

**OptiMOS™<sup>3</sup> Power-MOSFET**
**Features**

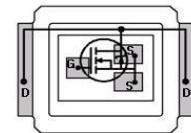
- Optimized for high switching frequency DC/DC converter
- Very low on-resistance  $R_{DS(on)}$
- Excellent gate charge x  $R_{DS(on)}$  product (FOM)
- Low parasitic inductance
- Low profile (<0.7 mm)
- 100% avalanche tested
- 100% Rg Tested
- Double-sided cooling
- Pb-free plating; RoHS compliant
- Compatible with DirectFET® package ST footprint and outline <sup>1)</sup>
- Qualified according to JEDEC<sup>2)</sup> 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 <sup>3)</sup>	$I_{D,pulse}$	$T_C=25\text{ °C}$	400	
Avalanche current, single pulse <sup>4)</sup>	$I_{AS}$	$T_C=25\text{ °C}$	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

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

<sup>2)</sup> J-STD20 and JESD22

<sup>3)</sup> See figure 3 for more detailed information

<sup>4)</sup> 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	$P_{\text{tot}}$	$T_C=25\text{ °C}$	42	W
		$T_A=25\text{ °C}$ , $R_{\text{thJA}}=58\text{ K/W}$	2.2	
Operating and storage temperature	$T_j, T_{\text{stg}}$		-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	$R_{\text{thJC}}$	bottom	-	1.0		K/W
		top	-	-	3	
Device on PCB	$R_{\text{thJA}}$	6 cm <sup>2</sup> cooling area <sup>5)</sup>	-	-	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	$I_{\text{DSS}}$	$V_{\text{DS}}=30\text{ V}$ , $V_{\text{GS}}=0\text{ V}$ , $T_j=25\text{ °C}$	-	0.1	10	$\mu\text{A}$
		$V_{\text{DS}}=30\text{ V}$ , $V_{\text{GS}}=0\text{ V}$ , $T_j=125\text{ °C}$	-	10	100	
Gate-source leakage current	$I_{\text{GSS}}$	$V_{\text{GS}}=20\text{ V}$ , $V_{\text{DS}}=0\text{ V}$	-	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 $\Omega$
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	$R_{\text{G}}$		0.2	0.5	0.8	$\Omega$
Transconductance	$g_{\text{fs}}$	$ V_{\text{DS}} >2 I_{\text{D}} R_{\text{DS(on)max}}$ , $I_{\text{D}}=30\text{ A}$	55	110	-	S

<sup>5)</sup> Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm<sup>2</sup> (one layer, 70  $\mu\text{m}$  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 Characteristics<sup>6)</sup>**

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	-	

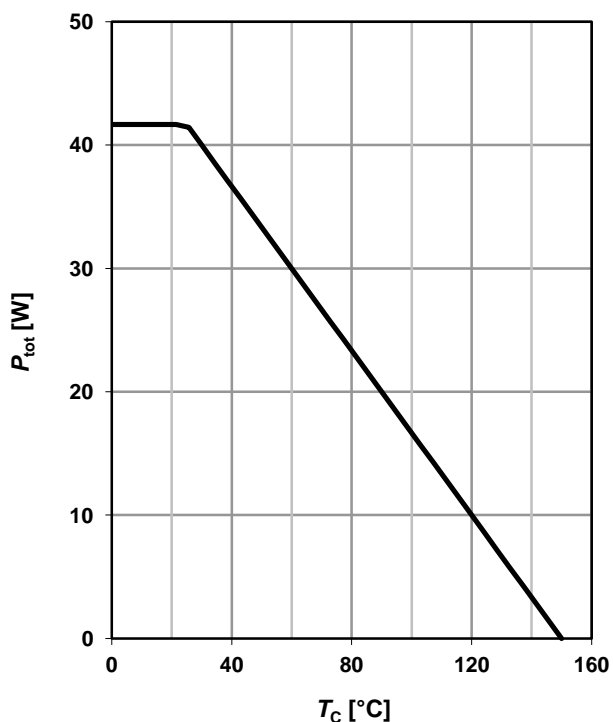
**Reverse Diode**

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

<sup>6)</sup> See figure 16 for gate charge parameter definition

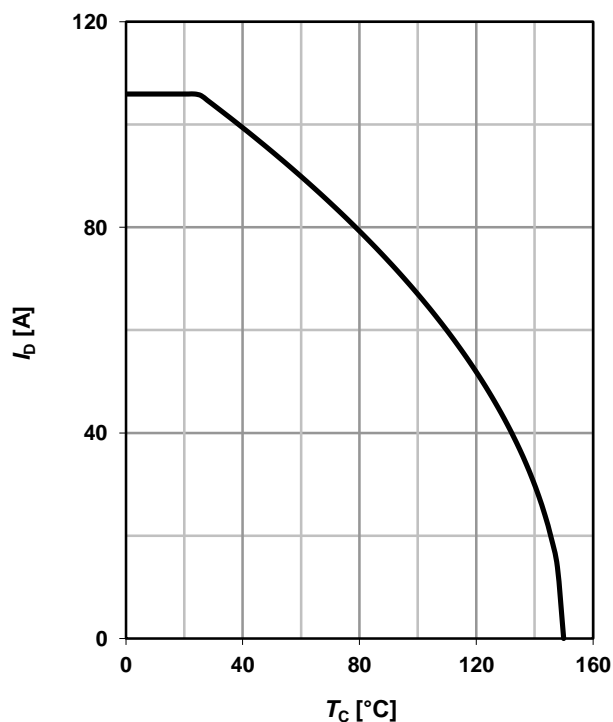
### 1 Power dissipation

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



### 2 Drain current

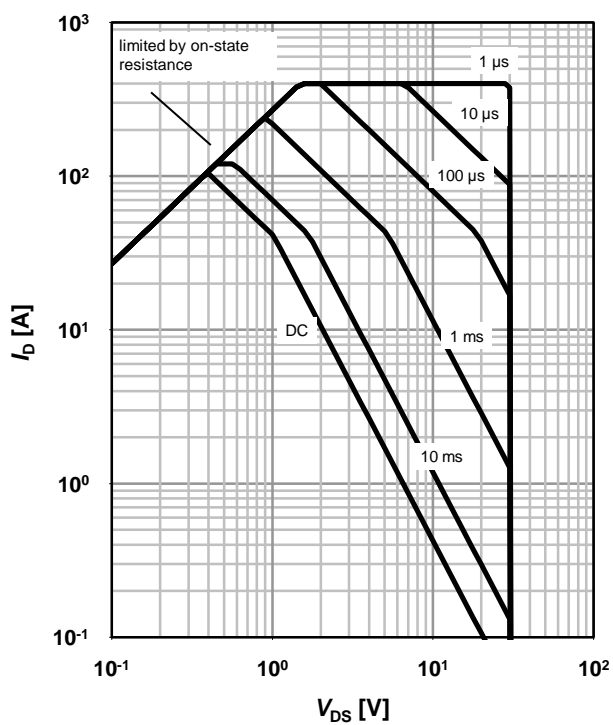
$$I_D=f(T_C); V_{GS}\geq 10\text{ V}$$



### 3 Safe operating area

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

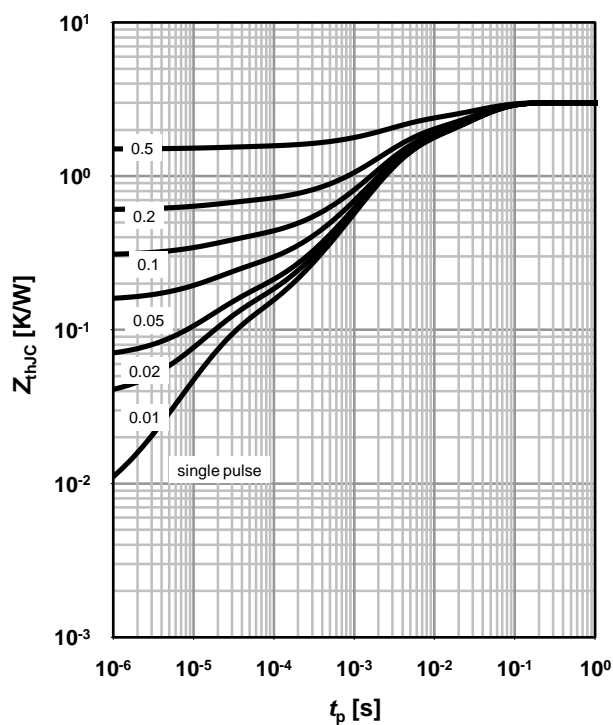
parameter:  $t_p$



### 4 Max. transient thermal impedance

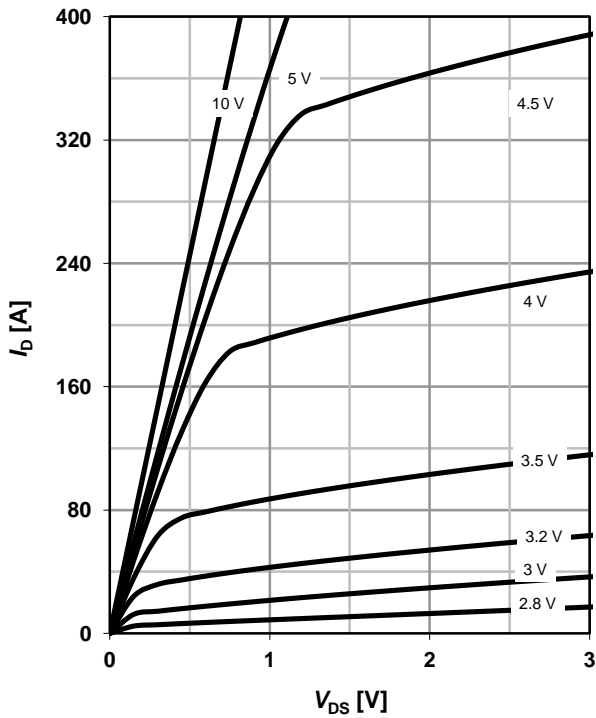
$$Z_{thJC}=f(t_p)$$

parameter:  $D=t_p/T$

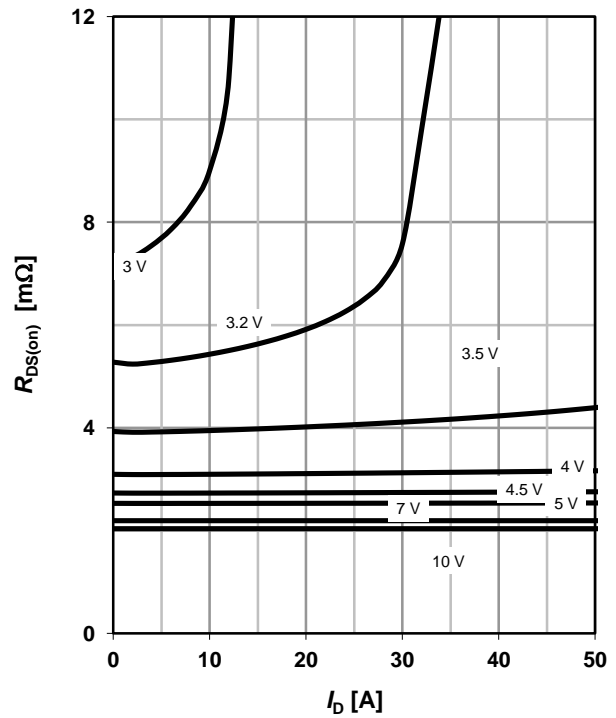


**5 Typ. output characteristics**

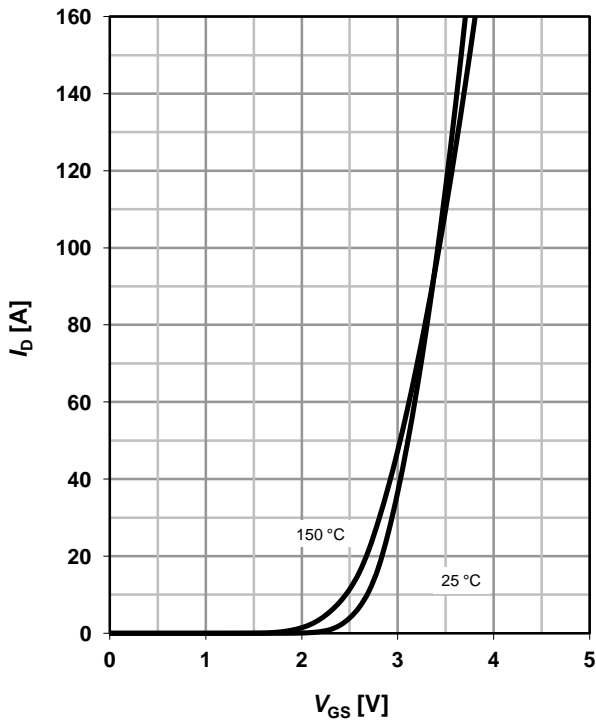
$$I_D = f(V_{DS}); T_j = 25\text{ °C}$$

 parameter:  $V_{GS}$ 

**6 Typ. drain-source on resistance**

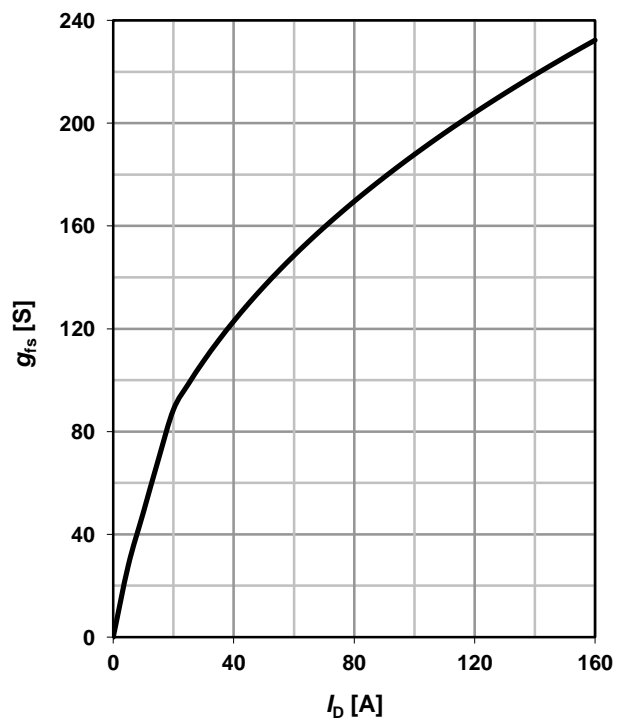
$$R_{DS(on)} = f(I_D); T_j = 25\text{ °C}$$

 parameter:  $V_{GS}$ 

**7 Typ. transfer characteristics**

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

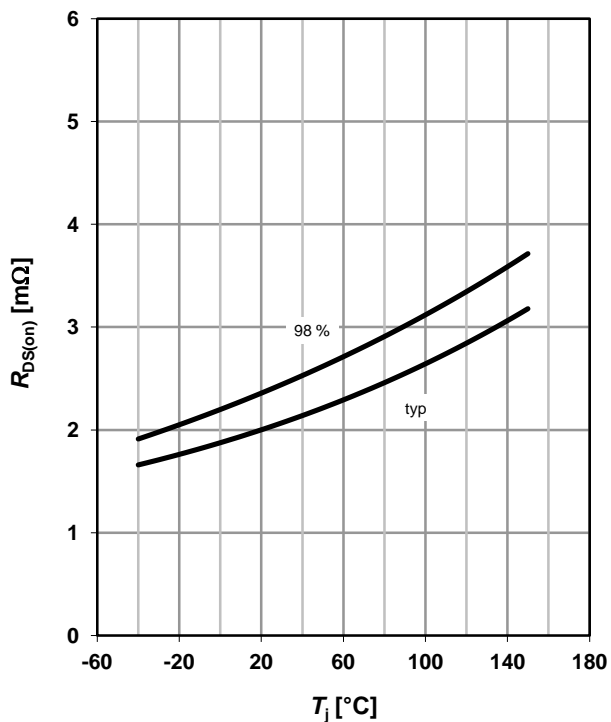
 parameter:  $T_j$ 

**8 Typ. forward transconductance**

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

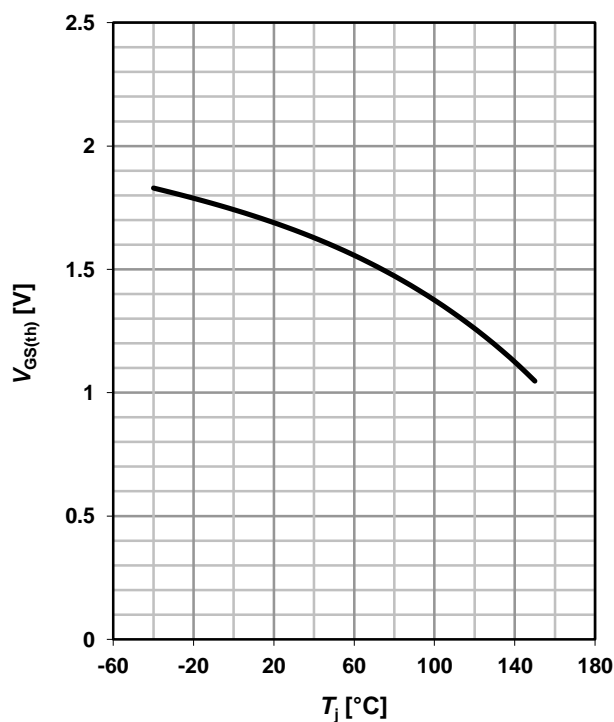


**9 Drain-source on-state resistance**

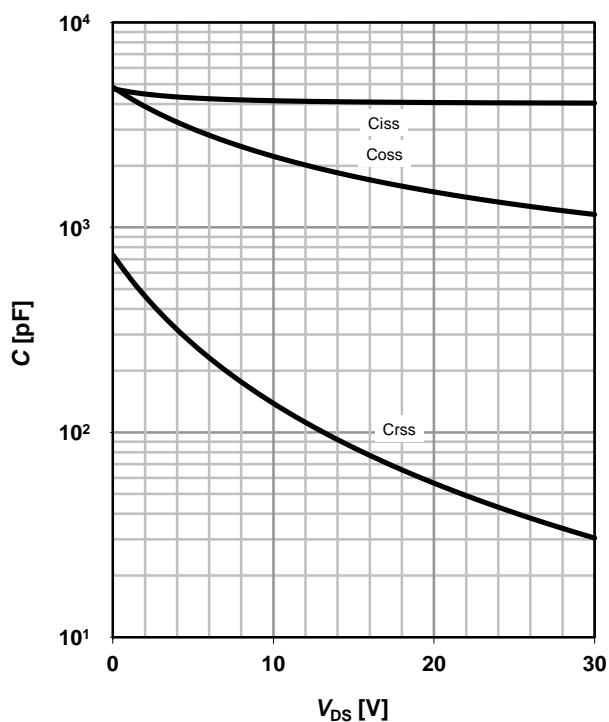
$$R_{DS(on)}=f(T_j); I_D=20\text{ A}; V_{GS}=10\text{ V}$$


**10 Typ. gate threshold voltage**

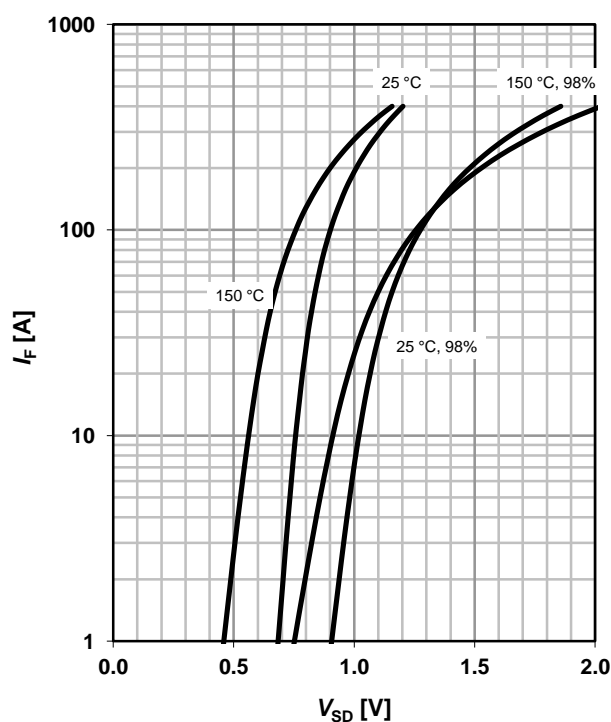
$$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}; I_D=250\ \mu\text{A}$$


**11 Typ. capacitances**

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


**12 Forward characteristics of reverse diode**

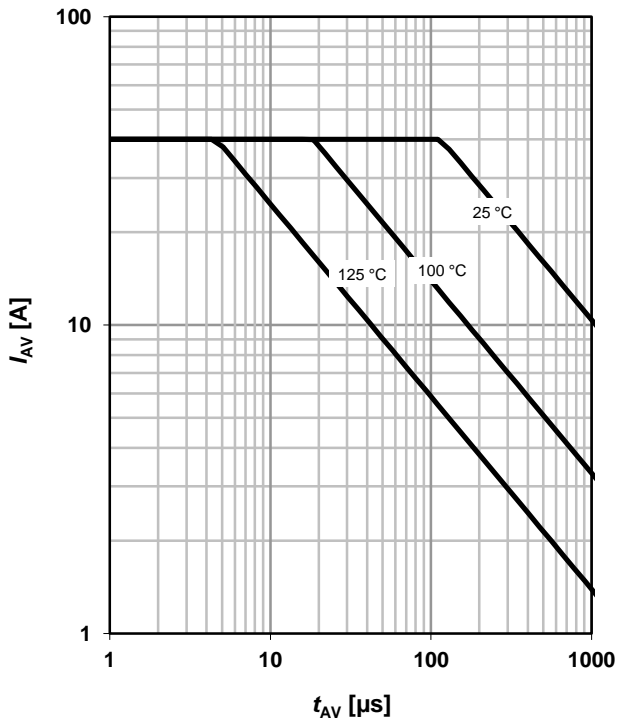
$$I_F=f(V_{SD})$$

 parameter:  $T_j$ 


**13 Avalanche characteristics**

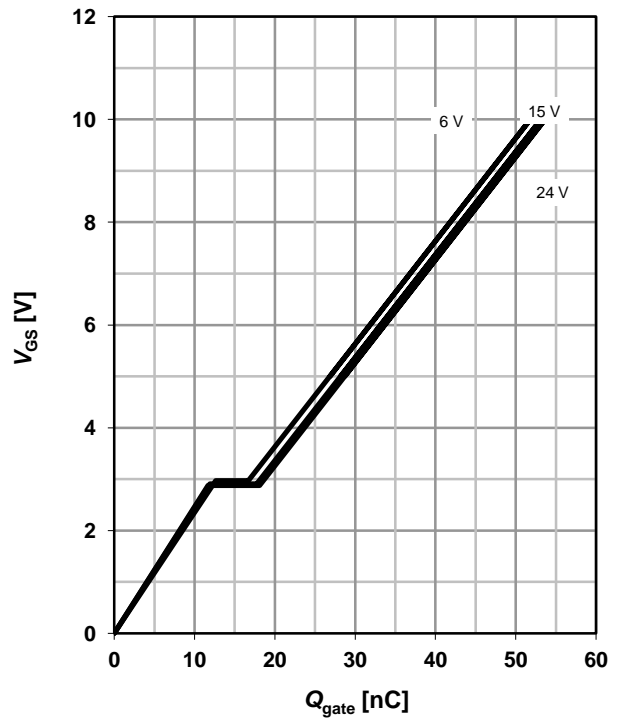
$$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$$

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

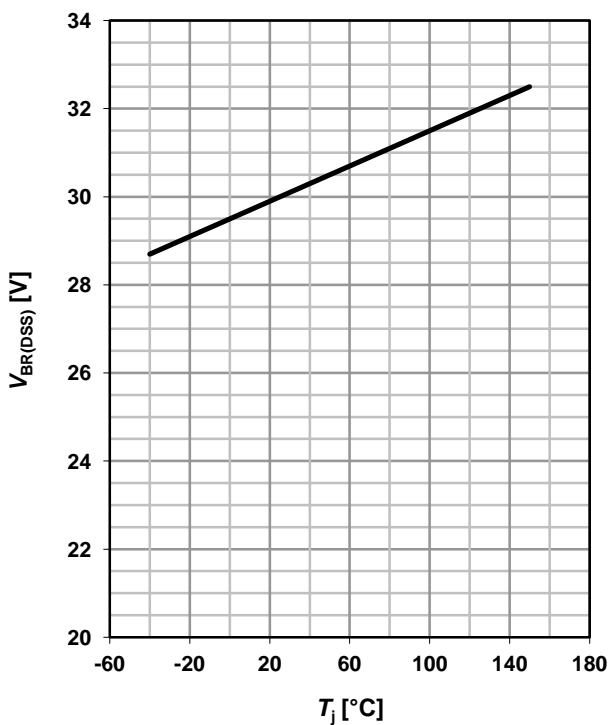
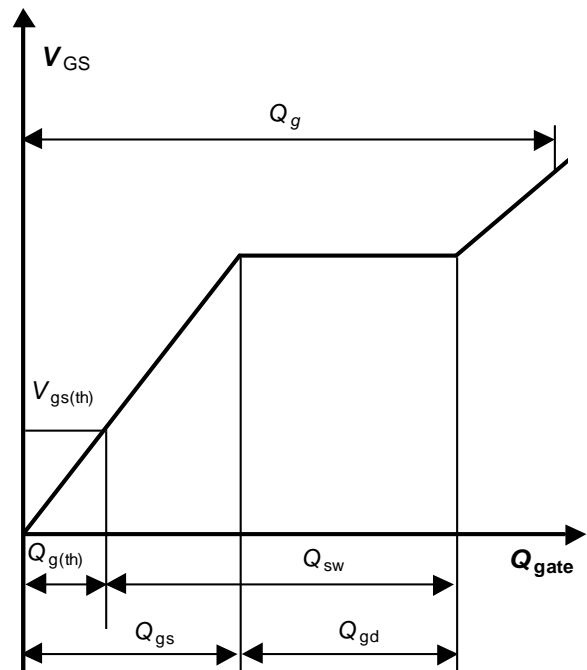

**14 Typ. gate charge**

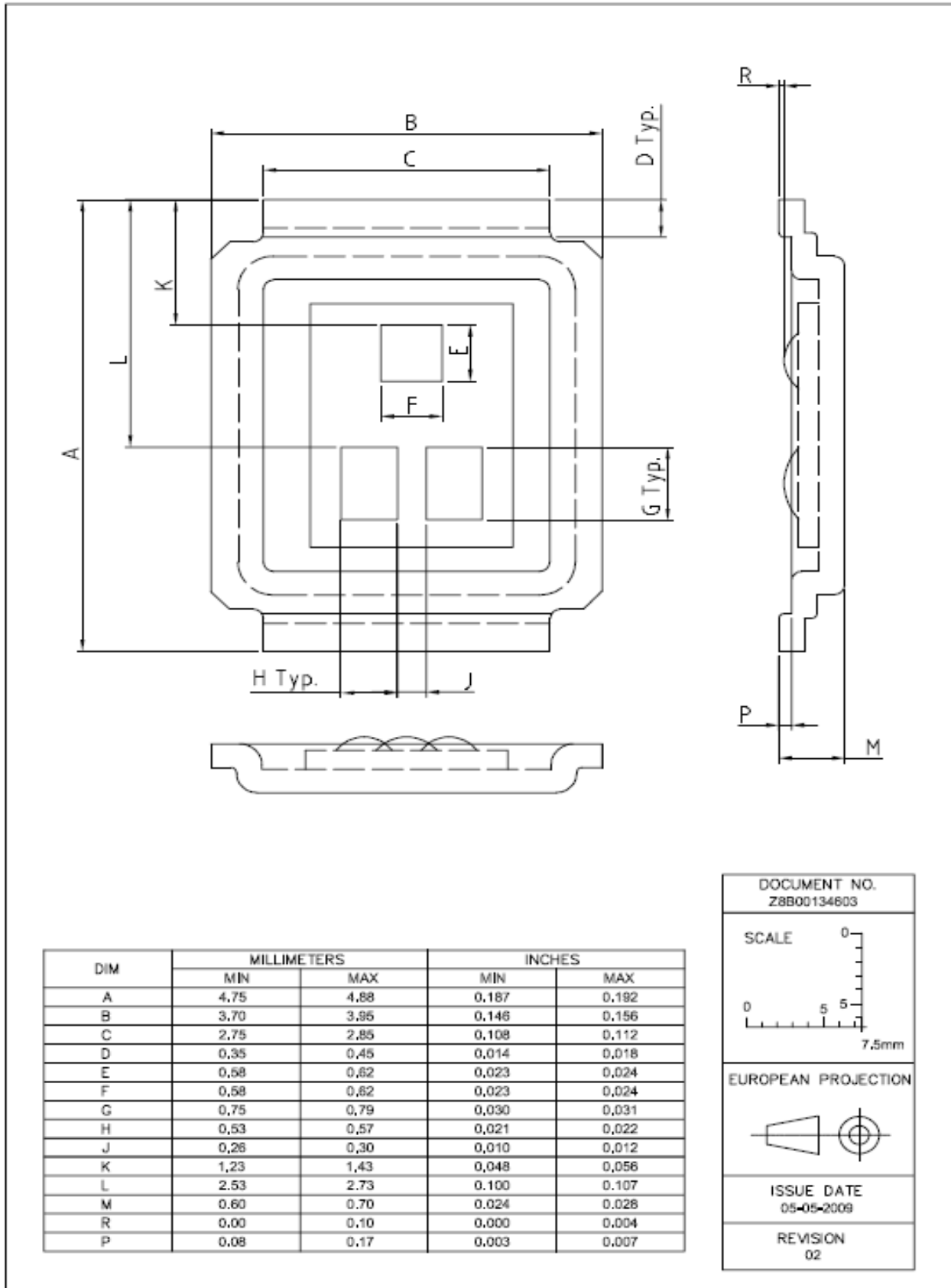
$$V_{GS}=f(Q_{\text{gate}}); I_D=30 \text{ A pulsed}$$

parameter:  $V_{DD}$


**15 Drain-source breakdown voltage**

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

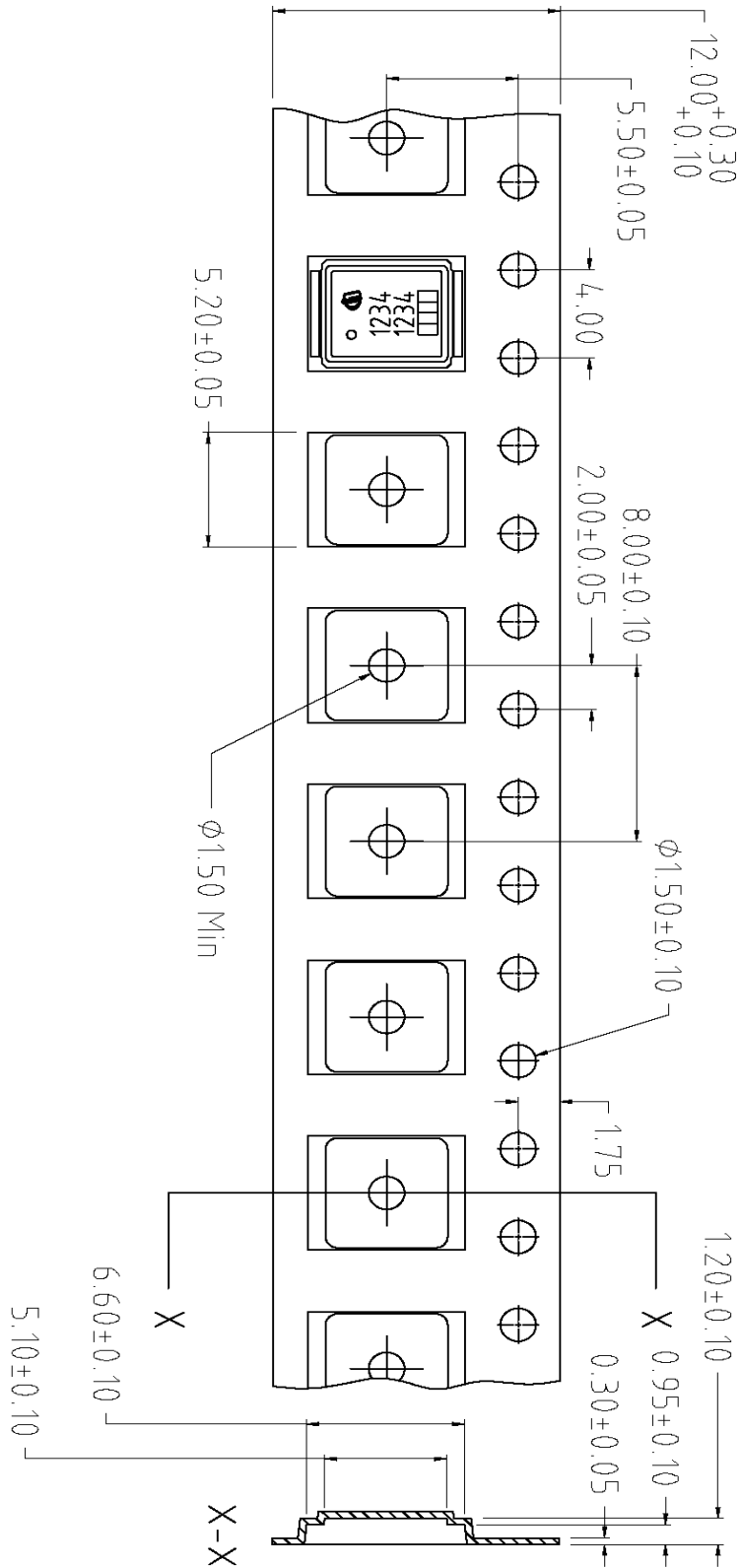

**16 Gate charge waveforms**


**Package Outline**
**MG-WDSO-2**


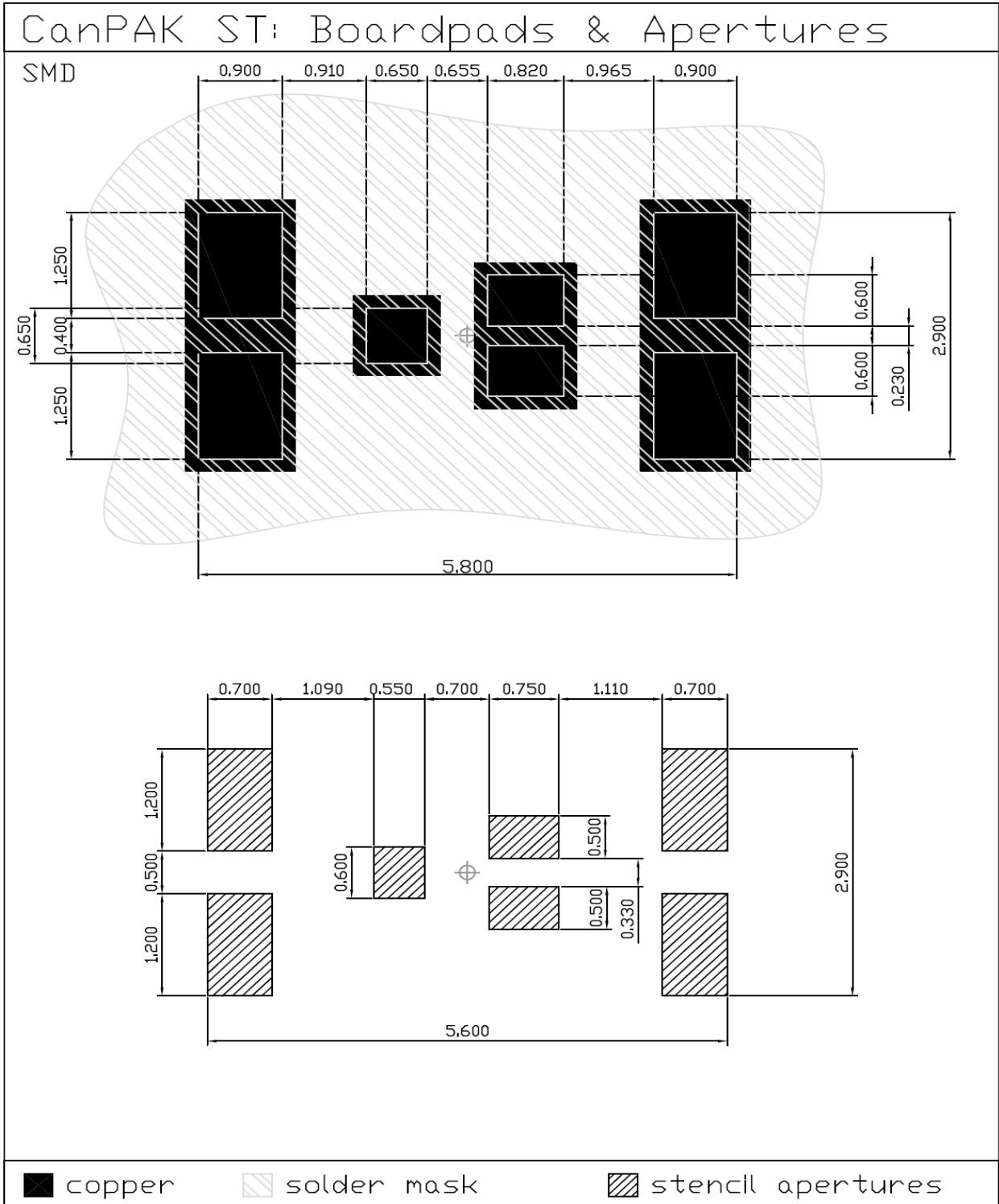


Package Outline

CanPAK



Dimensions in mm



Dimensions in mm  
 Recommended stencil thickness 150 μm

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