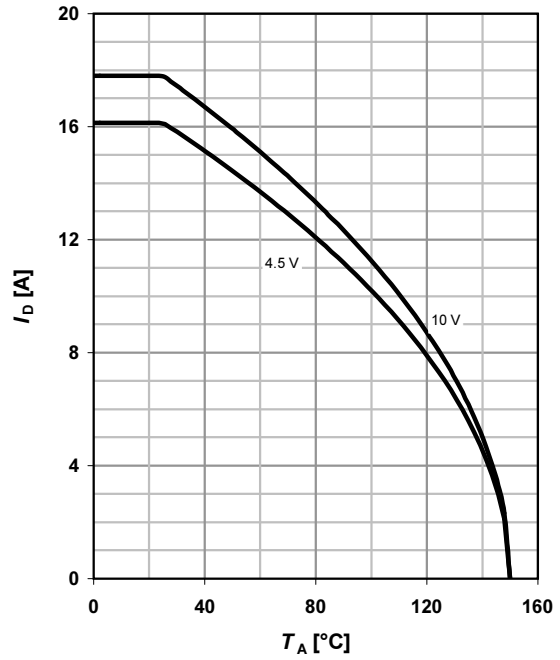
$P_{tot}=f(T_A); t_p \leq 10 \text{ s}$



**2 Drain current**

$I_D=f(T_A); t_p \leq 10 \text{ s}$

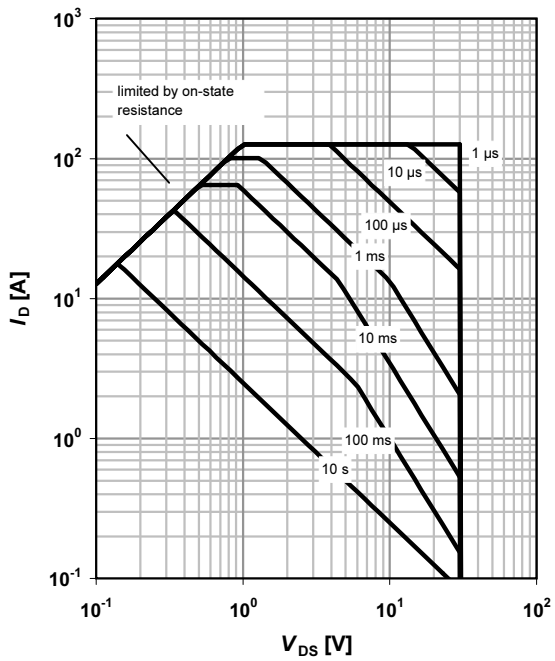
parameter:  $V_{GS}$



**3 Safe operating area**

$I_D=f(V_{DS}); T_A=25 \text{ °C}^2; D=0$

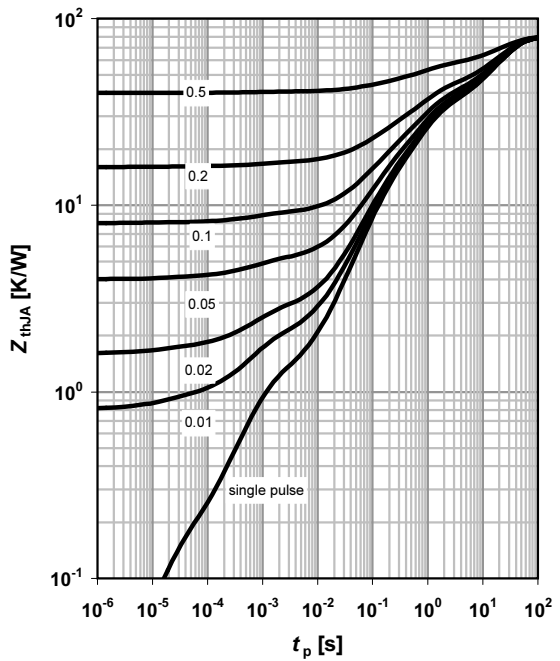
parameter:  $t_p$



**4 Max. transient thermal impedance**

$Z_{thJA}=f(t_p)^2$

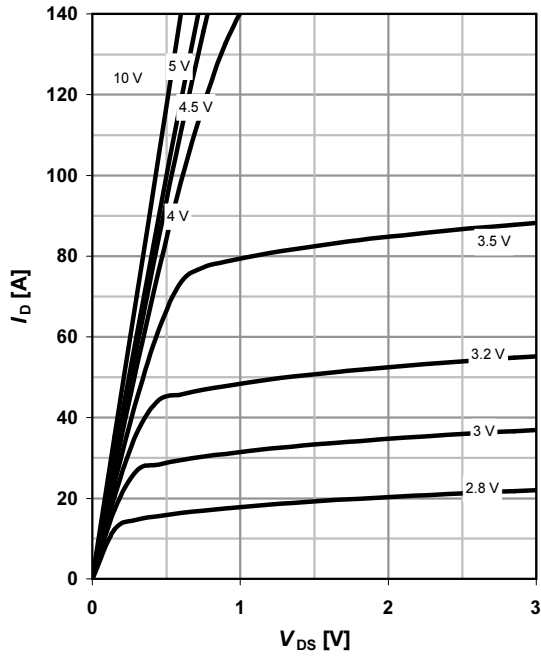
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

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

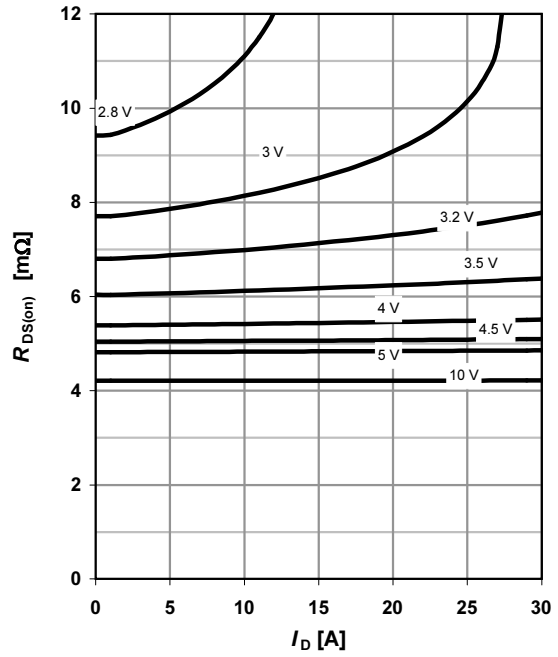
parameter:  $V_{GS}$



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

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

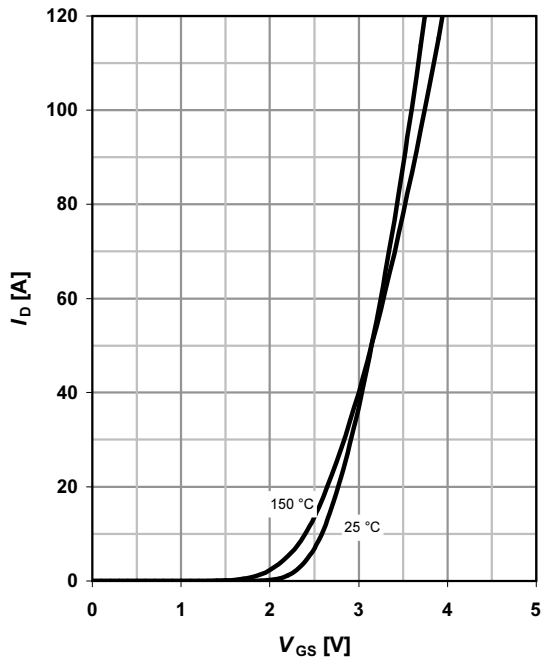
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

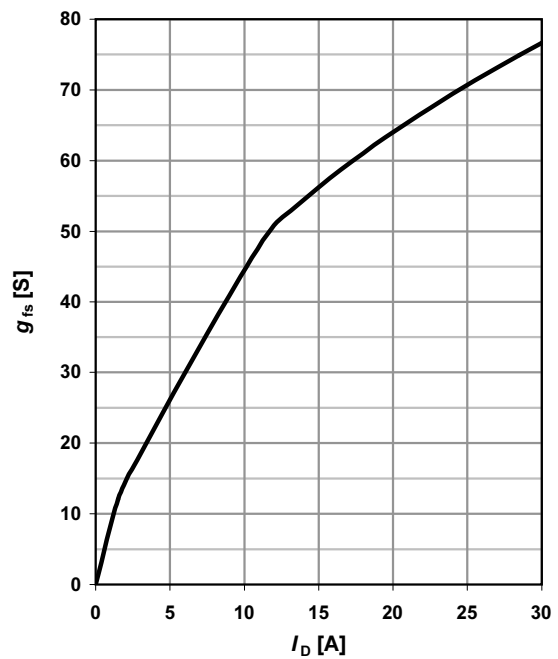
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



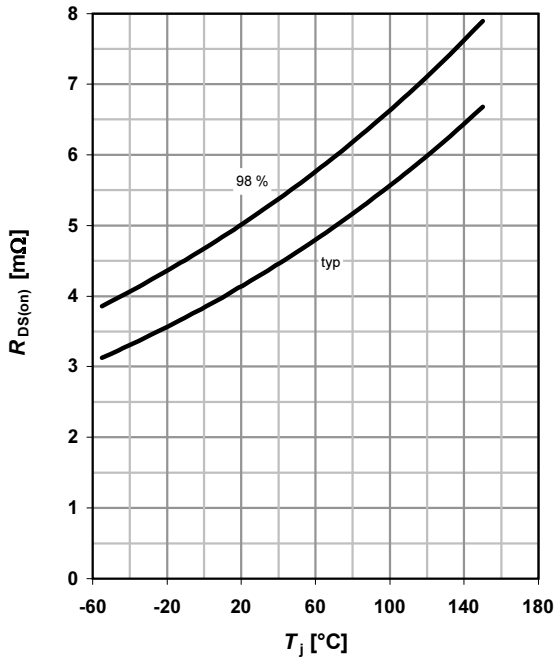
**8 Typ. forward transconductance**

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



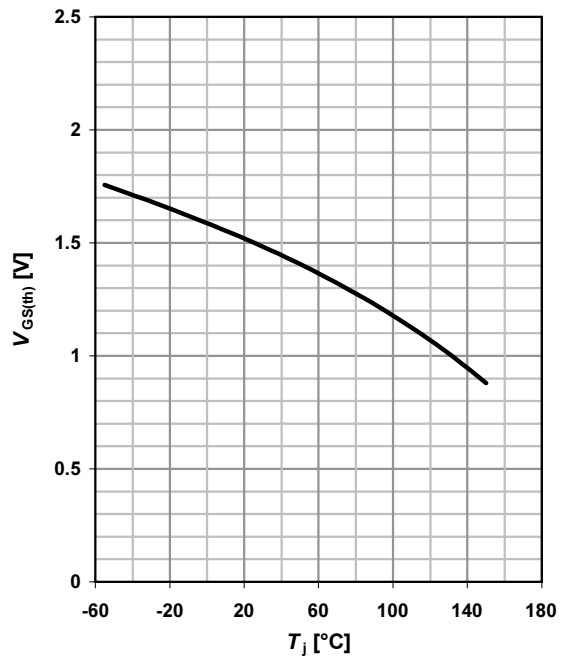
**9 Drain-source on-state resistance**

$R_{DS(on)} = f(T_j); I_D = 18 \text{ A}; V_{GS} = 10 \text{ V}$



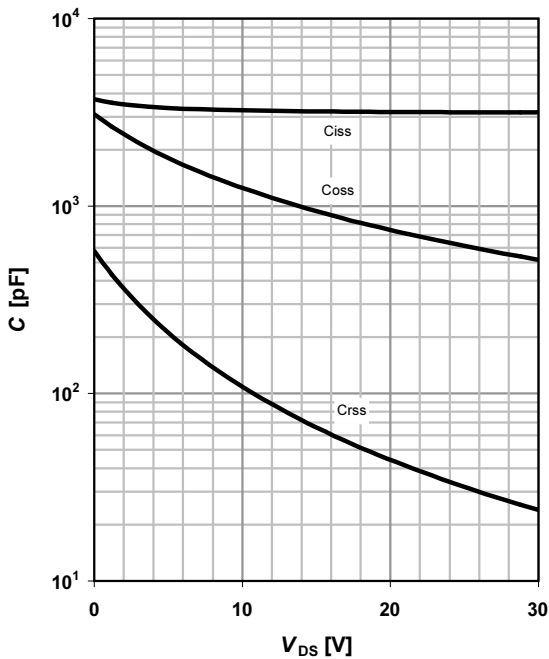
**10 Typ. gate threshold voltage**

$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = 250 \mu\text{A}$



**11 Typ. capacitances**

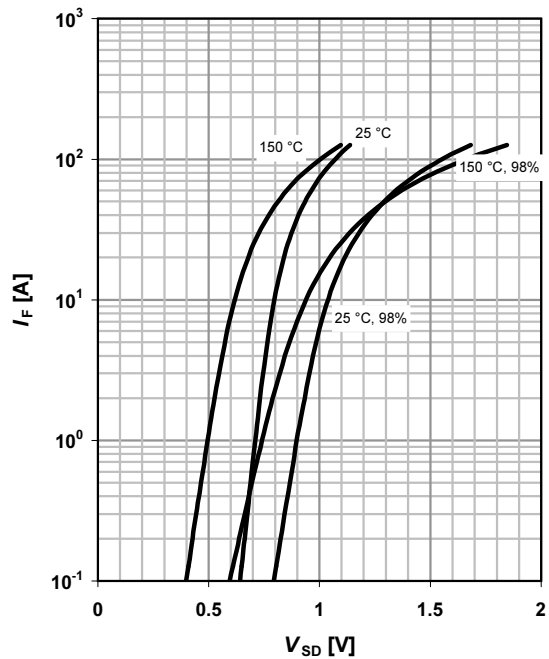
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

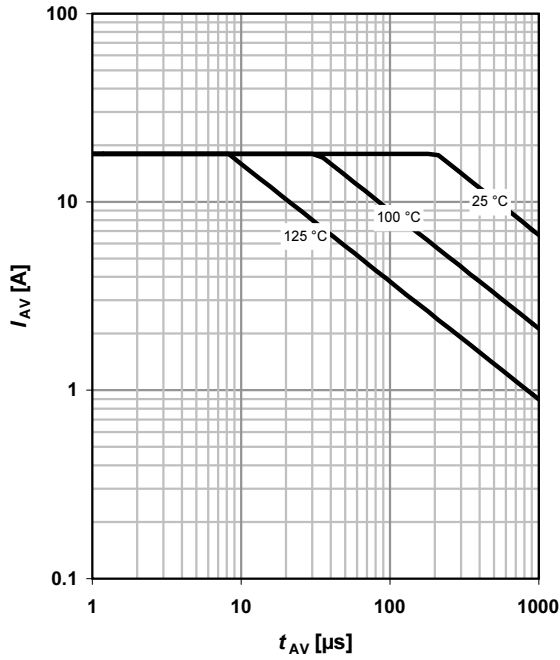
parameter:  $T_j$



**13 Avalanche characteristics**

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

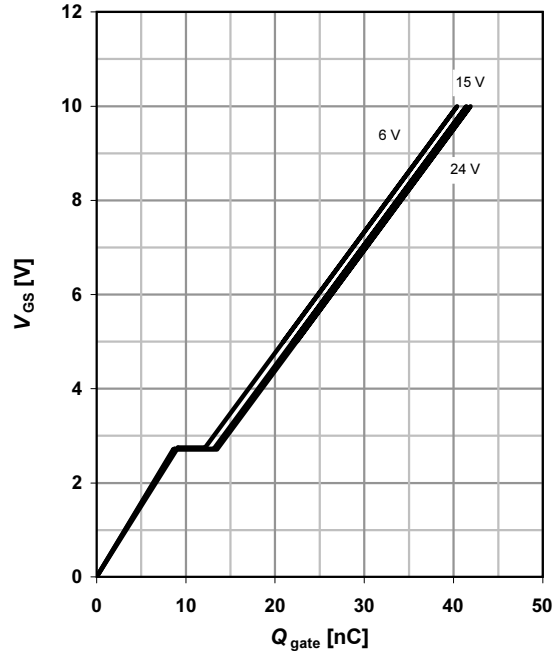
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

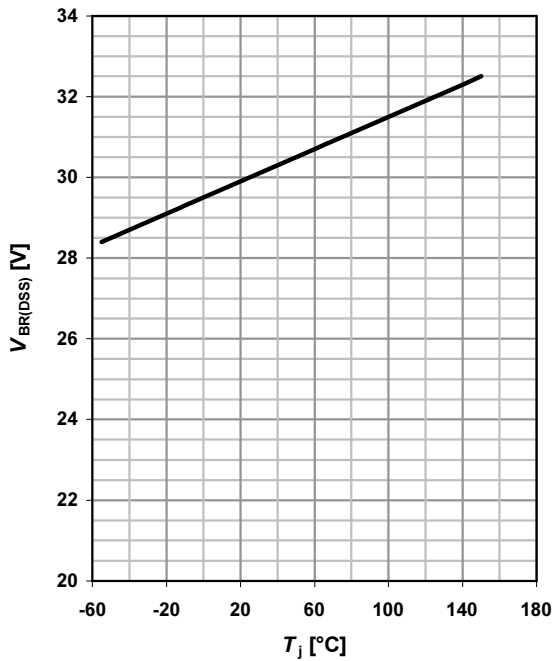
$V_{GS}=f(Q_{gate}); I_D=18 \text{ A pulsed}$

parameter:  $V_{DD}$

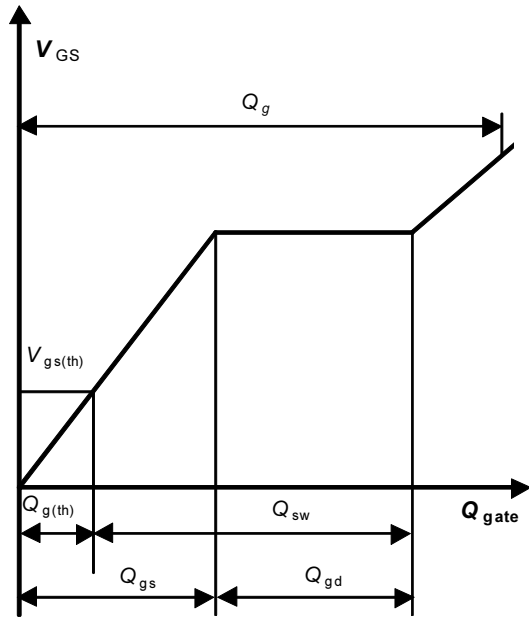


**15 Drain-source breakdown voltage**

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

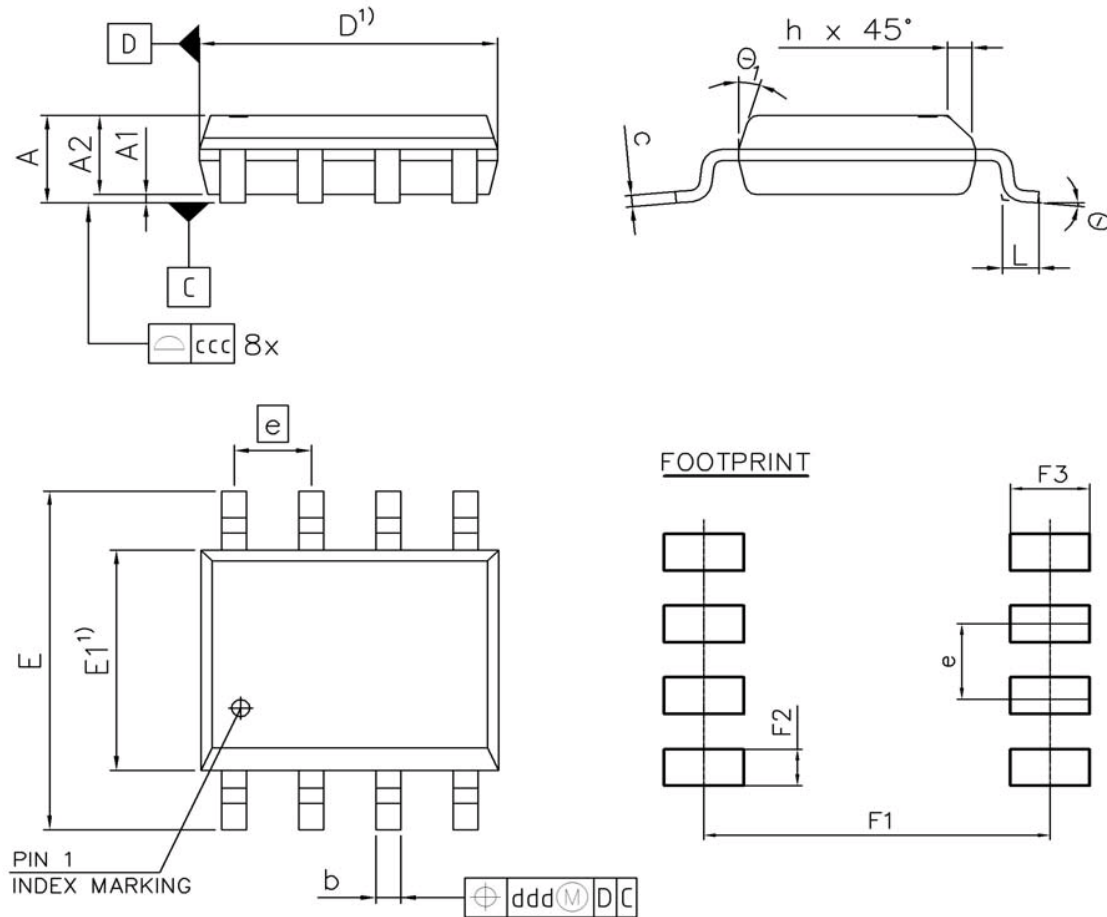


**16 Gate charge waveforms**



Package Outline

PG-DSO-8: Outline



1) DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	-	1.75	-	0.069
A1	0.10	-	0.004	-
A2	1.25	1.65	0.049	0.065
b	0.35	0.51	0.014	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27		0.050	
N	8		8	
L	0.39	0.89	0.015	0.035
h	0.23	0.50	0.009	0.020
θ	0°	8°	0°	8°
θ <sub>1</sub>	-	19°	-	19°
ccc	0.10		0.004	
ddd	0.25		0.010	
F1	5.59	5.79	0.220	0.228
F2	0.55	0.75	0.022	0.030
F3	1.21	1.41	0.048	0.056

DOCUMENT NO.  
Z8B00003333

SCALE

EUROPEAN PROJECTION

ISSUE DATE  
09.01.2008

REVISION  
02



**Published by**  
Infineon Technologies AG  
81726 Munich, Germany  
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