Never stop thinking

n-Channel Power MOSFET

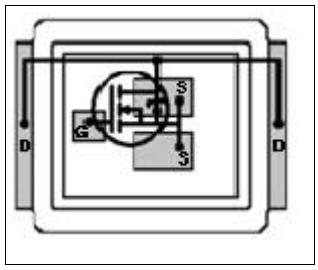
OptiMOS™
BSB028N06NN3 G

Data Sheet

1.3, 2011-03-01
Preliminary

Industrial & Multimarket

1 Description



OptiMOS™60V 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™ 60V the best choice for the demanding requirements of switched mode power supplies in Servers, Datacom and Telecom applications but also for motor drives. With almost no parasitic package inductances, the CanPAK allows best controllability of the gate in highly dynamic switching enviroments. This package in addition features best cooling capability through top-side cooling of the metal can. Hence, this packaging technology combined with the OptiMOS silicon enables highest efficiency levels while having mininal space requirements at the same time.

Features

- Optimized technology for DC/DC converters
- 100% avalanche tested
- Excellent Q_g x $R_{DS(on)}$ product (FOM)
- Qualified according to JEDEC[1)] for target applications
- Superior thermal resistance
- Pb-free plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Double sided cooling
- Compatible with DirectFET® package MN footprint and outline[2)]
- N-channel, normal level
- Low parasitic inductance
- Low profile (<0.7 mm)

Applications

- DC/DC converters
- Synchronous rectification
- Power distribution
- Motor drive applications

Table 1 Key Performance Parameters

Parameter	Value	Unit		Related Links
V_{DS}	60	V		IFX OptiMOS webpage
$R_{DS(on),max}$	2.8	mΩ		IFX OptiMOS product brief
I_D	90	A		IFX OptiMOS spice models
Q_{OSS}	87	nC		IFX Design tools
$Q_{g\cdot typ}$	108			

Type	Package	Marking
BSB028N06NN3 G	MG-WDSON-2	0106

1) J-STD20 and JESD22

2) DirectFET ® is a trademark of International Rectifier Corporation. BSB028N06NN3 G 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	-	-	90	A	V_{GS}=10 V, T_C=25 °C
				85		V_{GS}=10 V, T_C=100 °C
				22		V_{GS}=10 V, T_A=25 °C, R_{thJA}=58 K/W)[1]
Pulsed drain current[2]	$I_{D,pulse}$	-	-	360		T_C=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	590	mJ	I_D=30 A,R_{GS}=25 Ω
Gate source voltage	V_{GS}	-20	-	20	V	
Power dissipation	P_{tot}	-	-	78	W	T_C=25 °C
				2.2		T_A=25 °C, R_{thJA}=58[3] K/W
Operating and storage temperature	T_j,T_{stg}	-40	-	150	°C	
IEC climatic category; DIN IEC 68-1		55	150	56	Ncm	

1) DirectFET ® is a trademark of International Rectifier Corporation. BSB028N06NN3 G uses DirectFET ® technology licensed from International Rectifier Corporation

2) See figure 3 for more detailed information

3) 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.

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}	-	-	58		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, 70µ, thick) copper area for drain conneciton. PCB is vertical in still air.

4 Electrical characteristics

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

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	60	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2	3	4		V_{DS}=V_{GS}, I_D=102 µA
Zero gate voltage drain current	I_{DSS}	-	0.1	10	µA	V_{DS}=60V, V_{GS}=0 V, T_j=25 °C
		-	10	100		V_{DS}=60 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	$R_{DS(on)}$	-	2.2	2.8	mΩ	V_{GS}=10 V, I_D=30A
Gate resistance	R_G	-	0.5	-	Ω	
Transconductance	g_{fs}	42	83		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}	-	8800	12000	pF	V_{GS}=0 V, V_{DS}=30 V, f=1 MHz
Output capacitance	C_{oss}	-	2100	2800		
Reverse transfer capacitance	C_{rss}	-	64	-		
Turn-on delay time	$t_{d(on)}$	-	21	-	ns	V_{DD}=30V, V_{GS}=10 V, I_D=30 A, R_G= 1.6 Ω
Rise time	t_r	-	9	-		
Turn-off delay time	$t_{d(off)}$	-	38	-		
Fall time	t_f	-	6	-		

Table 6 Gate charge characteristics[1)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	41	-	nC	V_{DD}=30 V, I_D=30 A, V_{GS}=0 to 10 V
	Q_{gd}		8			
Gate to drain charge	Q_{sw}	-	23	-		
Switching charge	Q_g	-	108	143		
Gate charge total	$V_{plateau}$	-	4.6	-	V	
Output charge	Q_{oss}		87	116	nC	V_{DD}=30 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			30	A	T_C=25 °C
Diode pulse current	$I_{S,pulse}$			120		
Diode forward voltage	V_{SD}	-	0.8	1.2	V	V_{GS}=0 V, I_F=30 A, T_j=25 °C
Reverse recovery charge	Q_{rr}	-	87	-	nC	V_R=30V, I_F=I_s, di_F/dt=100 A/µs
Reverse recovery time	t_{rr}	-	60	-	ns	

5 Electrical characteristics diagrams

Table 8

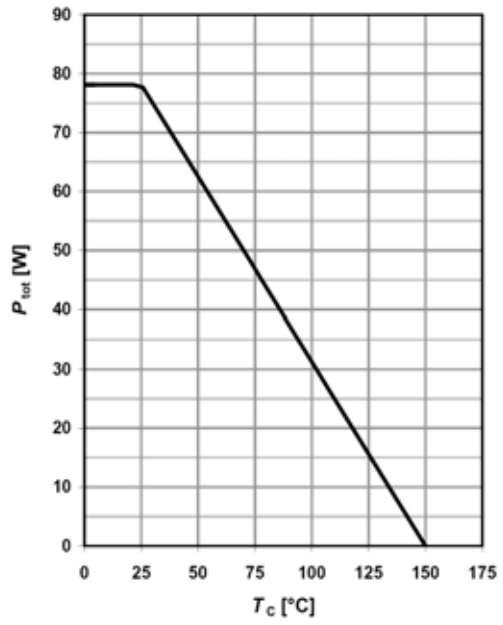
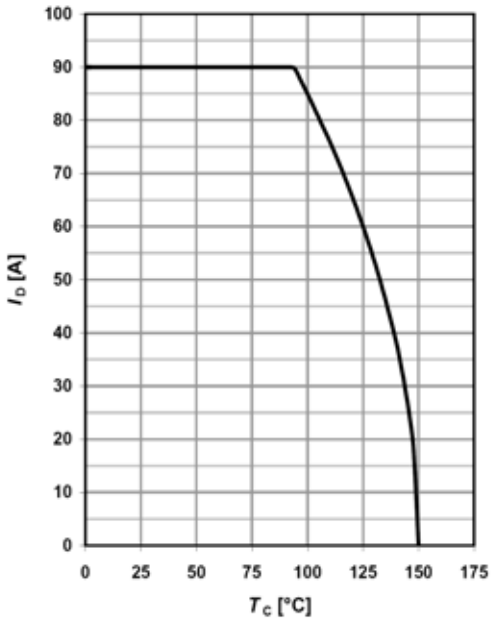
1 Power dissipation	2 Drain current
	
P_{tot} = f(T_C)	I_D=$f(T_C)$; parameter:V_{GS}

Table 9

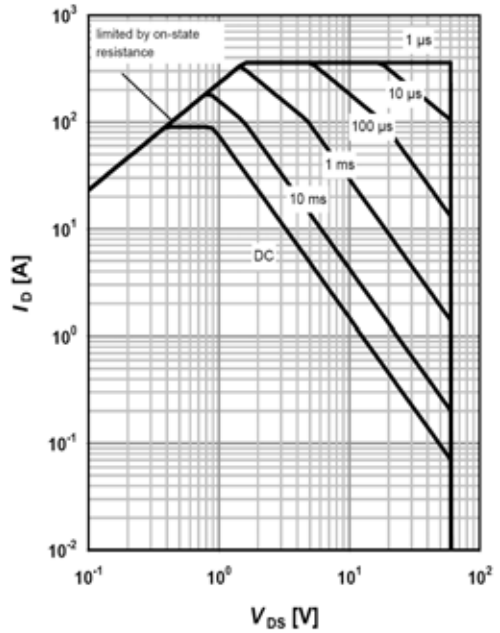
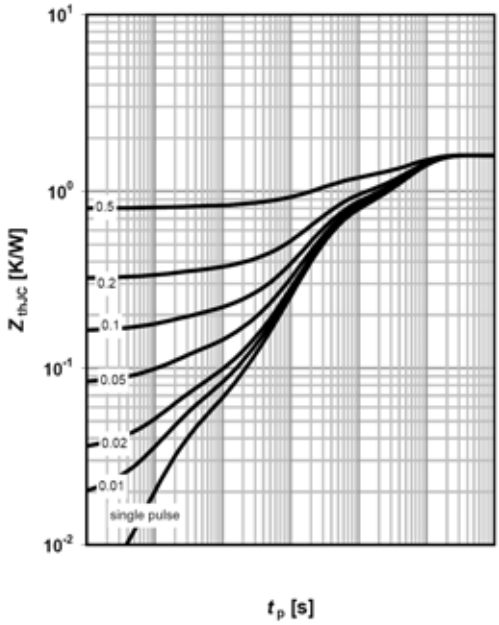
3 Safe operating area T_C=25 °C	4 Max. transient thermal impedance
	
I_D=f(V_{DS}); T_j=25 °C; D=0; parameter: T_p	$Z_{(thJC)}$=f(t_p); parameter: D=t_p/T

Table 10

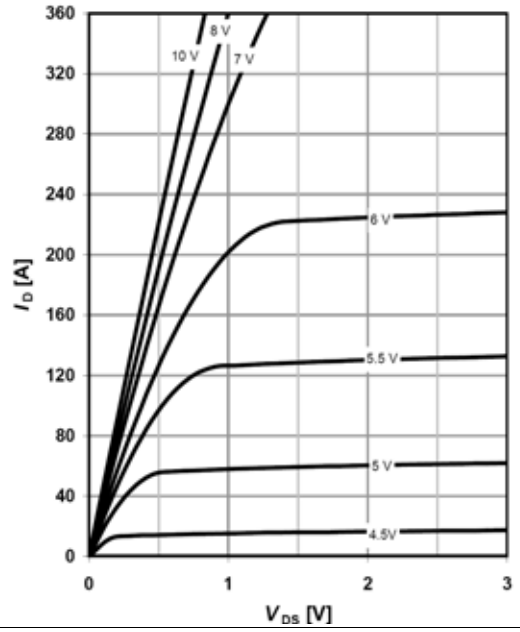
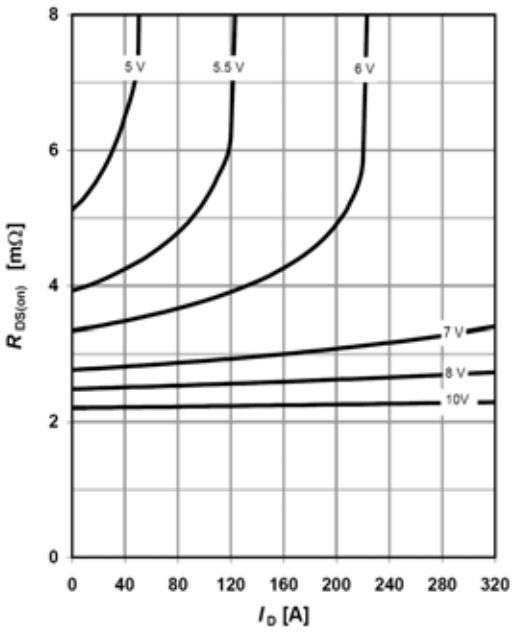
5 Typ. output characteristics T_C=25 °C	6 Typ. drain-source on-state resistance
	
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}	$R_{DS(on)}$=f(I_D); T_j=25 °C; parameter: V_{GS}

Table 11

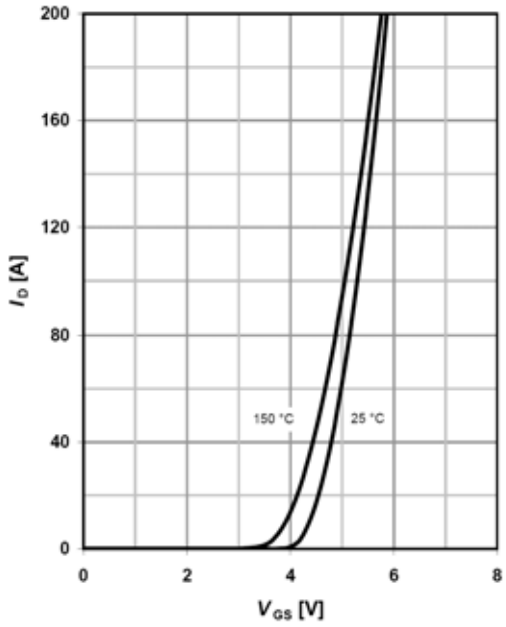
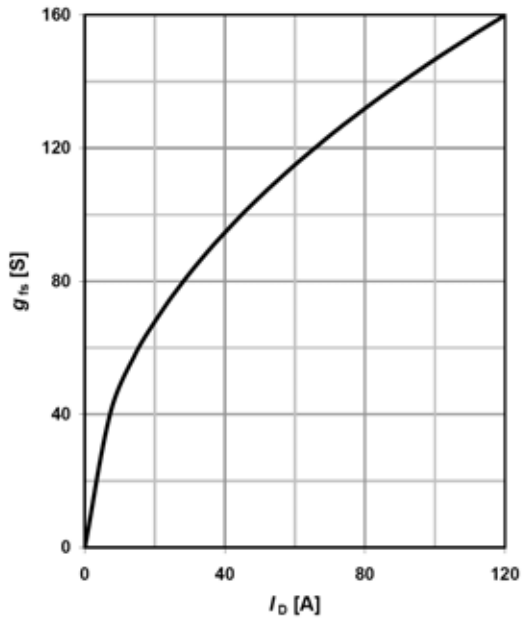
7 Typ. transfer characteristics	8 Typ. forward transconductance
	
I_D=f(VGS); |V_{DS}|>2|I_D|$R_{DS(on)max}$	g_{fs}=f(I_D); T_j=25 °C

Table 12

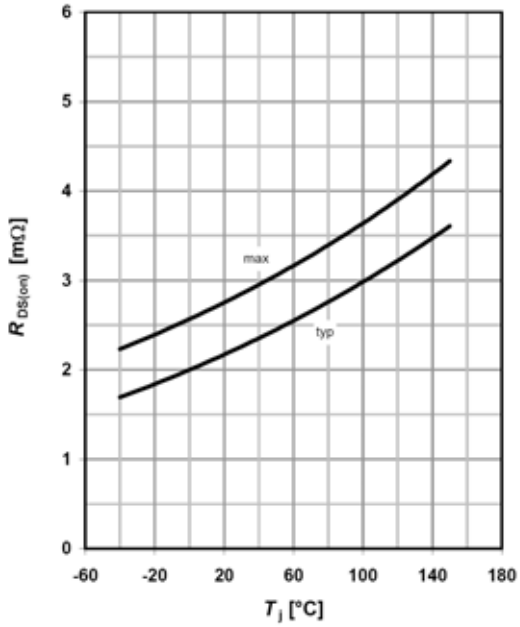
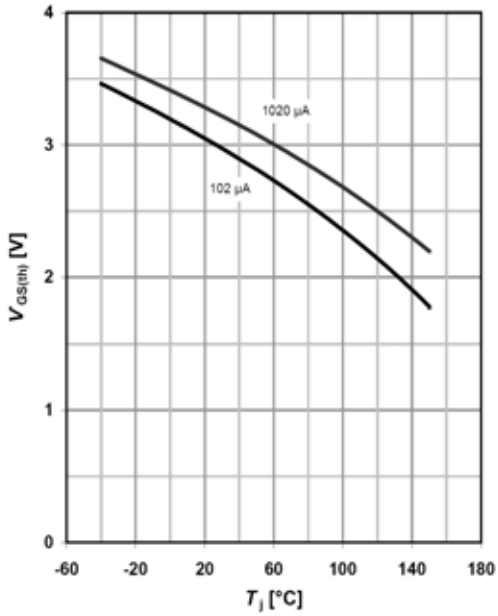
9 Drain-source on-state resistance	10 Typ. gate threshold voltage
	
$R_{DS(on)}=f(T_j)$; I_D=30 A; V_{GS}=10 V	$V_{GS(th)}=f(T_j)$; $V_{GS}=V_{DS}$;

Table 13

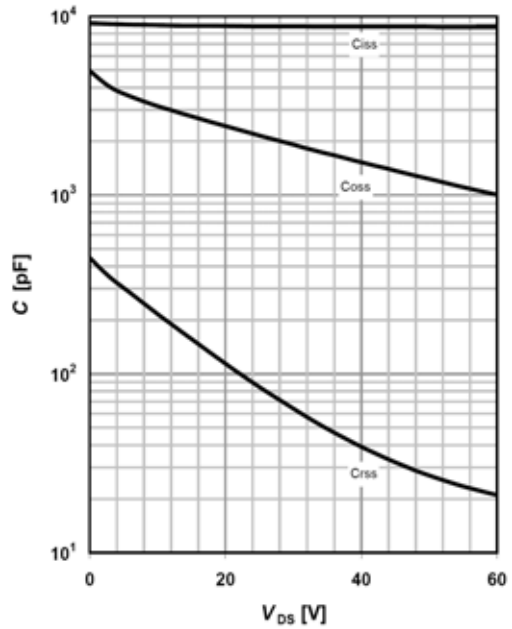
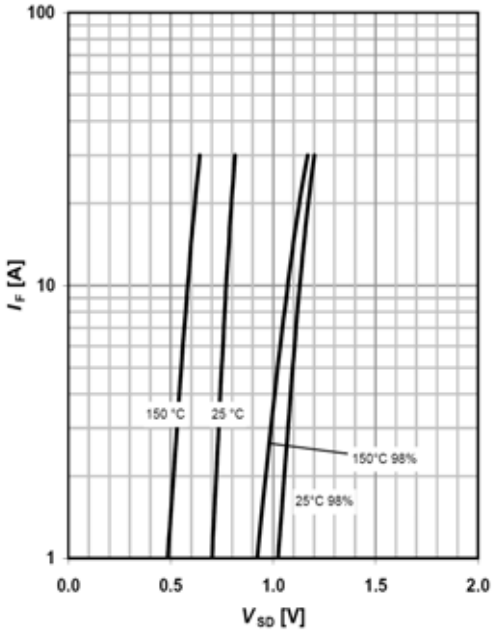
11 Typ. capacitances	12 Forward characteristics of reverse diode
	
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz	$I_F=f(V_{SD})$; parameter: T_j

Table 14

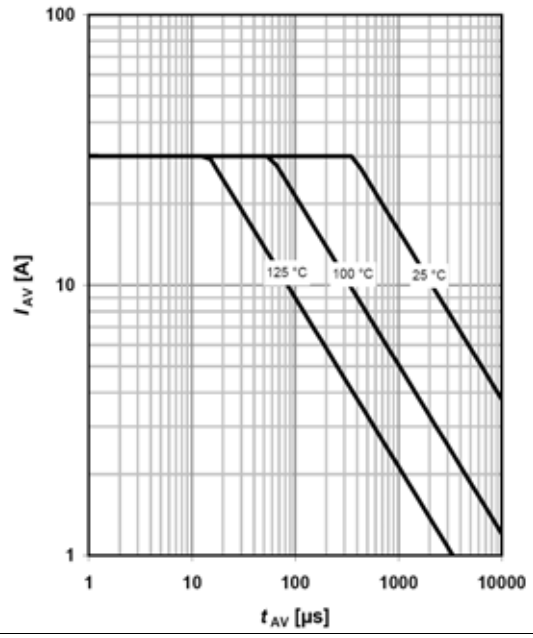
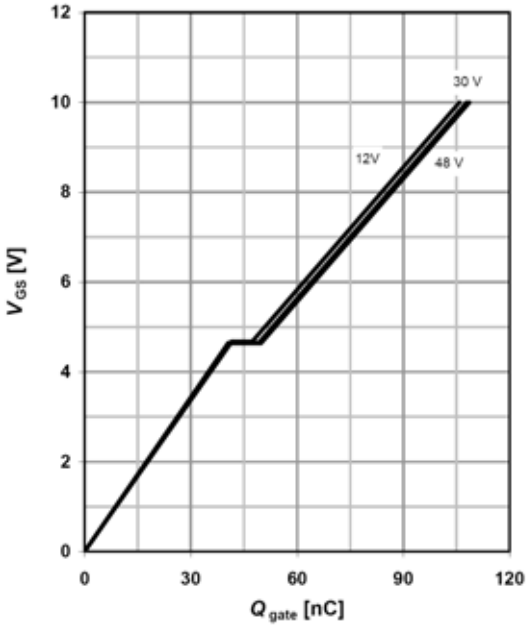
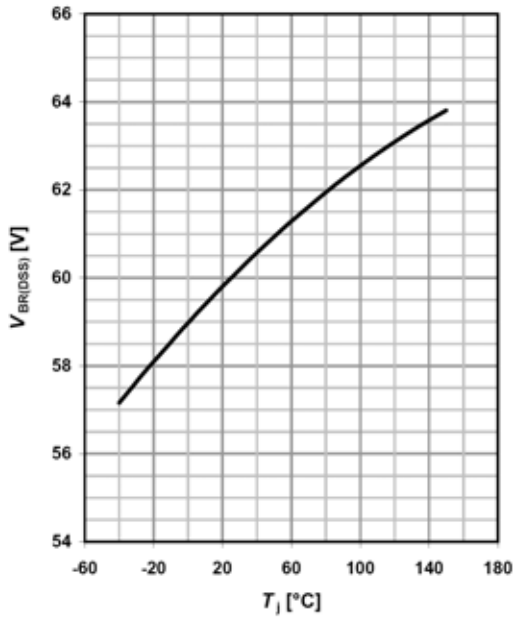
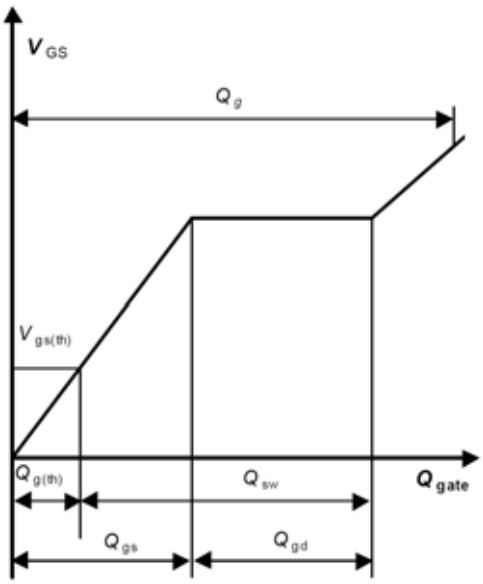
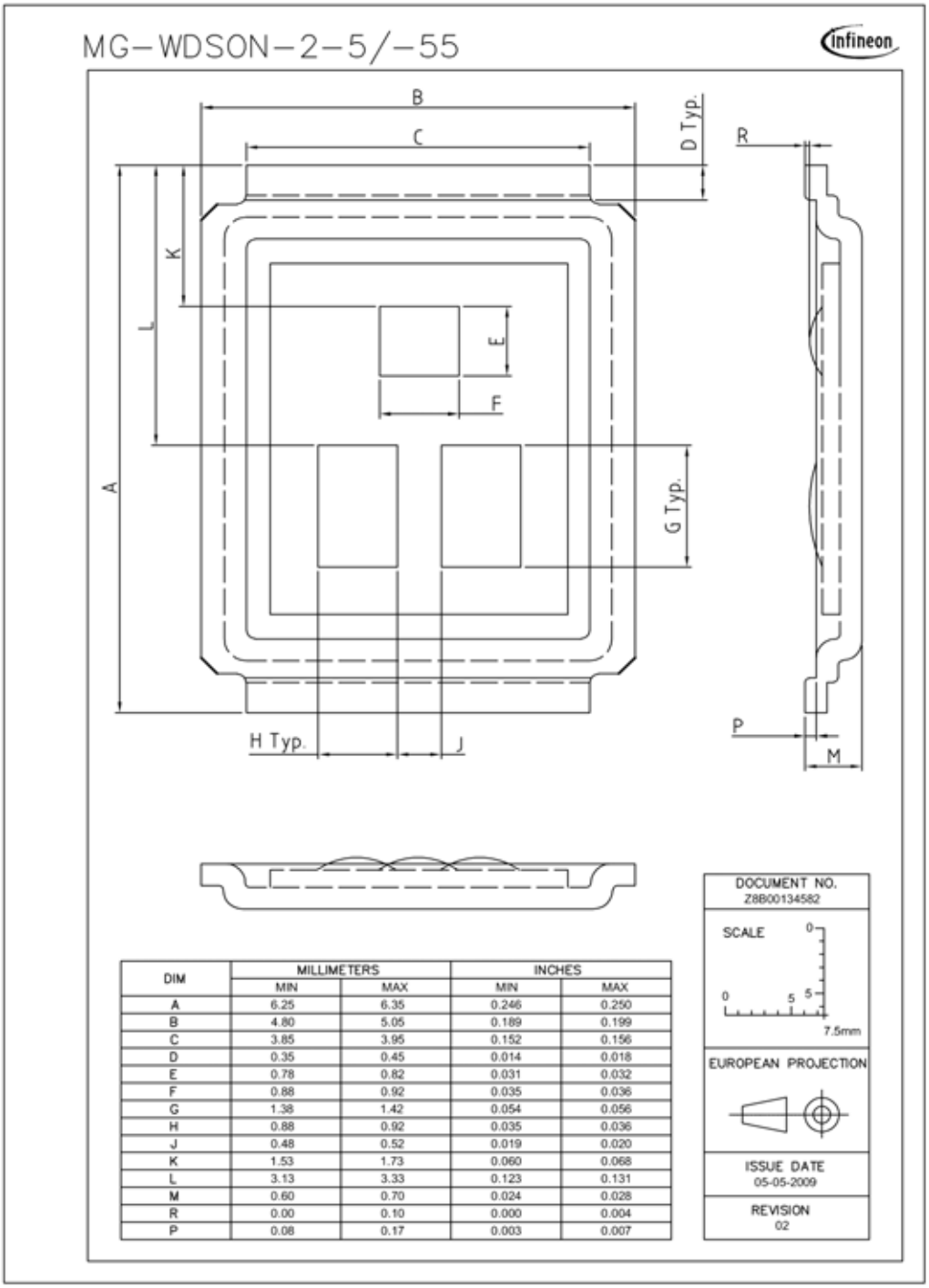
13 Avalanche characteristics	14 Typ. gate charge
	
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$	V_{GS}=f(Q_{gate}); I_D=30 A pulsed; parameter: V_{DD}

Table 15

15 Drain-source breakdown voltage	16 Gate charge waveforms
	
$V_{BR(DSS)}$=f(T_j); 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	0.78	0.82	0.031	0.032
F	0.88	0.92	0.035	0.036
G	1.38	1.42	0.054	0.056
H	0.88	0.92	0.035	0.036
J	0.48	0.52	0.019	0.020
K	1.53	1.73	0.060	0.068
L	3.13	3.33	0.123	0.131
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

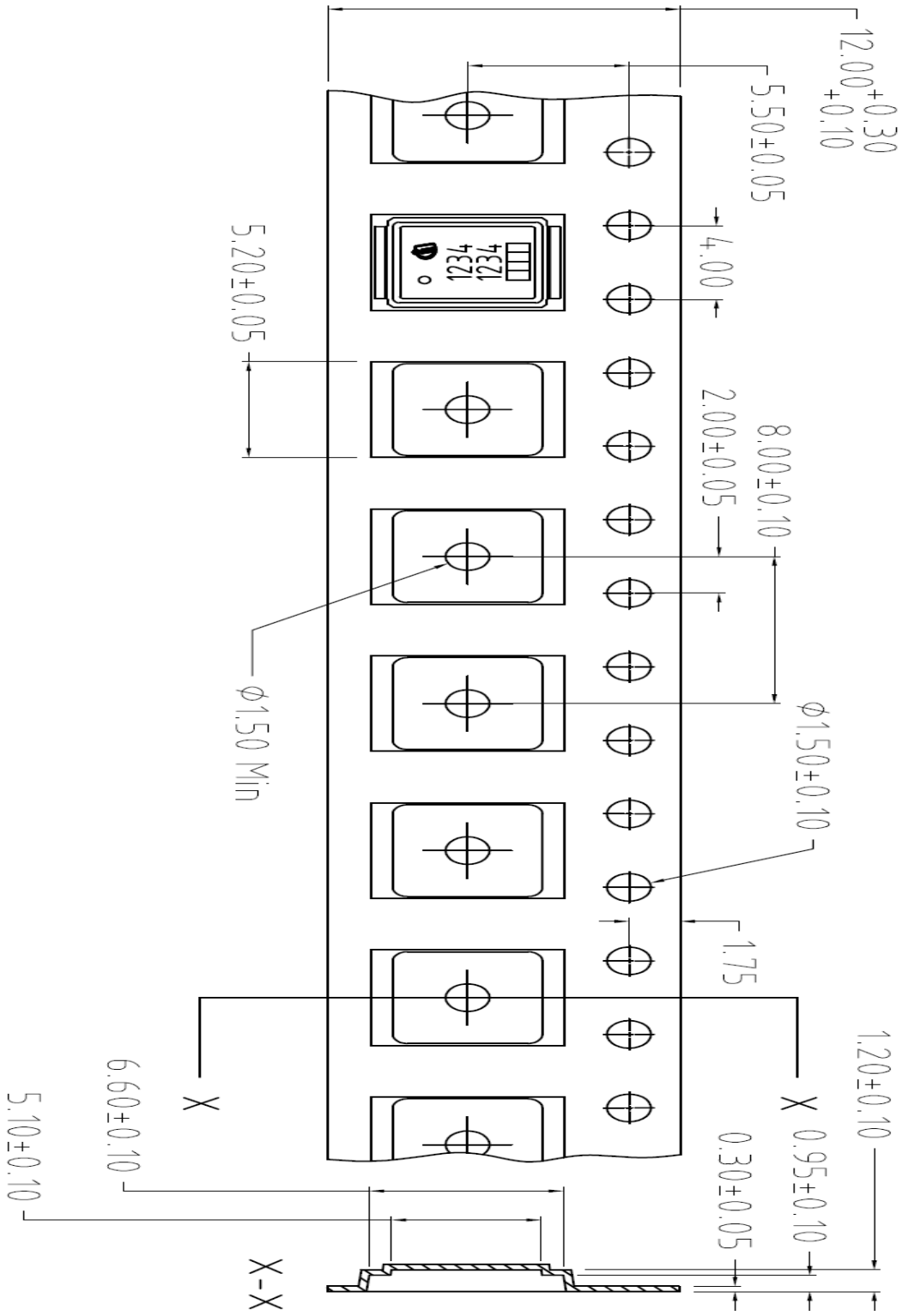


Figure 2 Outlines MG-WDSON-2, dimensions in mm/inches

8 Package outlines

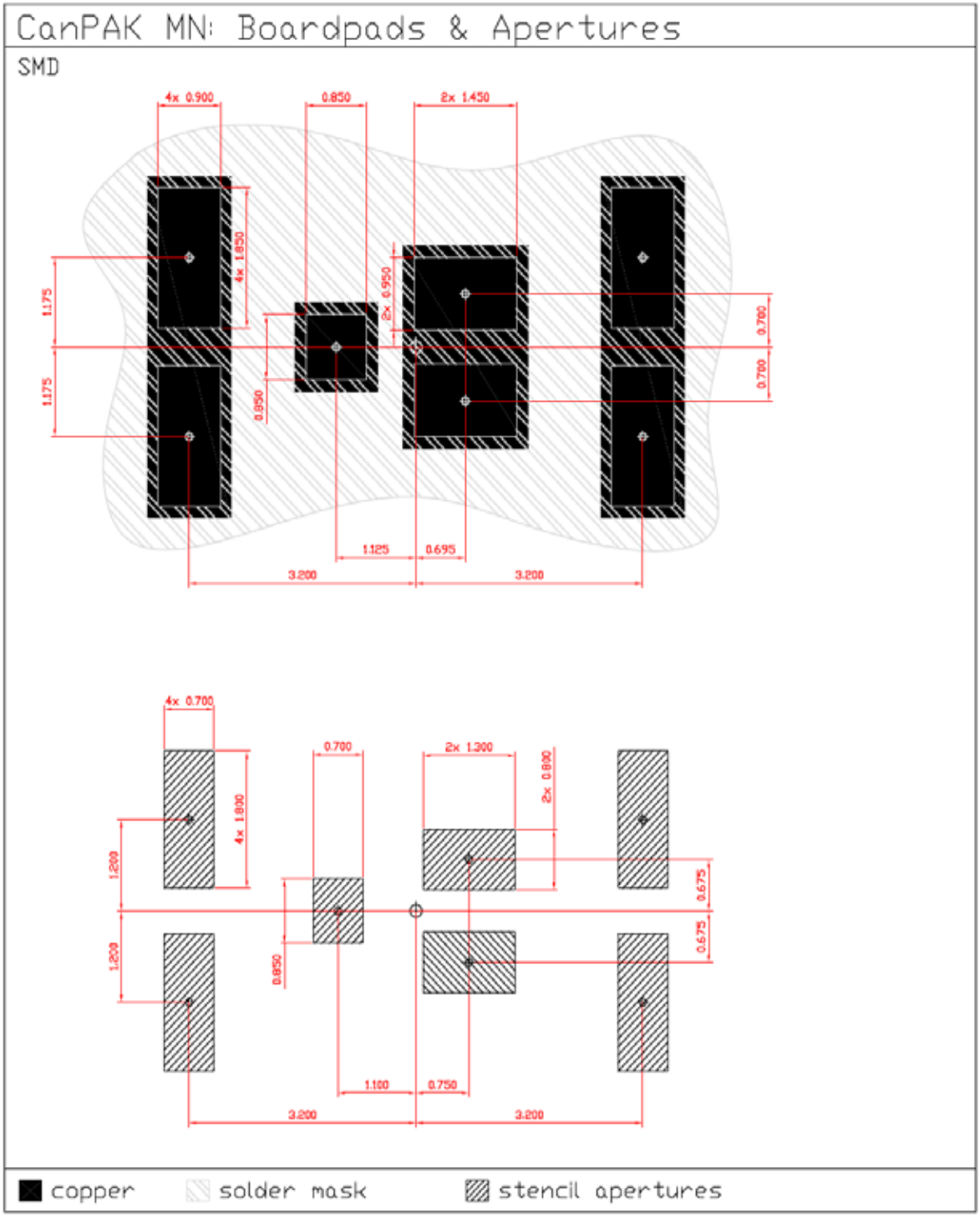


Figure 3 Dimensions in mm/ Recomended stencil thikness 150µm

9 Revision History

Revision History: 2011-03-01, 1.3

Previous Revision:

Revision	Subjects (major changes since last revision)
0.1	Release of target data sheet
1.0	Release of Preliminary data sheet

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