Never stop thinking

p-Channel Power MOSFET

OptiMOS™ P3
BSB027P03LX3 G

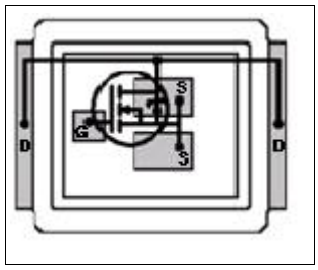
Data Sheet

1.9, 2011-03-02
Preliminary

Industrial & Multimarket

1 Description





OptiMOS™ P3 -30V products are class leading power P-Channel MOSFETs for highest power density and energy efficient solutions. Lowest on state resistance in small footprint packages make OptiMOS™ P3 -30V the best choice for the demanding requirements of load switch, high-side switch and battery management applications. OptiMOS™ P3 products are available in high performance packages to tackle your most challenging applications giving full flexibility in optimizing space, efficiency and cost.

Features

- **P-Channel MOSFET**
- Very low on-resistance $R_{DS(on)}$
- Qualified for consumer level application
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Double sided cooling
- Compatible with DirectFET® package MX footprint and outline[1)]
- 100% avalanche tested
- Low parasitic inductance
- Low profile (<0.7 mm)

Applications

- load switch
- high-side switch
- battery management

Table 1 Key Performance Parameters

Parameter	Value	Unit		Related Links
V_{DS}	-30	V		IFX OptiMOS webpage
$R_{DS(on),max}$	2.7	mΩ		IFX OptiMOS product brief
I_D	142	A		IFX OptiMOS spice models
Q_{OSS}	108	nC		IFX Design tools
$Q_{g\cdot typ}$	75			

Type	Package	Marking
BSB027P03LX3 G	MG-WDSON-2	5003

1) DirectFET ® is a trademark of International Rectifier Corporation. BSB027P03LX3 GG uses DirectFET ® technology licensed from International Rectifier Corporation

2 Maximum ratings

at T_j = 25 °C, unless otherwise specified.

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	-	-	142	A	V_{GS}=10 V, T_C=25 °C
				90		V_{GS}=10 V, T_C=100 °C
				27		V_{GS}=10 V, T_A=25 °C, R_{thJA}=45 K/W)[1]
Pulsed drain current[2]	$I_{D,pulse}$	-	-	400		T_C=25 °C
Avalanche current, single pulse[3]	I_{AS}			40		T_C=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	290	mJ	I_D=40 A,R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	
Power dissipation	P_{tot}	-	-	78	W	T_C=25 °C
				2.8		T_A=25 °C, R_{thJA}=45[1] K/W
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 6cm2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air

2) See figure 3 for more detailed information

3) See figure 13 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}	-	1.0	-	°K/W	bottom
		-	-	1.6		top
Device on PCB	R_{thJA}	-	-	45		6 cm^2 cooling area[1]

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

4 Electrical characteristics

Electrical characteristics, at T_j=25 °C, unless otherwise specified.

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	-1	-1.5	-2		V_{DS}=V_{GS}, I_D=250 µA
Zero gate voltage drain current	I_{DSS}	-	0.1	10	µA	V_{DS}=30V, V_{GS}=0 V, T_j=25 °C
		-	10	100		V_{DS}=30 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	10	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	3.4	4.2	mΩ	V_{GS}=4.5 V, I_D=25A
			2.3	2.7		V_{GS}=10 V, I_D=30A
Gate resistance	R_G	-	2.5	-	Ω	
Transconductance	g_{fs}	55	110		S	|V_{DS}|>2|$I_{D\|RDS(on)max}$, I_D=30 A

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	13000	17000	pF	V_{GS}=0 V, V_{DS}=15 V, f=1 MHz
Output capacitance	C_{oss}	-	5800	7700		
Reverse transfer capacitance	C_{rss}	-	380	570		
Turn-on delay time	$t_{d(on)}$	-	27	41	ns	V_{DD}=15V, V_{GS}=10 V, I_D=30 A, R_G= 1.6 Ω
Rise time	t_r	-	11	17		
Turn-off delay time	$t_{d(off)}$	-	80	120		
Fall time	t_f	-	14	21		

Table 6 Gate charge characteristics[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	33	44	nC	V_{DD}=15 V, I_D=30 A, V_{GS}=0 to 4.5 V
Gate charge at threshold	$Q_{g(th)}$		19	25		
Gate to drain charge	Q_{gd}	-	17	28		
Switching charge	Q_{sw}	-	31	47		
Gate charge total	Q_g		75	100		
Gate plateau voltage	$V_{plateau}$	-	2.8	-	V	
Gate charge total	Q_g		158	210	nC	V_{DD}=15 V, I_D=30A,V_{GS}=0 to10V
Gate charge total, sync. FET	$Q_{g(sync)}$		65	86		V_{DS}=0.1V, V_{GS}=0 to 4.5V
Output charge	Q_{oss}		108	143		V_{DD}=15 V, V_{GS}=0 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			78	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$			310		
Diode forward voltage	V_{SD}	-	0.8	1.0	V	V_{GS}=0 V, I_F=30 A, T_j=25 °C
Reverse recovery charge	Q_{rr}	-	119	149	nC	V_R=15V, I_F=I_S, di_F/dt=400 A/µs

5 Electrical characteristics diagrams

Table 8

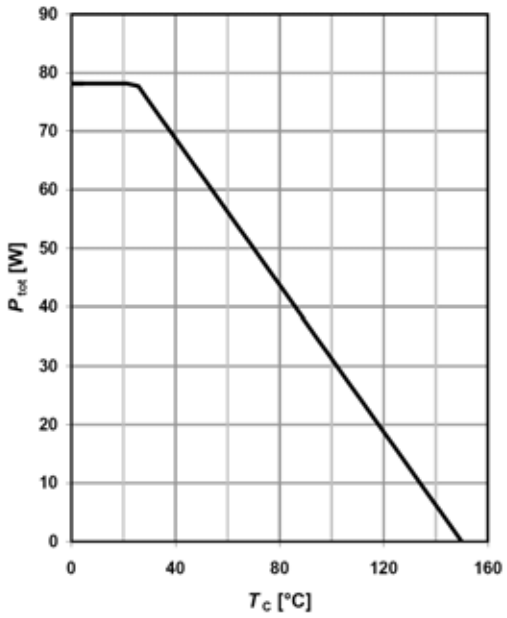
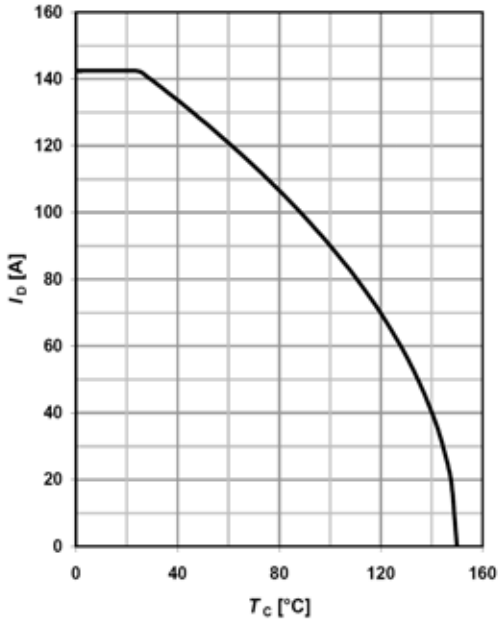
1 Power dissipation	2 Drain current
	
P_{tot} = f(T_C)	I_D=$f(T_C)$; parameter:V_{GS}

Table 9

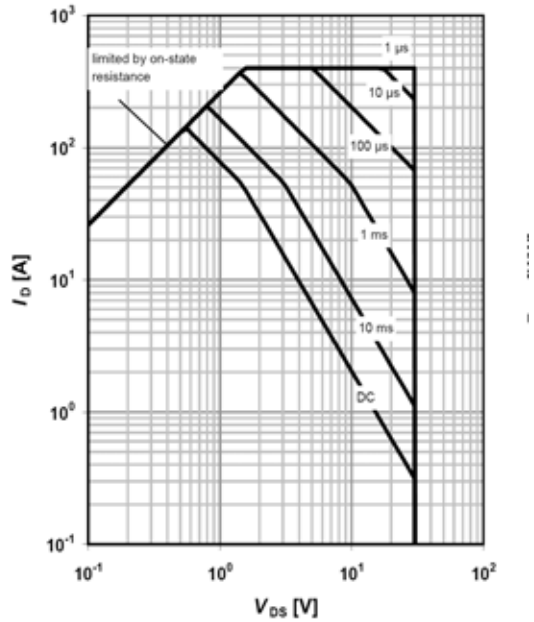
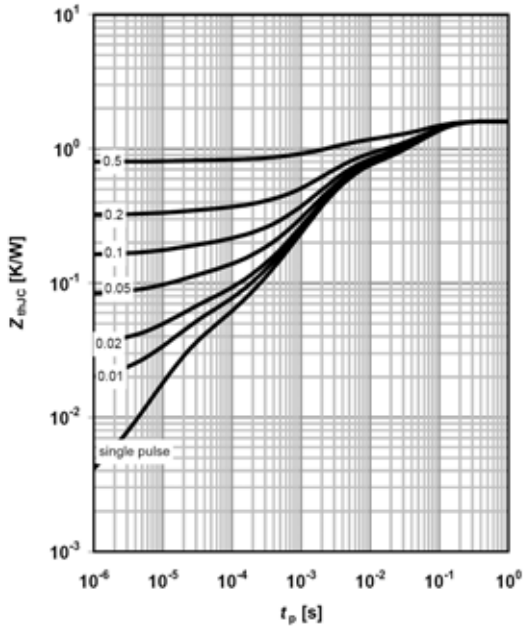
3 Safe operating area T_C=25 °C	4 Max. transient thermal impedance
	
I_D=f(V_{DS}); T_j=25 °C; D=0; parameter: T_p	$Z_{(thJC)}$=f(t_p); parameter: D=t_p/T

Table 10

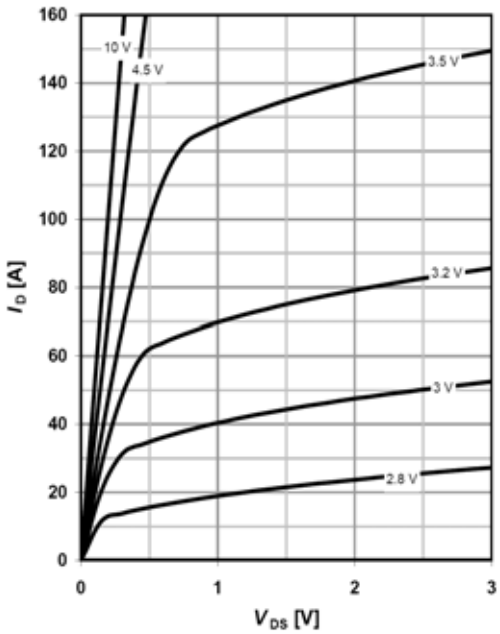
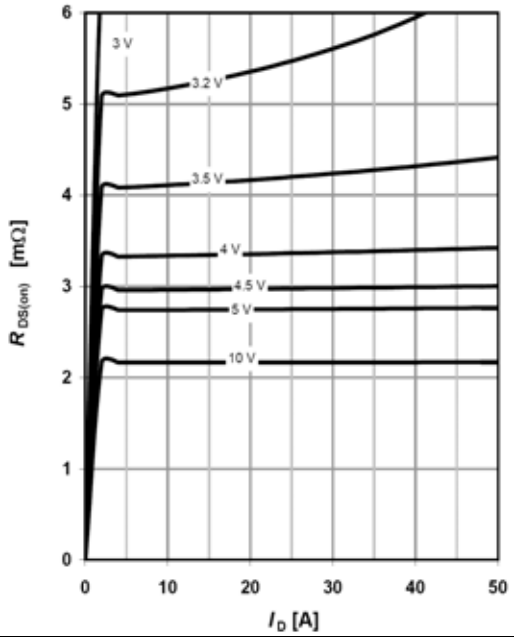
5 Typ. output characteristics T_C=25 °C	6 Typ. drain-source on-state resistance
	
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}	$R_{DS(on)}$=f(I_D); T_j=25 °C; parameter: V_{GS}

Table 11

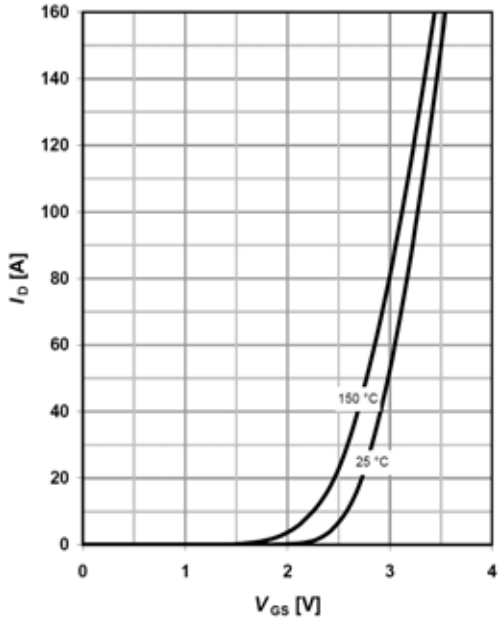
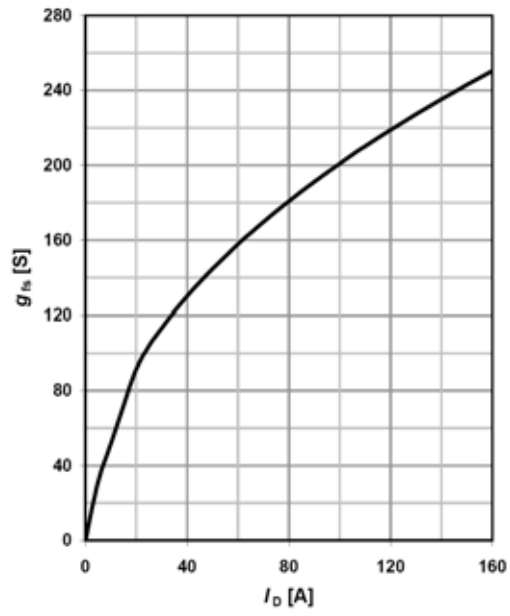
7 Typ. transfer characteristics	8 Typ. forward transconductance
	
I_D=f(VGS); |V_{DS}|>2|I_D|$R_{DS(on)max}$	g_{fs}=f(I_D); T_j=25 °C

Table 12

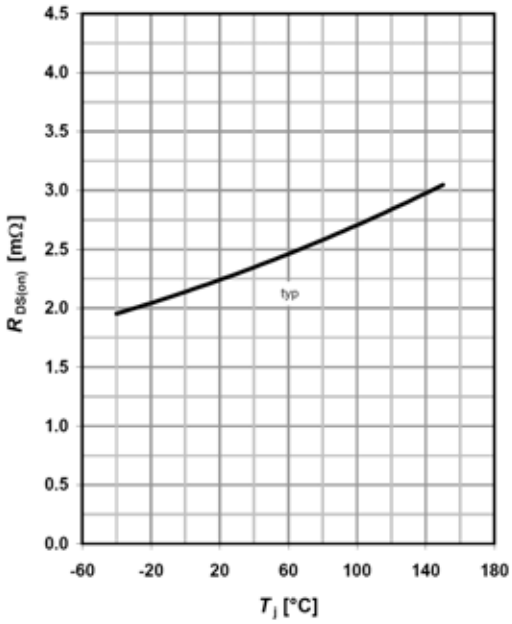
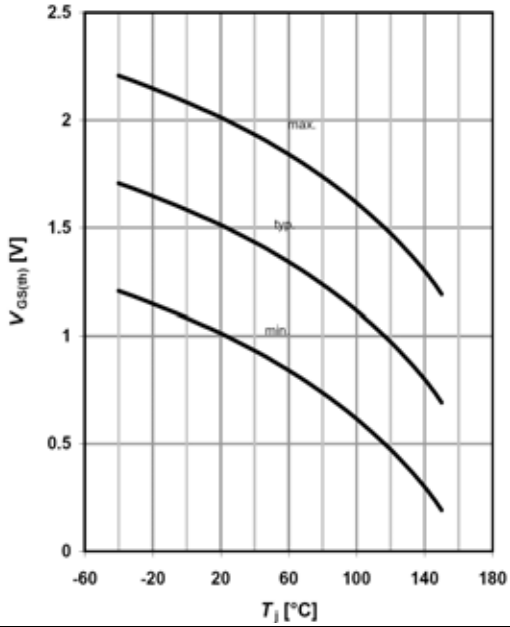
9 Drain-source on-state resistance	10 Typ. gate threshold voltage
	
$R_{DS(on)}$=f(T_j); I_D=30 A; V_{GS}=10 V	$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS};I_D=250µA

Table 13

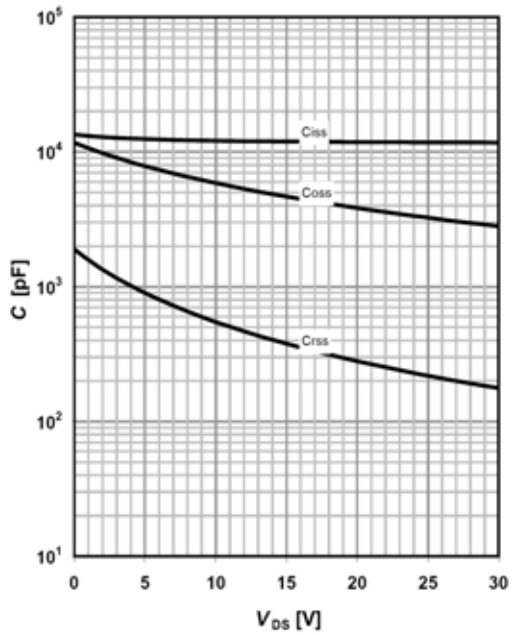
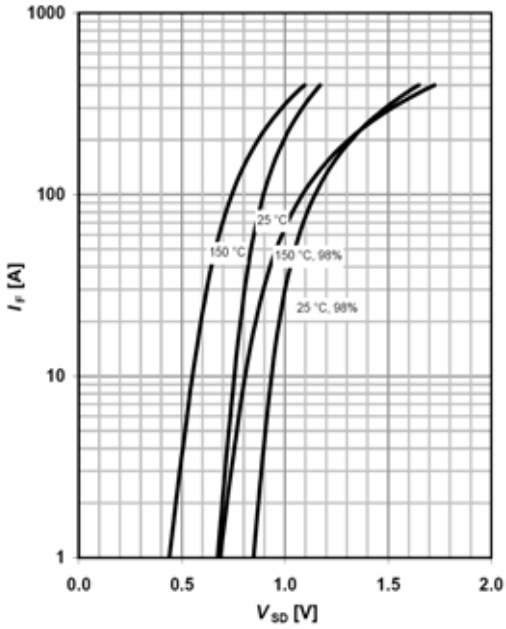
11 Typ. capacitances	12 Forward characteristics of reverse diode
	
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz	I_F=f(V_{SD}); parameter: T_j

Table 14

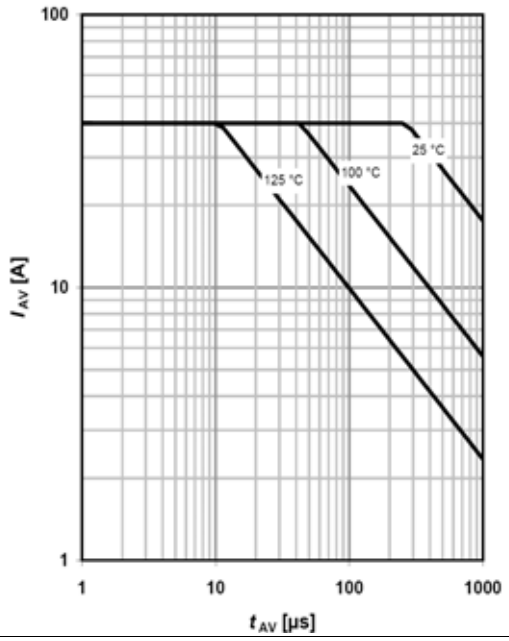
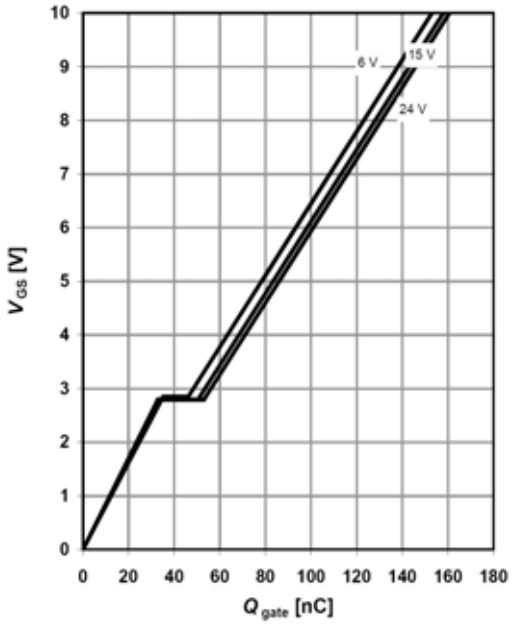
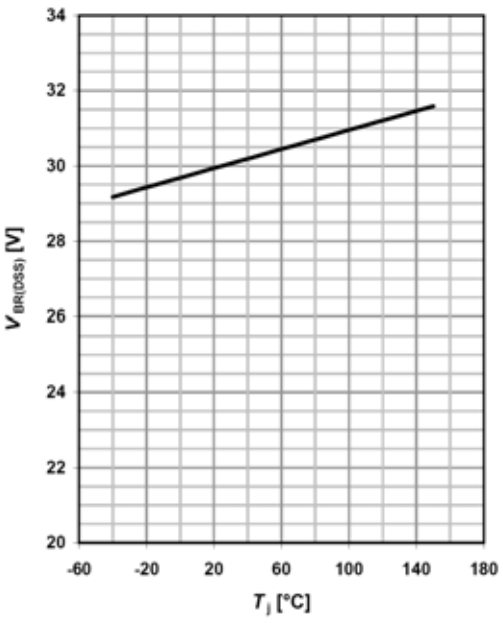
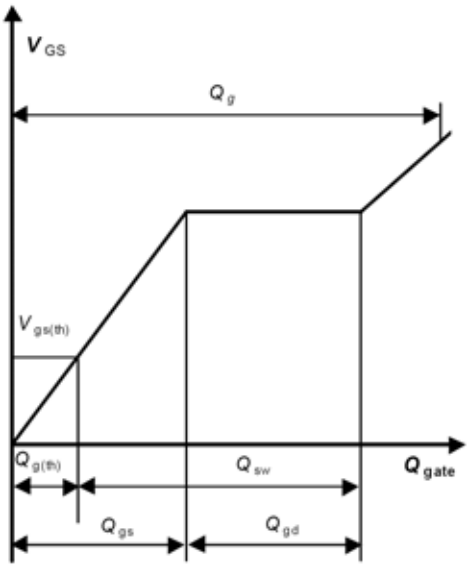
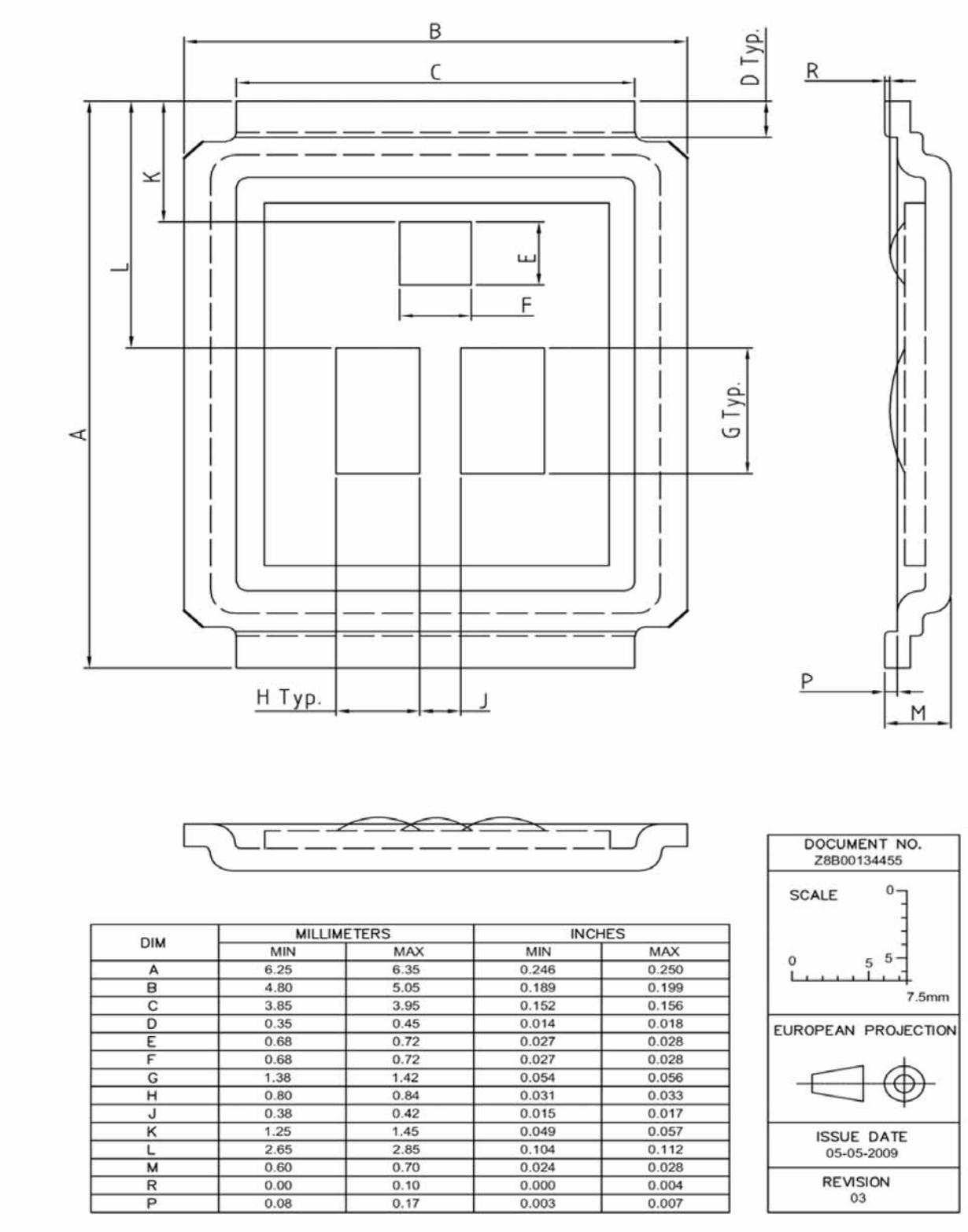
13 Avalanche characteristics	14 Typ. gate charge
	
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$	V_{GS}=f(Q_{gate}); I_D=30 A pulsed; parameter: V_{DD}

Table 15

15 Drain-source breakdown voltage	16 Gate charge waveforms
	
$V_{BR(DSS)}$=f(V_{DS}); I_D=1 mA	

6 Package outlines



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.25	6.35	0.246	0.250
B	4.80	5.05	0.189	0.199
C	3.85	3.95	0.152	0.156
D	0.35	0.45	0.014	0.018
E	0.68	0.72	0.027	0.028
F	0.68	0.72	0.027	0.028
G	1.38	1.42	0.054	0.056
H	0.80	0.84	0.031	0.033
J	0.38	0.42	0.015	0.017
K	1.25	1.45	0.049	0.057
L	2.65	2.85	0.104	0.112
M	0.60	0.70	0.024	0.028
R	0.00	0.10	0.000	0.004
P	0.08	0.17	0.003	0.007

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

7 Package outlines

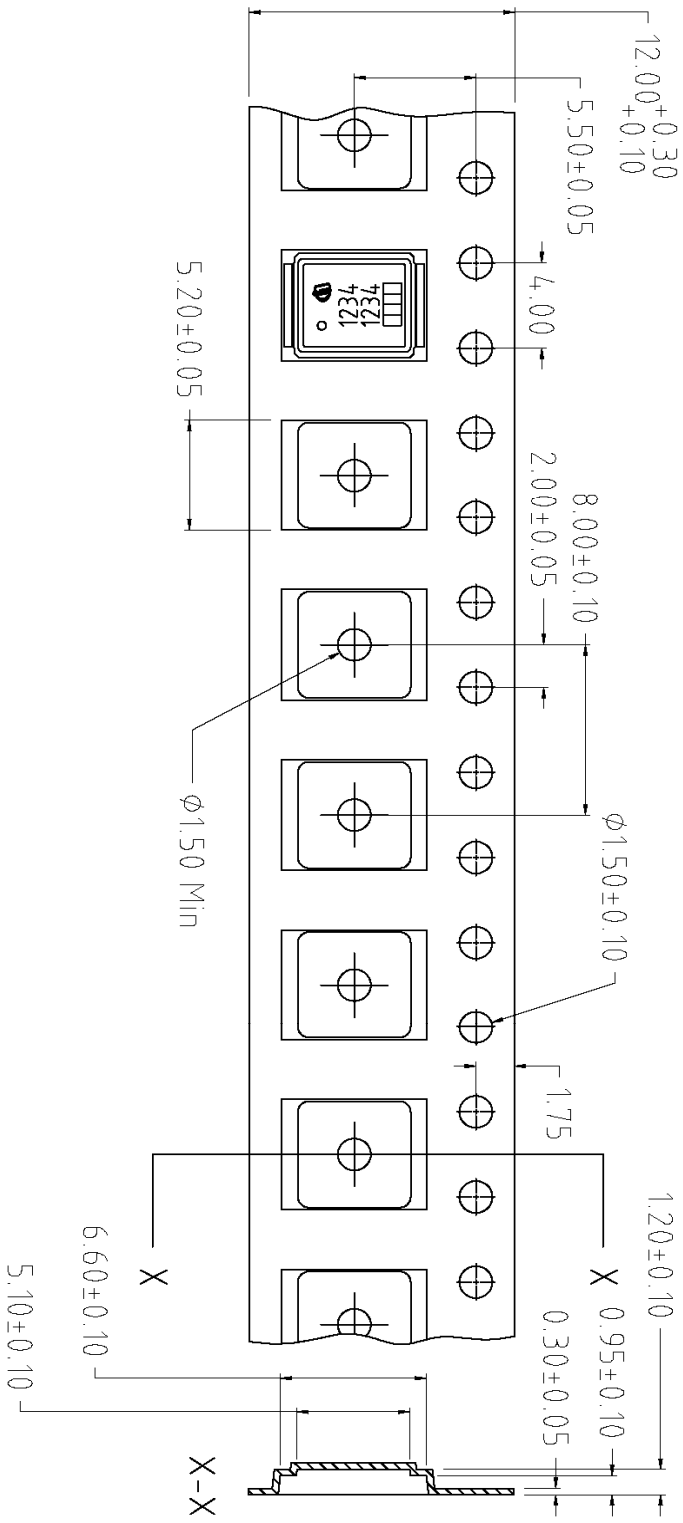
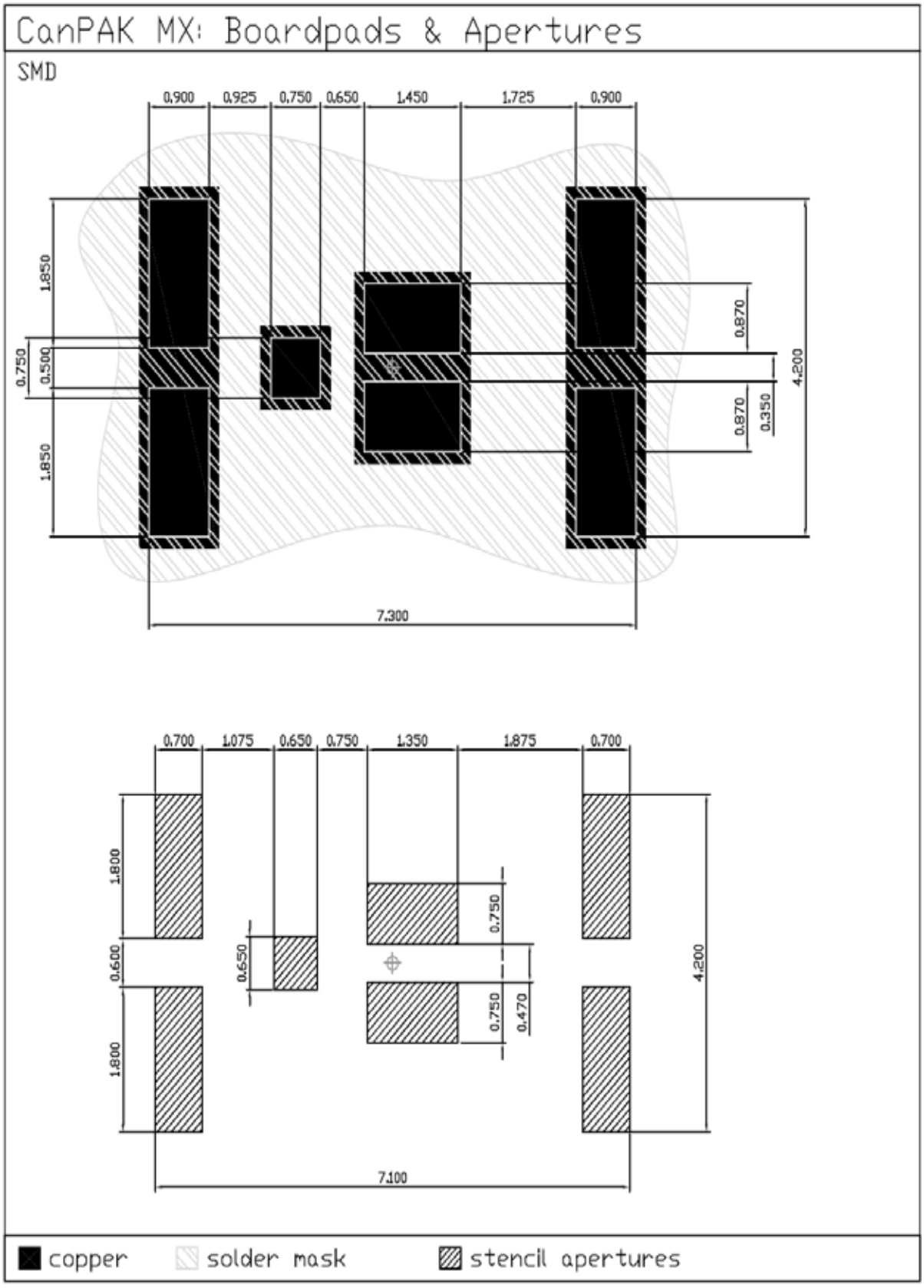


Figure 2 Outlines MG-WDSON-2, dimensions in mm/inches

8 Package outlines



9 Revision History

Revision History: 2011-03-02, 1.9

Previous Revision:

Revision	Subjects (major changes since last revision)
0.1	Release of target data sheet
1.9	Release of preliminary data sheet

We Listen to Your Comments

Any information within this document that you feel is wrong, unclear or missing at all?
Your feedback will help us to continuously improve the quality of this document.
Please send your proposal (including a reference to this document) to: **erratum@infineon.com**



Edition 2011-03-02

Published by
Infineon Technologies AG
81726 Munich, Germany

© 2011 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**).

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.