

# n-Channel Power MOSFET

OptiMOS™  
BSB165N15NZ3 G

## Data Sheet

2.2, 2011-07-20  
Final

Industrial & Multimarket

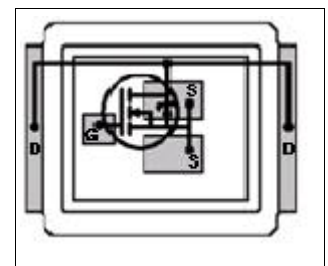
## 1 Description

OptiMOS™150V products are class leading power MOSFETs for highest power density and energy efficient solutions. Ultra low gate- and output charges together with lowest on state resistance in small footprint packages make OptiMOS™ 150V the best choice for the demanding requirements of voltage regulator solutions in Solar, Drives, Datacom and Telecom applications. Super fast switching Control FETs together with low EMI Sync FETs provide solutions that are easy to design in. OptiMOS™ products are available in high performance packages to tackle your most challenging applications giving full flexibility in optimizing space, efficiency and cost.



### Features

- Optimized for high switching frequency DC/DC converter
- Very low on-resistance  $R_{DS(on)}$
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Double sided cooling
- Compatible with DirectFET® package MZ footprint and outline
- Low parasitic inductance
- Low profile (<0.7 mm)



### Applications

- Synchronous rectification
- Primary side switches
- Power management for high performance computing
- High power density point of load converters



**Table 1 Key Performance Parameters**

Parameter	Value	Unit	Related Links
$V_{DS}$	150	V	<a href="#">IFX OptiMOS webpage</a> <a href="#">IFX OptiMOS product brief</a> <a href="#">IFX OptiMOS spice models</a> <a href="#">IFX Design tools</a>
$R_{DS(on),max}$	16.5	mΩ	
$I_D$	45	A	
$Q_{OSS}$	68	nC	
$Q_{g,typ}$	26		

Type	Package	Marking
BSB165N15NZ3 G	MG-WDSO-2	0115

## 2 Maximum ratings

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

**Table 2 Maximum ratings**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	$I_D$	-	-	45	A	$V_{GS}=10\text{ V}, T_C=25\text{ °C}$
		-	-	29		$V_{GS}=10\text{ V}, T_C=100\text{ °C}$
		-	-	9		$V_{GS}=10\text{ V}, T_A=25\text{ °C}, R_{thJA}=45\text{ K/W}^{1)}$
Pulsed drain current <sup>2)</sup>	$I_{D,pulse}$	-	-	180		$T_C=25\text{ °C}$
Avalanche energy, single pulse	$E_{AS}$	-	-	440	mJ	$I_D=30\text{ A}, R_{GS}=25\text{ }\Omega$
Gate source voltage	$V_{GS}$	-20	-	20	V	
Power dissipation	$P_{tot}$	-	-	78	W	$T_C=25\text{ °C}$
		-	-	2.8		$T_A=25\text{ °C}, R_{thJA}=45\text{ K/W}^{1)}$
Operating and storage temperature	$T_j, T_{stg}$	-40	-	150	°C	
IEC climatic category; DIN IEC 68-1		55/150/56				

1) Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70µm thick) copper area for drain connection. PCB is vertical in still air.

2) See figure 3 for more detailed information

## 3 Thermal characteristics

**Table 3 Thermal characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	$R_{thJC}$	-	-	1.6	K/W	top
		-	1	-		bottom
Device on PCB	$R_{thJA}$	-	-	45		6 cm <sup>2</sup> cooling area <sup>1)</sup>

1) Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70µ, thick) copper area for drain connecton. PCB is vertical in still air.

## 4 Electrical characteristics

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

**Table 4 Static characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	150	-	-	V	$V_{GS}=0\text{ V}$ , $I_D=1.0\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	2	3	4		$V_{DS}=V_{GS}$ , $I_D=110\text{ }\mu\text{A}$
Zero gate voltage drain current	$I_{DSS}$	-	0.1	10	$\mu\text{A}$	$V_{DS}=120\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_J=25\text{ °C}$
		-	10	100		$V_{DS}=120\text{ V}$ , $V_{GS}=0\text{ V}$ , $T_J=125\text{ °C}$
Gate-source leakage current	$I_{GSS}$	-	10	100	nA	$V_{GS}=20\text{ V}$ , $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	13.1	16.5	m $\Omega$	$V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$
		-	14	17.9		$V_{GS}=8\text{ V}$ , $I_D=15\text{ A}$
Gate resistance	$R_G$	-	0.7	-	$\Omega$	
Transconductance	$g_{fs}$	24	48	-	S	$ V_{DS}  > 2 I_D R_{DS(on)max}$ , $I_D=30\text{ A}$

**Table 5 Dynamic characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	$C_{iss}$	-	2100	2800	pF	$V_{GS}=0\text{ V}$ , $V_{DS}=75\text{ V}$ , $f=1\text{ MHz}$
Output capacitance	$C_{oss}$	-	240	320		
Reverse transfer capacitance	$C_{riss}$	-	5	-		
Turn-on delay time	$t_{d(on)}$	-	10	-	ns	$V_{DD}=75\text{ V}$ , $V_{GS}=10\text{ V}$ , $I_D=30\text{ A}$ , $R_G=1.6\text{ }\Omega$
Rise time	$t_r$	-	10	-		
Turn-off delay time	$t_{d(off)}$	-	17	-		
Fall time	$t_f$	-	7	-		

**Table 6 Gate charge characteristics<sup>1)</sup>**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	$Q_{gs}$	-	11	-	nC	$V_{DD}=75\text{ V}$ , $I_D=30\text{ A}$ , $V_{GS}=0\text{ to }10\text{ V}$
Gate to drain charge	$Q_{gd}$	-	4	-		
Switching charge	$Q_{sw}$	-	12	-		
Gate charge total	$Q_g$	-	26	35		
Gate plateau voltage	$V_{plateau}$	-	5.2	-	V	
Output charge	$Q_{oss}$	-	68	90		$V_{DD}=75\text{ V}$ , $V_{GS}=0\text{ V}$

1) See figure 16 for gate charge parameter definition

**Table 7 Reverse diode characteristics**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continuous forward current	$I_s$	-	-	45	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{S,pulse}$	-	-	180		
Diode forward voltage	$V_{SD}$	-	0.9	1.2	V	$V_{GS}=0\text{ V}$ , $I_F=45\text{ A}$ , $T_j=25\text{ °C}$
Reverse recovery time	$t_{rr}$	-	110	-	ns	$V_R=75\text{ V}$ , $I_F=30\text{ A}$ ,
Reverse recovery charge	$Q_{rr}$	-	337	-	nC	$di_F/dt=100\text{ A}/\mu\text{s}$

## 5 Electrical characteristics diagrams

Table 8

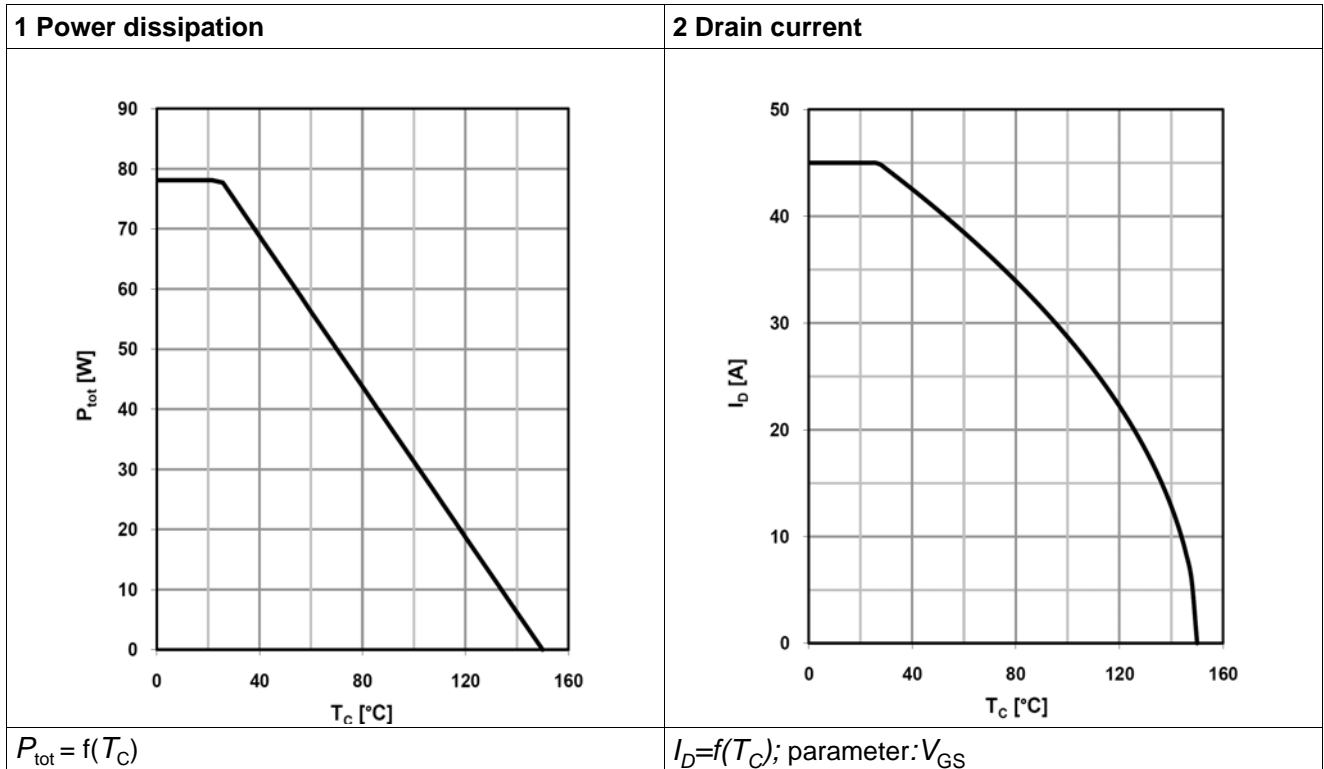


Table 9

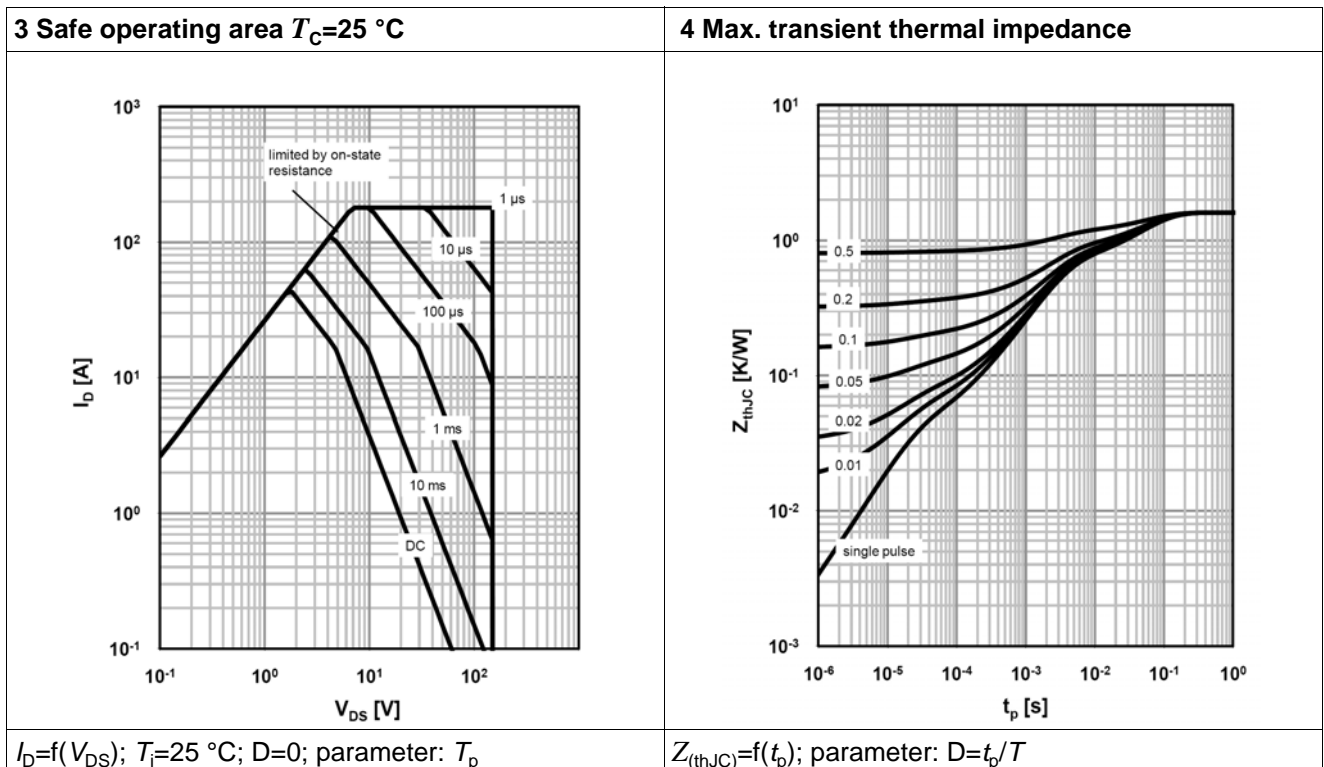




Table 10

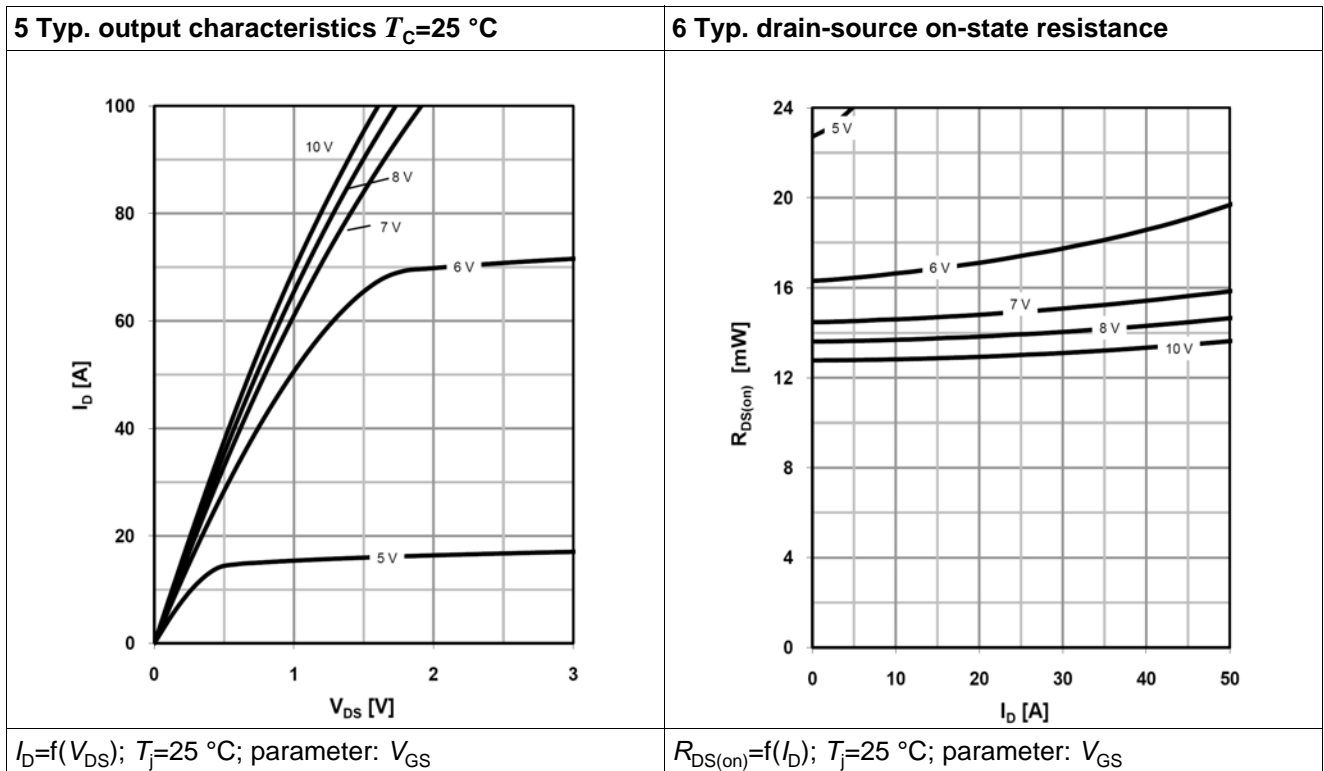


Table 11

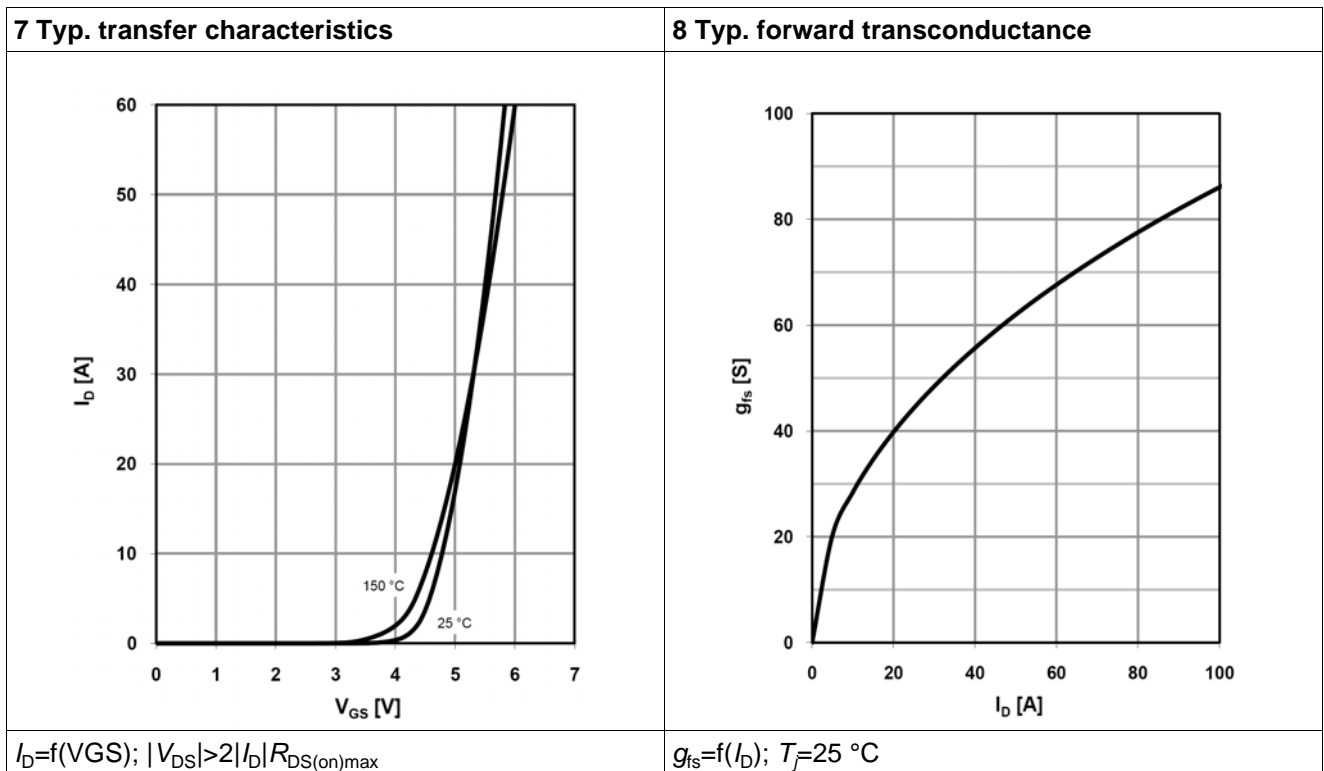


Table 12

<p><b>9 Drain-source on-state resistance</b></p> <p><math>R_{DS(on)}=f(T_j)</math>; <math>I_D=30\text{ A}</math>; <math>V_{GS}=10\text{ V}</math></p>	<p><b>10 Typ. gate threshold voltage</b></p> <p><math>V_{GS(th)}=f(T_j)</math>; <math>V_{GS}=V_{DS}</math>; <math>I_D=250\text{ µA}</math></p>
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Table 13

<p><b>11 Typ. capacitances</b></p> <p><math>C=f(V_{DS})</math>; <math>V_{GS}=0\text{ V}</math>; <math>f=1\text{ MHz}</math></p>	<p><b>12 Forward characteristics of reverse diode</b></p> <p><math>I_F=f(V_{SD})</math>; parameter: <math>T_j</math></p>
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Table 14

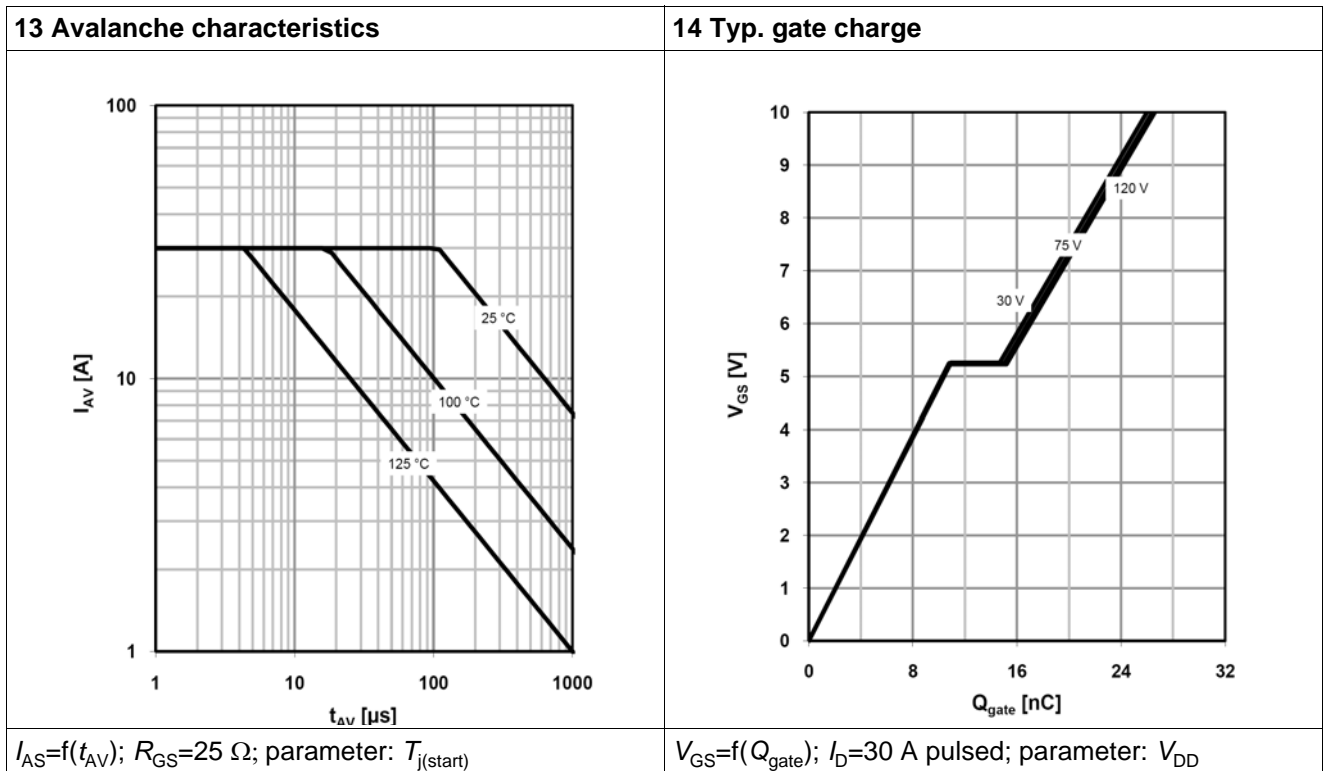
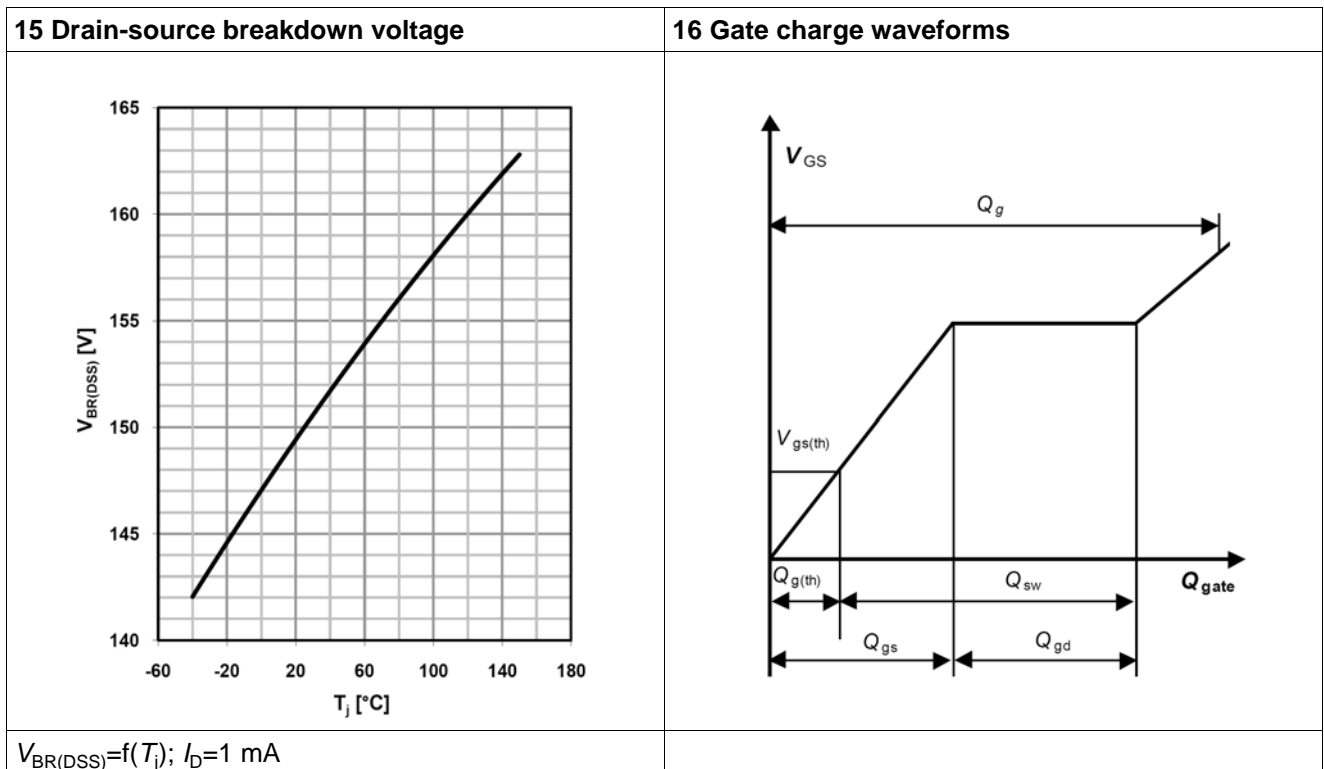


Table 15



## 6 Package outlines

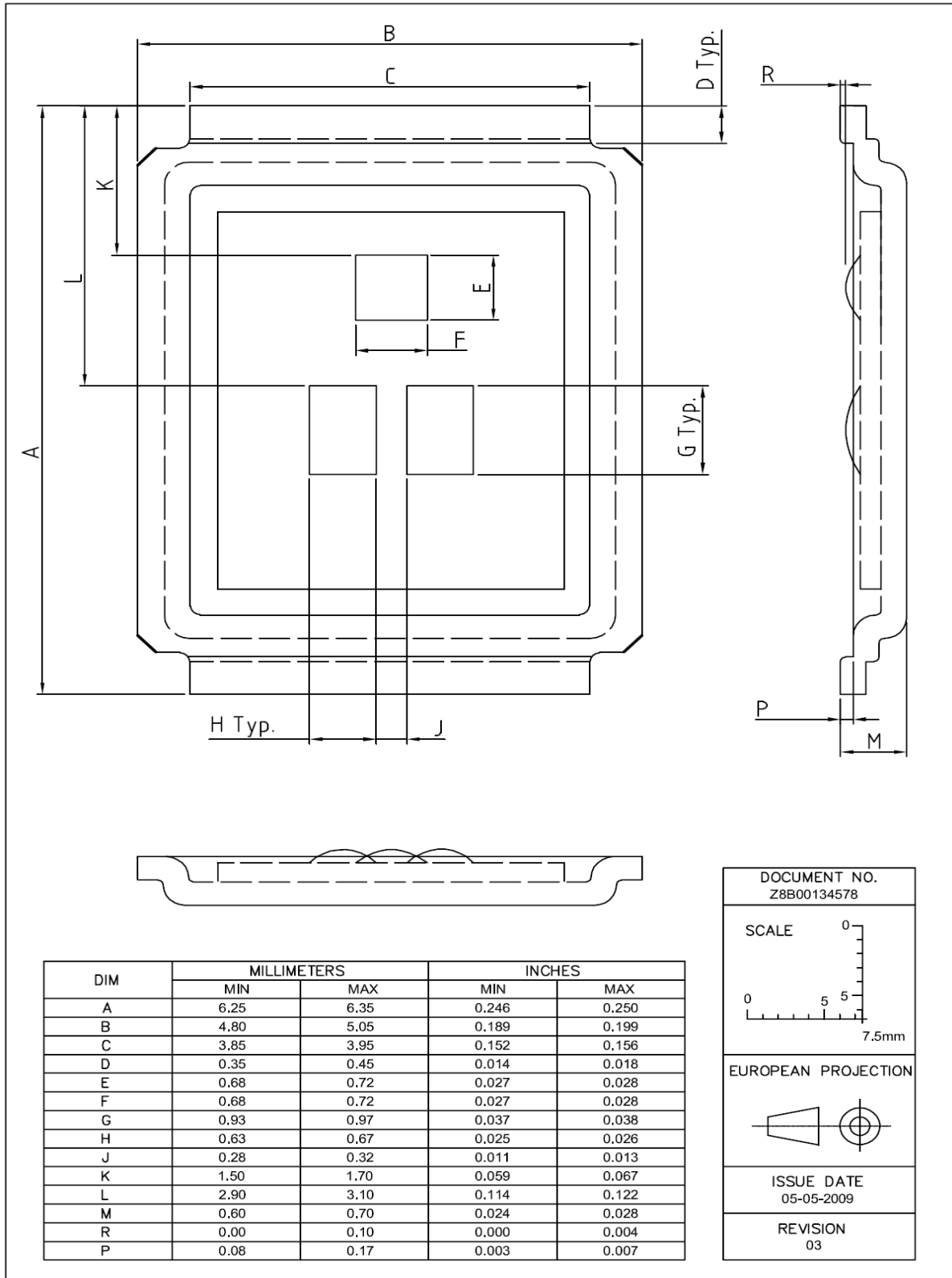


Figure 1 Outlines MG-WDSO-2, dimensions in mm/inches

7 Package outlines

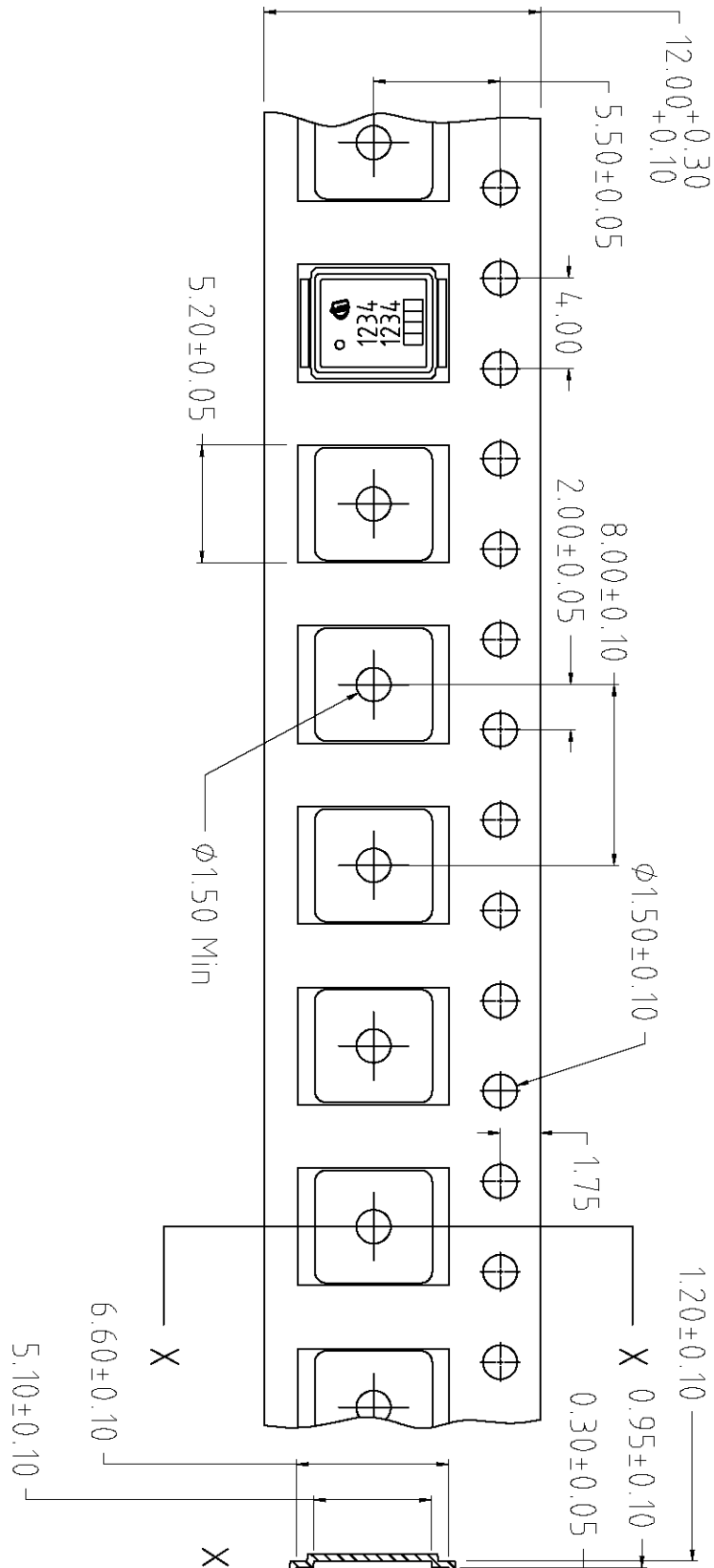


Figure 2 Outlines MG-WDSOIN-2, dimensions in mm/inches

## 8 Package outlines

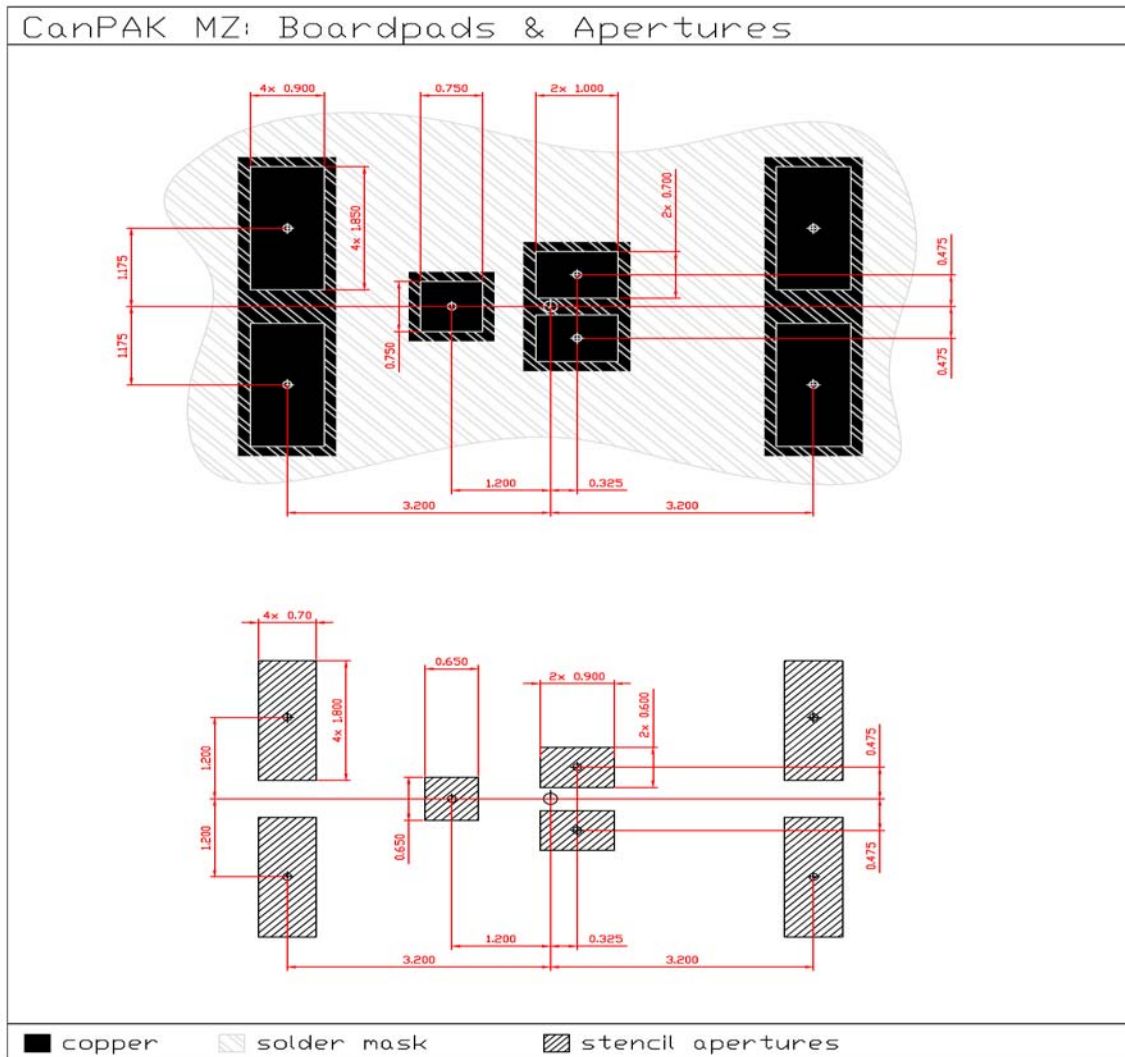
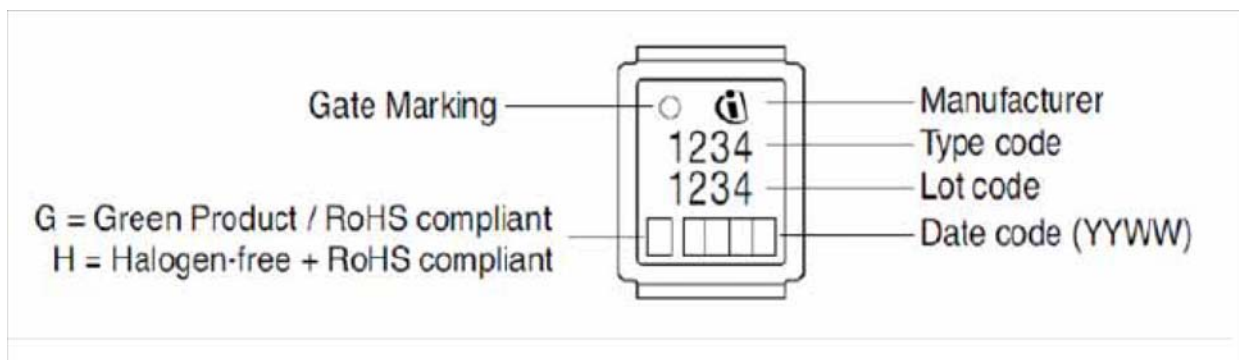


Figure 3 Outlines MG-WDSO-2, dimensions in mm/inches

## 9 Marking layout



## 9 Revision History

Revision History: 2011-07-20, 2.1

Previous Revision:

Revision	Subjects (major changes since last revision)
0.1	Release of target data sheet
2.0	Release Final version
2.2	Insert Marking layout

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Edition 2011-07-20

Published by

Infineon Technologies AG

81726 Munich, Germany

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#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.