

OptiMOS™³ Power-MOSFET
Features

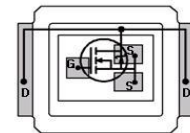
- Optimized for high switching frequency DC/DC converter
- Very low on-resistance $R_{DS(on)}$
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Low parasitic inductance
- Low profile (<0.7 mm)
- 100% avalanche tested
- 100% Rg Tested
- Double-sided cooling
- Pb-free plating; RoHS compliant
- Compatible with DirectFET® package ST footprint and outline ¹⁾
- Qualified according to JEDEC²⁾ for target applications

Product Summary

V_{DS}	30	V
$R_{DS(on),max}$	2.4	mΩ
I_D	106	A

CanPAK™ S


Type	Package	Outline	Marking
BSF024N03LT3 G	MG-WDSO-2	ST	0703



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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	$V_{GS}=10\text{ V}$, $T_C=25\text{ °C}$	106	A
		$V_{GS}=10\text{ V}$, $T_C=100\text{ °C}$	67	
		$V_{GS}=10\text{ V}$, $T_A=25\text{ °C}$, $R_{thJA}=58\text{ K/W}^{2)}$	15	
Pulsed drain current ³⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$	400	
Avalanche current, single pulse ⁴⁾	I_{AS}	$T_C=25\text{ °C}$	40	
Avalanche energy, single pulse	E_{AS}	$I_D=40\text{ A}$, $R_{GS}=25\text{ Ω}$	125	mJ
Gate source voltage	V_{GS}		±20	V

¹⁾ CanPAK™ uses DirectFET® technology licensed from International Rectifier Corporation. DirectFET® is a registered trademark of International Rectifier Corporation.

²⁾ J-STD20 and JESD22

³⁾ See figure 3 for more detailed information

⁴⁾ 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}	$T_C=25\text{ °C}$	42	W
		$T_A=25\text{ °C}$, $R_{\text{thJA}}=58\text{ K/W}$	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	
Device on PCB	R_{thJA}	6 cm ² cooling area ⁵⁾	-	-	58	

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

Static characteristics

Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}}=0\text{ V}$, $I_{\text{D}}=1\text{ mA}$	30	-	-	V
Gate threshold voltage	$V_{\text{GS(th)}}$	$V_{\text{DS}}=V_{\text{GS}}$, $I_{\text{D}}=250\text{ }\mu\text{A}$	1	-	2.2	
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
		$V_{\text{DS}}=30\text{ V}$, $V_{\text{GS}}=0\text{ V}$, $T_j=125\text{ °C}$	-	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	$R_{\text{DS(on)}}$	$V_{\text{GS}}=4.5\text{ V}$, $I_{\text{D}}=20\text{ A}$	-	2.6	3.2	m Ω
Drain-source on-state resistance	$R_{\text{DS(on)}}$	$V_{\text{GS}}=10\text{ V}$, $I_{\text{D}}=20\text{ A}$	-	2.0	2.4	
Gate resistance	R_{G}		0.2	0.5	0.8	Ω
Transconductance	g_{fs}	$ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}$, $I_{\text{D}}=30\text{ A}$	55	110	-	S

⁵⁾ 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.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics

Input capacitance	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=15\text{ V}, f=1\text{ MHz}$	-	4100	5500	pF
Output capacitance	C_{oss}		-	1730	2300	
Reverse transfer capacitance	C_{rss}		-	84	-	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=15\text{ V}, V_{GS}=10\text{ V}, I_D=30\text{ A}, R_{G,ext}=1.6\ \Omega$	-	5.7	-	ns
Rise time	t_r		-	5.6	-	
Turn-off delay time	$t_{d(off)}$		-	29	-	
Fall time	t_f		-	4.8	-	

Gate Charge Characteristics⁶⁾

Gate to source charge	Q_{gs}	$V_{DD}=15\text{ V}, I_D=30\text{ A}, V_{GS}=0\text{ to }4.5\text{ V}$	-	11.9	-	nC
Gate charge at threshold	$Q_{g(th)}$		-	6.6	-	
Gate to drain charge	Q_{gd}		-	5.8	-	
Switching charge	Q_{sw}		-	11.1	-	
Gate charge total	Q_g		-	26	34	
Gate plateau voltage	$V_{plateau}$		-	2.9	-	
Gate charge total	Q_g	$V_{DD}=15\text{ V}, I_D=30\text{ A}, V_{GS}=0\text{ to }10\text{ V}$	-	53	71	nC
Gate charge total, sync. FET	$Q_{g(sync)}$	$V_{DS}=0.1\text{ V}, V_{GS}=0\text{ to }4.5\text{ V}$	-	22	-	
Output charge	Q_{oss}	$V_{DD}=15\text{ V}, V_{GS}=0\text{ V}$	-	36	-	

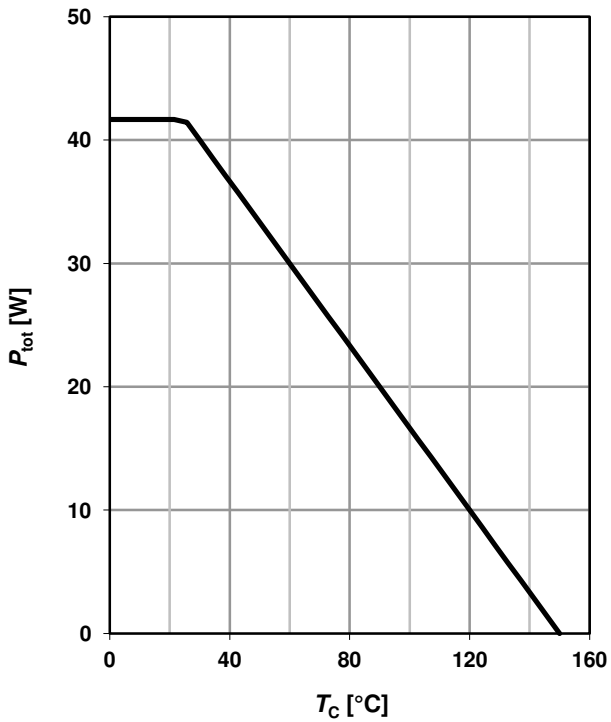
Reverse Diode

Diode continuous forward current	I_S	$T_C=25\text{ }^\circ\text{C}$	-	-	35	A
Diode pulse current	$I_{S,pulse}$		-	-	400	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=30\text{ A}, T_j=25\text{ }^\circ\text{C}$	-	0.81	1.2	V
Reverse recovery charge	Q_{rr}	$V_R=15\text{ V}, I_F=I_S, di_F/dt=400\text{ A}/\mu\text{s}$	-	-	28	nC

⁶⁾ See figure 16 for gate charge parameter definition

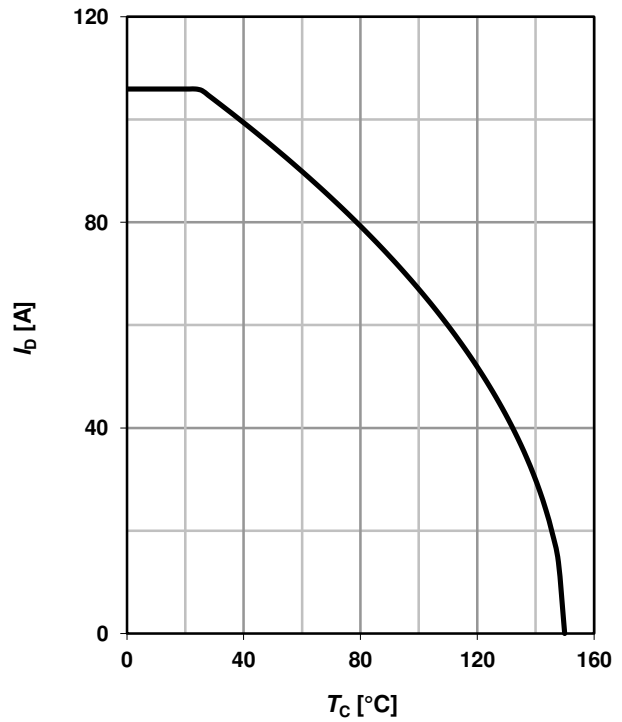
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

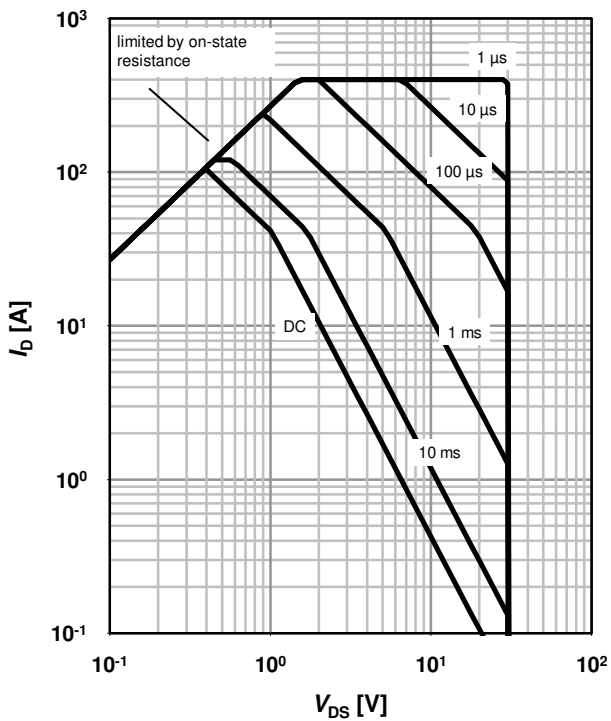
$I_D=f(T_C); V_{GS} \geq 10\text{ V}$



3 Safe operating area

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

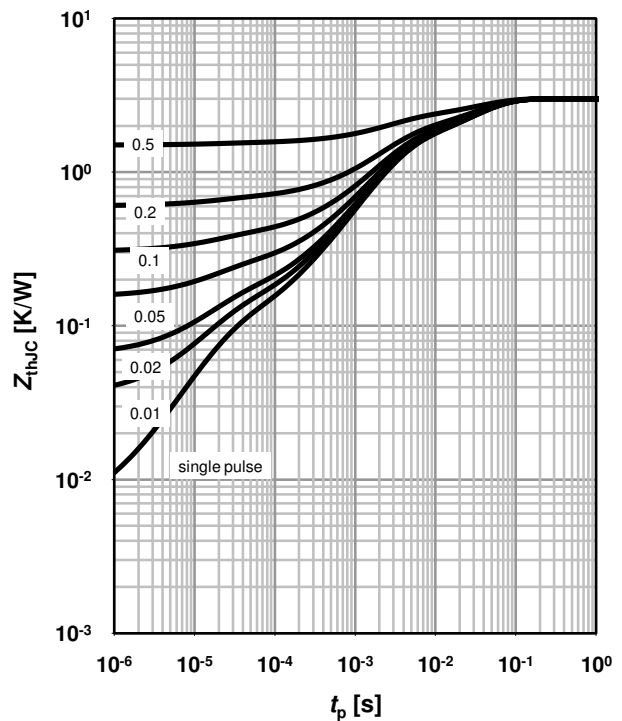
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

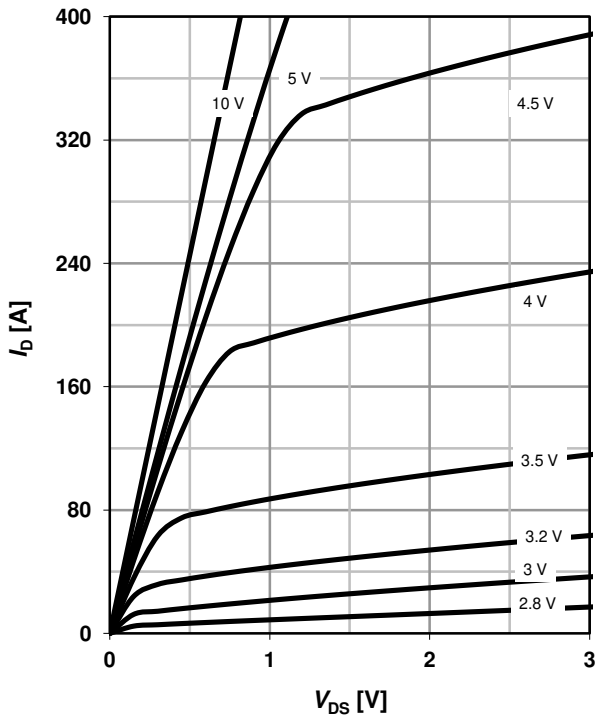
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D = f(V_{DS}); T_j = 25\text{ °C}$

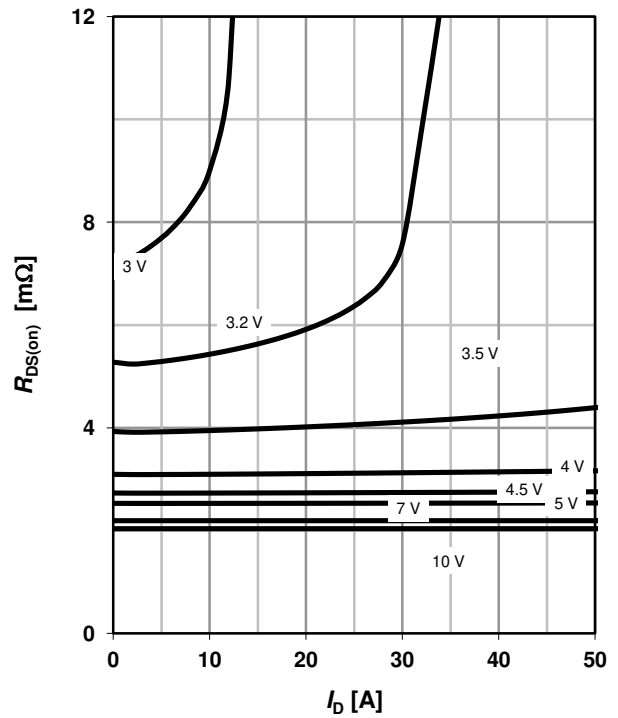
parameter: V_{GS}



6 Typ. drain-source on resistance

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

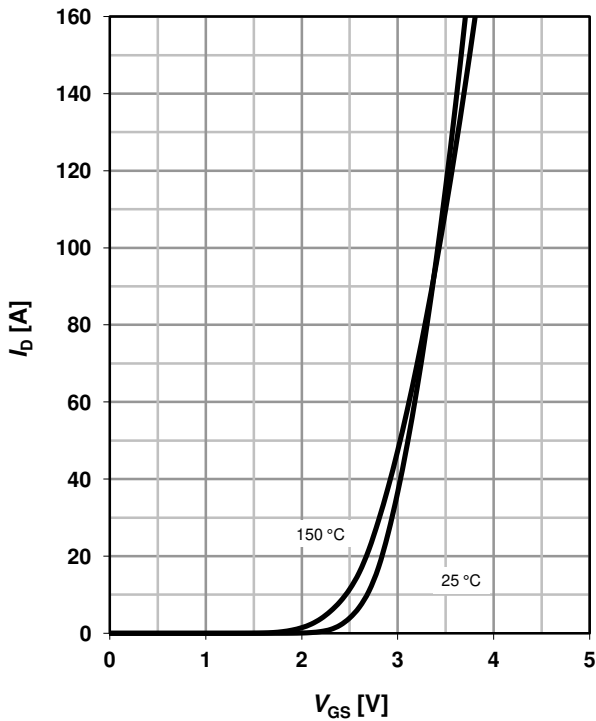
parameter: V_{GS}



7 Typ. transfer characteristics

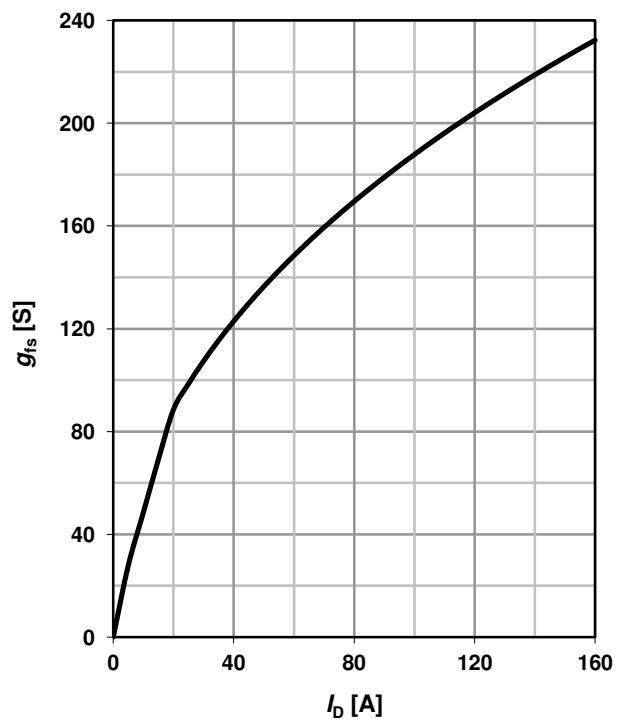
$I_D = f(V_{GS}); |V_{DS}| > 2|I_D|R_{DS(on)max}$

parameter: T_j



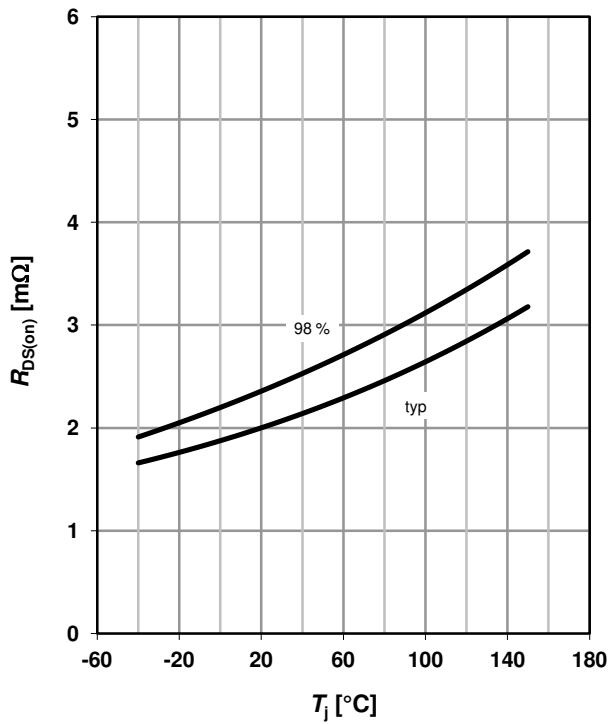
8 Typ. forward transconductance

$g_{fs} = f(I_D); T_j = 25\text{ °C}$

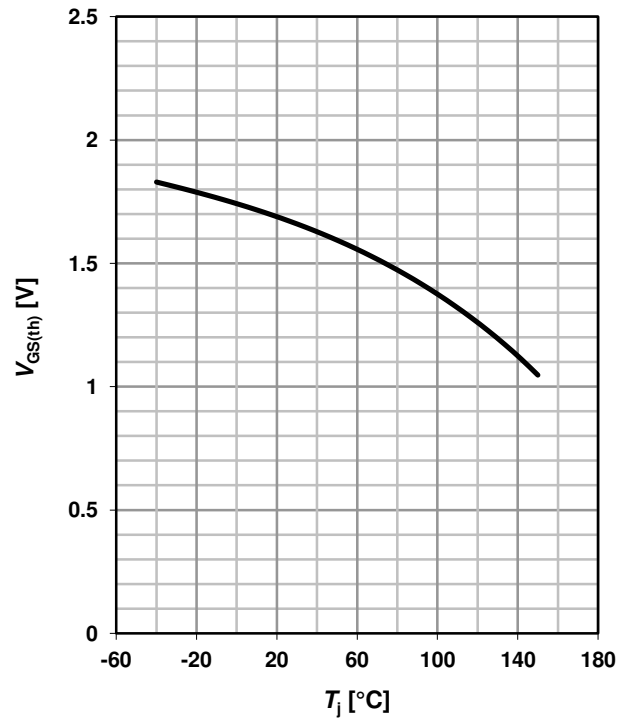


9 Drain-source on-state resistance

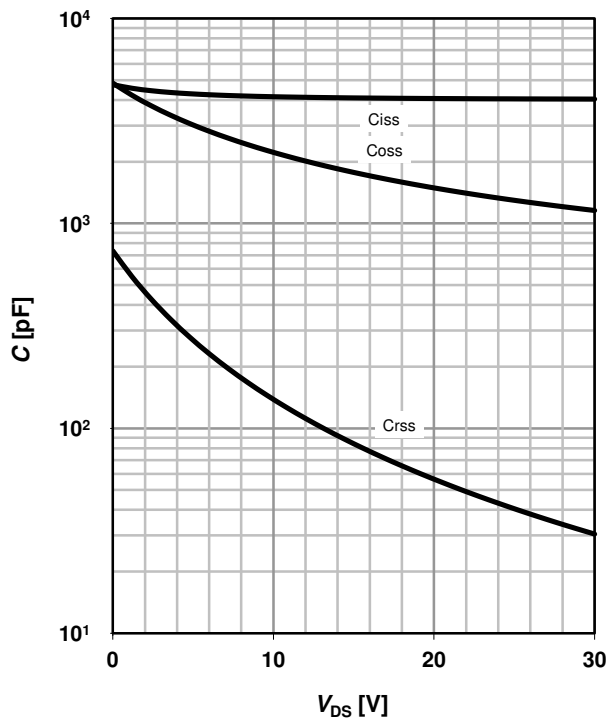
$$R_{DS(on)} = f(T_j); I_D = 20 \text{ A}; V_{GS} = 10 \text{ V}$$


10 Typ. gate threshold voltage

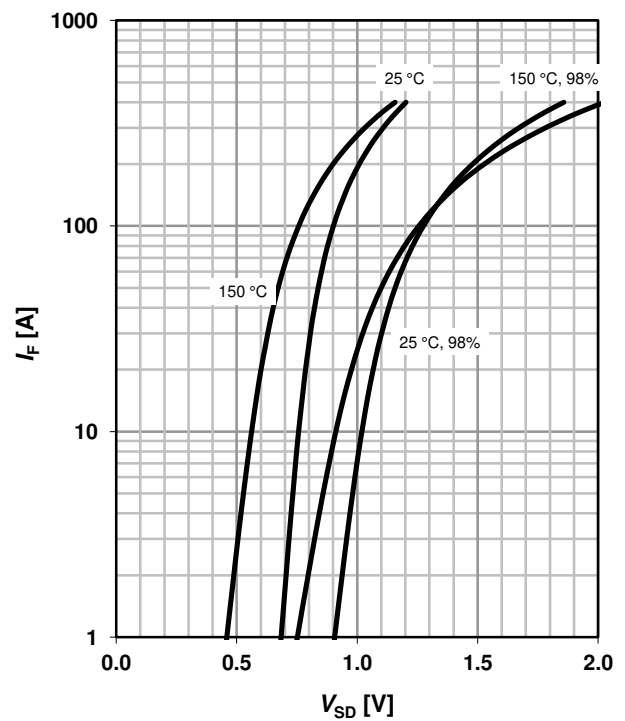
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}; I_D = 250 \mu\text{A}$$


11 Typ. capacitances

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


12 Forward characteristics of reverse diode

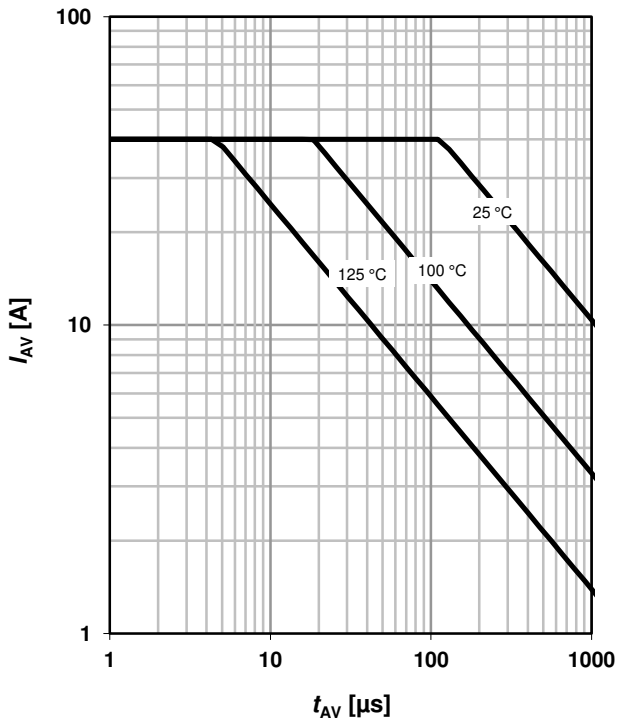
$$I_F = f(V_{SD})$$

 parameter: T_j


13 Avalanche characteristics

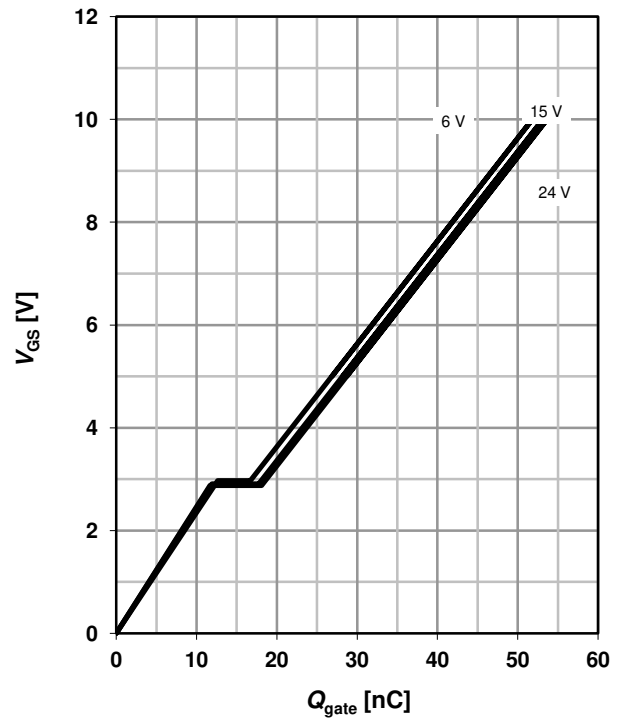
$$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$$

parameter: $T_{j(\text{start})}$

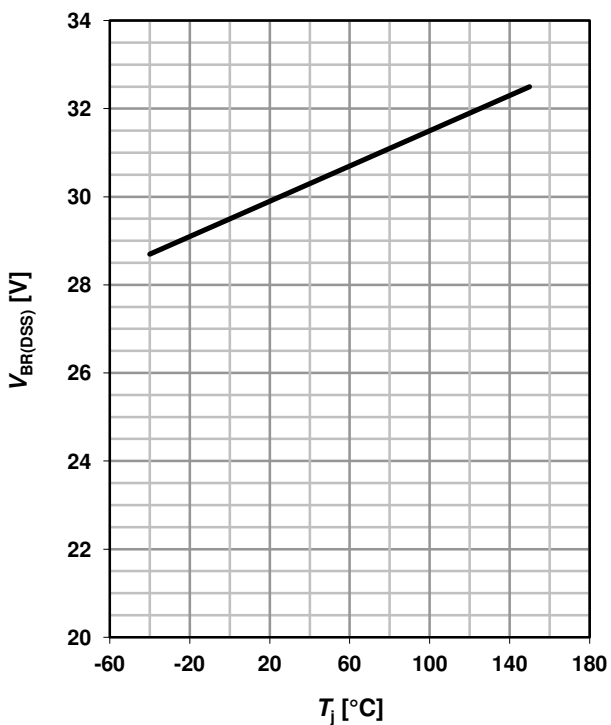
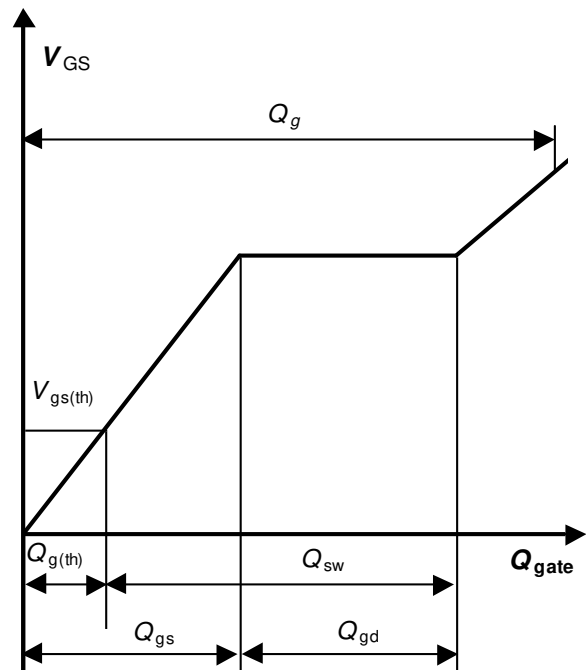

14 Typ. gate charge

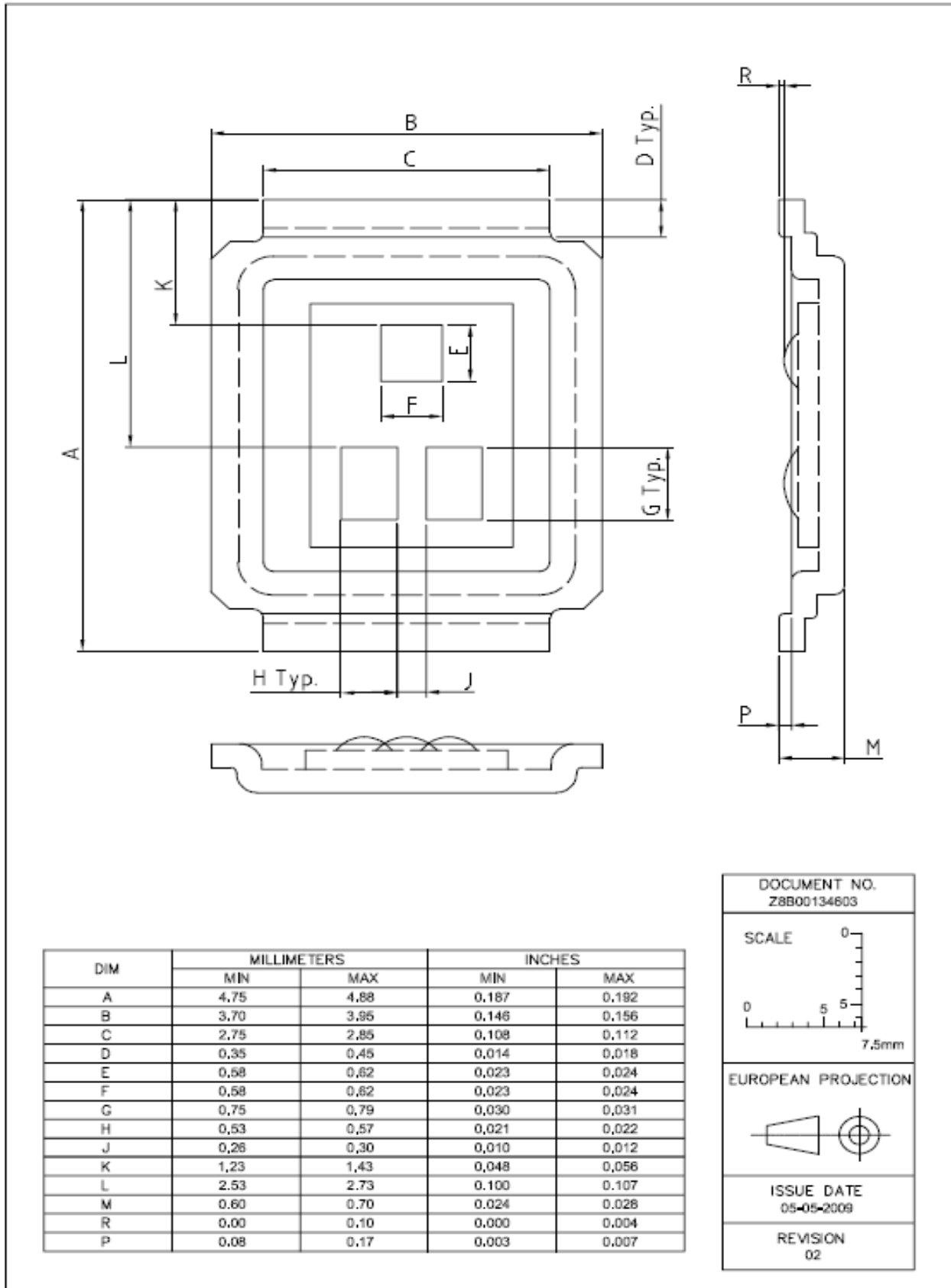
$$V_{GS}=f(Q_{\text{gate}}); I_D=30 \text{ A pulsed}$$

parameter: V_{DD}


15 Drain-source breakdown voltage

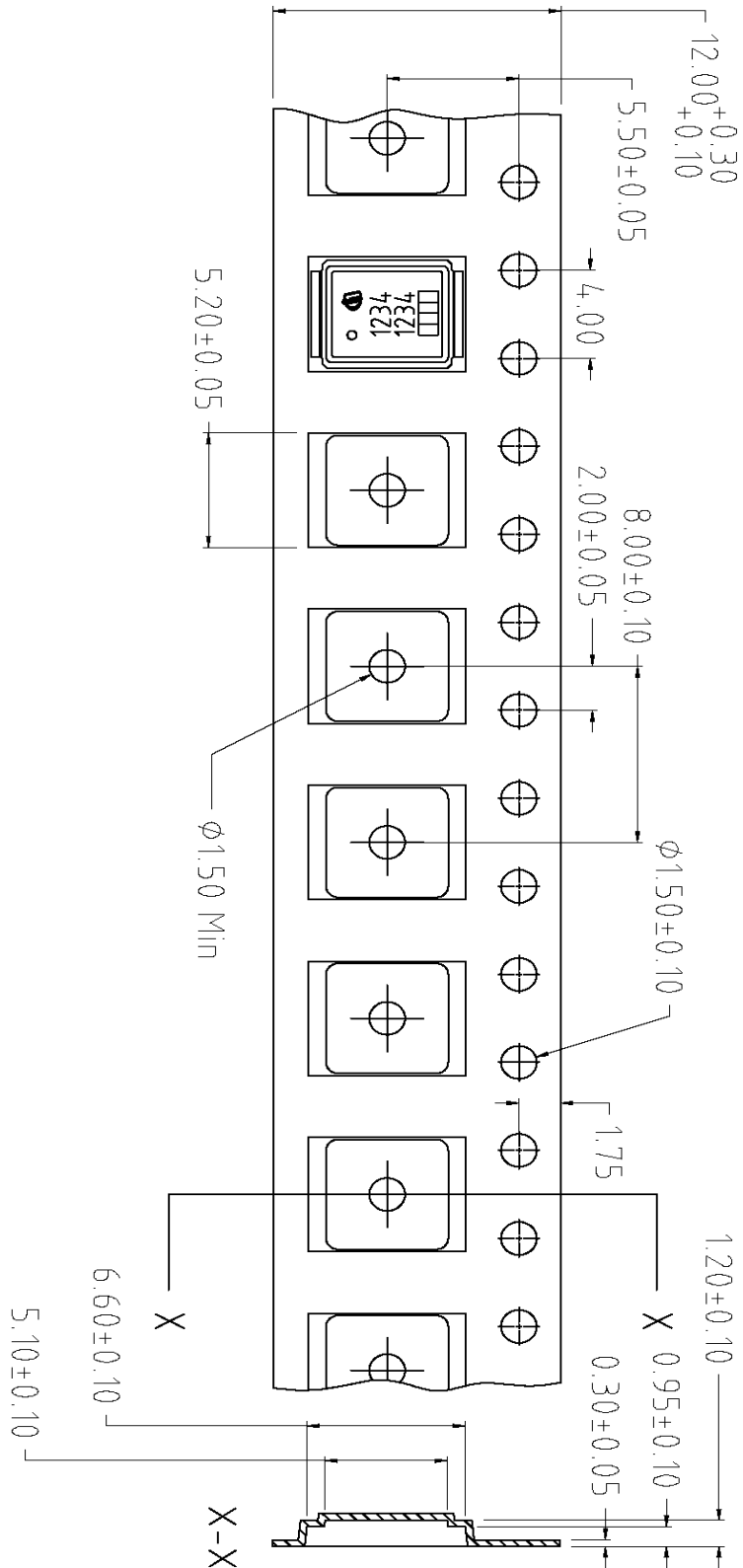
$$V_{BR(DSS)}=f(T_j); I_D=1 \text{ mA}$$


16 Gate charge waveforms


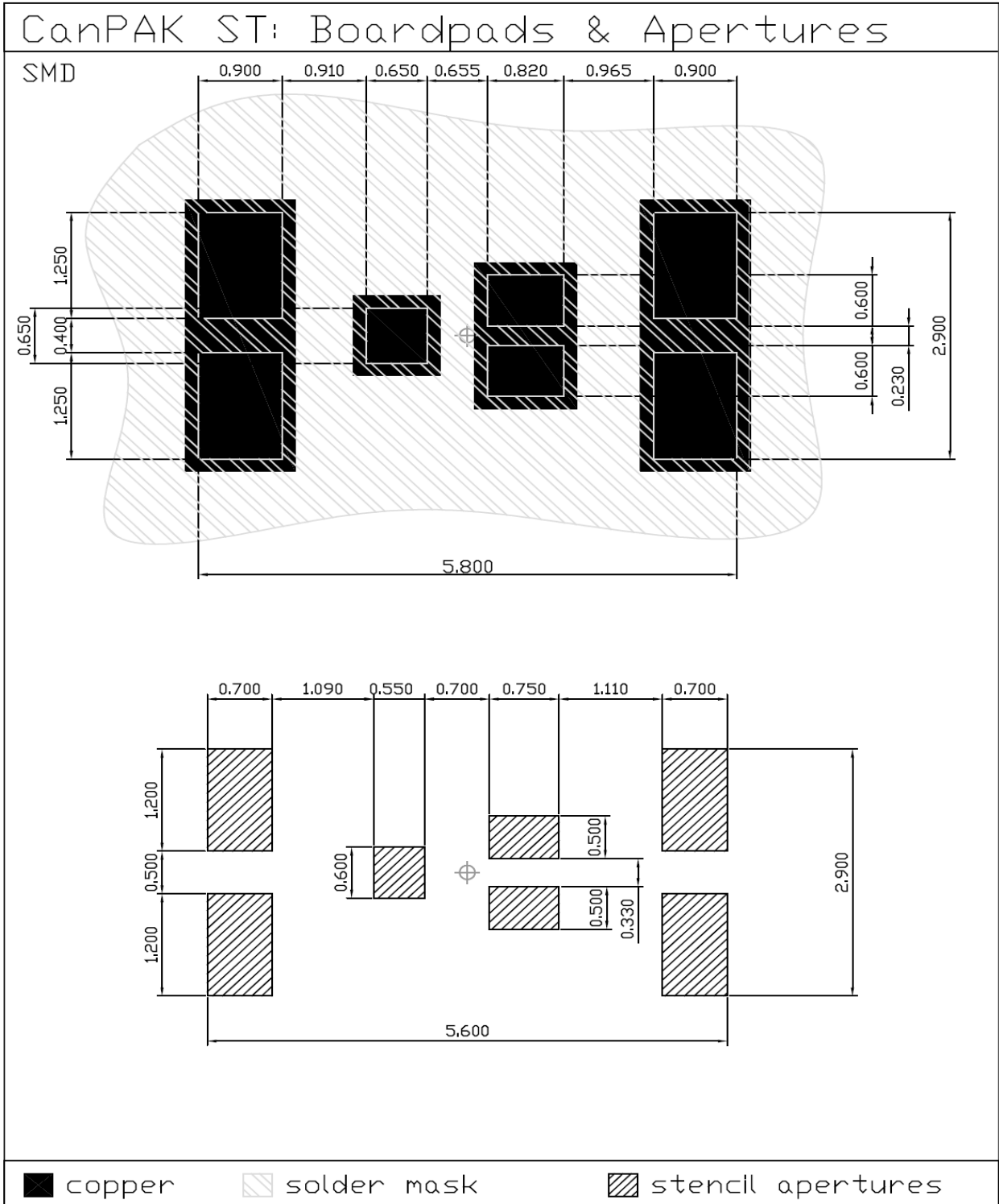
Package Outline
MG-WDSO-2


Package Outline

CanPAK



Dimensions in mm



Dimensions in mm
Recommended stencil thickness 150 μ m

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