

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

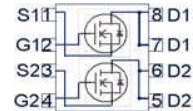
- Dual N-channel
- Optimized for 5V driver application (Notebook, VGA, POL)
- Low FOM<sub>SW</sub> for High Frequency SMPS
- 100% Avalanche tested
- Very low on-resistance  $R_{DS(on)}$  @  $V_{GS}=4.5$  V
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Qualified for consumer level application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


**Product Summary**

$V_{DS}$		30	V
$R_{DS(on),max}$	$V_{GS}=10$ V	22	mΩ
	$V_{GS}=4.5$ V	27	
$I_D$		7.7	A

**PG-DSO-8**


Type	Package	Marking
BSO220N03MD G	PG-DSO-8	220N03MD


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

Parameter	Symbol	Conditions	Value		Unit
			10 secs	steady state	
Continuous drain current <sup>1)</sup>	$I_D$	$V_{GS}=10$ V, $T_A=25$ °C	7.7	6	A
		$V_{GS}=10$ V, $T_A=90$ °C	5.3	4.4	
		$V_{GS}=4.5$ V, $T_A=25$ °C	6.9	5.8	
		$V_{GS}=4.5$ V, $T_A=90$ °C	4.8	4	
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	$T_A=25$ °C	54		
Avalanche current, single pulse <sup>3)</sup>	$I_{AS}$	$T_A=25$ °C	7.7		
Avalanche energy, single pulse	$E_{AS}$	$I_D=7.7$ A, $R_{GS}=25$ Ω	9		mJ
Gate source voltage	$V_{GS}$		±20		V
Power dissipation <sup>1)</sup>	$P_{tot}$	$T_A=25$ °C	2	1.4	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	$R_{thJS}$		-	-	50	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	-	-	62.5	
		6 cm <sup>2</sup> cooling area <sup>1)</sup> , steady state	-	-	90	

**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	-	2.1	
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, $I_D=6.9$ A	-	21.6	27	m $\Omega$
		$V_{GS}=10$ V, $I_D=7.7$ A	-	18.3	22	
Gate resistance	$R_G$		0.6	1.3	2.3	$\Omega$
Transconductance	$g_{fs}$	$ V_{DS}  > 2 I_D  R_{DS(on)max}$ , $I_D=7.7$ A	9	18	-	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. One transistor active.

<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	$C_{iss}$	$V_{GS}=0\text{ V}, V_{DS}=15\text{ V},$ $f=1\text{ MHz}$	-	600	800	pF
Output capacitance	$C_{oss}$		-	230	310	
Reverse transfer capacitance	$C_{rss}$		-	12	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15\text{ V}, V_{GS}=4.5\text{ V},$ $I_D=7.7\text{ A}, R_G=1.6\ \Omega$	-	5.7	-	ns
Rise time	$t_r$		-	2.8	-	
Turn-off delay time	$t_{d(off)}$		-	6.4	-	
Fall time	$t_f$		-	3.4	-	

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

Gate to source charge	$Q_{gs}$	$V_{DD}=15\text{ V}, I_D=7.7\text{ A},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	1.8	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	1.0	-	
Gate to drain charge	$Q_{gd}$		-	0.9	-	
Switching charge	$Q_{sw}$		-	1.7	-	
Gate charge total	$Q_g$		-	3.8	5	
Gate plateau voltage	$V_{plateau}$		-	3.0	-	
Gate charge total	$Q_g$	$V_{DD}=15\text{ V}, I_D=7.7\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	7.8	10	nC
Gate charge total, sync. FET	$Q_{g(sync)}$	$V_{DS}=0.1\text{ V},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	3.3	4.4	
Output charge	$Q_{oss}$	$V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$	-	6.1	8.1	

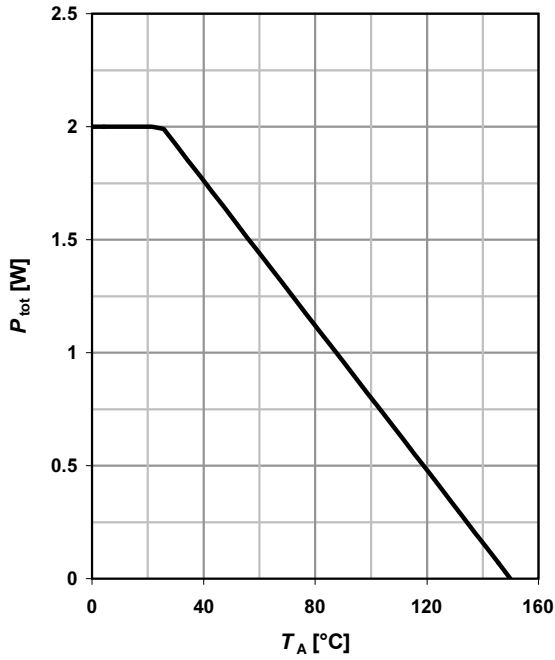
**Reverse Diode**

Diode continuous forward current	$I_S$	$T_A=25\text{ }^\circ\text{C}$	-	-	2.4	A
Diode pulse current	$I_{S,pulse}$		-	-	54	
Diode forward voltage	$V_{SD}$	$V_{GS}=0\text{ V}, I_F=7.7\text{ A},$ $T_j=25\text{ }^\circ\text{C}$	-	0.88	1.1	V
Reverse recovery charge	$Q_{rr}$	$V_R=15\text{ V}, I_F=I_S,$ $di_F/dt=400\text{ A}/\mu\text{s}$	-	-	10	nC

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

**1 Power dissipation**

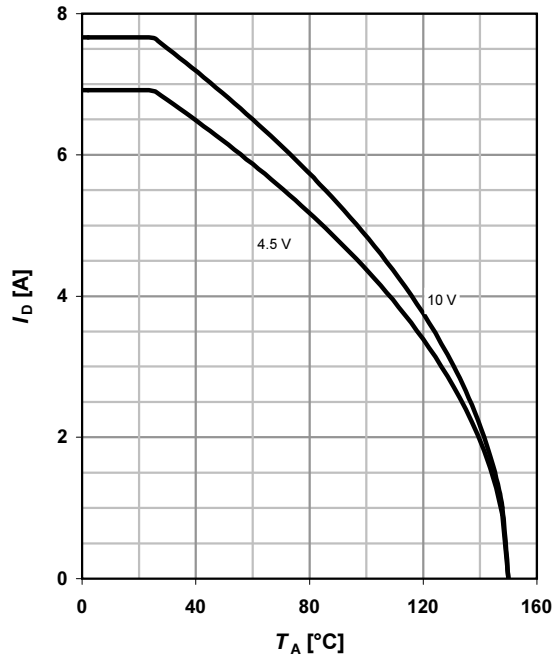
$P_{tot}=f(T_A); t_p \leq 10 \text{ s}$



**2 Drain current**

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

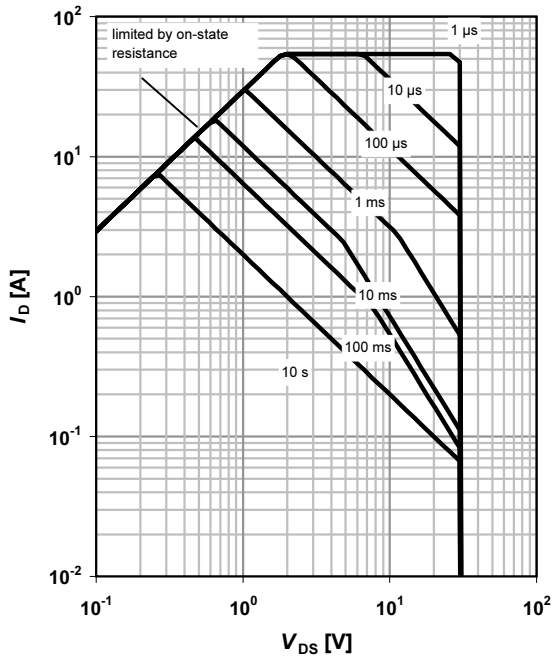
parameter:  $V_{GS}$



**3 Safe operating area**

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

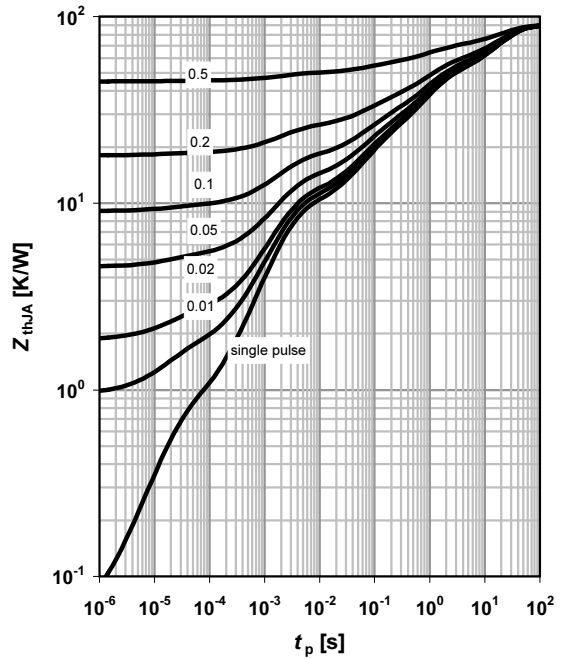
parameter:  $t_p$



**4 Max. transient thermal impedance**

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

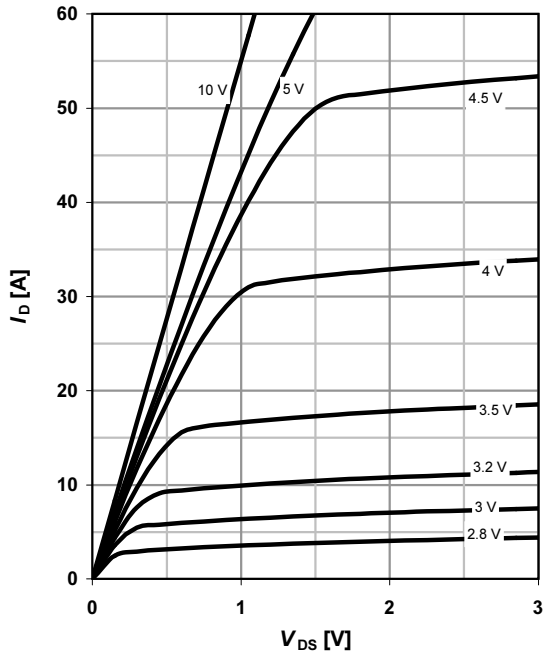
parameter:  $D=t_p/T$



**5 Typ. output characteristics**

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

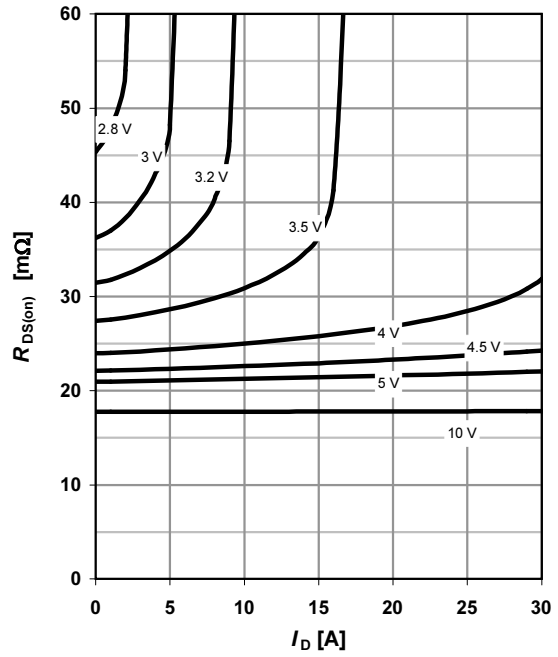
parameter:  $V_{GS}$



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

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

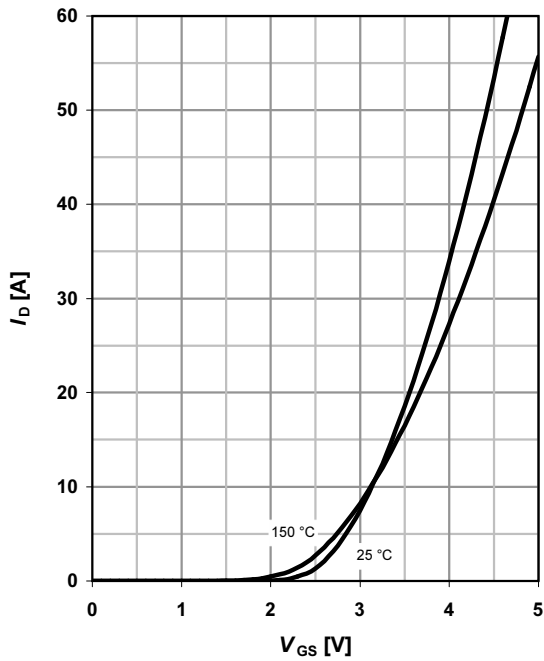
parameter:  $V_{GS}$



**7 Typ. transfer characteristics**

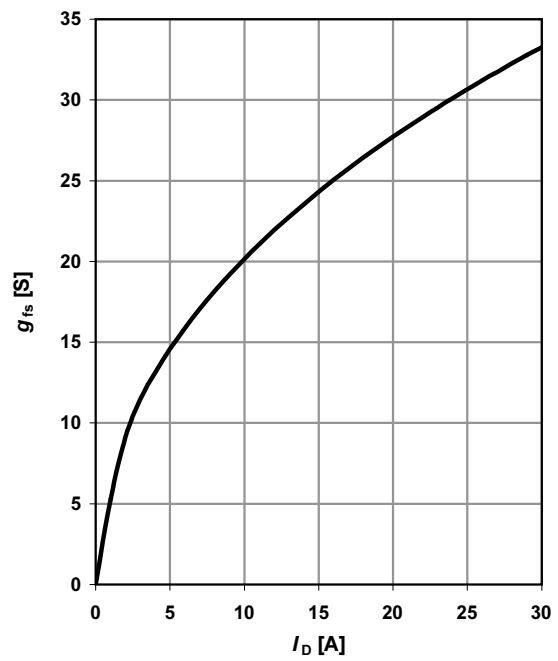
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter:  $T_j$



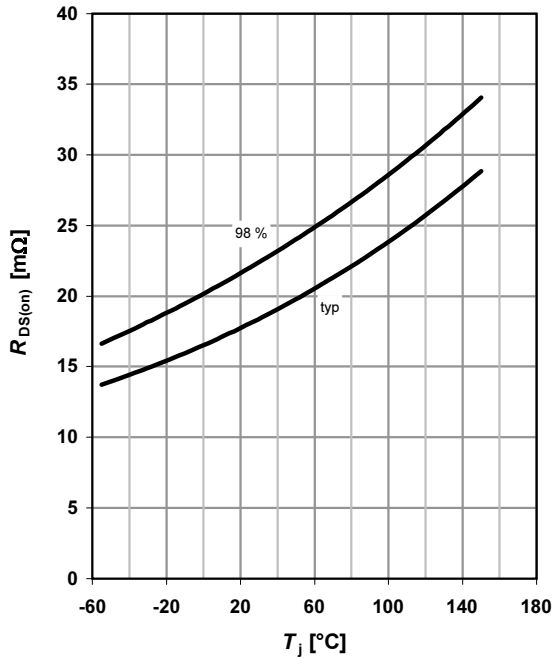
**8 Typ. forward transconductance**

$g_{fs} = f(I_D); T_j = 25\text{ °C}$



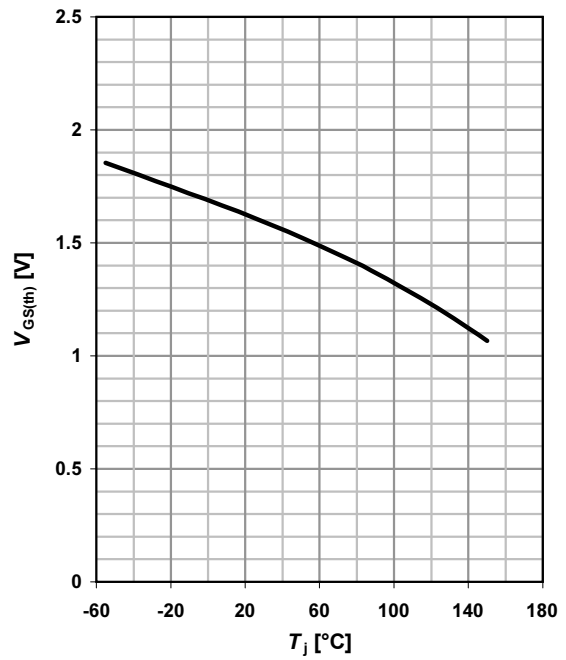
**9 Drain-source on-state resistance**

$R_{DS(on)} = f(T_j); I_D = 7.7 \text{ A}; V_{GS} = 10 \text{ V}$



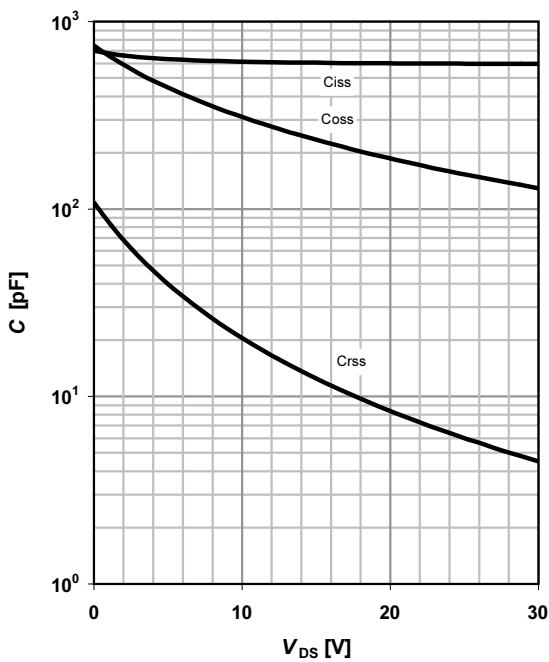
**10 Typ. gate threshold voltage**

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



**11 Typ. capacitances**

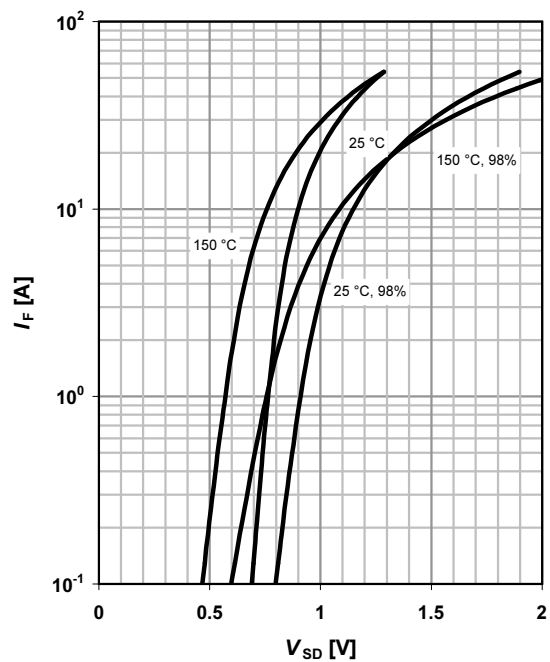
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$



**12 Forward characteristics of reverse diode**

$I_F = f(V_{SD})$

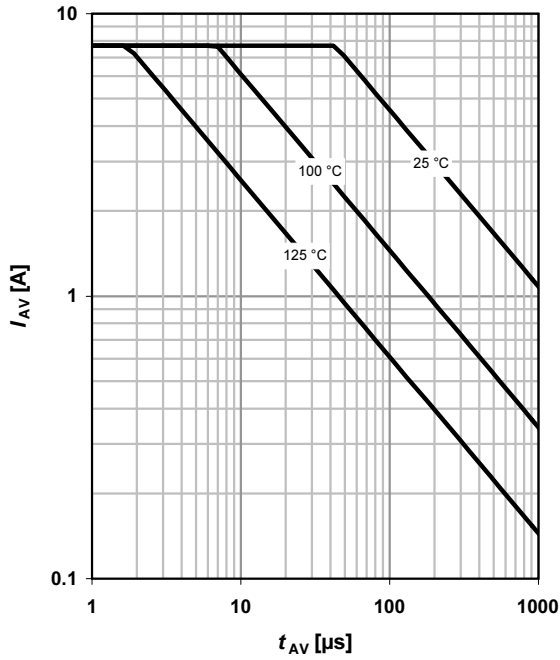
parameter:  $T_j$



**13 Avalanche characteristics**

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

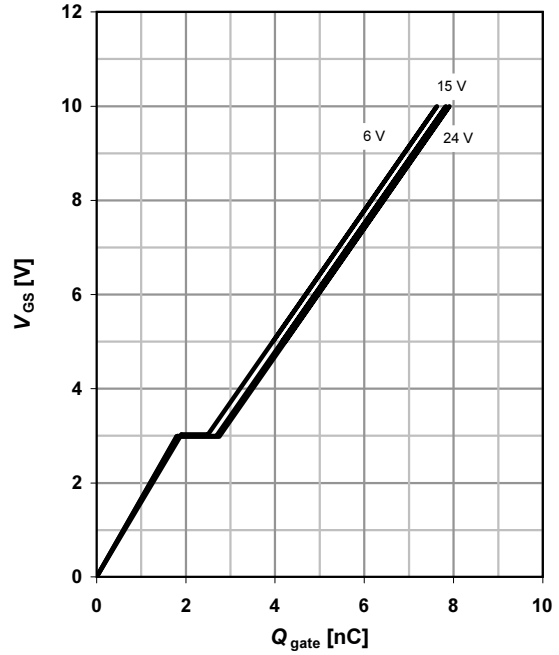
parameter:  $T_{j(start)}$



**14 Typ. gate charge**

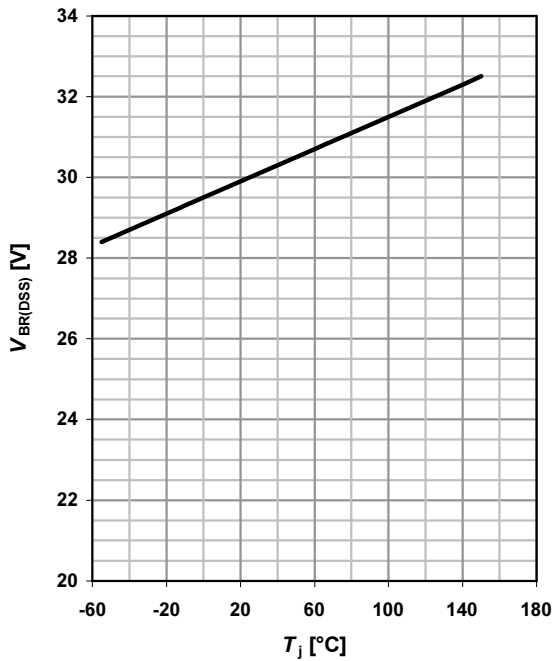
$V_{GS}=f(Q_{gate}); I_D=7.7 \text{ A pulsed}$

parameter:  $V_{DD}$

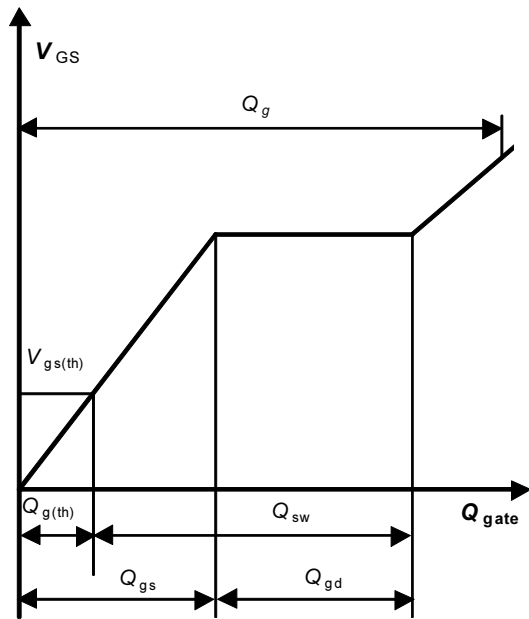


**15 Drain-source breakdown voltage**

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

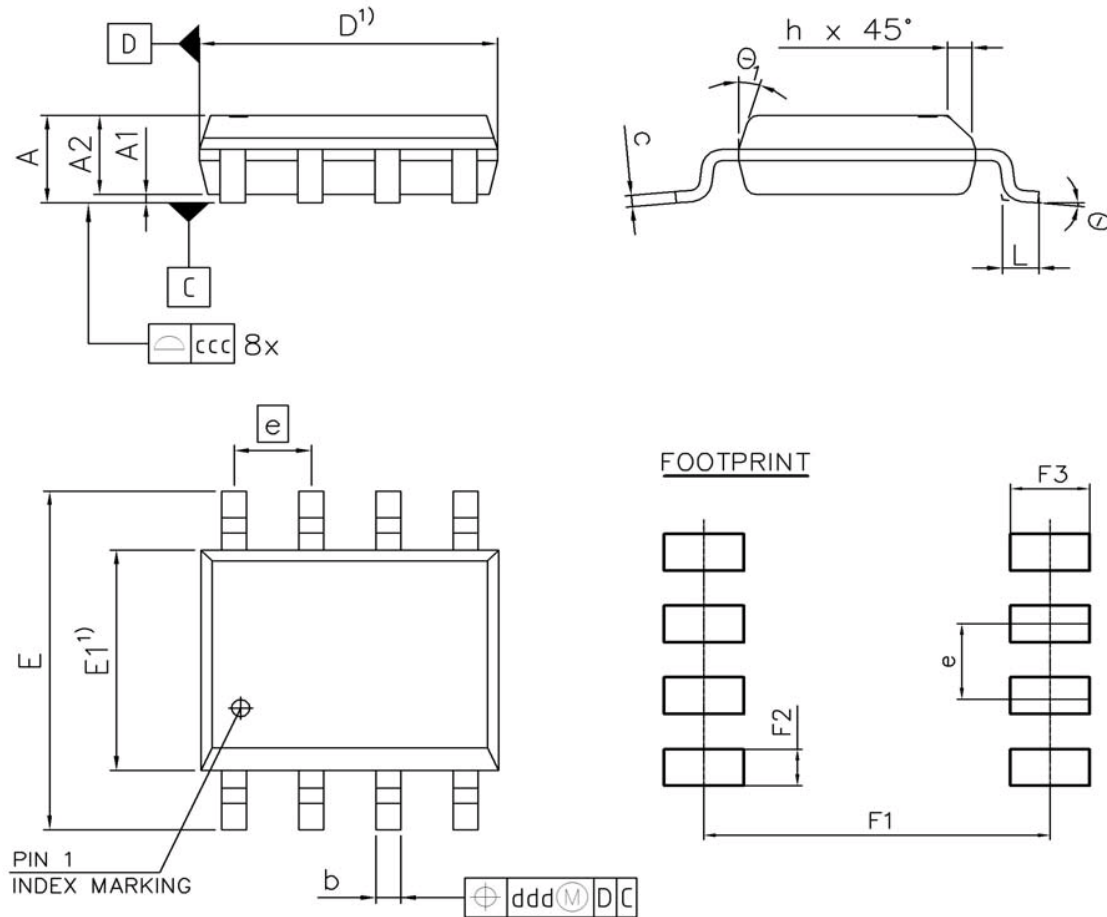


**16 Gate charge waveforms**



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  
© 2008 Infineon Technologies AG  
All Rights Reserved.

### **Legal Disclaimer**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

### **Information**

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office ([www.infineon.com](http://www.infineon.com)).

### **Warnings**

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office. The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.