OptiMOS™2 Power-Transistor

Features

- N-channel, normal level
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC[1)] for target application
- Ideal for high-frequency switching and synchronous rectification
- Halogen-free according to IEC61249-2-21

Product Summary

V_{DS}	100	V
$R_{DS(on),max\ (TO\ 263)}$	3.9	mΩ
I_D	100	A

Type	IPB04CN10N G	IPI04CN10N G	IPP04CN10N G
Package	PG-TO263-3	PG-TO262-3	PG-TO220-3
Marking	04CN10N	04CN10N	04CN10N

Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	T_C=25 °C[2)]	100	A
		T_C=100 °C	100	
Pulsed drain current[3)]	$I_{D,pulse}$	T_C=25 °C	400	
Avalanche energy, single pulse	E_{AS}	I_D=100 A, R_{GS}=25 Ω	1000	mJ
Gate source voltage [4)]	V_{GS}		±20	V
Power dissipation	P_{tot}	T_C=25 °C	300	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 175	°C
IEC climatic category; DIN IEC 68-1			55/175/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	0.5	K/W
Thermal resistance, junction - ambient	R_{thJA}	minimal footprint	-	-	62	
		6 cm^2 cooling area[5)]	-	-	40	
Electrical characteristics, at T_j=25 °C, unless otherwise specified						
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=1 mA	100	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250 µA	2	3	4	
Zero gate voltage drain current	I_{DSS}	V_{DS}=80 V, V_{GS}=0 V, T_j=25 °C	-	0.1	1	µA
		V_{DS}=80 V, V_{GS}=0 V, T_j=125 °C	-	10	100	
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=0 V	-	1	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=100 A	-	3.5	4.2	mΩ
		V_{GS}=10 V, I_D=100 A, TO263	-	3.2	3.9	
Gate resistance	R_G		-	1.3	-	Ω
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=100 A	83	165	-	S

[1)] J-STD20 and JESD22

[2)] Current is limited by bondwire; with an R_{thJC}=0.5 K/W the chip is able to carry 182 A.

[3)] See figure 3

[4)] T_{jmax}=150 °C and duty cycle D=0.01 for V_{gs}<-5V

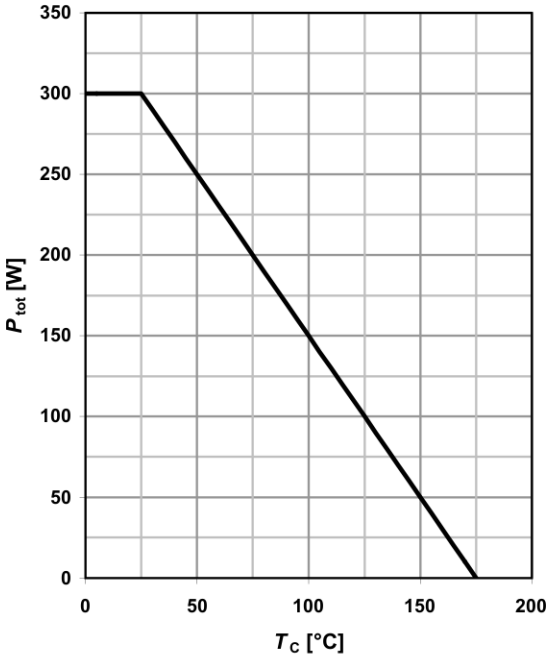
[5)] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=50 V, f=1 MHz	-	10400	13800	pF
Output capacitance	C_{oss}		-	1590	2110	
Reverse transfer capacitance	C_{rss}		-	86	129	
Turn-on delay time	$t_{d(on)}$	V_{DD}=50 V, V_{GS}=10 V, I_D=50 A, R_G=1.6 Ω	-	34	51	ns
Rise time	t_r		-	78	117	
Turn-off delay time	$t_{d(off)}$		-	76	114	
Fall time	t_f		-	25	38	
Gate Charge Characteristics[6)]						
Gate to source charge	Q_{gs}	V_{DD}=50 V, I_D=100 A, V_{GS}=0 to 10 V	-	52	70	nC
Gate to drain charge	Q_{gd}		-	37	55	
Switching charge	Q_{sw}		-	58	83	
Gate charge total	Q_g		-	158	210	
Gate plateau voltage	$V_{plateau}$		-	5.0	-	V
Output charge	Q_{oss}	V_{DD}=50 V, V_{GS}=0 V	-	168	223	nC
Reverse Diode						
Diode continous forward current	I_S	T_C=25 °C	-	-	100	A
Diode pulse current	$I_{S,pulse}$		-	-	400	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=100 A, T_j=25 °C	-	1.0	1.2	V
Reverse recovery time	t_{rr}	V_R=50 V, I_F=I_S, di_F/dt=100 A/µs	-	100	-	ns
Reverse recovery charge	Q_{rr}		-	300	-	nC

[6)] See figure 16 for gate charge parameter definition

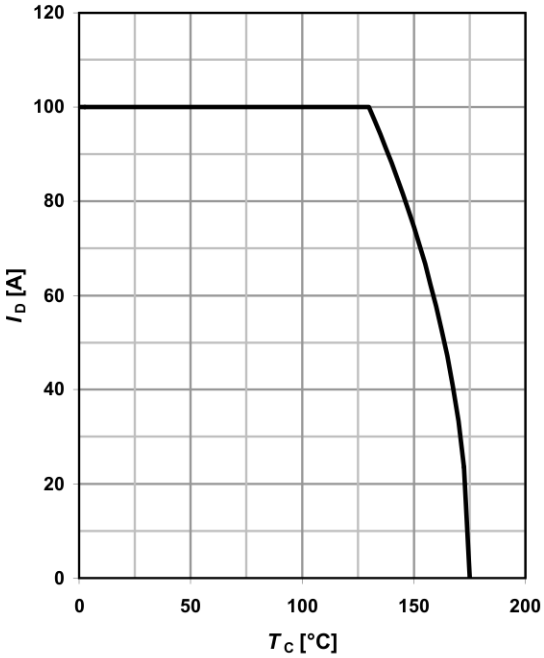
1 Power dissipation

$P_{tot}=f(T_C)$



2 Drain current

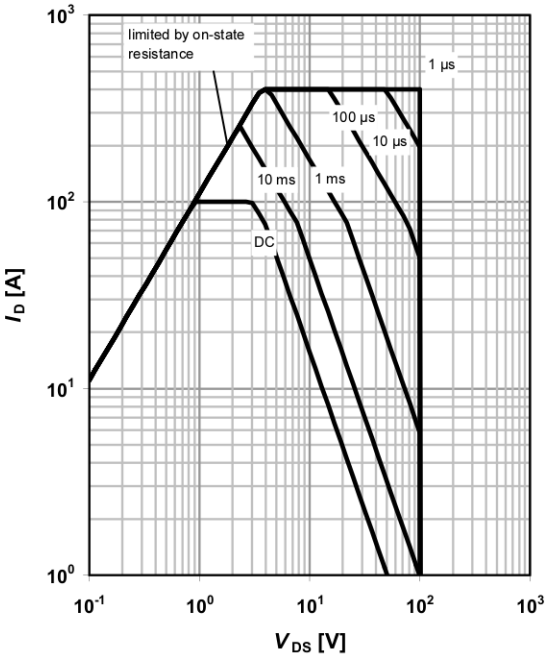
$I_D=f(T_C)$; $V_{GS}\geq 10$ V



3 Safe operating area

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

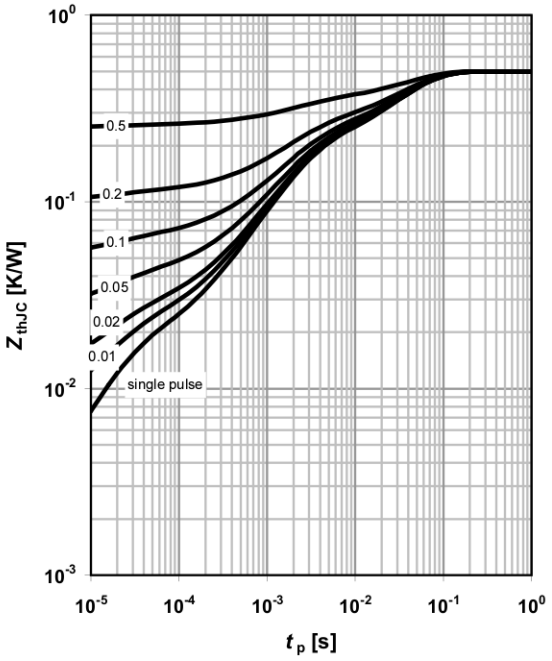
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC}=f(t_p)$

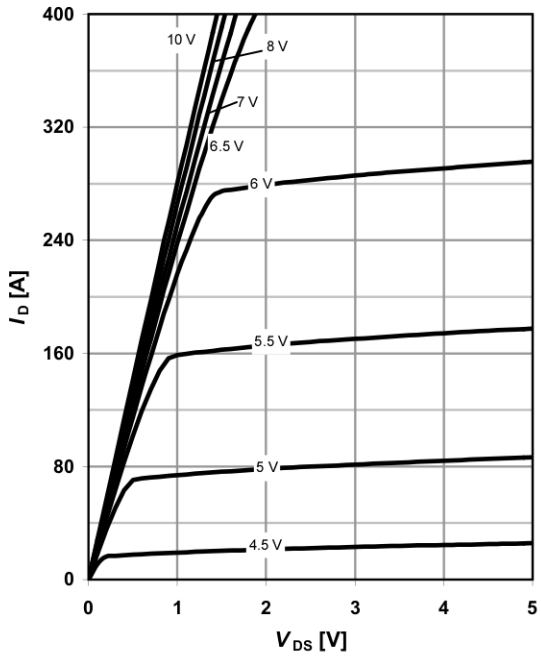
parameter: $D=t_p/T$



5 Typ. output characteristics

$I_D=f(V_{DS})$; $T_j=25$ °C

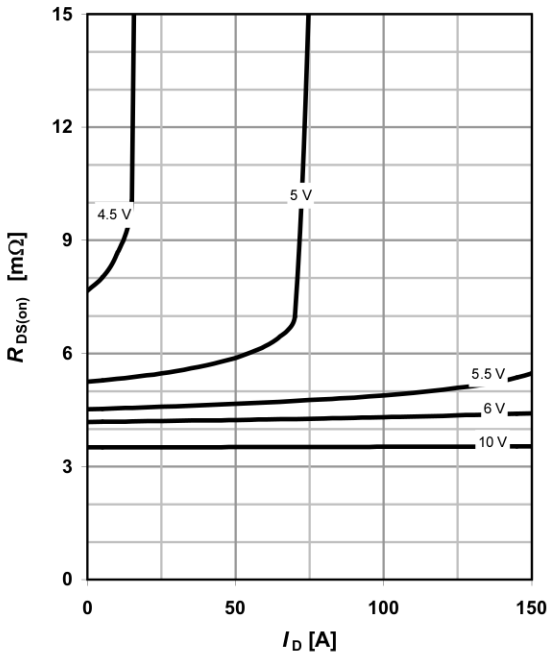
parameter: V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$; $T_j=25$ °C

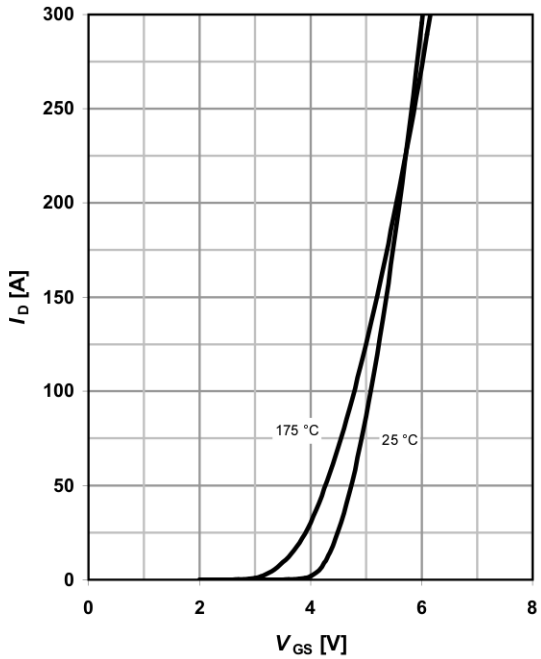
parameter: V_{GS}



7 Typ. transfer characteristics

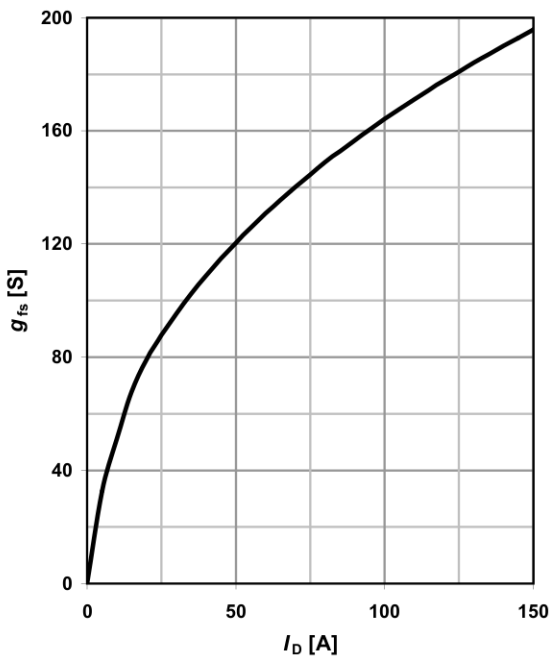
$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$

parameter: T_j



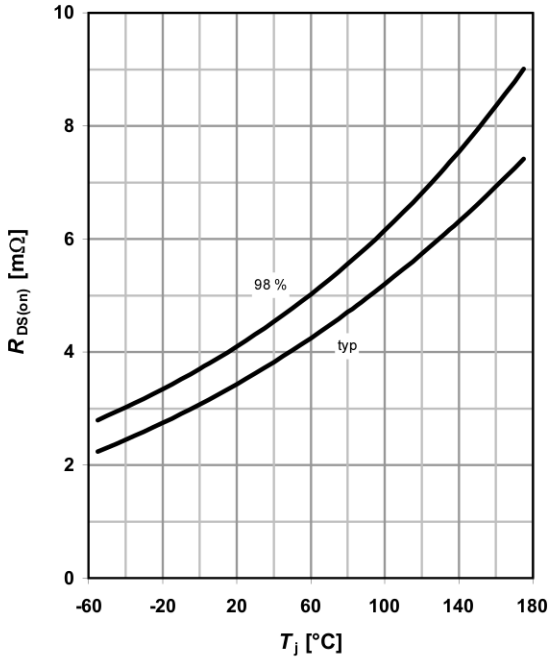
8 Typ. forward transconductance

$g_{fs}=f(I_D)$; $T_j=25$ °C



9 Drain-source on-state resistance

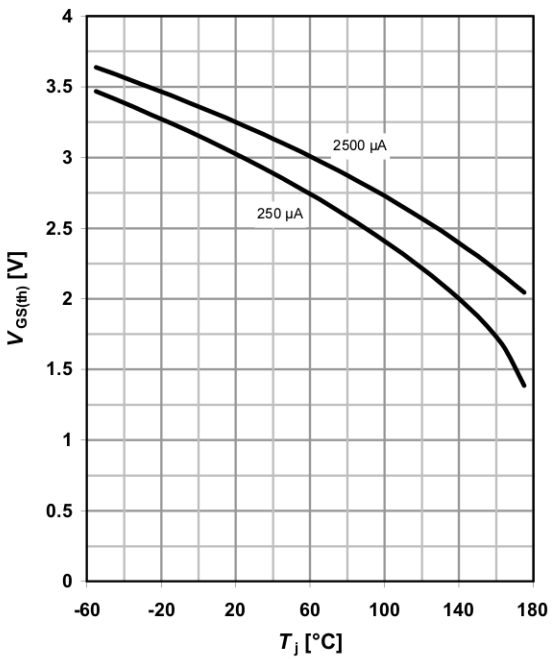
$R_{DS(on)}$=f(T_j); I_D=100 A; V_{GS}=10 V



10 Typ. gate threshold voltage

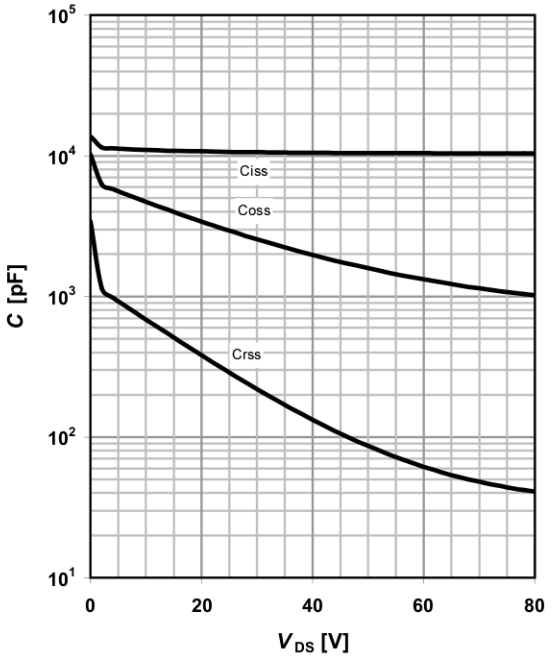
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}

parameter: I_D



11 Typ. capacitances

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



12 Forward characteristics of reverse diode

I_F=f(V_{SD})

parameter: T_j