MOSFET

Metal Oxide Semiconductor Field Effect Transistor

CoolMOS™ CE

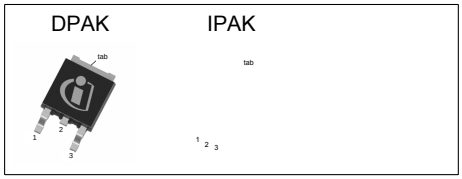
500V CoolMOS™ CE Power Transistor
IPX50R3K0CE

Data Sheet

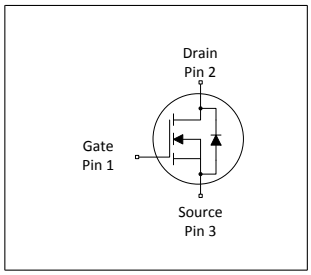
Rev. 2.2
Final

Power Management & Multimarket

1 Description



CoolMOS™ is a revolutionary technology for high voltage power MOSFETs, designed according to the superjunction (SJ) principle and pioneered by Infineon Technologies. CoolMOS™ CE is a price-performance optimized platform enabling to target cost sensitive applications in Consumer and Lighting markets by still meeting highest efficiency standards. The new series provides all benefits of a fast switching Superjunction MOSFET while not sacrificing ease of use and offering the best cost down performance ratio available on the market.



Features

- Extremely low losses due to very low FOM Rdson*Qg and Eoss
- Very high commutation ruggedness
- Easy to use/drive
- Pb-free plating, Halogen free mold compound
- Qualified for standard grade applications

Applications

PFC stages, hard switching PWM stages and resonant switching stages for e.g. PC Silverbox, Adapter, LCD & PDP TV and indoor lighting.

Please note: For MOSFET paralleling the use of ferrite beads on the gate or separate totem poles is generally recommended.

Table 1 Key Performance Parameters

Parameter	Value	Unit
T_{BQ} > R*k_v	33.	T
P_{BQ}ml'*k_v	1	Ω
$O_{e,rwn}$	2,1	lA
GB*nsjqc	2,/	?
C_{mqq} > 2..T	.,27	ÉH
@mbw bgmbc bg-br	3..	?-Éq

Type / Ordering Code	Package	Marking	Related Links
GNB3.P1I.AC	NE+RM 030	3.Q1I.AC	qcc ?nnclbgv ?
GNS3.P1I.AC	NE+RM 03/		

Table of Contents

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.		
Amlrglsmsq bp_gl asppclr[1]	I_D	+ +	+ +	/,5 /,/	?	R_A ; 03ÄA R_A ; /..ÄA
Nsjqcb bp_gl asppclr[2]	$I_{D,pulse}$	+	+	2,/	?	R_A;03ÄA
?t_j_lafc clcpew* qglejc nsjqc	E_{AS}	+	+	/6	kH	G_B ;.,3?9 T_{BB} ; 3.T
?t_j_lafc clcpew* pcncrgrgtc	E_{AR}	+	+	.,.1	kH	G_B ;.,3?9 T_{BB} ; 3.T
?t_j_lafc asppclr* pcncrgrgtc	I_{AR}	+	+	.,3	?	+
KMQDCR bt-br pseecblcqq	bt-br	+	+	3.	T-lq	V_{DS} =0...400V
E_rc qmspac tmjr_ec	V_{GS}	+0. +1.	+ +	0. 1.	T	qr_rga9 ?A &d</ Fx'
Nmucp bgqqgn_rgml &lml DsjjN? I' RM+030* RM+03/	P_{tot}	+	+	/6	U	T_C=25°C
Mncp_rgle _lb qrmp_ec rcknep_rspc	T_j, T_{stg}	+33	+	/3.	ÄA	+
Amlrglsmsq bgmbc dmpu_pb asppclr	I_S	+	+	/,3	?	T_C=25°C
Bgmbc nsjqc asppclr[2]	$I_{S,pulse}$	+	+	2,/	?	R_A ; 03ÄA
Pctcpqc bgmbc bt-br[3]	bt-br	+	+	/3	T-lq	V_{DS} =0...400V, I_{SD}<=I_S, T_j=25°C, t_{cond}<2µs
K_vgksk bgmbc amkksr_rgml qnccb[3]	bgd-br	+	+	3..	?-µq	V_{DS} =0...400V, I_{SD}<=I_S, T_j=25°C, t_{cond}<2µs

3 Thermal characteristics

Table 3 Thermal characteristics DPAK, IPAK

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Rfcpk_jpcqgqr_lac* hslargml +a_qc	R_{thJC}	+	+	5,/	ÄA-U	+
Rfcpk_jpcqgqr_lac* hslargml +_k`gclr[4]	R_{thJA}	+ +	+ 13	40 +	ÄA-U	QKB tcpqgml* bctgac ml NA@* kglgk_j dmmrnpglr QKB tcpqgml* bctgac ml NA@* 4ak[0] ammjgle _pc_[4]
Qmjbcpgle rcknep_rspc* u_tc+ $ pcdjmuqmjbcpgle _jjmucb	T_{sold}	+	+	04.	ÄA	pcdjmu KQJ /

[1] Jgkgrcb `w R_{thk_v}, K_vgksk bsrw awajc B;.,53

[2] Nsjqc ugbrf rn jgkgrcb `w R_{thk_v}

[3] V_{DClink}=400V; $V_{DS,peak}$<$V_{(BR)DSS}$; identical low side and high side switch with identical R_G

[4] Bctgac ml 2.kk(2.kk(/,3kk mlc j_wcp cnmvw NA@ DP2 ugrf 4ak[0] amnncp _pc_ &rfgailcqq 5.µk' dmp bp_gl amllcargml, NA@ gq tcprga_j ugrfmsr _gp qrpc_k ammjgle,

4 Electrical characteristics

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Bp_gl+qmspac `pc_ibmul tmjr_ec	$V_{(BR)DSS}$	3..	+	+	T	V_{GS}=0V, I_D=1mA
E_rc rfpcqfmjb tmjr_ec	$V_{(GS)th}$	0,3.	1	1,3.	T	V_{DS}=V_{GS}, I_D=0.03mA
Xcpm e_rc tmjr_ec bp_gl asppclr	I_{DSS}	+ +	+ /.	/ +	µ?	V_{DS}=500V, V_{GS}=0V, T_j=25°C V_{DS}=500V, V_{GS}=0V, T_j=150°C
E_rc+qmspac jc_i_ec aspclr	I_{GSS}	+	+	/..	l?	V_{GS}=20V, V_{DS}=0V
Bp_gl+qmspac ml+qr_rc pcqgqr_lac	$R_{DS(on)}$	+ +	0,5. 5,.0	1,.. +	Ω	V_{GS}=13V, I_D=0.4A, T_j=25°C V_{GS}=13V, I_D=0.4A, T_j=150°C
E_rc pcqgqr_lac	R_G	+	4	+	Ω	f=1 MHz, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Glnsr a_n_agr_lac	C_{iss}	+	62	+	nD	V_{GS}=0V, V_{DS}=100V, f=1MHz
Msrnsr a_n_agr_lac	C_{oss}	+	5	+	nD	V_{GS}=0V, V_{DS}=100V, f=1MHz
Cddcargtc msrnsr a_n_agr_lac* clcpew pcj_rcb[1]	$C_{o(er)}$	+	4	+	nD	V_{GS}=0V, V_{DS}=0...400V
Cddcargtc msrnsr a_n_agr_lac* rgkc pcj_rcb[2]	$C_{o(tr)}$	+	/7	+	nD	I_D=constant, V_{GS}=0V, V_{DS}=0...400V
Rspl+ml bcj_w rgkc	$t_{d(on)}$	+	5,1	+	lq	V_{DD}=400V, V_{GS}=13V, I_D=0.5A, R_G=5.3Ω
Pgqc rgkc	t_r	+	3,6	+	lq	V_{DD}=400V, V_{GS}=13V, I_D=0.5A, R_G=5.3Ω
Rspl+mdd bcj_w rgkc	$t_{d(off)}$	+	01	+	lq	V_{DD}=400V, V_{GS}=13V, I_D=0.5A, R_G=5.3Ω
D_jj rgkc	t_f	+	27	+	lq	V_{DD}=400V, V_{GS}=13 V, I_D=0.5A, R_G=5.3Ω

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
E_rc rm qmspac af_pec	Q_{gs}	+	.,3	+	lA	V_{DD}=400V, I_D=0.5A, V_{GS}=0 to 10V
E_rc rm bp_gl af_pec	Q_{gd}	+	0,4	+	lA	V_{DD}=400V, I_D=0.5A, V_{GS}=0 to 10V
E_rc af_pec rmr_j	Q_g	+	2,1	+	lA	V_{DD}=400V, I_D=0.5A, V_{GS}=0 to 10V
E_rc nj_rc_s tmjr_ec	$V_{plateau}$	+	3,1	+	T	V_{DD}=400V, I_D=0.5A, V_{GS}=0 to 10V

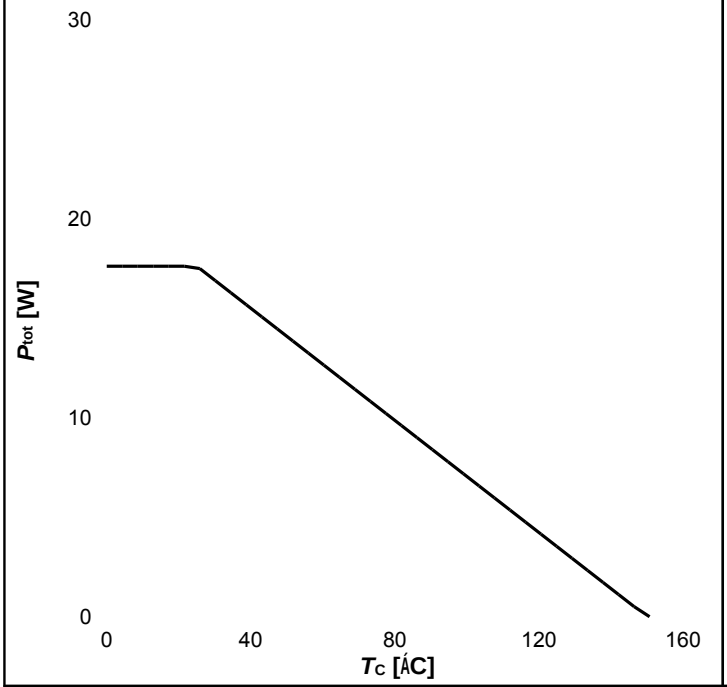
[1] $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$
[2] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Bgmbc dmpu_pb tmjr_ec	V_{SD}	+	.,61	+	T	V_{GS}=0V, I_F=0.5A, T_f=25°C
Pctcpqc pcamtcpw rgkc	t_{rr}	+	77	+	lq	V_R=400V, I_F=0.5A, di_F/dt=100A/µs
Pctcpqc pcamtcpw af_pec	Q_{rr}	+	.,1	+	ÉA	V_R=400V, I_F=0.5A, di_F/dt=100A/µs
Nc_i pctcpqc pcamtcpw asppclr	I_{rrm}	+	2,0	+	?	V_R=400V, I_F=0.5A, di_F/dt=100A/µs

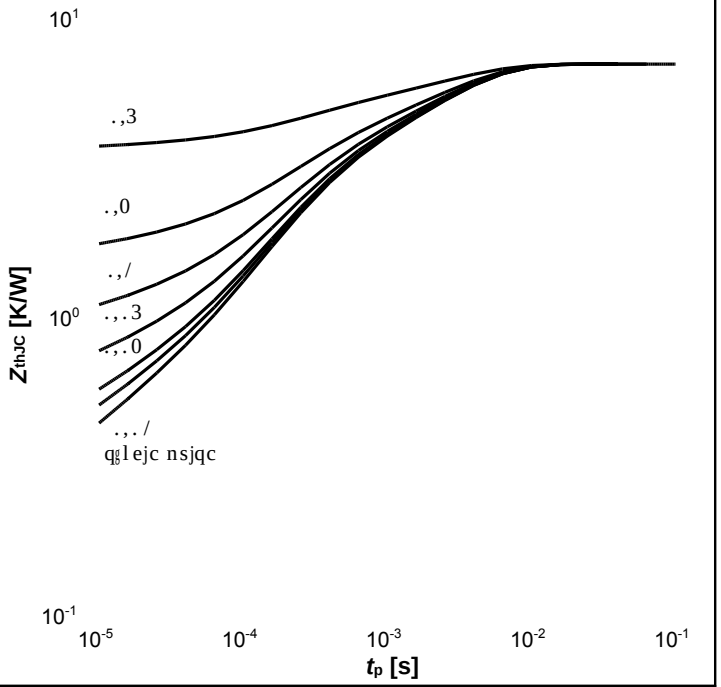
5 Electrical characteristics diagrams

Diagram 1: Power dissipation (Non FullPAK)



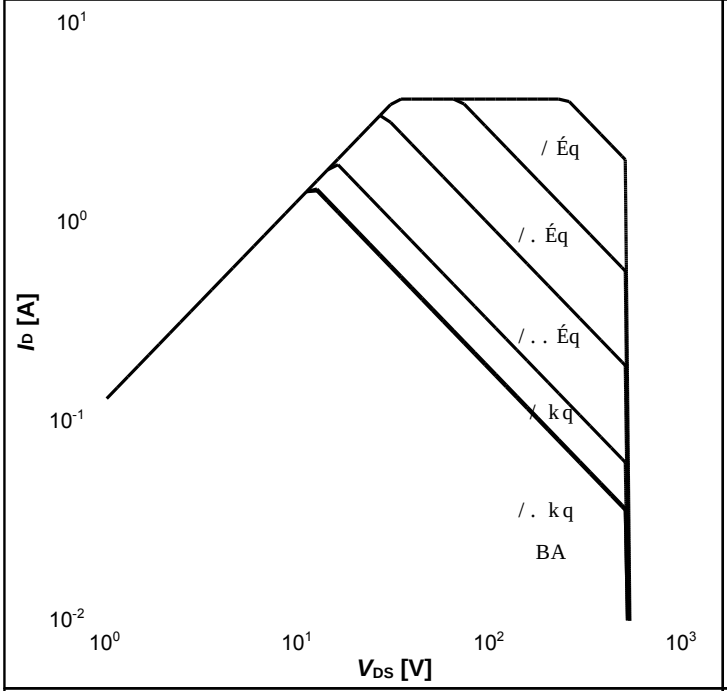
$P_{tot}=f(T_C)$

Diagram 2: Max. transient thermal impedance (Non FullPAK)



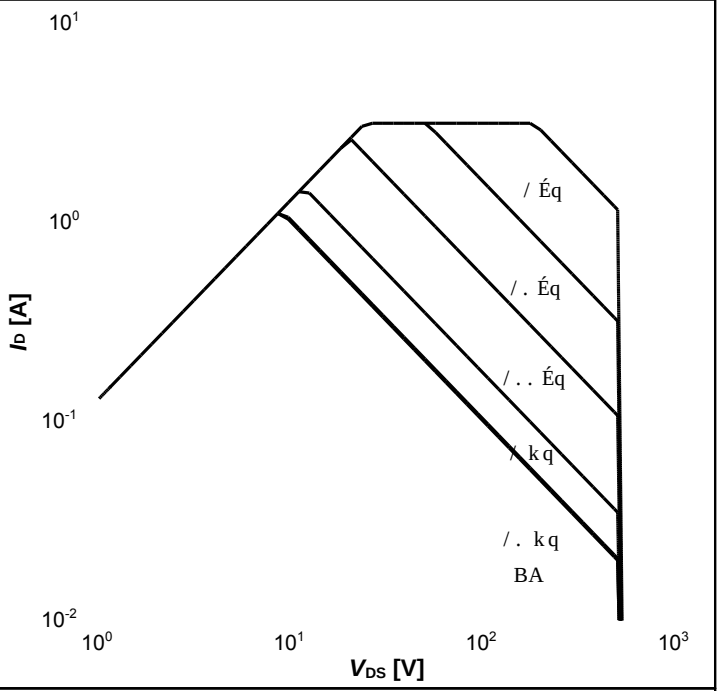
$Z_{thJC}=f(t_P)$; parameter: $D=t_p/T$

Diagram 3: Safe operating area (Non FullPAK) Tj=25ÁC



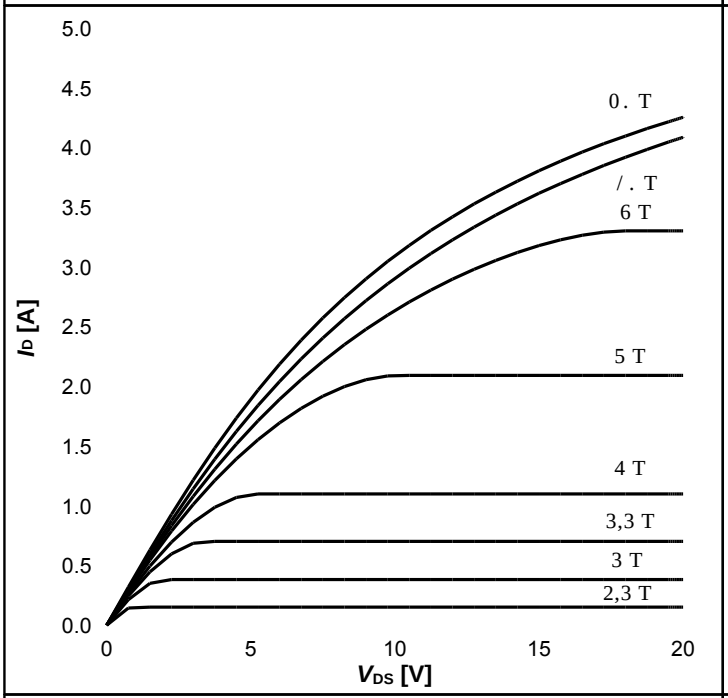
$I_D=f(V_{DS})$; T_C=25 °C; D=0; parameter: t_p

Diagram 4: Safe operating area (Non FullPAK) Tj=80ÁC



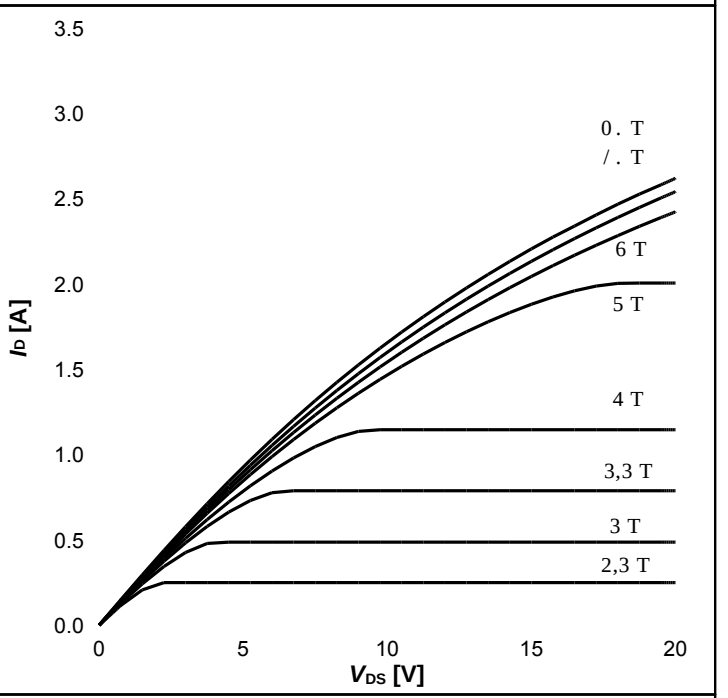
$I_D=f(V_{DS})$; T_C=80 °C; D=0; parameter: t_p

Diagram 5: Typ. output characteristics Tj=25ÁC



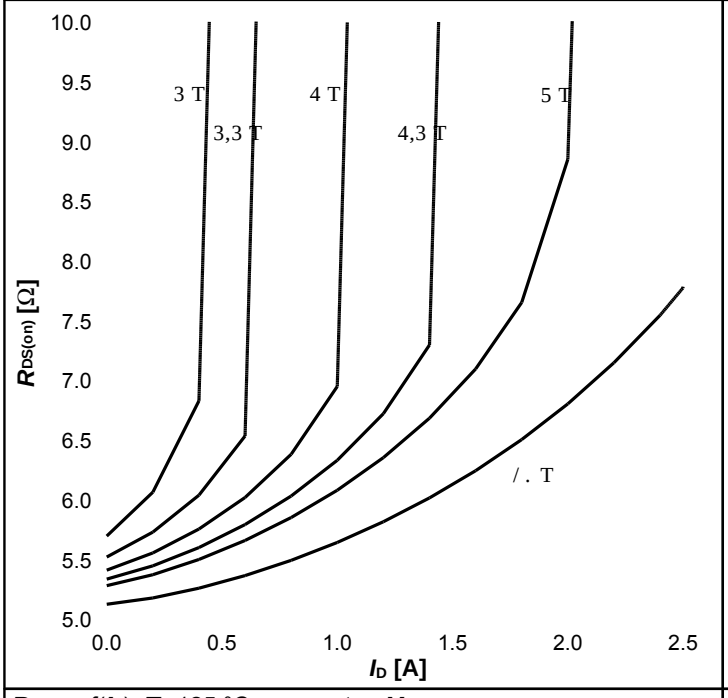
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. output characteristics Tj=125ÁC



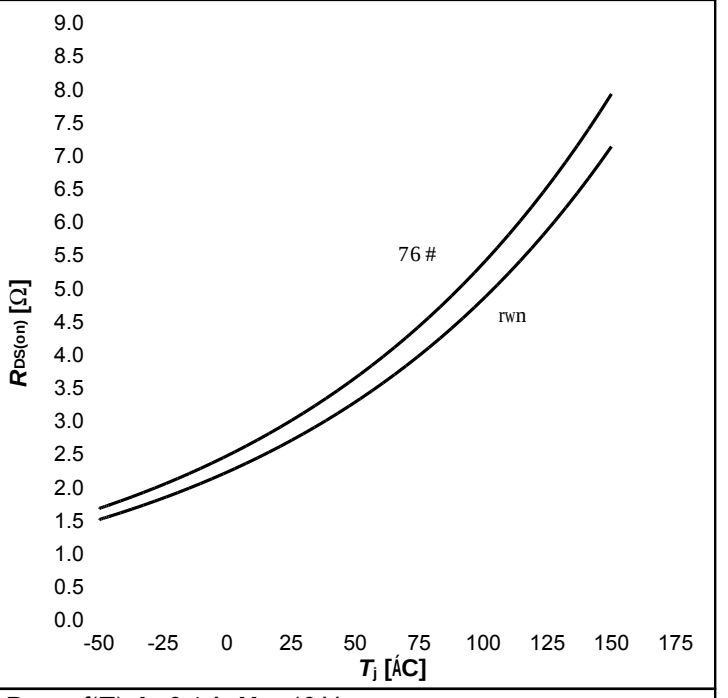
I_D=f(V_{DS}); T_j=125 °C; parameter: V_{GS}

Diagram 7: Typ. drain-source on-state resistance



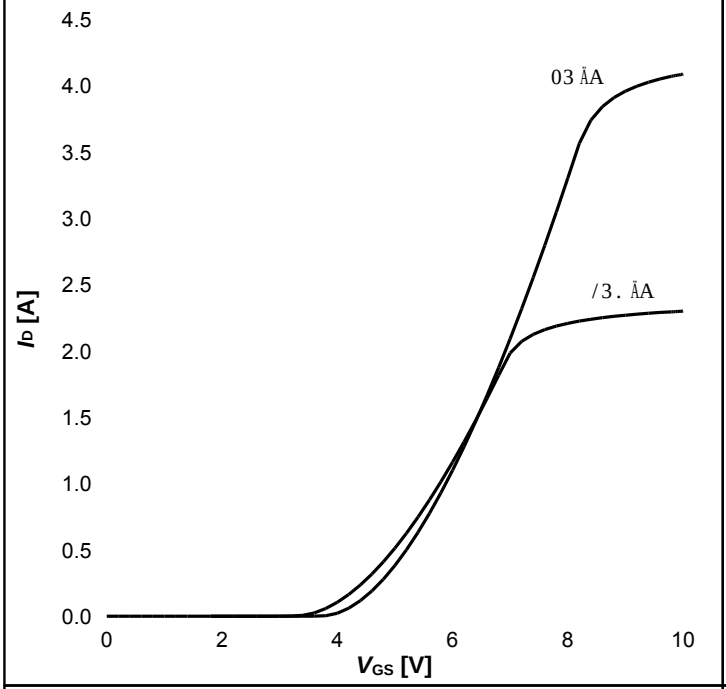
$R_{DS(on)}$=f(I_D); T_j=125 °C; parameter: V_{GS}

Diagram 8: Drain-source on-state resistance



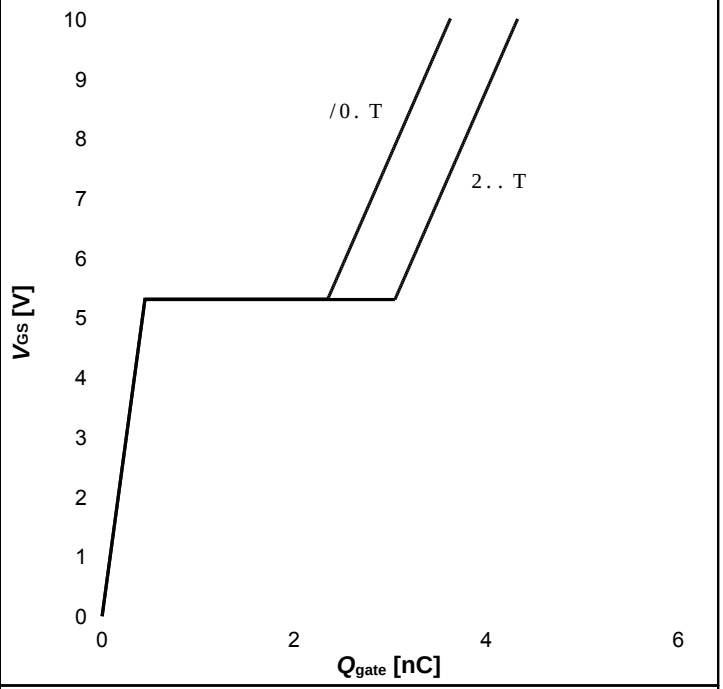
$R_{DS(on)}$=f(T_j); I_D=0.4 A; V_{GS}=13 V

Diagram 9: Typ. transfer characteristics



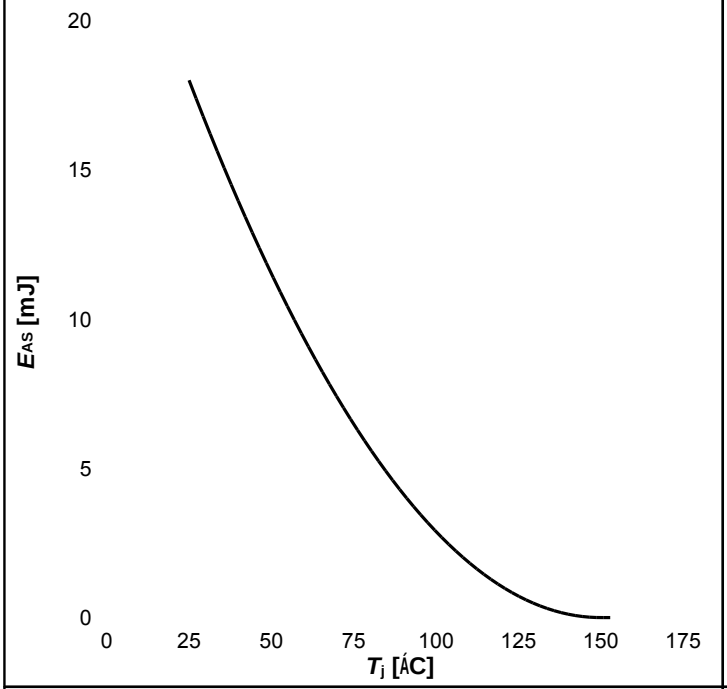
I_D=f(V_{GS}); V_{DS}=20V; parameter: T_j

Diagram 10: Typ. gate charge



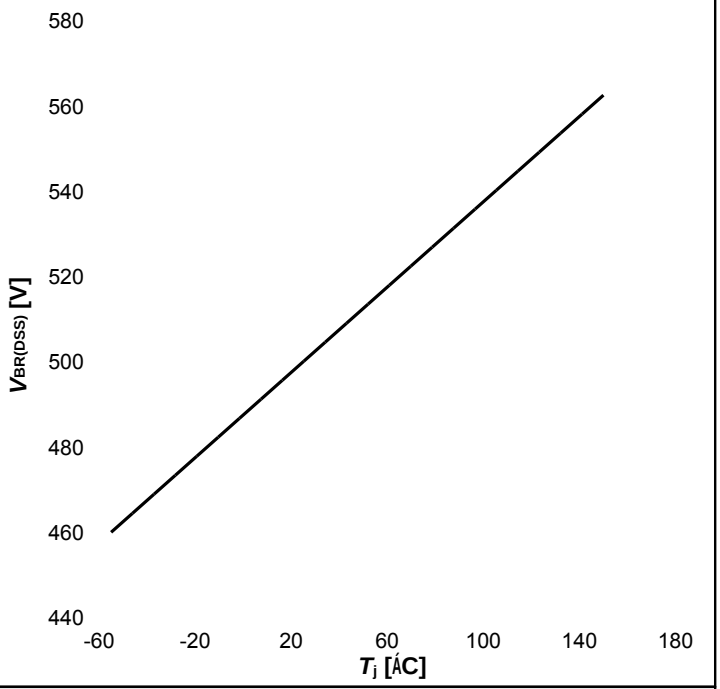
V_{GS}=f(Q_{gate}); I_D=0.5 A pulsed; parameter: V_{DD}

Diagram 11: Avalanche energy



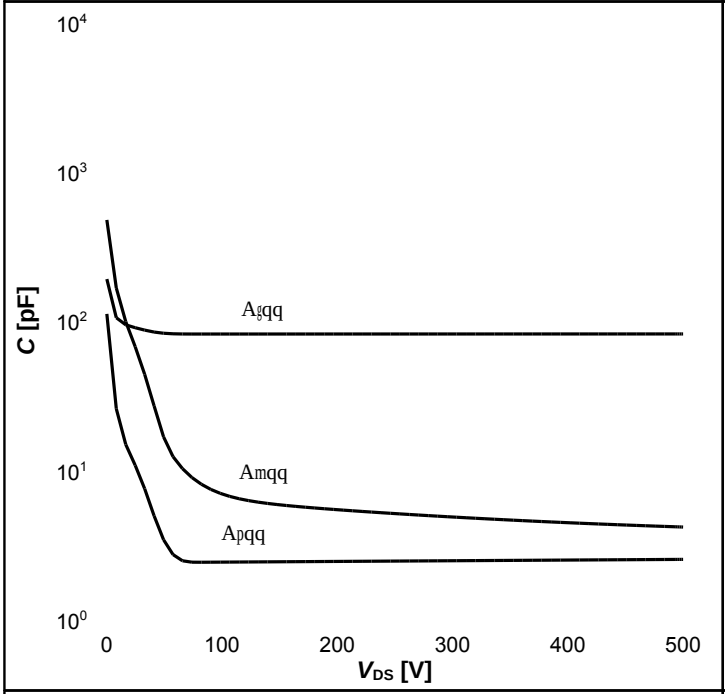
E_{AS}=f(T_j); I_D=0.5 A; V_{DD}=50 V

Diagram 12: Drain-source breakdown voltage



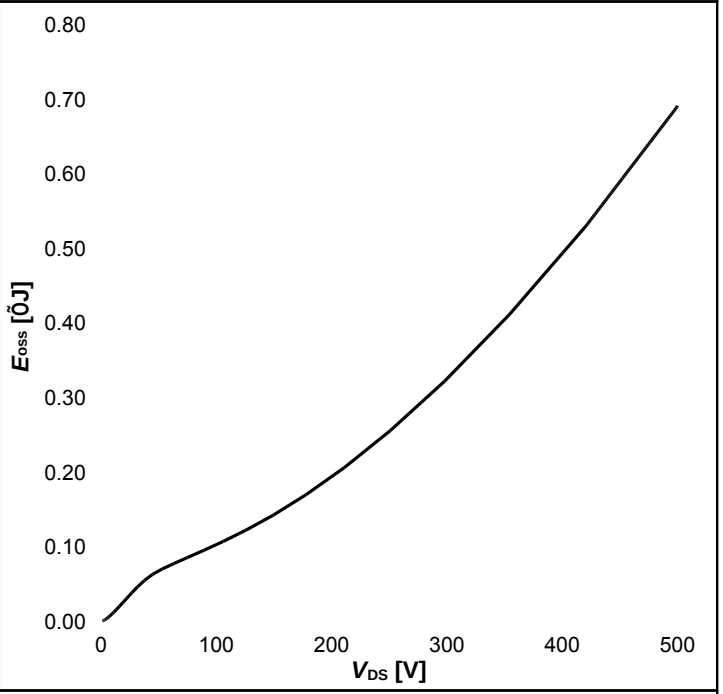
$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Diagram 13: Typ. capacitances



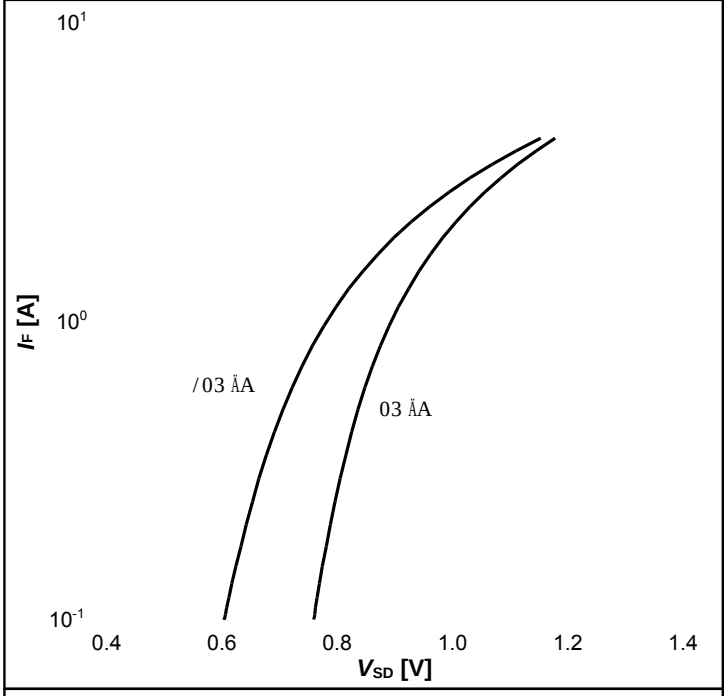
C=f(***V***$_{DS}$); ***V***$_{GS}$=0 V; ***f***=1 MHz

Diagram 14: Typ. Coss stored energy



E$_{oss}$=f(***V***$_{DS}$)

Diagram 15: Forward characteristics of reverse diode



I$_F$=f(***V***$_{SD}$); parameter: ***T***$_j$

6 Test Circuits

Table 8 Diode characteristics

Table 9 Switching times

Table 10 Unclamped inductive load

7 Package Outlines

Figure 1 Outline PG-TO 252, dimensions in mm/inches

Figure 2 Outline PG-TO 251, dimensions in mm/inches

8 Appendix A

Table 11 Related Links

- **IFX CoolMOS Webpage:** www.infineon.com
- **IFX Design tools:** www.infineon.com

Revision History

GNB3.P1I.AC* GNS3.P1I.AC

Revision: 2015-11-17, Rev. 2.2

Npctgmsq Pctgqgml		
Pctgqgml	B_rc	Qs`hcarq&k_hmp af_lecq qglac j_qr pctgqgml'
0,.	0./0+/0+.3	Pcjc_qc md dgl_j tcpqgml
0,/	0./1+.5+/4	snb_rc rm F_jmecl dpcc kmjb amknmslb
0,0	0./3+//+/5	Snb_rcb rm os_jgdgcb dmp qr_lb_pb ep_bc $ snb_rcb n_ai_ec bp_ugle

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