OptiMOS™ Power-MOSFET

Features

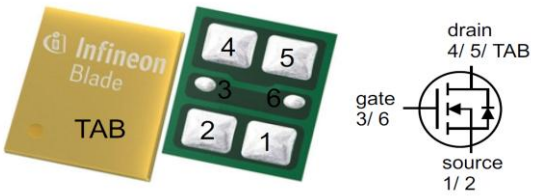
- Optimized for high performance Buck converter
- Very low parasitic inductance
- Low profile (<0.5 mm)
- Double side cooling
- N-channel
- 100% avalanche tested
- Very low on-resistance $R_{DS(on)}$ @ V_{GS}=4.5 V
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Qualified according to JEDEC[1] for target applications

Pb-Free RoHS Halogen-Free

Product Summary

V_{DS}	25	V
$R_{DS(on),max}$	4.5	mΩ
I_D	50	A
Q_{OSS}	7.6	nC
Q_G(0V..10V)	11	nC

LG-USON-6-1



Type	Package	Marking
BSN045NE2LS	LG-USON-6-1	045NE2L

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	V_{GS}=10 V, T_C=25 °C	50	A
		V_{GS}=10 V, T_C=100 °C	47	
		V_{GS}=4.5 V, T_C=25 °C	50	
		V_{GS}=4.5 V, T_C=100 °C	39	
		V_{GS}=10 V, T_A=25 °C, R_{thJA}=50 K/W[2]	19	
Pulsed drain current[3]	$I_{D,pulse}$	T_C=25 °C	200	
Avalanche current, single pulse[4]	I_{AS}	T_C=25 °C	35	
Avalanche energy, single pulse	E_{AS}	I_D=35 A, R_{GS}=25 Ω	5	mJ
Gate source voltage	V_{GS}		±20	V

[1] J-STD20 and JESD22

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

Parameter	Symbol	Conditions	Value	Unit
Power dissipation	P_{tot}	T_C=25 °C	39	W
		T_A=25 °C, R_{thJA}=50 K/W[2)]	2.5	
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 - case	R_{thJC}	bottom	-	-	3.2	K/W
		top	-	-	1	
Device on PCB	R_{thJA}	6 cm^2 cooling area[2)]	-	-	50	
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	25	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250 µA	1.2	-	2	
Zero gate voltage drain current	I_{DSS}	V_{DS}=30 V, V_{GS}=0 V, T_j=25 °C	-	0.1	1	µA
		V_{DS}=30 V, V_{GS}=0 V, T_j=125 °C	-	10	100	
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=0 V	-	10	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=4.5 V, I_D=30 A	-	5.2	6.5	mΩ
		V_{GS}=10 V, I_D=30 A	-	3.8	4.5	
Gate resistance	R_G		0.4	0.8	1.6	Ω
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=30 A	39	78	-	S

[2)] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

[3)] See figure 3 for more detailed information

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Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=15 V, f=1 MHz	-	780	1100	pF
Output capacitance	C_{oss}		-	290	400	
Reverse transfer capacitance	C_{rss}		-	32	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=15 V, V_{GS}=10 V, I_D=30 A, $R_{G,ext}$=1.6 Ω	-	1.8	-	ns
Rise time	t_r		-	3.4	-	
Turn-off delay time	$t_{d(off)}$		-	12	-	
Fall time	t_f		-	2.4	-	
Gate Charge Characteristics[5)]						
Gate to source charge	Q_{gs}	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 4.5 V	-	2.2	3	nC
Gate charge at threshold	$Q_{g(th)}$		-	1.3	-	
Gate to drain charge	Q_{gd}		-	1.4	2	
Switching charge	Q_{sw}		-	2.4	-	
Gate charge total	Q_g		-	5.3	7	
Gate plateau voltage	$V_{plateau}$		-	2.8	-	V
Gate charge total	Q_g	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 10 V	-	11	15	nC
Gate charge total, sync. FET	$Q_{g(sync)}$	V_{DS}=0.1 V, V_{GS}=0 to 4.5 V	-	4.5	-	
Output charge	Q_{oss}	V_{DD}=15 V, V_{GS}=0 V	-	7.6	10	
Reverse Diode						
Diode continuous forward current	I_S	T_C=25 °C	-	-	36	A
Diode pulse current	$I_{S,pulse}$		-	-	200	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=30 A, T_j=25 °C	-	0.9		V
Reverse recovery charge	Q_{rr}	V_R=15 V, I_F=I_S, di_F/dt =400 A/µs	-	5	-	nC

[4)] See figure 13 for more detailed information
[5)] See figure 16 for gate charge parameter definition

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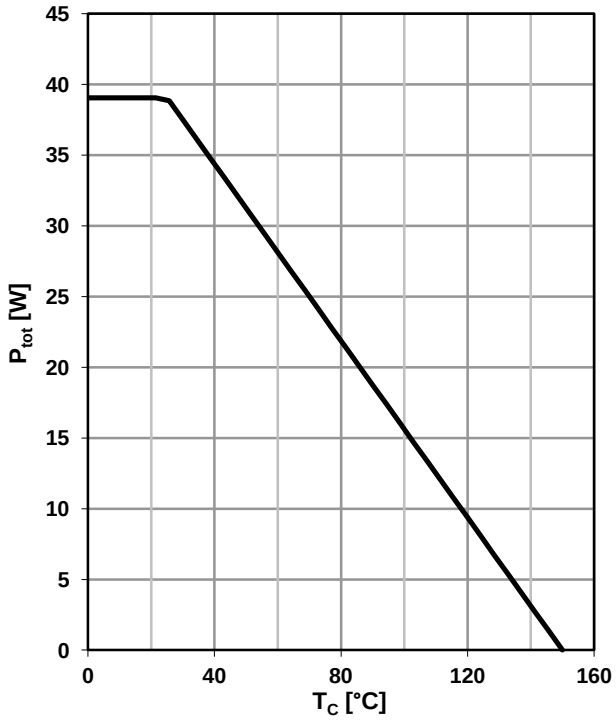
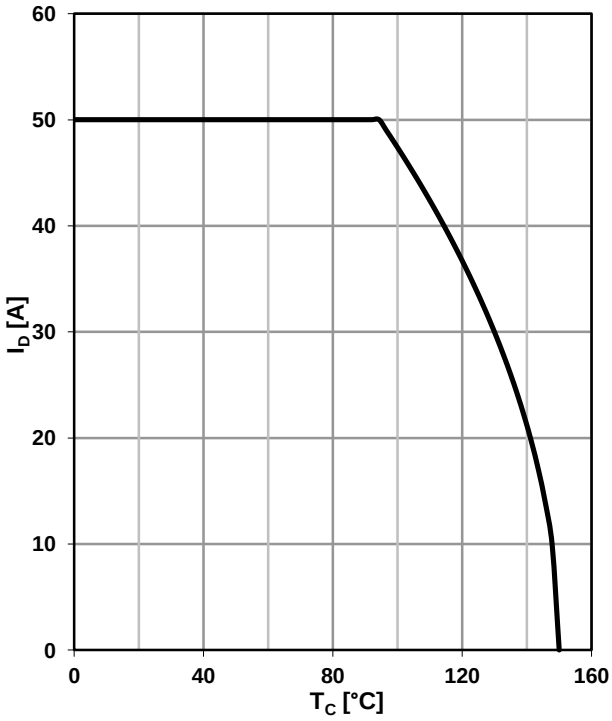
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

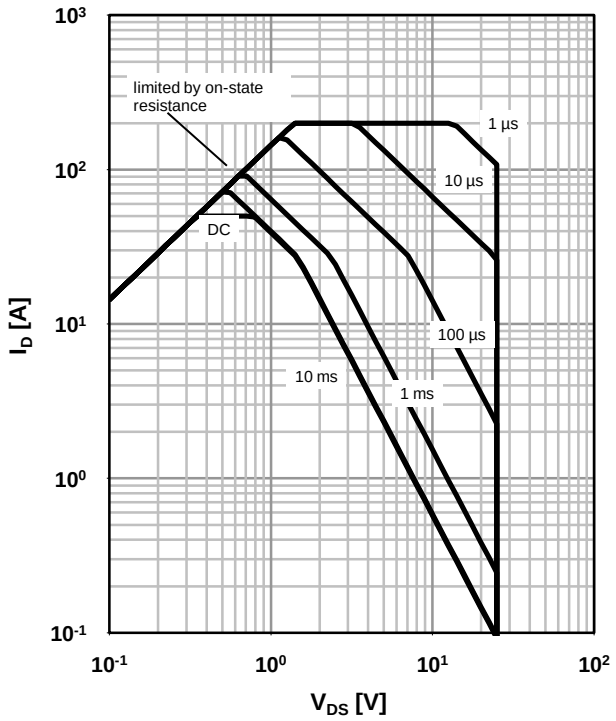
$I_D=f(T_C)$; $V_{GS}\geq 10$ V



3 Safe operating area

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

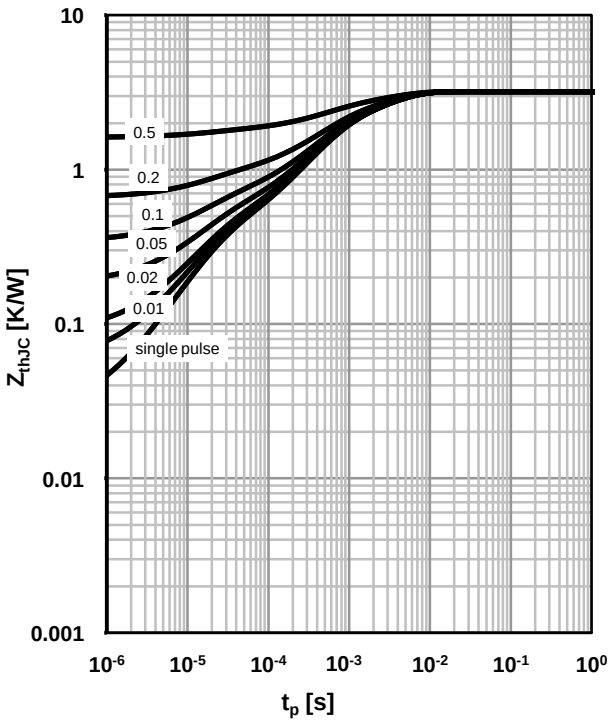
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

parameter: $D=t_p/T$



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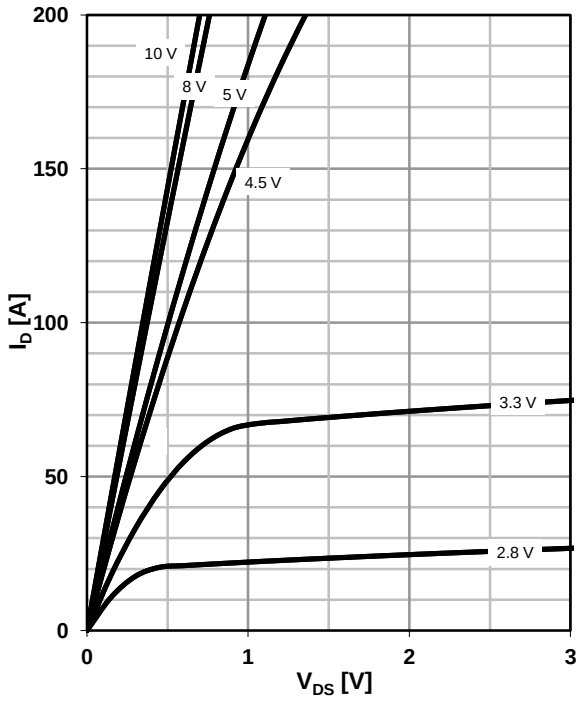
5 Typ. output characteristics

$I_D=f(V_{DS})$; $T_j=25$ °C

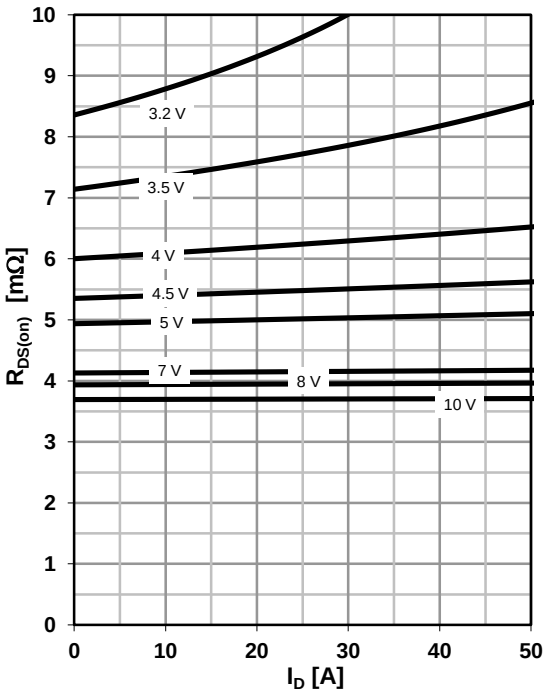
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$; $T_j=25$ °C

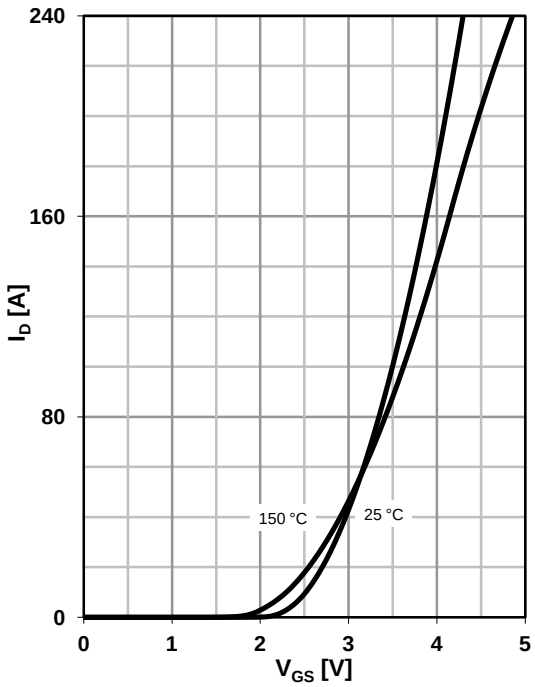
parameter: V_{GS}



7 Typ. transfer characteristics

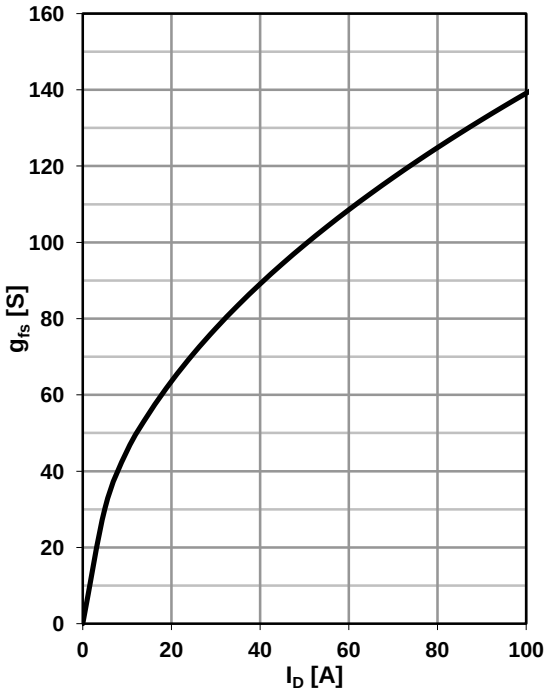
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: T_j



8 Typ. forward transconductance

$g_{fs}=f(I_D)$; $T_j=25$ °C



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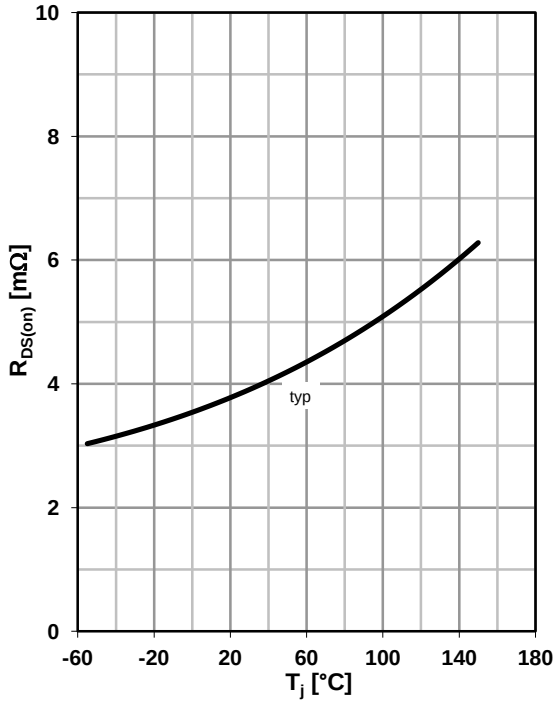
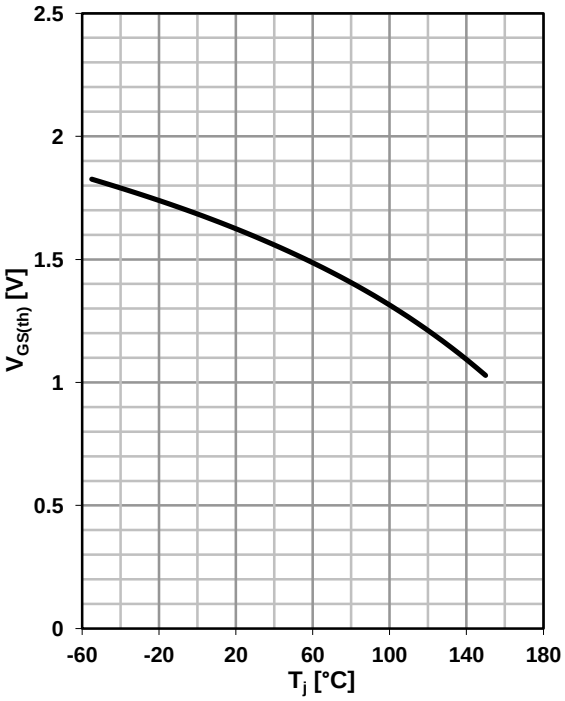
9 Drain-source on-state resistance

$R_{DS(on)}$=f(T_j); I_D=30 A; V_{GS}=10 V



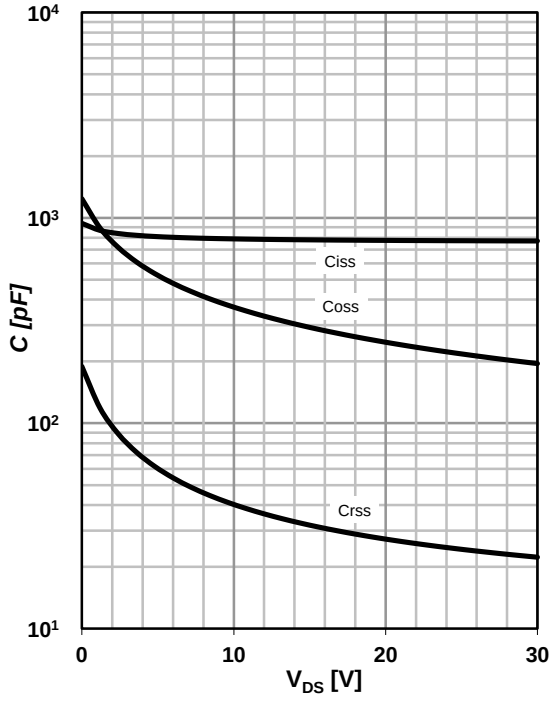
10 Typ. gate threshold voltage

$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; I_D=250 µA



11 Typ. capacitances

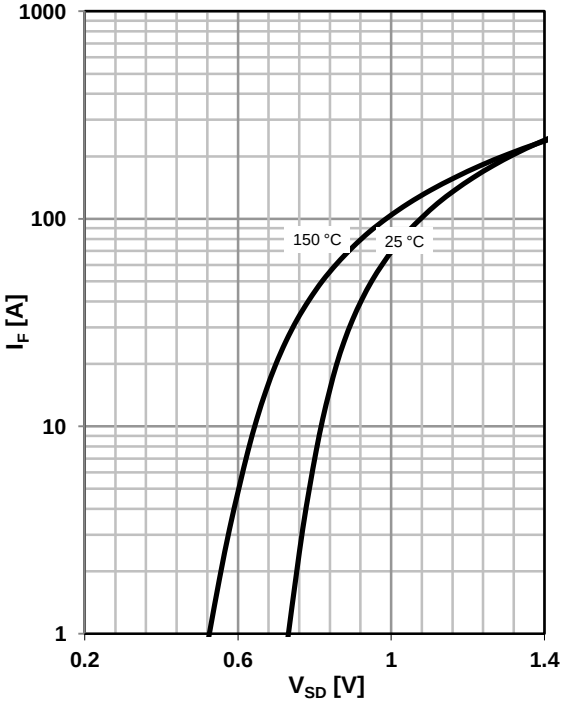
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz



12 Forward characteristics of reverse diode

I_F=f(V_{SD})

parameter: T_j



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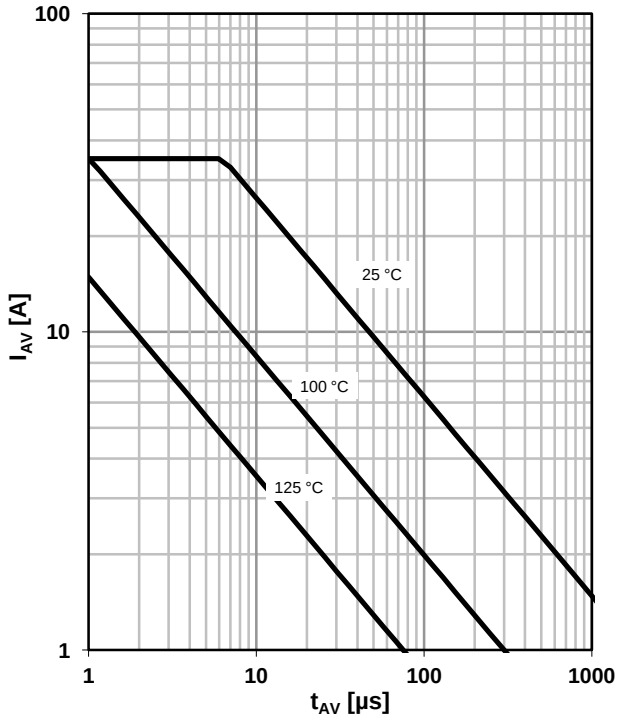
13 Avalanche characteristics

I_{AS}=f(t_{AV}); R_{GS}=25 Ω

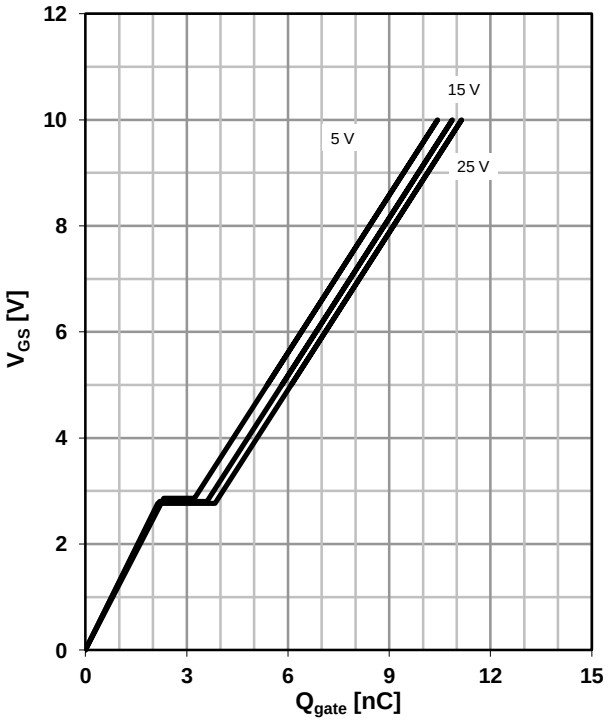
parameter: $T_{j(start)}$



14 Typ. gate charge

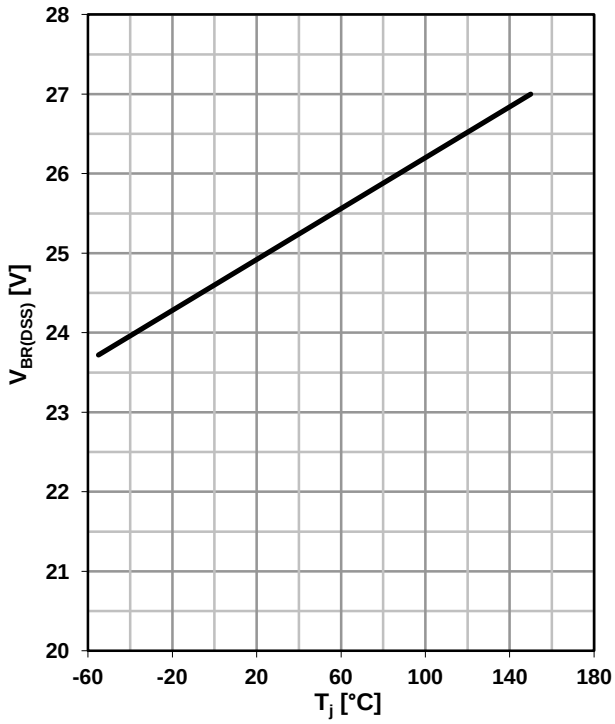
V_{GS}=f(Q_{gate}); I_D=30 A pulsed

parameter: V_{DD}

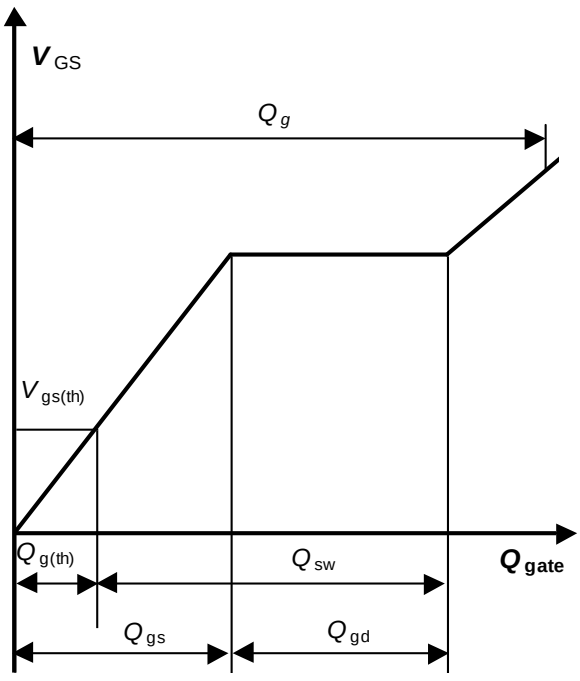


15 Drain-source breakdown voltage

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



16 Gate charge waveforms



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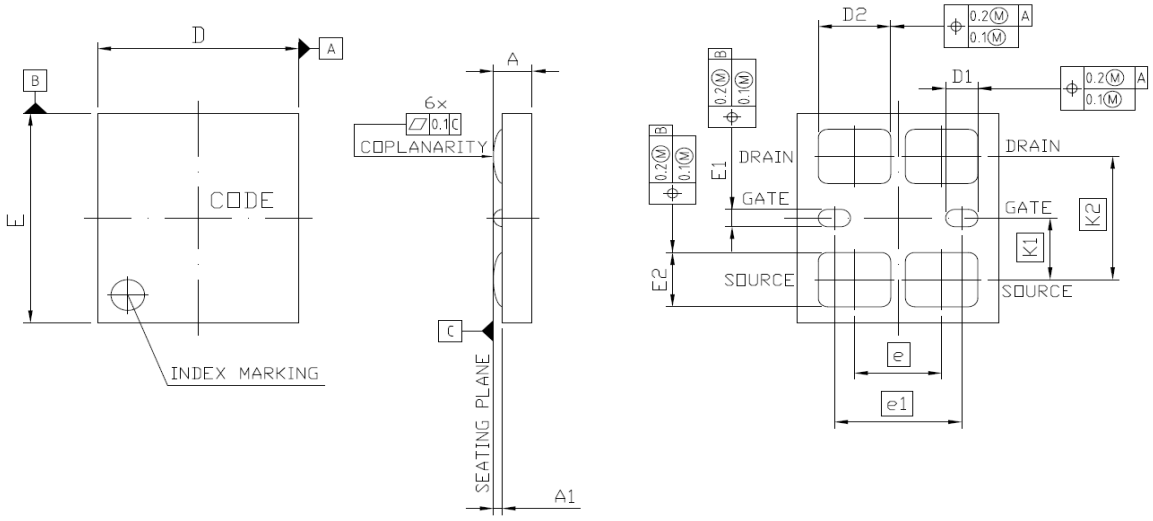
Package Outline **LG-USON-6-1**

LG-USON-6-1: Outline



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	-	0.65	-	0.026
A1	0.08	-	0.003	-
D	2.90	3.10	0.114	0.122
D1	0.38	0.58	0.015	0.023
D2	0.98	1.18	0.039	0.046
e	1.30		0.051	
e1	1.90		0.075	
E	3.30	3.50	0.130	0.138
E1	0.18	0.38	0.007	0.015
E2	0.78	0.98	0.031	0.039
K1	1.00		0.039	
K2	2.00		0.079	

DOCUMENT NO.
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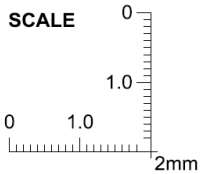
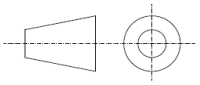
SCALE



EUROPEAN PROJECTION



ISSUE DATE
03.09.2013

REVISION
01

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Infineon Technologies AG
81726 Munich, Germany
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