

OptiMOS™3 Power-MOSFET

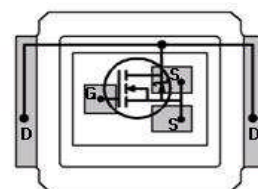
Features

- Optimized technology for DC/DC converters
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Superior thermal resistance
- Dual sided cooling
- Low parasitic inductance
- Low profile (<0.7mm)
- N-channel, normal level
- 100% avalanche tested
- Pb-free plating; RoHS compliant
- Qualified according to JEDEC¹⁾ for target applications
- Compatible with DirectFET® package ST footprint and outline²⁾

Product Summary

V_{DS}	60	V
$R_{DS(on),max}$	11	mΩ
I_D	47	A

CanPAK™ S
MG-WDSO-2



Type	Package	Outline	Marking
BSF110N06NT3 G	MG-WDSO-2	ST	0306

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$	47	A
		$V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$	30	
		$V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=58\text{ K/W}^{3)}$	11	
Pulsed drain current ⁴⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$	188	
Avalanche energy, single pulse ⁵⁾	E_{AS}	$I_D=30\text{ A}$, $R_{GS}=25\text{ Ω}$	100	mJ
Gate source voltage	V_{GS}		±20	V

¹⁾ J-STD20 and JESD22

²⁾ DirectFET® is a trademark of International Rectifier Corporation

BSF110N06NT3 G uses DirectFET® technology licensed from International Rectifier Corporation

³⁾ 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.

⁴⁾ See figure 3 for more detailed information

⁵⁾ See figure 13 for more detailed information

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

Parameter	Symbol	Conditions	Value	Unit
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	38	W
		$T_A=25\text{ °C}$, $R_{\text{thJA}}=58\text{ K/W}^{(3)}$	2.2	
Operating and storage temperature	T_j, T_{stg}		-40 ... 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	-	1.0	-	K/W
		top	-	-	3.3	
Device on PCB	R_{thJA}	6 cm ² cooling area ⁽³⁾	-	-	58	

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

Static characteristics

Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}}=0\text{ V}$, $I_{\text{D}}=1\text{ mA}$	60	-	-	V
Gate threshold voltage	$V_{\text{GS(th)}}$	$V_{\text{DS}}=V_{\text{GS}}$, $I_{\text{D}}=33\text{ μA}$	2	3	4	
Zero gate voltage drain current	I_{DSS}	$V_{\text{DS}}=30\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j=25\text{ °C}$	-	0.1	10	μA
		$V_{\text{DS}}=60\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j=125\text{ °C}$	-	10	100	
Gate-source leakage current	I_{GSS}	$V_{\text{GS}}=20\text{ V}$, $V_{\text{DS}}=0\text{ V}$	-	10	100	nA
Drain-source on-state resistance	$R_{\text{DS(on)}}$	$V_{\text{GS}}=10\text{ V}$, $I_{\text{D}}=30\text{ A}$	-	8.6	11	mΩ
Gate resistance	R_{G}		-	0.5	-	Ω
Transconductance	g_{fs}	$ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}$, $I_{\text{D}}=30\text{ A}$	23	46	-	S

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=30\text{ V},$ $f=1\text{ MHz}$	-	2800	3700	pF
Output capacitance	C_{oss}		-	800	1060	
Reverse transfer capacitance	C_{rss}		-	22	33	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=30\text{ V}, V_{GS}=10\text{ V},$ $I_D=30\text{ A}, R_G=1.6\ \Omega$	-	11	-	ns
Rise time	t_r		-	2	-	
Turn-off delay time	$t_{d(off)}$		-	17	-	
Fall time	t_f		-	2	-	

Gate Charge Characteristics⁶⁾

Gate to source charge	Q_{gs}	$V_{DD}=30\text{ V}, I_D=30\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	15	-	nC
Gate to drain charge	Q_{gd}		-	3	-	
Switching charge	Q_{sw}		-	9	-	
Gate charge total	Q_g		-	34	46	
Gate plateau voltage	$V_{plateau}$		-	5.2	-	V
Output charge	Q_{oss}	$V_{DD}=30\text{ V}, V_{GS}=0\text{ V}$	-	28	37	nC

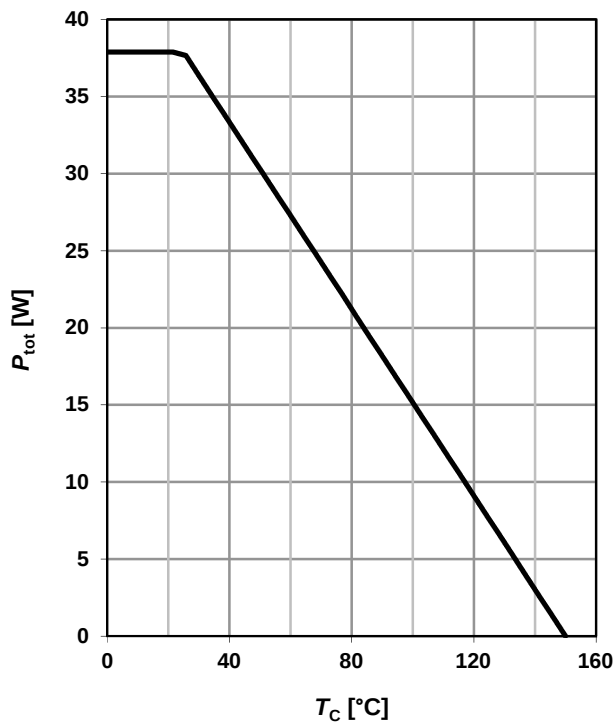
Reverse Diode

Diode continuous forward current	I_S	$T_C=25\text{ °C}$	-	-	30	A
Diode pulse current	$I_{S,pulse}$		-	-	120	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=30\text{ A},$ $T_J=25\text{ °C}$	-	0.9	1.2	V
Reverse recovery time	t_{rr}	$V_R=30\text{ V}, I_F=I_S,$ $di_F/dt=400\text{ A}/\mu\text{s}$	-	41	-	ns
Reverse recovery charge	Q_{rr}		-	56	-	nC

⁶⁾ See figure 16 for gate charge parameter definition

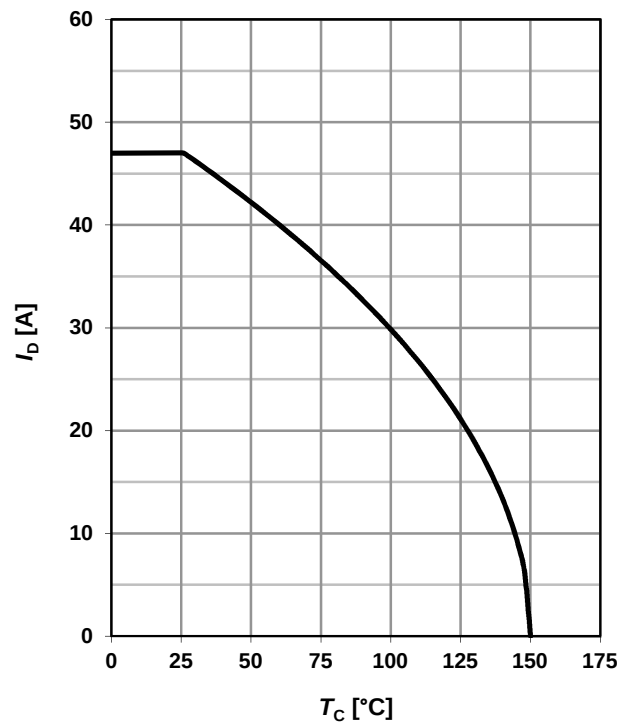
1 Power dissipation

$$P_{\text{tot}} = f(T_C)$$



2 Drain current

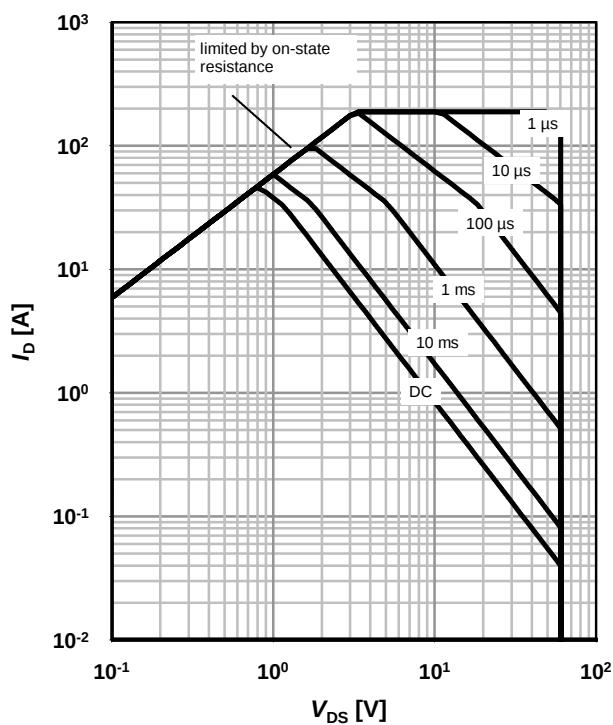
$$I_D = f(T_C); V_{GS} \geq 10 \text{ V}$$



3 Safe operating area

$$I_D = f(V_{DS}); T_C = 25^\circ\text{C}; D = 0$$

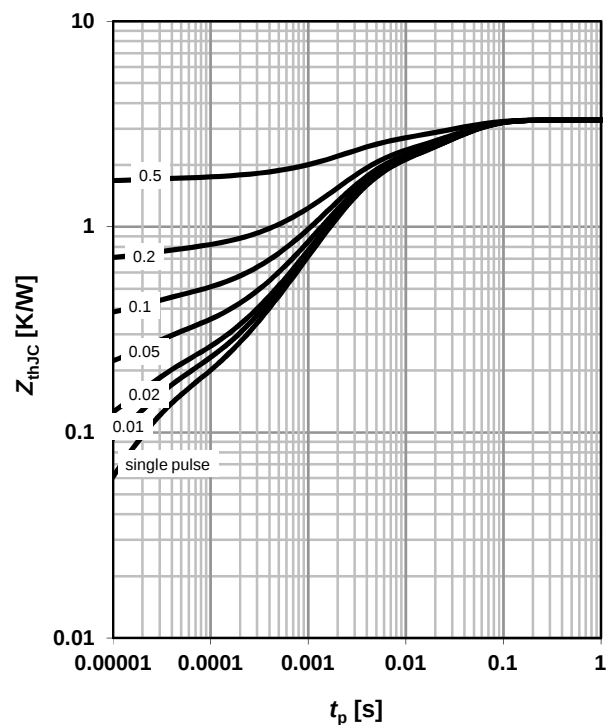
parameter: t_p



4 Max. transient thermal impedance

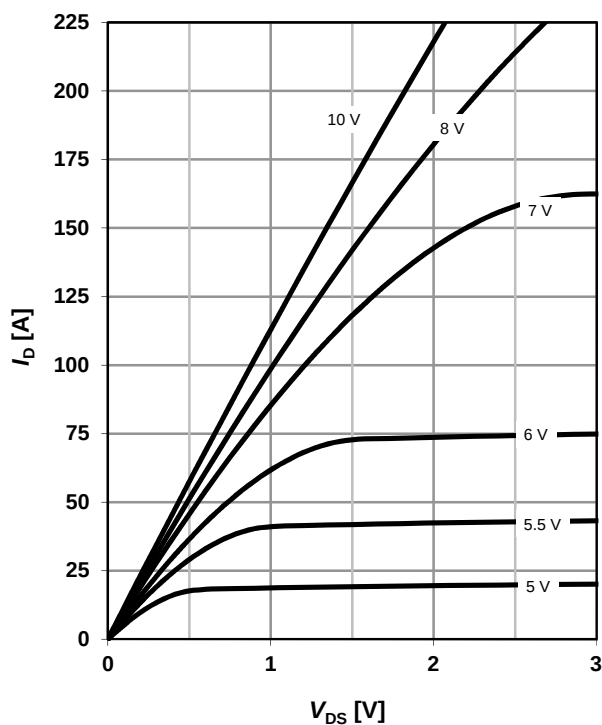
$$Z_{\text{thJC}} = f(t_p)$$

parameter: $D = t_p/T$



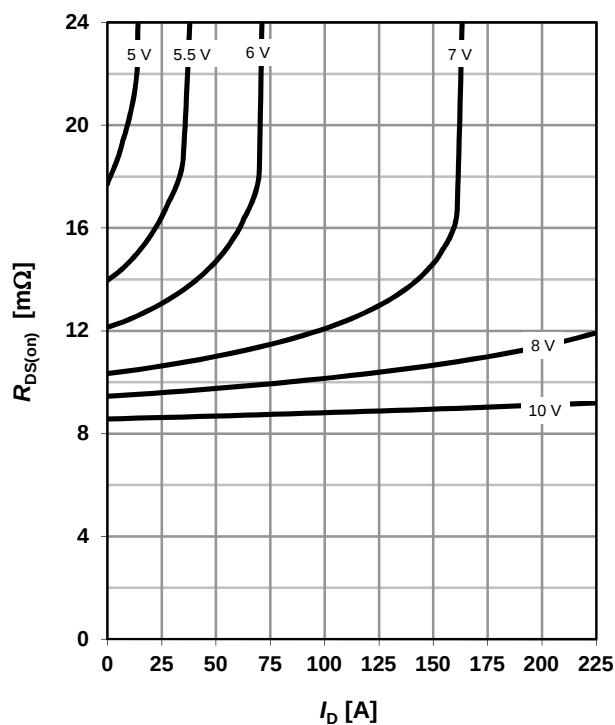
5 Typ. output characteristics

 $I_D = f(V_{DS}); T_j = 25^\circ\text{C}$

parameter: V_{GS}


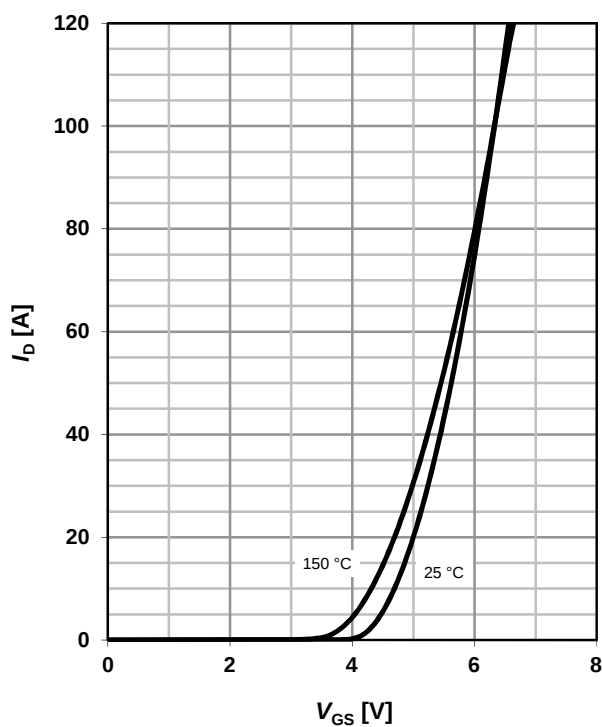
6 Typ. drain-source on resistance

 $R_{DS(on)} = f(I_D); T_j = 25^\circ\text{C}$

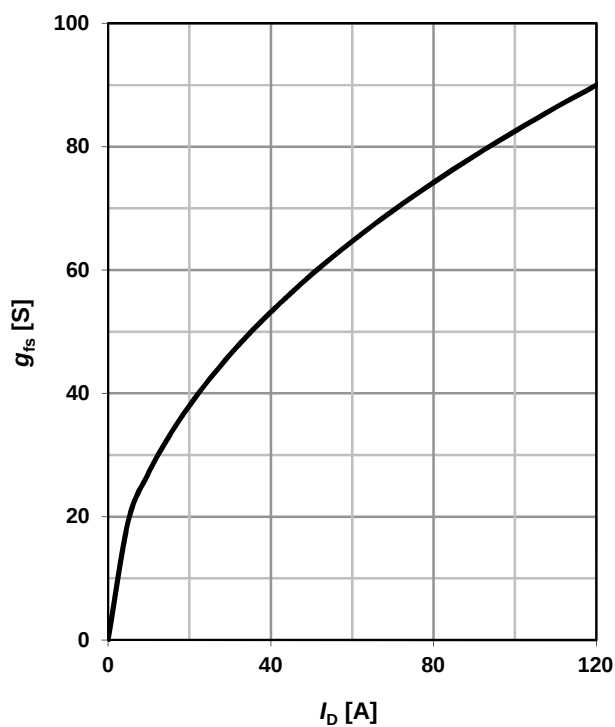
parameter: V_{GS}


7 Typ. transfer characteristics

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

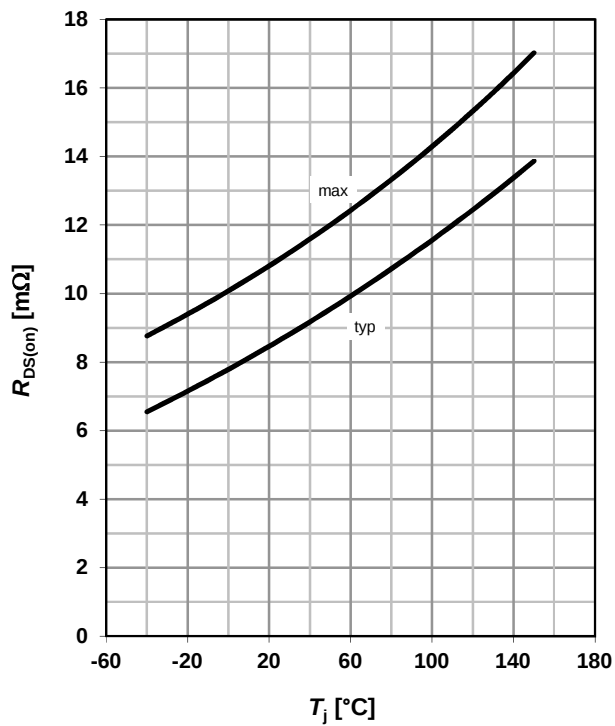
parameter: T_j


8 Typ. forward transconductance

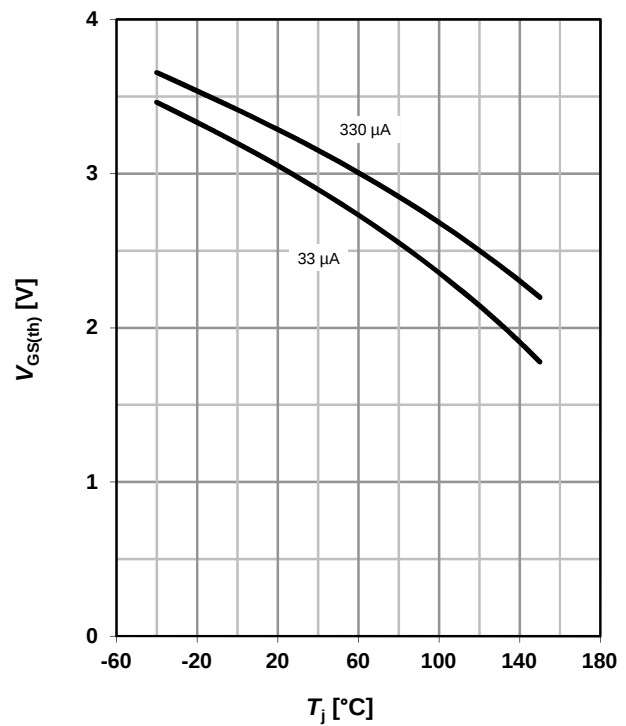
 $g_{fs} = f(I_D); T_j = 25^\circ\text{C}$


9 Drain-source on-state resistance

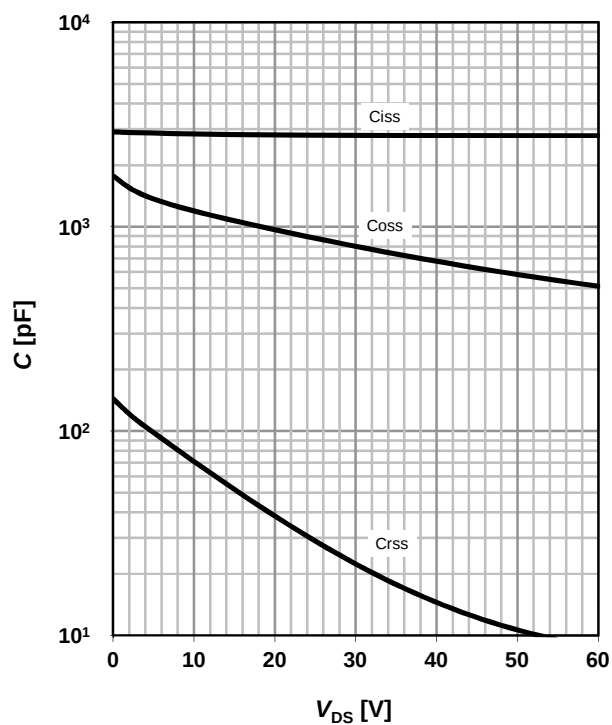
$$R_{DS(on)} = f(T_j); I_D = 30 \text{ A}; V_{GS} = 10 \text{ V}$$


10 Typ. gate threshold voltage

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

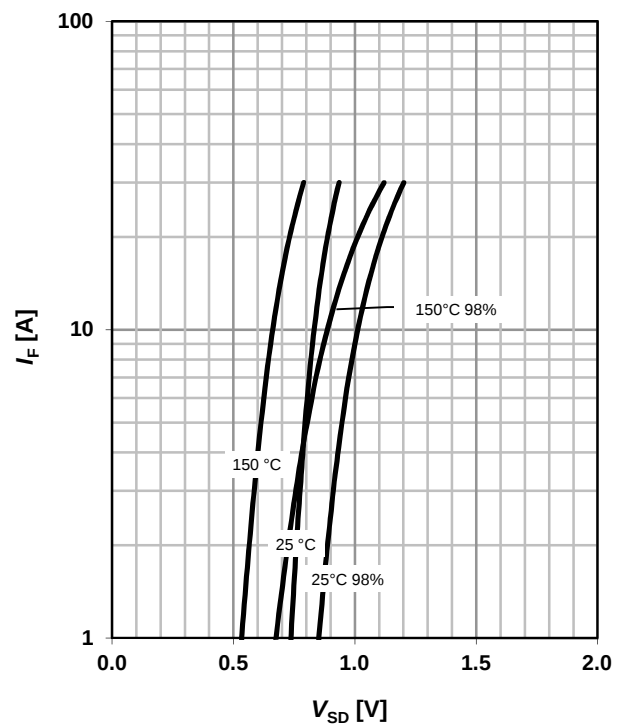

11 Typ. capacitances

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


12 Forward characteristics of reverse diode

$$I_F = f(V_{SD})$$

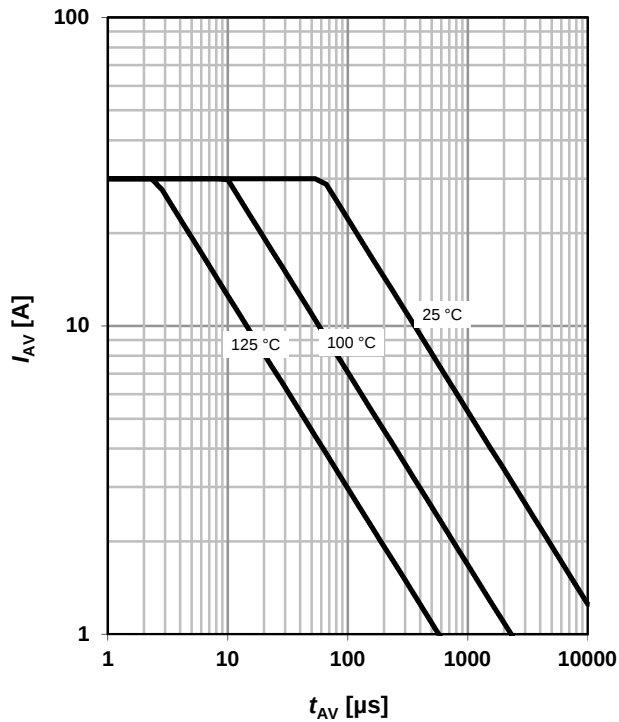
parameter: T_j



13 Avalanche characteristics

$I_{AS}=f(t_{AV}); R_{GS}=25\ \Omega$

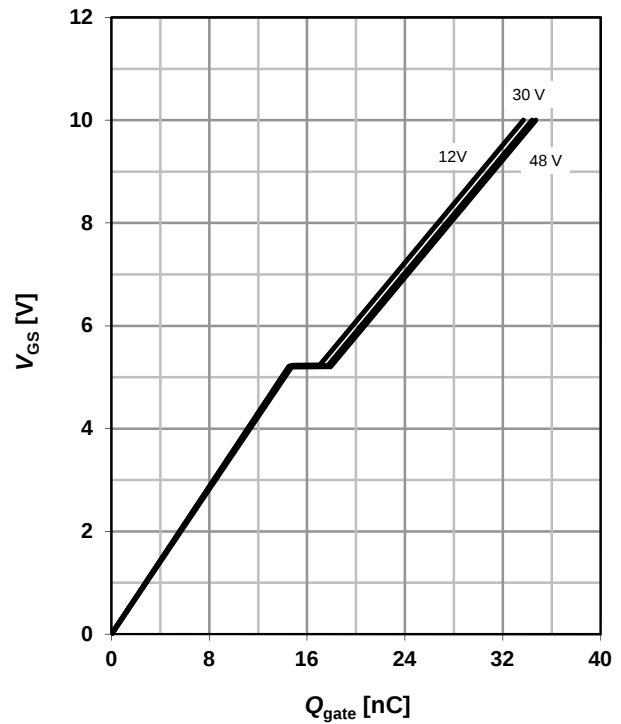
parameter: $T_{j(start)}$



14 Typ. gate charge

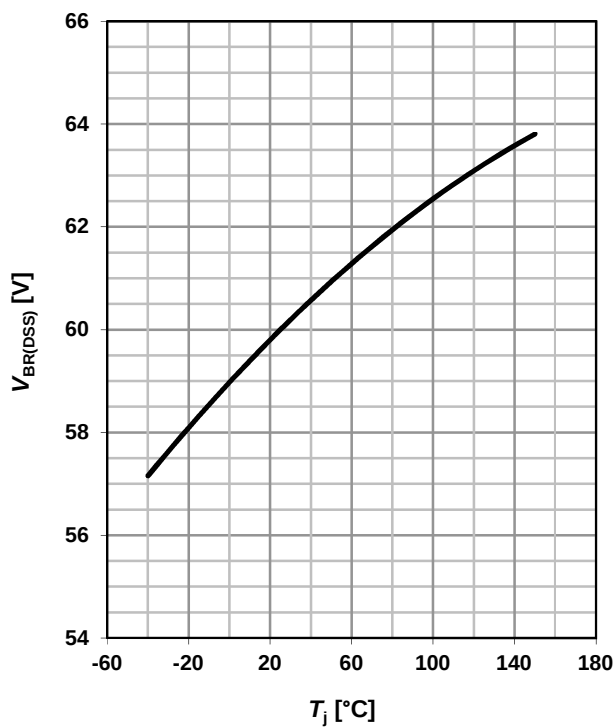
$V_{GS}=f(Q_{gate}); I_D=30\text{ A pulsed}$

parameter: V_{DD}

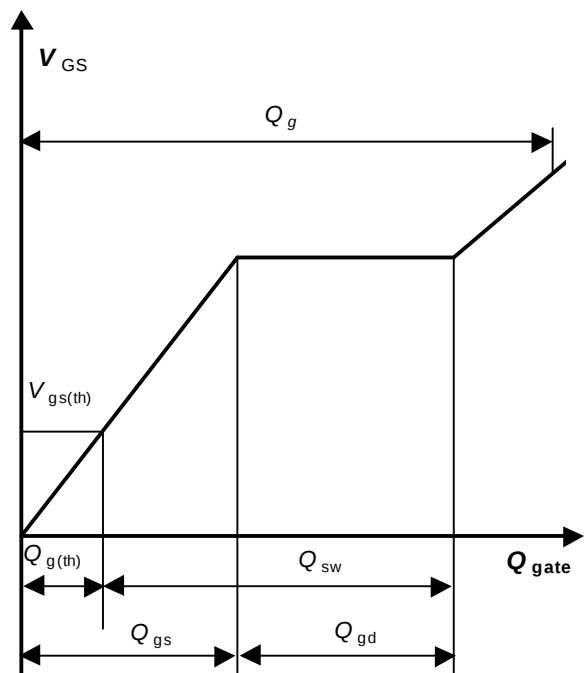


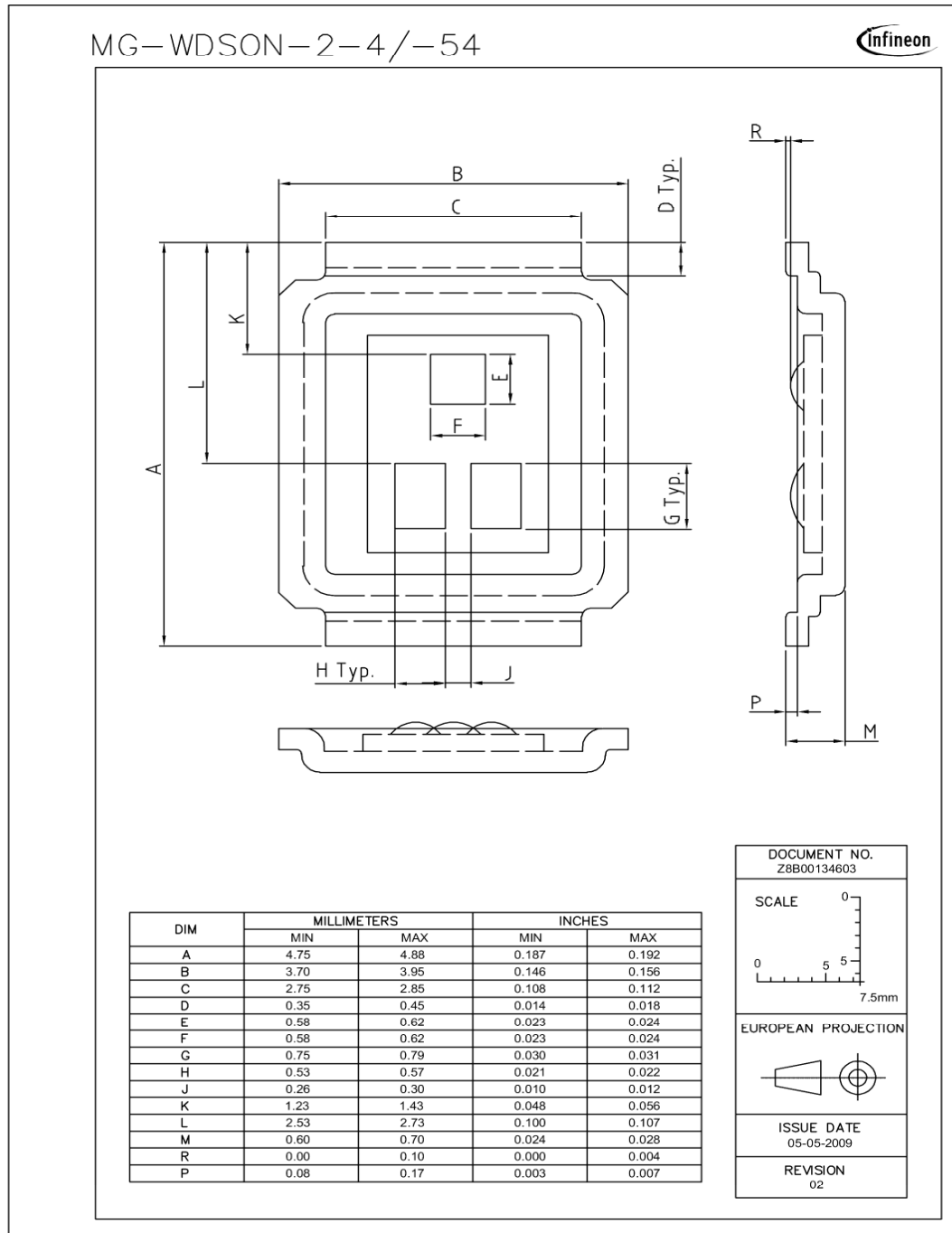
15 Drain-source breakdown voltage

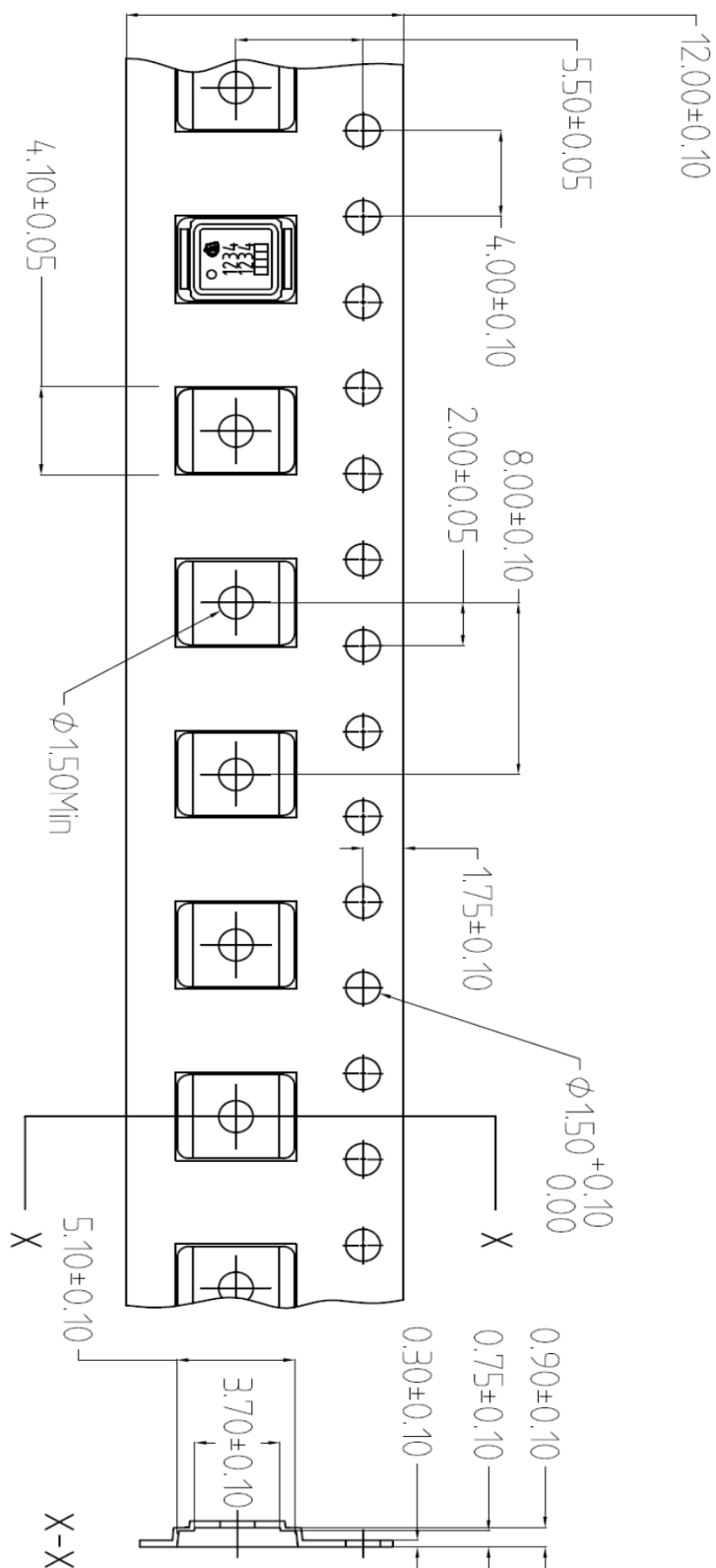
$V_{BR(DSS)}=f(T_j); I_D=1\text{ mA}$



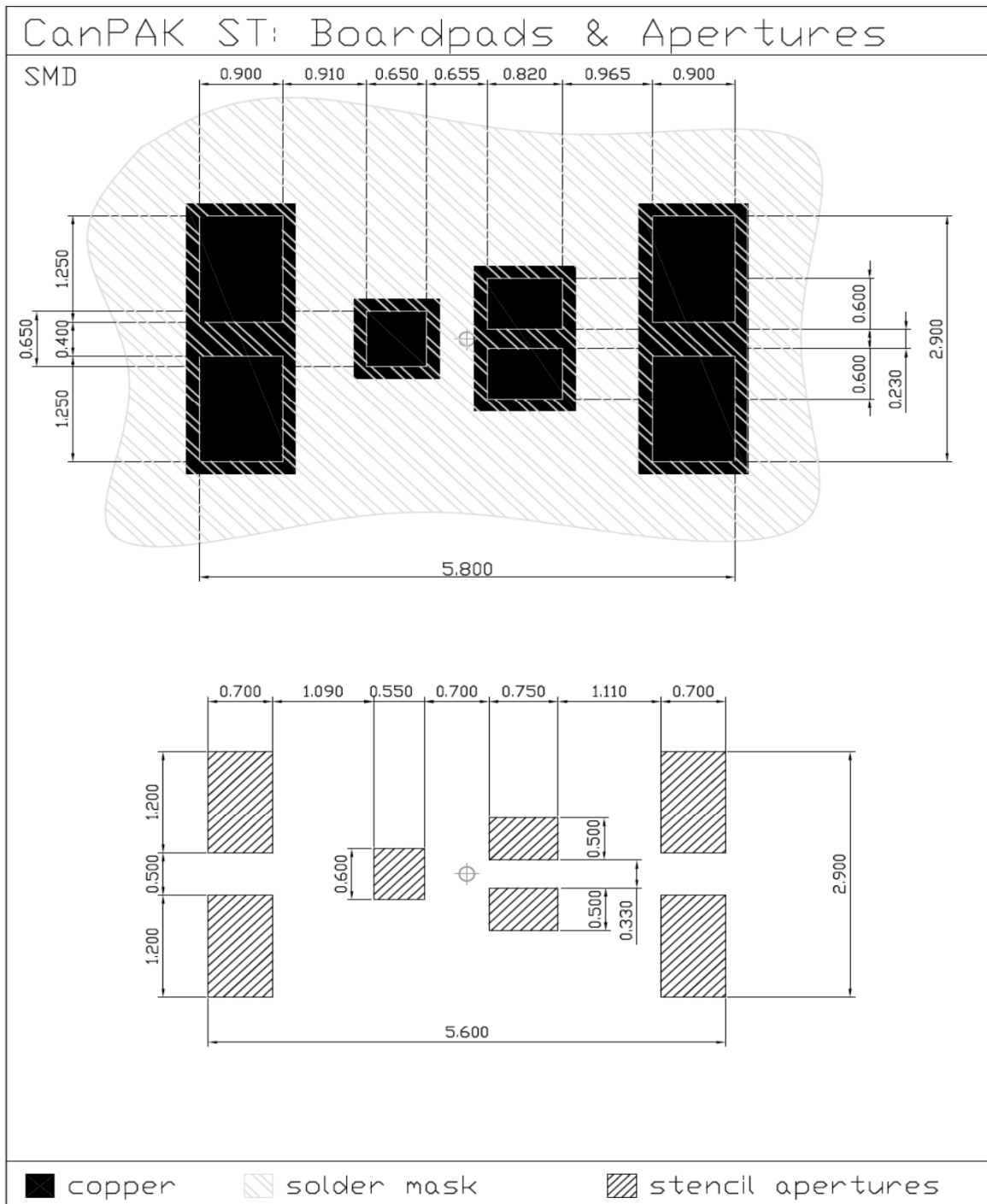
16 Gate charge waveforms



Package Outline
**CanPAK™ S
MG-WDSO-2**


CanPAK™ S
MG-WDSO-2

Dimensions in mm

CanPAK™ S
MG-WDSO-2



Dimensions in mm

Recommended stencil thickness 150 µm

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