

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 outline¹⁾
- 100% avalanche tested
- Low parasitic inductance
- Low profile (<0.7 mm)

Applications

- load switch
- high-side switch
- battery management

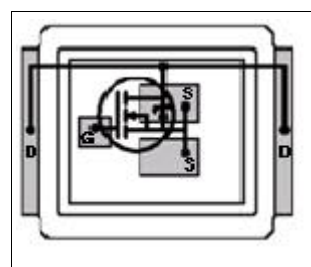


Table 1 Key Performance Parameters

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

Type	Package	Marking
BSB027P03LX3 G	MG-WDSO-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 $T_j = 25\text{ °C}$, unless otherwise specified.

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	-	-	142	A	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$
				90		$V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$
				27		$V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=45\text{ K/W}$ ¹⁾
Pulsed drain current ²⁾	$I_{D,pulse}$	-	-	400		$T_C=25\text{ °C}$
Avalanche current, single pulse ³⁾	I_{AS}			40		$T_C=25\text{ °C}$
Avalanche energy, single pulse	E_{AS}	-	-	290	mJ	$I_D=40\text{ A}$, $R_{GS}=25\text{ }\Omega$
Gate source voltage	V_{GS}	-20	-	20	V	
Power dissipation	P_{tot}	-	-	78	W	$T_C=25\text{ °C}$
				2.8		$T_A=25\text{ °C}$, $R_{thJA}=45$ 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 $T_j=25\text{ °C}$, unless otherwise specified.

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	30	-	-	V	$V_{GS}=0\text{ V}$, $I_D=1\text{ mA}$
Gate threshold voltage	$V_{GS(th)}$	-1	-1.5	-2		$V_{DS}=V_{GS}$, $I_D=250\text{ }\mu\text{A}$
Zero gate voltage drain current	I_{DSS}	-	0.1	10	μA	$V_{DS}=30\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=25\text{ °C}$
		-	10	100		$V_{DS}=30\text{ V}$, $V_{GS}=0\text{ V}$, $T_j=125\text{ °C}$
Gate-source leakage current	I_{GSS}	-	10	100	nA	$V_{GS}=20\text{ V}$, $V_{DS}=0\text{ V}$
Drain-source on-state resistance	$R_{DS(on)}$	-	3.4	4.2	$\text{m}\Omega$	$V_{GS}=4.5\text{ V}$, $I_D=25\text{ A}$
		-	2.3	2.7		$V_{GS}=10\text{ V}$, $I_D=30\text{ A}$
Gate resistance	R_G	-	2.5	-	Ω	
Transconductance	g_{fs}	55	110		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}	-	13000	17000	pF	$V_{GS}=0\text{ V}$, $V_{DS}=15\text{ V}$, $f=1\text{ MHz}$
Output capacitance	C_{oss}	-	5800	7700		
Reverse transfer capacitance	C_{rss}	-	380	570		
Turn-on delay time	$t_{d(on)}$	-	27	41	ns	$V_{DD}=15\text{ V}$, $V_{GS}=10\text{ V}$, $I_D=30\text{ A}$, $R_G=1.6\text{ }\Omega$
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 characteristics¹⁾

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	33	44	nC	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }4.5\text{ V}$
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	$V_{DD}=15\text{ V}$, $I_D=30\text{ A}$, $V_{GS}=0\text{ to }10\text{ V}$
Gate charge total, sync. FET	$Q_{g(sync)}$		65	86		$V_{DS}=0.1\text{ V}$, $V_{GS}=0\text{ to }4.5\text{ V}$
Output charge	Q_{oss}		108	143		$V_{DD}=15\text{ V}$, $V_{GS}=0\text{ V}$

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			78	A	$T_C=25\text{ °C}$
Diode pulse current	$I_{s,pulse}$			310		
Diode forward voltage	V_{SD}	-	0.8	1.0	V	$V_{GS}=0\text{ V}$, $I_F=30\text{ A}$, $T_j=25\text{ °C}$
Reverse recovery charge	Q_{rr}	-	119	149	nC	$V_R=15\text{ V}$, $I_F=I_s$, $di_F/dt=400\text{ A}/\mu\text{s}$

5 Electrical characteristics diagrams

Table 8

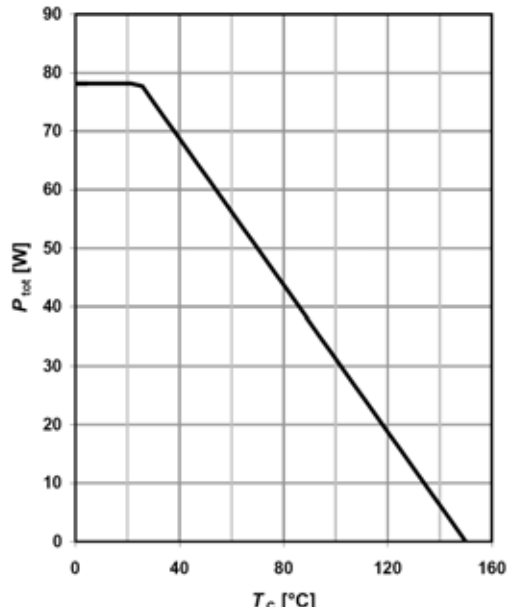
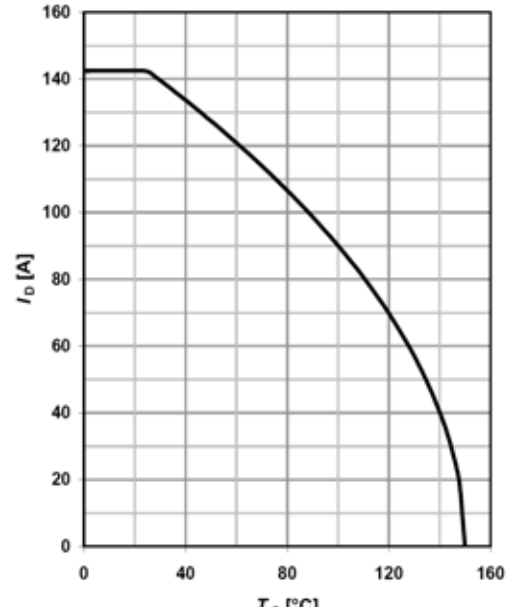
1 Power dissipation	2 Drain current
 $P_{\text{tot}} = f(T_c)$	 $I_D = f(T_c)$; parameter: V_{GS}

Table 9

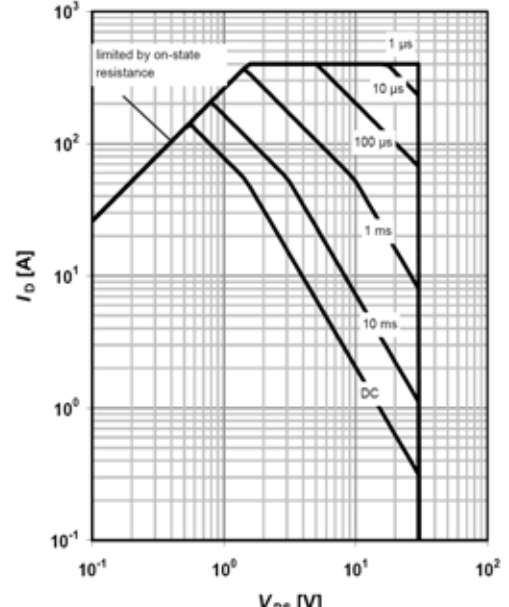
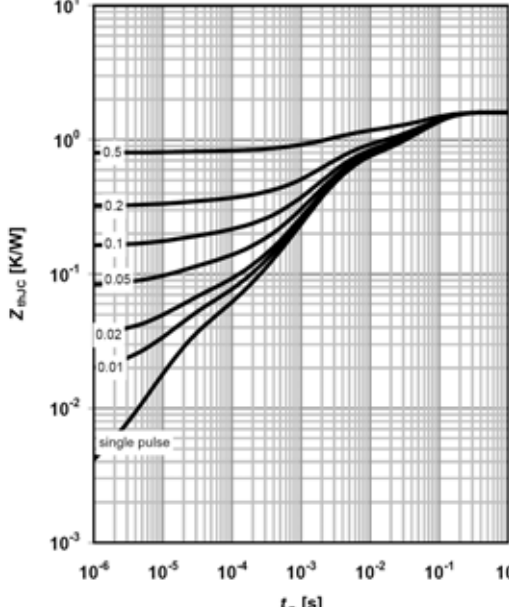
3 Safe operating area $T_c=25^\circ\text{C}$	4 Max. transient thermal impedance
 $I_D = f(V_{DS})$; $T_J = 25^\circ\text{C}$; $D=0$; parameter: T_p	 $Z_{(th)JC} = f(t_p)$; parameter: $D = t_p / T$

Table 10

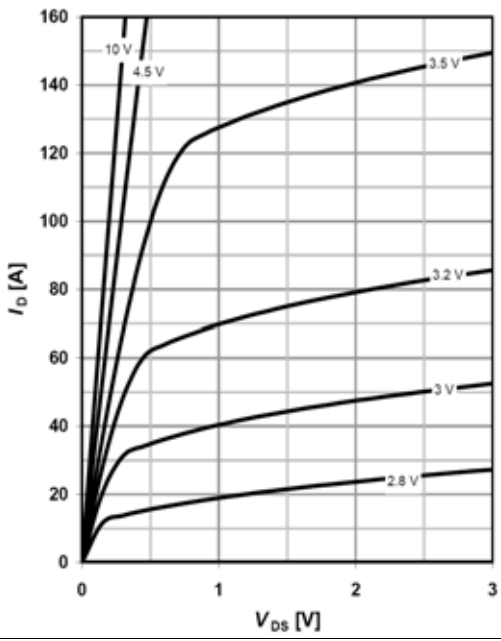
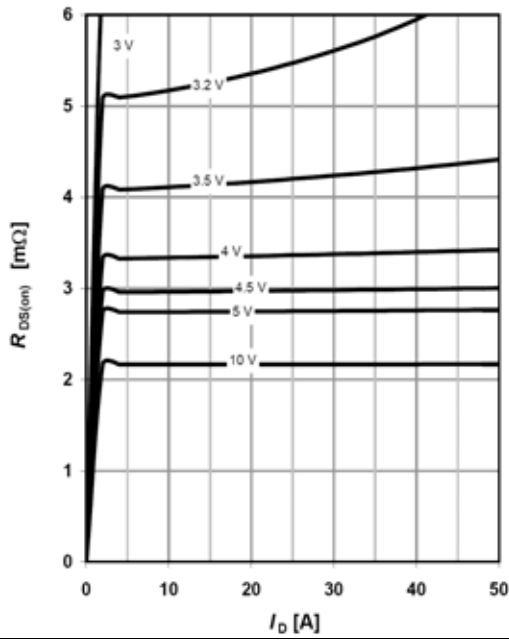
5 Typ. output characteristics $T_c=25\text{ }^{\circ}\text{C}$	6 Typ. drain-source on-state resistance
 $I_D = f(V_{DS}); T_J = 25\text{ }^{\circ}\text{C}; \text{parameter: } V_{GS}$	 $R_{DS(on)} = f(I_D); T_J = 25\text{ }^{\circ}\text{C}; \text{parameter: } V_{GS}$

Table 11

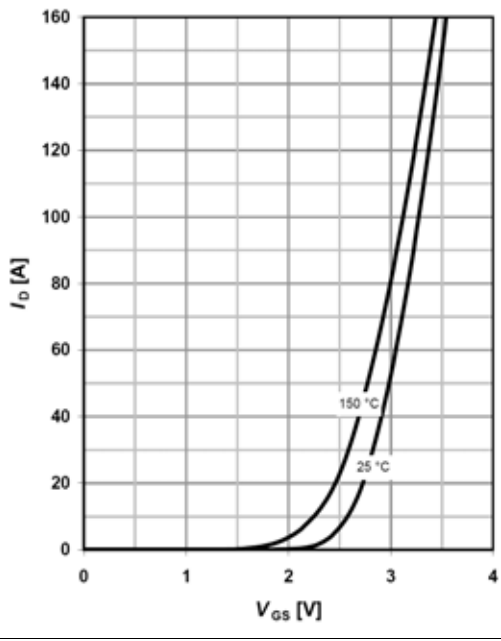
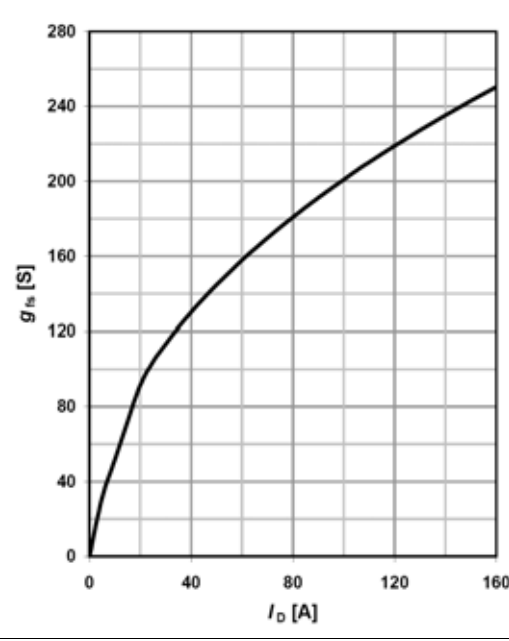
7 Typ. transfer characteristics	8 Typ. forward transconductance
 $I_D = f(V_{GS}); V_{DS} > 2 I_D R_{DS(on)max}$	 $g_{fs} = f(I_D); T_J = 25\text{ }^{\circ}\text{C}$

Table 12

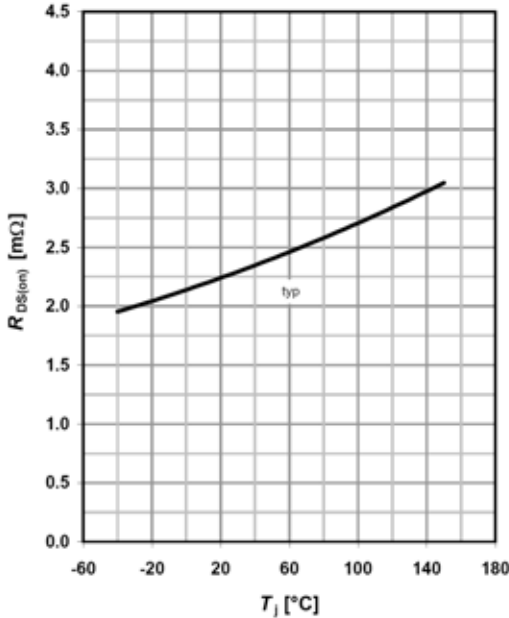
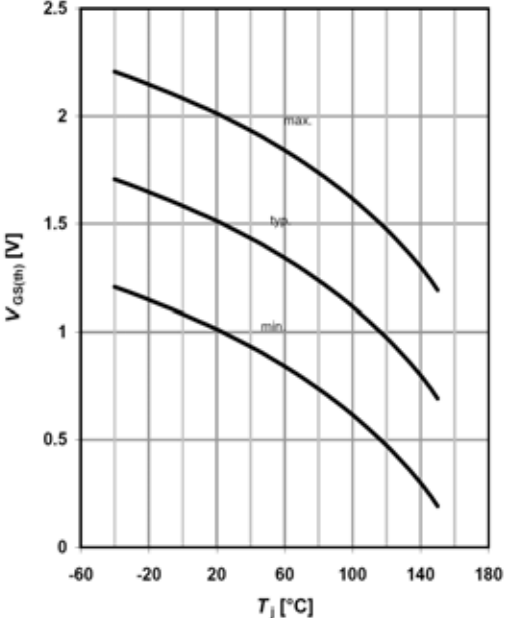
9 Drain-source on-state resistance	10 Typ. gate threshold voltage
	
$R_{DS(on)} = f(T_J); I_D = 30 \text{ A}; V_{GS} = 10 \text{ V}$	$V_{GS(th)} = f(T_J); V_{GS} = V_{DS}; I_D = 250 \mu\text{A}$

Table 13

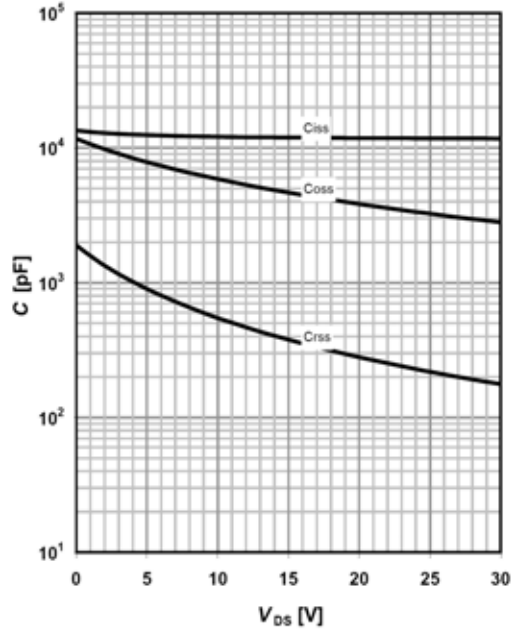
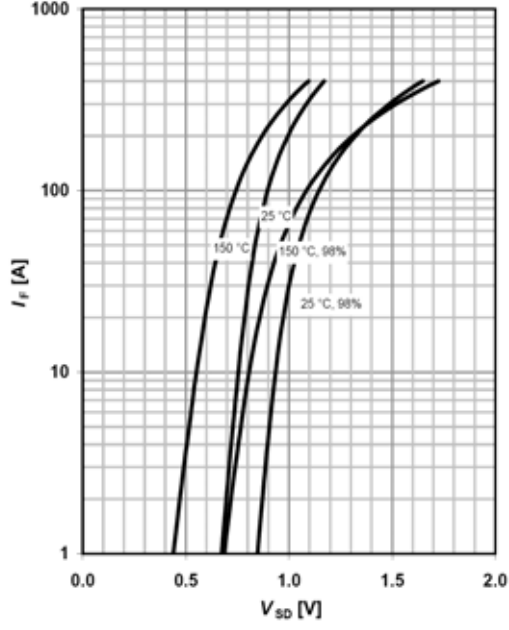
11 Typ. capacitances	12 Forward characteristics of reverse diode
	
$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$	$I_F = f(V_{SD}); \text{parameter: } T_J$

Table 14

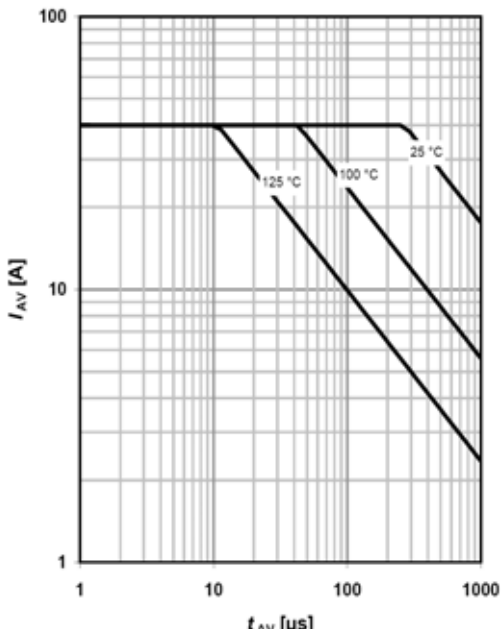
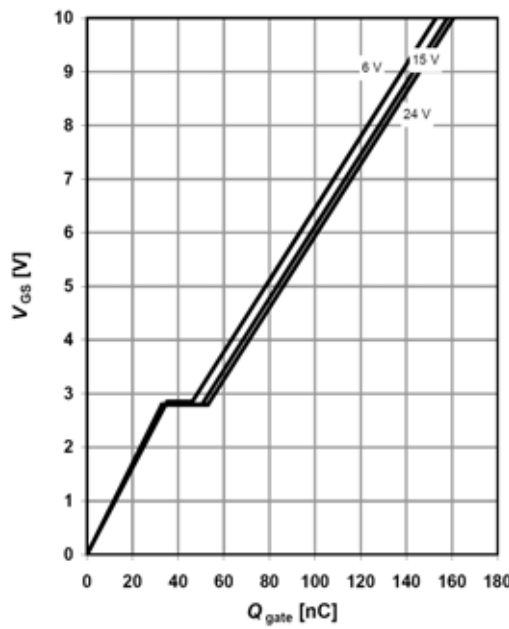
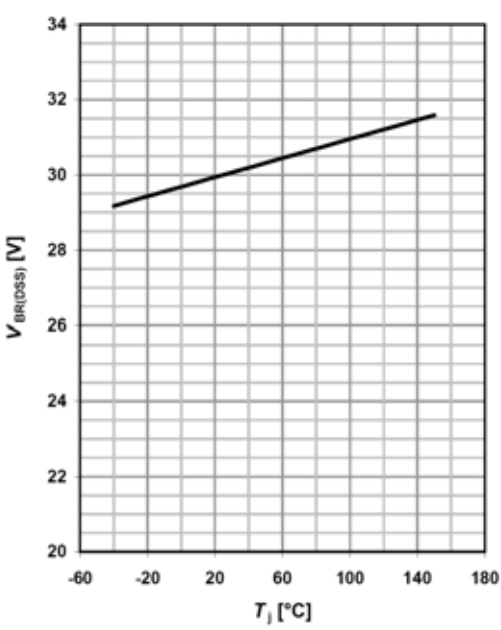
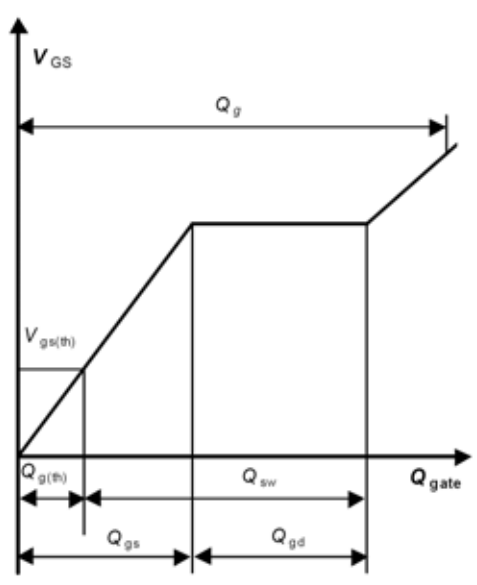
13 Avalanche characteristics	14 Typ. gate charge
	
$I_{AS}=f(t_{AV}); R_{GS}=25\ \Omega; \text{parameter: } T_{j(\text{start})}$	$V_{GS}=f(Q_{\text{gate}}); I_D=30\ \text{A pulsed}; \text{parameter: } V_{DD}$

Table 15

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

6 Package outlines

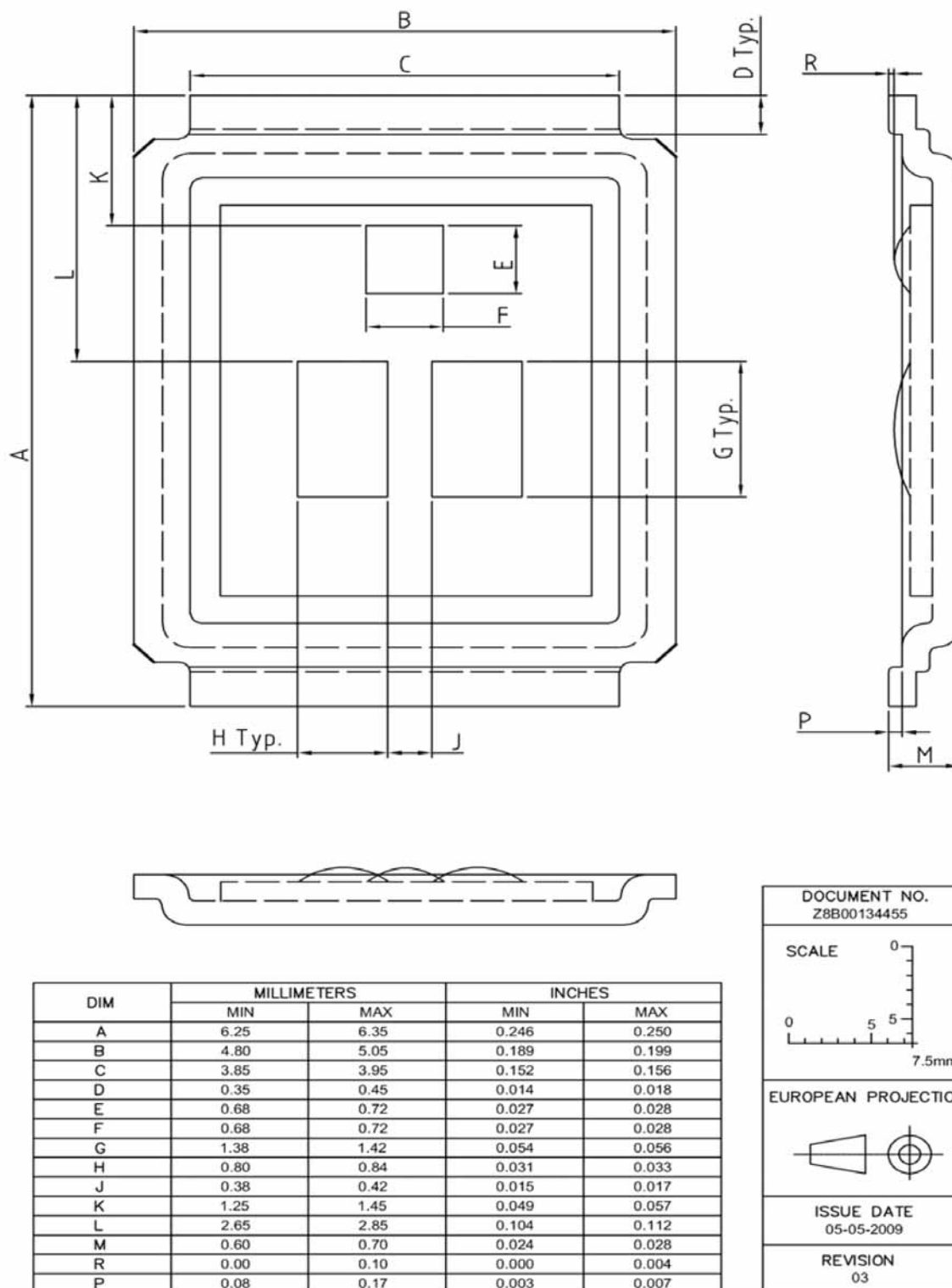


Figure 1 Outlines MG-WDSO-2, dimensions in mm/inches

7 Package outlines

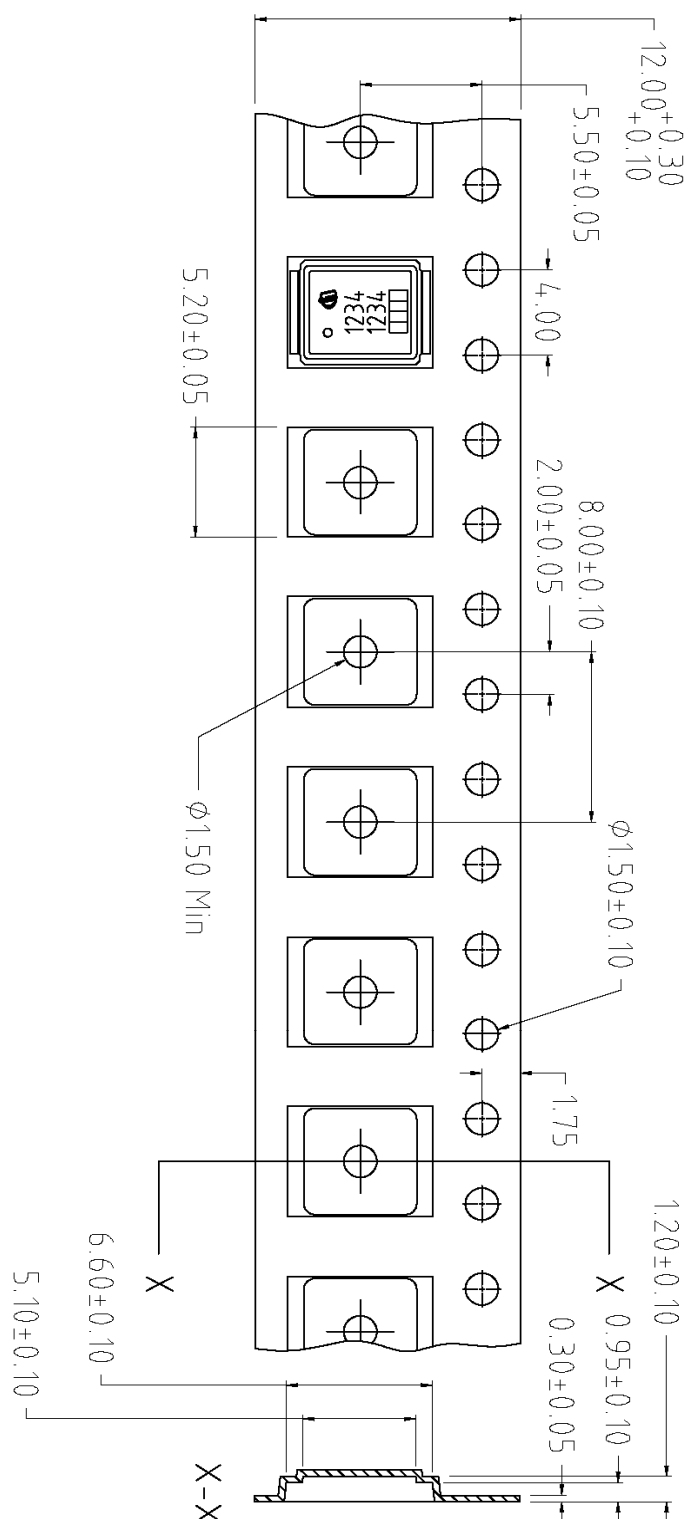
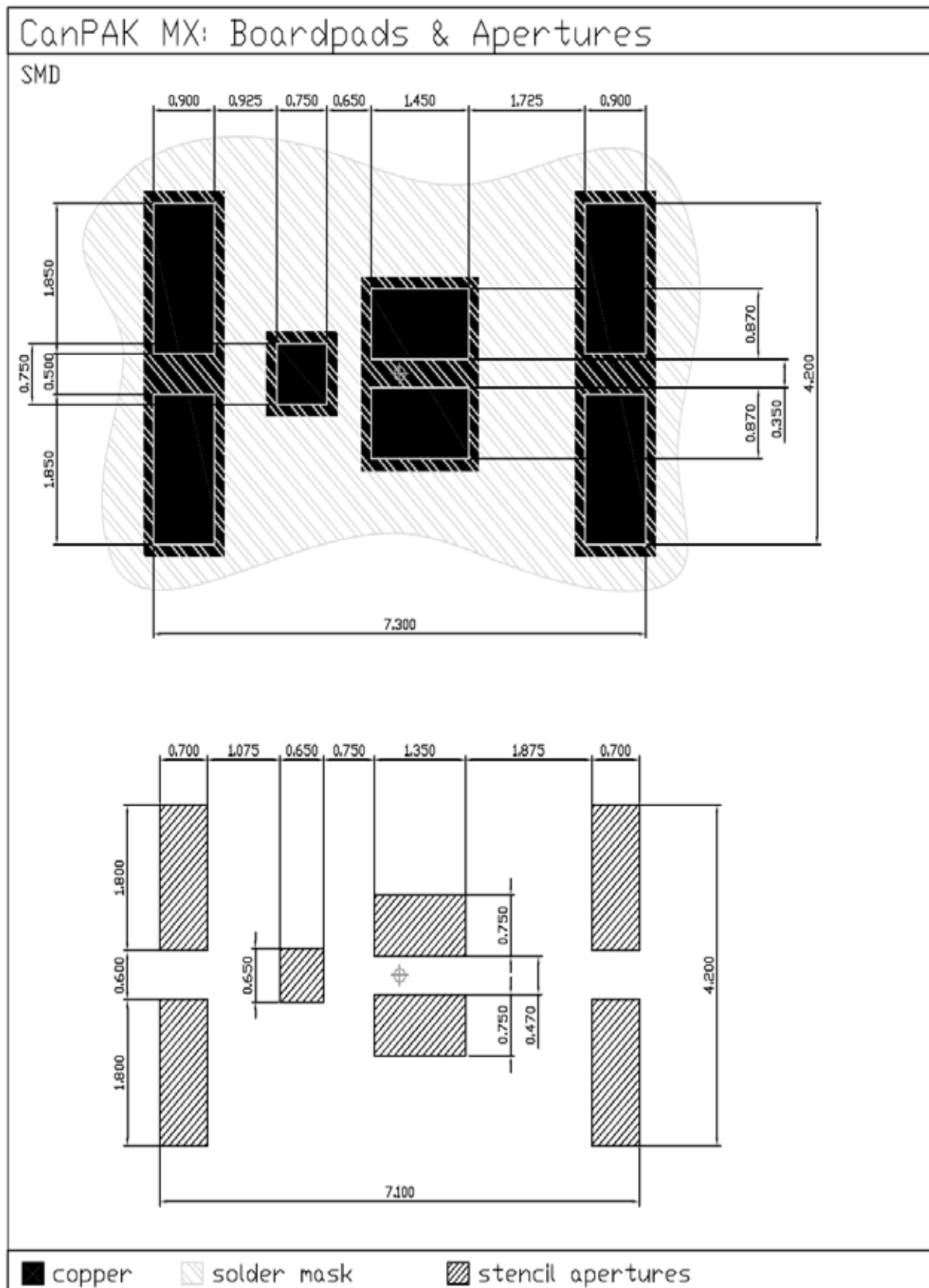


Figure 2 Outlines MG-WDSO-2, dimensions in mm/inches

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

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