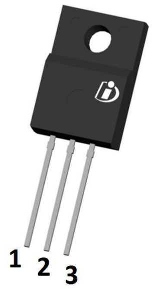
MOSFET

500V CoolMOS™ CE Power Transistor

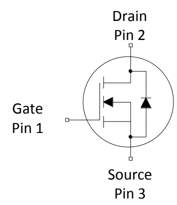
CoolMOS™ is a revolutionary technology for high voltage power MOSFETs, designed according to the superjunction (SJ) principle and pioneered by Infineon Technologies. CoolMOS™ CE is a price-performance optimized platform enabling to target cost sensitive applications in Consumer and Lighting markets by 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.

PG-TO 220 FP



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
V_{DS} @ $T_{j,max}$	550	V
$R_{DS(on),max}$	0.5	Ω
I_D	11.1	A
$Q_{g,typ}$	18.7	nC
$I_{D,pulse}$	24	A
E_{oss} @ 400V	2.02	µJ

Type / Ordering Code	Package	Marking	Related Links
IPAN50R500CE	PG-TO 220 FullPAK - Narrow Lead	50S500CE	see Appendix A

Table of Contents

1 Maximum ratings

at T_j = 25°C, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current[1)]	I_D	- -	- -	11.1 7.0	A	T_C = 25°C T_C = 100°C
Pulsed drain current[2)]	$I_{D,pulse}$	-	-	24	A	T_C=25°C
Avalanche energy, single pulse	E_{AS}	-	-	129	mJ	I_D =2.9A; V_{DD} = 50V
Avalanche energy, repetitive	E_{AR}	-	-	0.20	mJ	I_D =2.9A; V_{DD} = 50V
Avalanche current, repetitive	I_{AR}	-	-	2.9	A	-
MOSFET dv/dt ruggedness	dv/dt	-	-	50	V/ns	V_{DS} =0...400V
Gate source voltage	V_{GS}	-20 -30	- -	20 30	V	static; AC (f>1 Hz)
Power disspiation (Full PAK)	P_{tot}	-	-	28.0	W	T_C=25°C
Operating and storage temperature	T_j, T_{stg}	-40	-	150	°C	-
Mounting torque	-	-	-	50	Ncm	M2.5 screws
Continuous diode forward current	I_S	-	-	4.6	A	T_C=25°C
Diode pulse current[2)]	$I_{S,pulse}$	-	-	24.0	A	T_C = 25°C
Reverse diode dv/dt[3)]	dv/dt	-	-	15	V/ns	V_{DS} =0...400V, I_{SD}<=I_S, T_j=25°C
Maximum diode commutation speed[3)]	di_f/dt	-	-	500	A/µs	V_{DS} =0...400V, I_{SD}<=I_S, T_j=25°C
Insulation withstand voltage for TO-220 FullPAK	V_{ISO}	-	-	2500	V	V_{rms}, T_C=25°C, t=1min

2 Thermal characteristics

Table 3 Thermal characteristics TO220 Full PAK

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	4.46	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	80	°C/W	leaded
Soldering temperature, wavesoldering only allowed at leads	T_{sold}	-	-	260	°C	1.6mm (0.063 in.) from case for 10s

1) Limited by $T_{j\,max}$ <150°C, Maximum Duty Cycle D = 0.5, TO220 equivalent
2) Pulse width t_p limited by $T_{j,max}$
3) V_{DClink}=400V; $V_{DS,peak}$<$V_{(BR)DSS}$; identical low side and high side switch with identical R_G

3 Electrical characteristics

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	500	-	-	V	V_{GS}=0V, I_D=1mA
Gate threshold voltage	$V_{(GS)th}$	2.50	3	3.50	V	V_{DS}=V_{GS}, I_D=0.2mA
Zero gate voltage drain current	I_{DSS}	- -	- 10	1 -	µA	V_{DS}=500V, V_{GS}=0V, T_j=25°C V_{DS}=500V, V_{GS}=0V, T_j=150°C
Gate-source leakage curent	I_{GSS}	-	-	100	nA	V_{GS}=20V, V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	0.45 1.17	0.50 -	Ω	V_{GS}=13V, I_D=2.3A, T_j=25°C V_{GS}=13V, I_D=2.3A, T_j=150°C
Gate resistance	R_G	-	3	-	Ω	f=1 MHz, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	433	-	pF	V_{GS}=0V, V_{DS}=100V, f=1MHz
Output capacitance	C_{oss}	-	31	-	pF	V_{GS}=0V, V_{DS}=100V, f=1MHz
Effective output capacitance, energy related[1]	$C_{o(er)}$	-	25	-	pF	V_{GS}=0V, V_{DS}=0...400V
Effective output capacitance, time related[2]	$C_{o(tr)}$	-	100	-	pF	I_D=constant, V_{GS}=0V, V_{DS}=0...400V
Turn-on delay time	$t_{d(on)}$	-	6	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=2.9A, R_G=3.4Ω
Rise time	t_r	-	5	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=2.9A, R_G=3.4Ω
Turn-off delay time	$t_{d(off)}$	-	30	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=2.9A, R_G=3.4Ω
Fall time	t_f	-	12	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=2.9A, R_G=3.4Ω

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	2.3	-	nC	V_{DD}=400V, I_D=2.9A, V_{GS}=0 to 10V
Gate to drain charge	Q_{gd}	-	10	-	nC	V_{DD}=400V, I_D=2.9A, V_{GS}=0 to 10V
Gate charge total	Q_g	-	18.7	-	nC	V_{DD}=400V, I_D=2.9A, V_{GS}=0 to 10V
Gate plateau voltage	$V_{plateau}$	-	5.3	-	V	V_{DD}=400V, I_D=2.9A, V_{GS}=0 to 10V

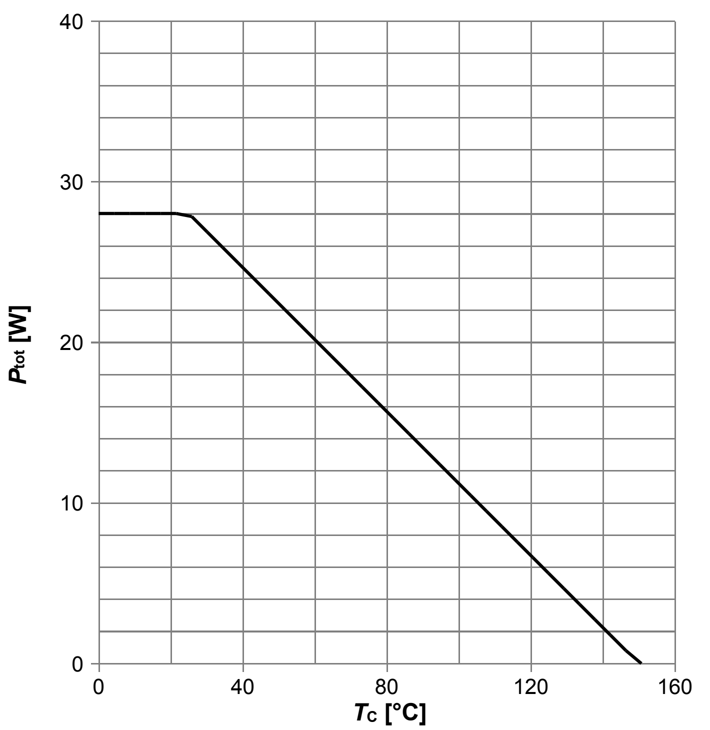
1) $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 400V
2) $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 400V

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.85	-	V	V_{GS}=0V, I_F=2.9A, T_j=25°C
Reverse recovery time	t_{rr}	-	180	-	ns	V_R=400V, I_F=2.9A, di_F/dt=100A/µs
Reverse recovery charge	Q_{rr}	-	1.2	-	µC	V_R=400V, I_F=2.9A, di_F/dt=100A/µs
Peak reverse recovery current	I_{rrm}	-	12	-	A	V_R=400V, I_F=2.9A, di_F/dt=100A/µs

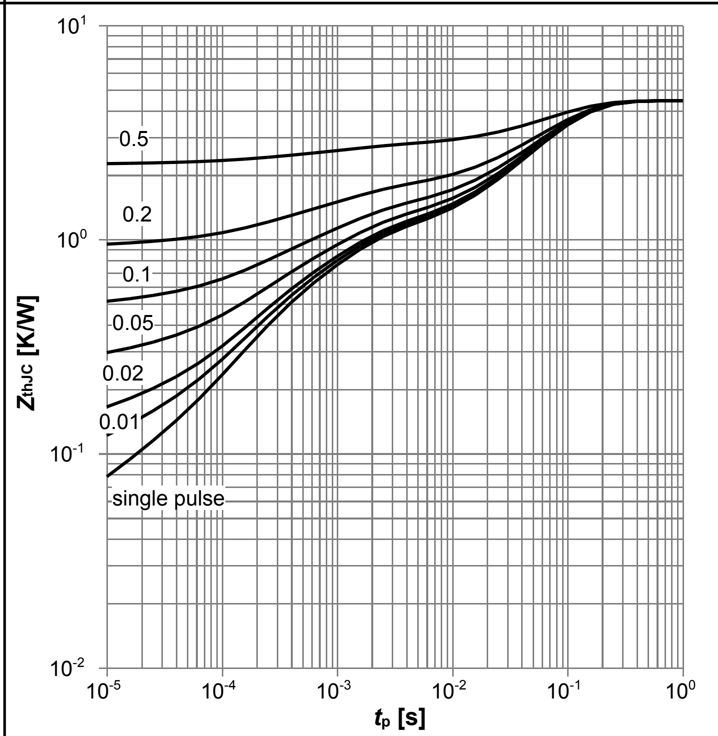
4 Electrical characteristics diagrams

Power dissipation (FullPAK)



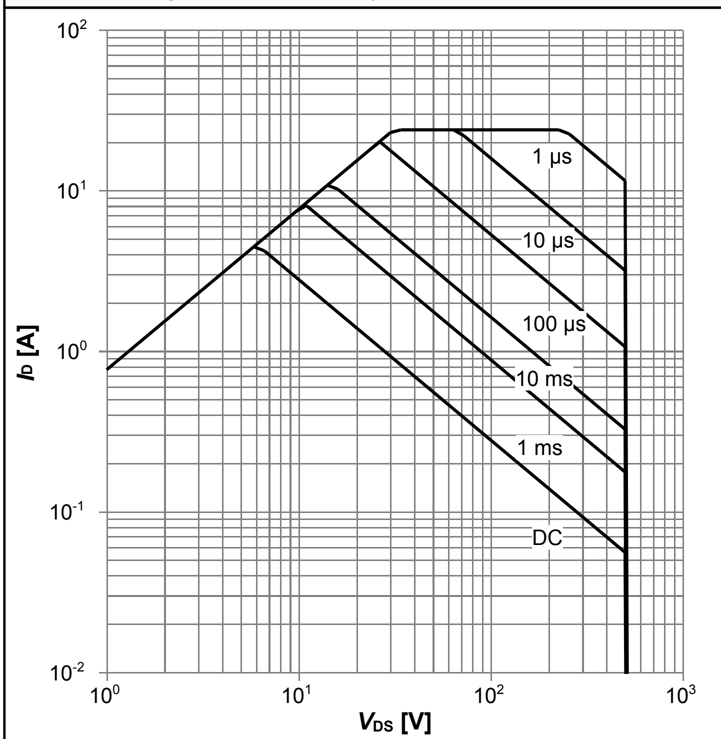
P_{tot}=f(T_C)

Max. transient thermal impedance (FullPAK)



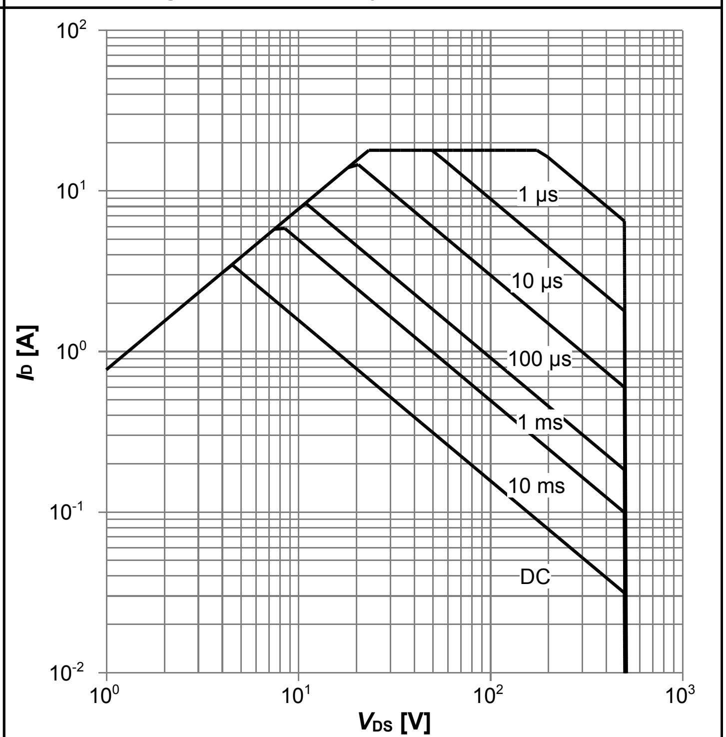
Z_{thJC} =f(t_P); parameter: $D=t_p/T$

Safe operating area (FullPAK) Tj=25°C



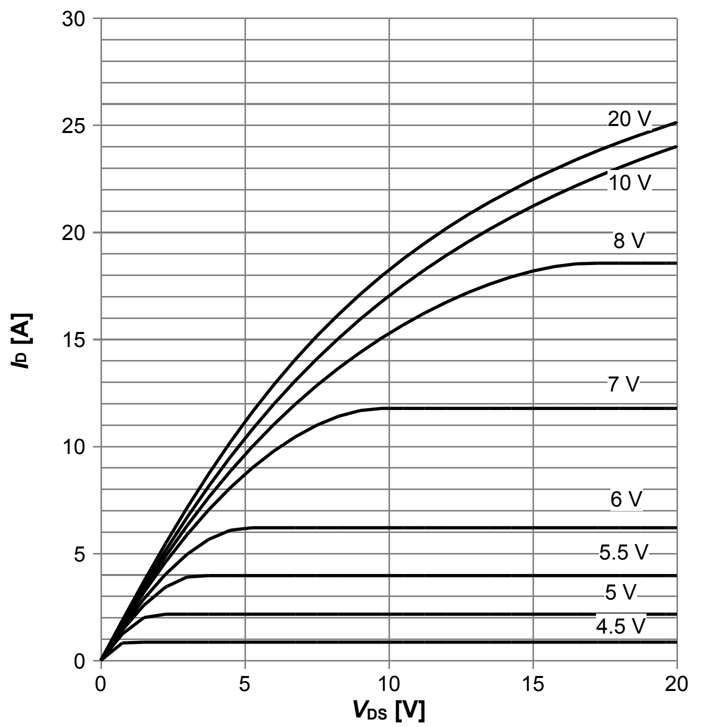
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Safe operating area (FullPAK) Tj=80°C



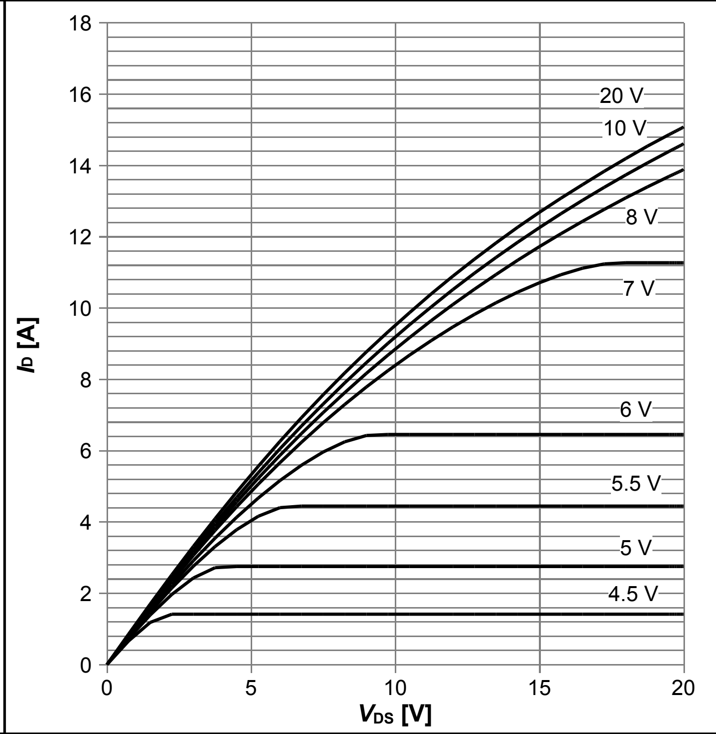
I_D=f(V_{DS}); T_C=80 °C; D=0; parameter: t_p

Typ. output characteristics Tj=25°C



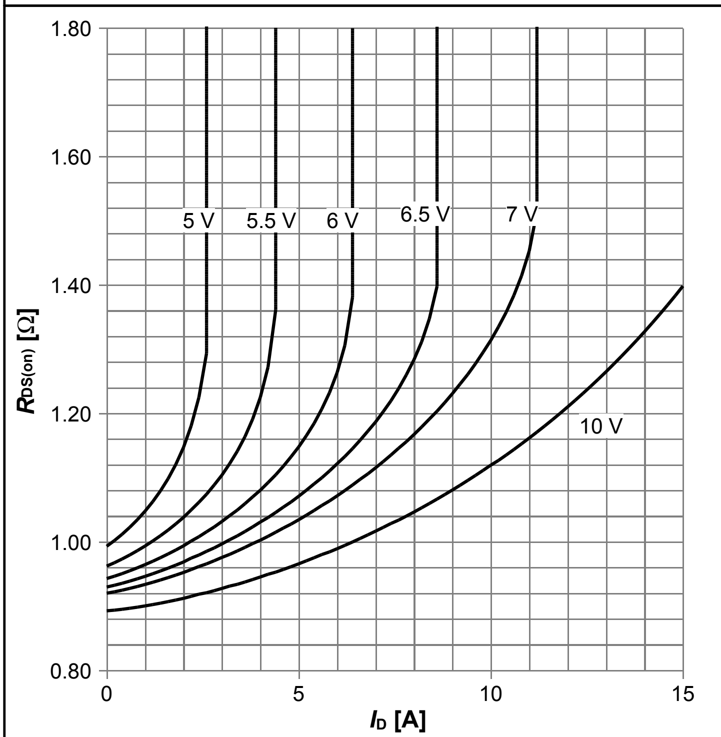
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Typ. output characteristics Tj=125°C



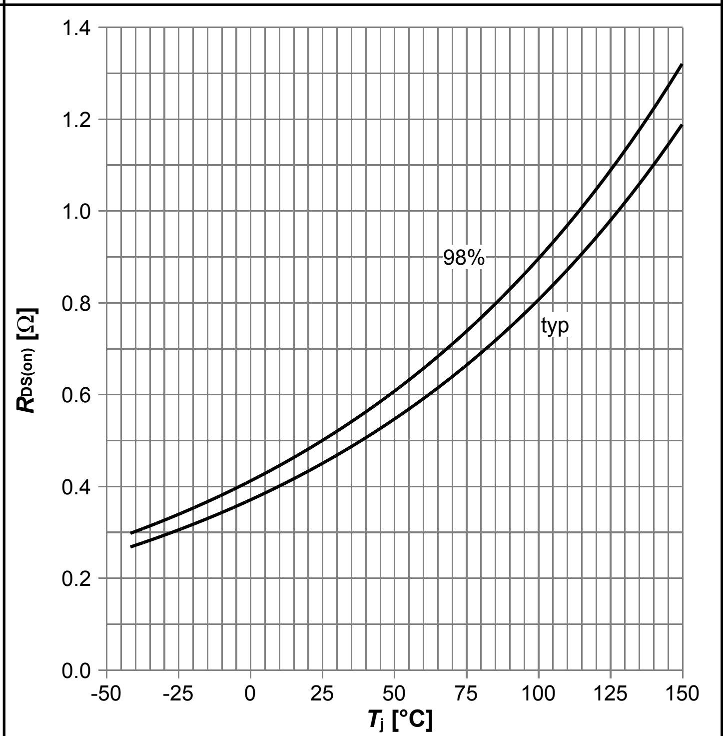
I_D=f(V_{DS}); T_j=125 °C; parameter: V_{GS}

Typ. drain-source on-state resistance



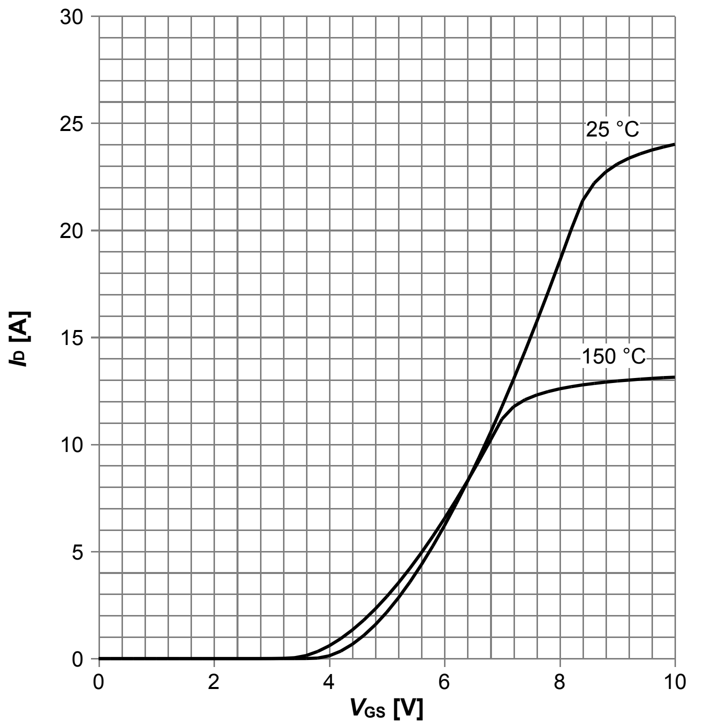
$R_{DS(on)}$=f(I_D); T_j=125 °C; parameter: V_{GS}

Drain-source on-state resistance



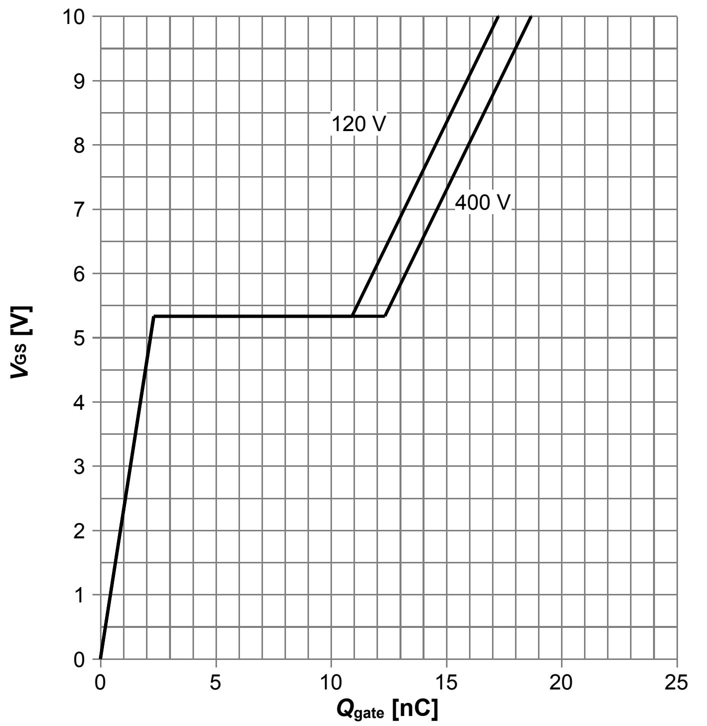
$R_{DS(on)}$=f(T_j); I_D=2.3 A; V_{GS}=13 V

Typ. transfer characteristics



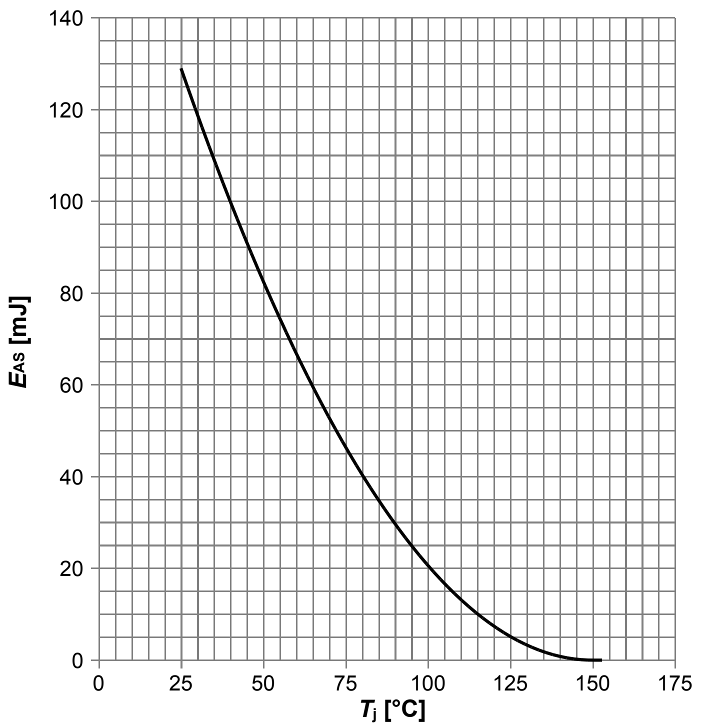
I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

Typ. gate charge



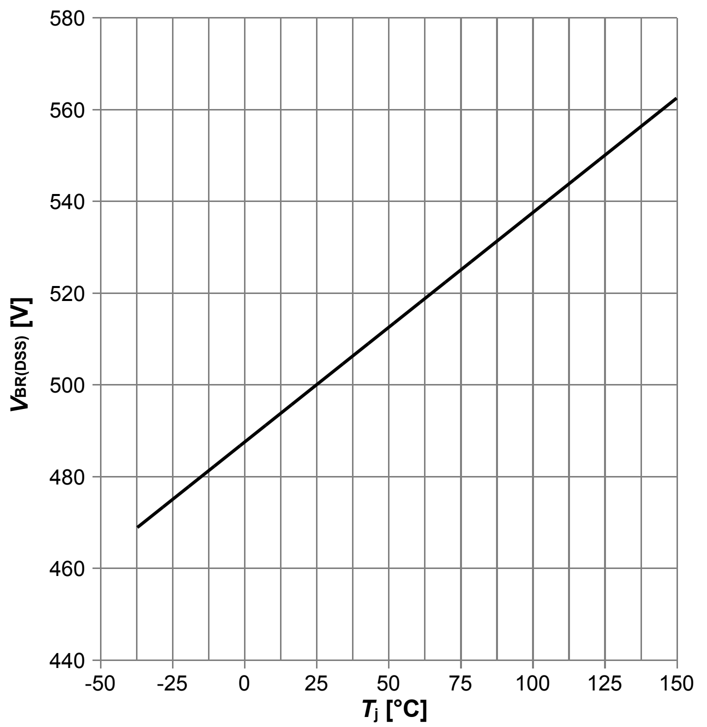
V_{GS}=f(Q_{gate}); I_D=2.9 A pulsed; parameter: V_{DD}

Avalanche energy

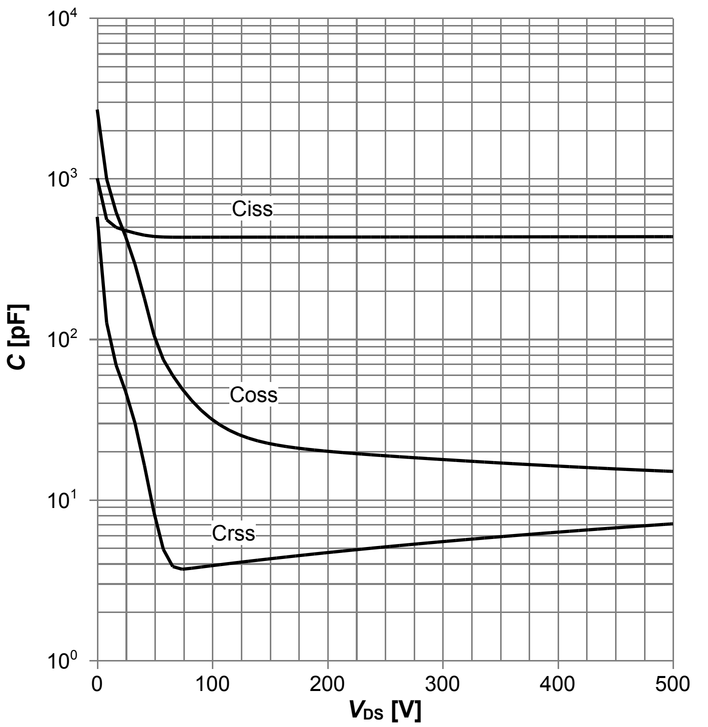
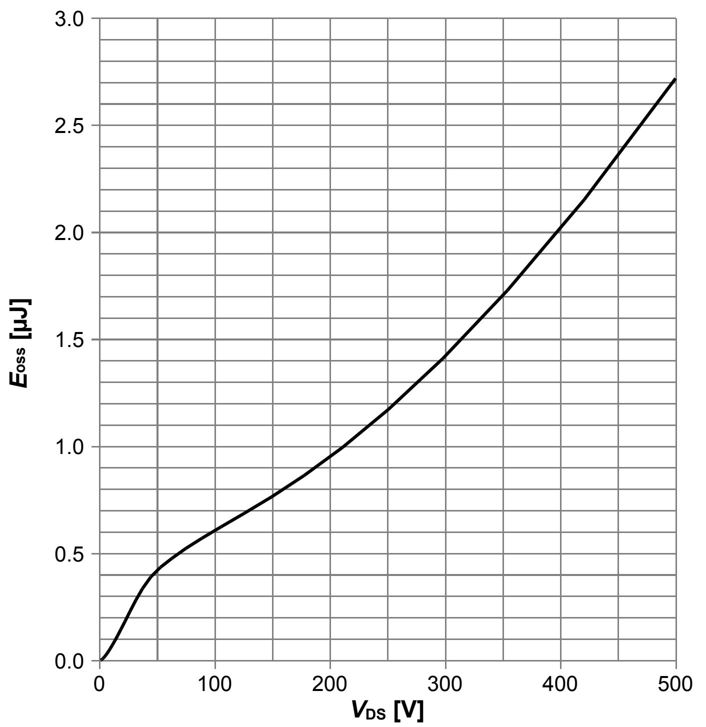


E_{AS}=f(T_j); I_D=2.9 A; V_{DD}=50 V

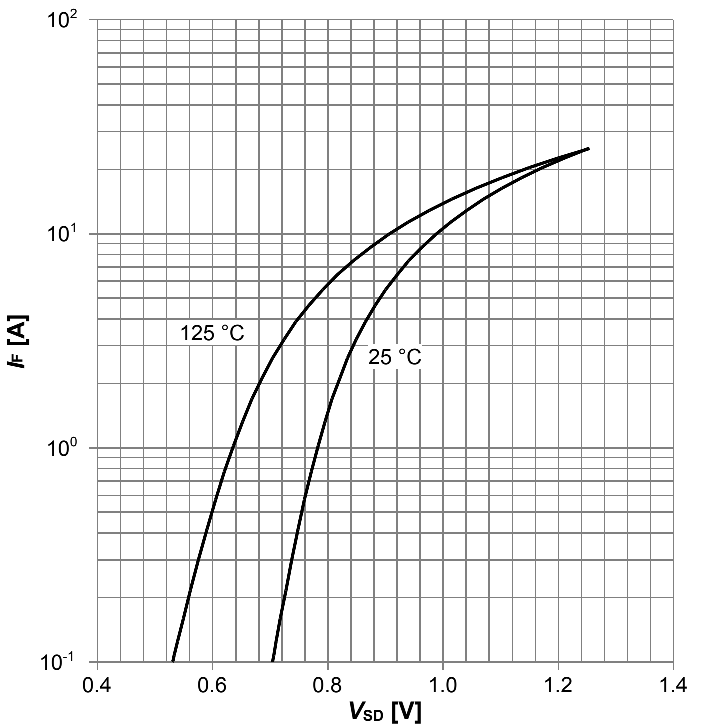
Drain-source breakdown voltage



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

Typ. capacitances	**Typ. Coss stored energy**
	
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz	E_{oss}=f(V_{DS})

Forward characteristics of reverse diode



I_F=f(V_{SD}); parameter: T_j

5 Test Circuits

Table 8 Diode characteristics

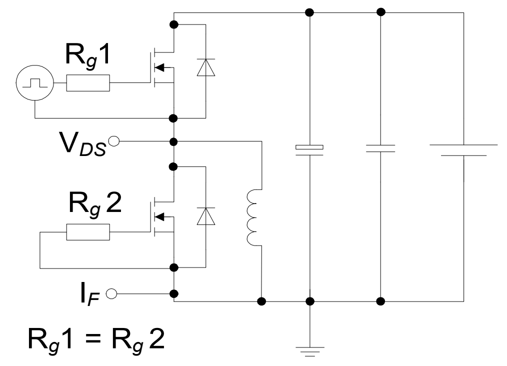
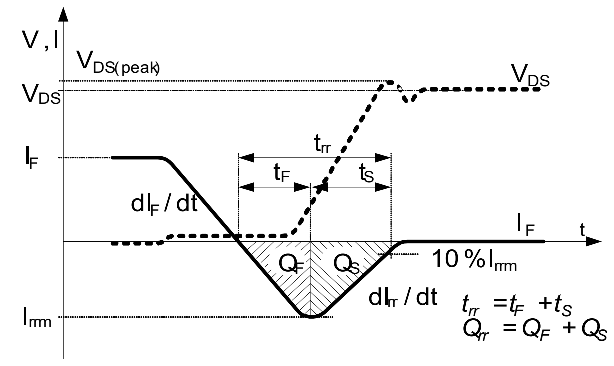
Test circuit for diode characteristics	Diode recovery waveform
	

Table 9 Switching times

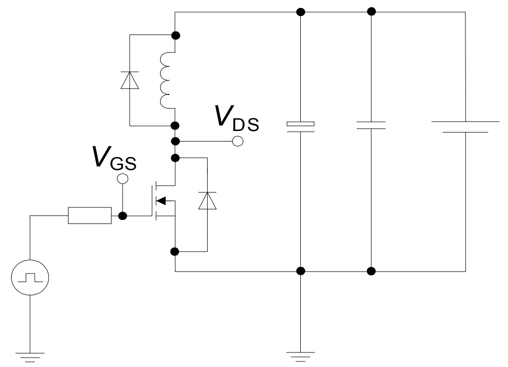
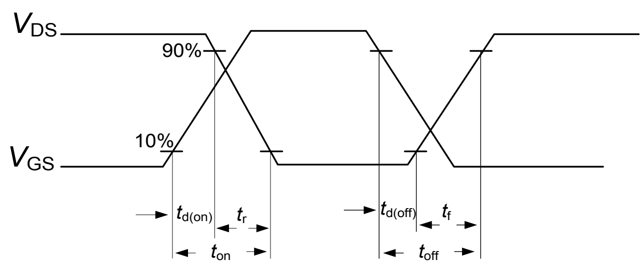
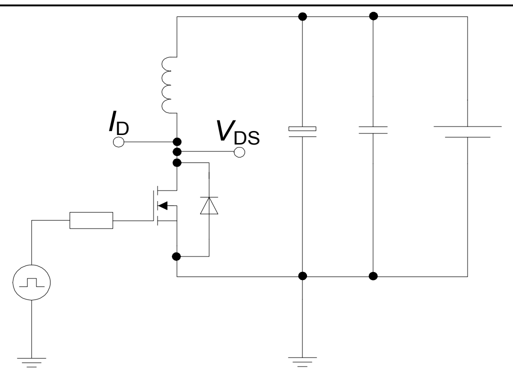
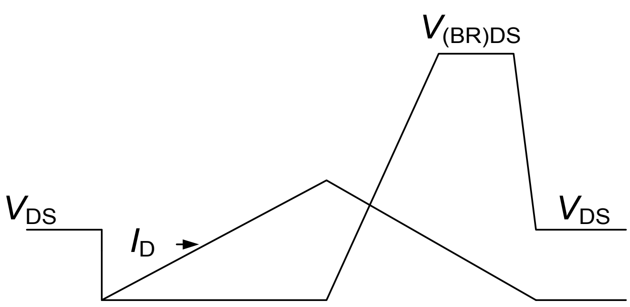
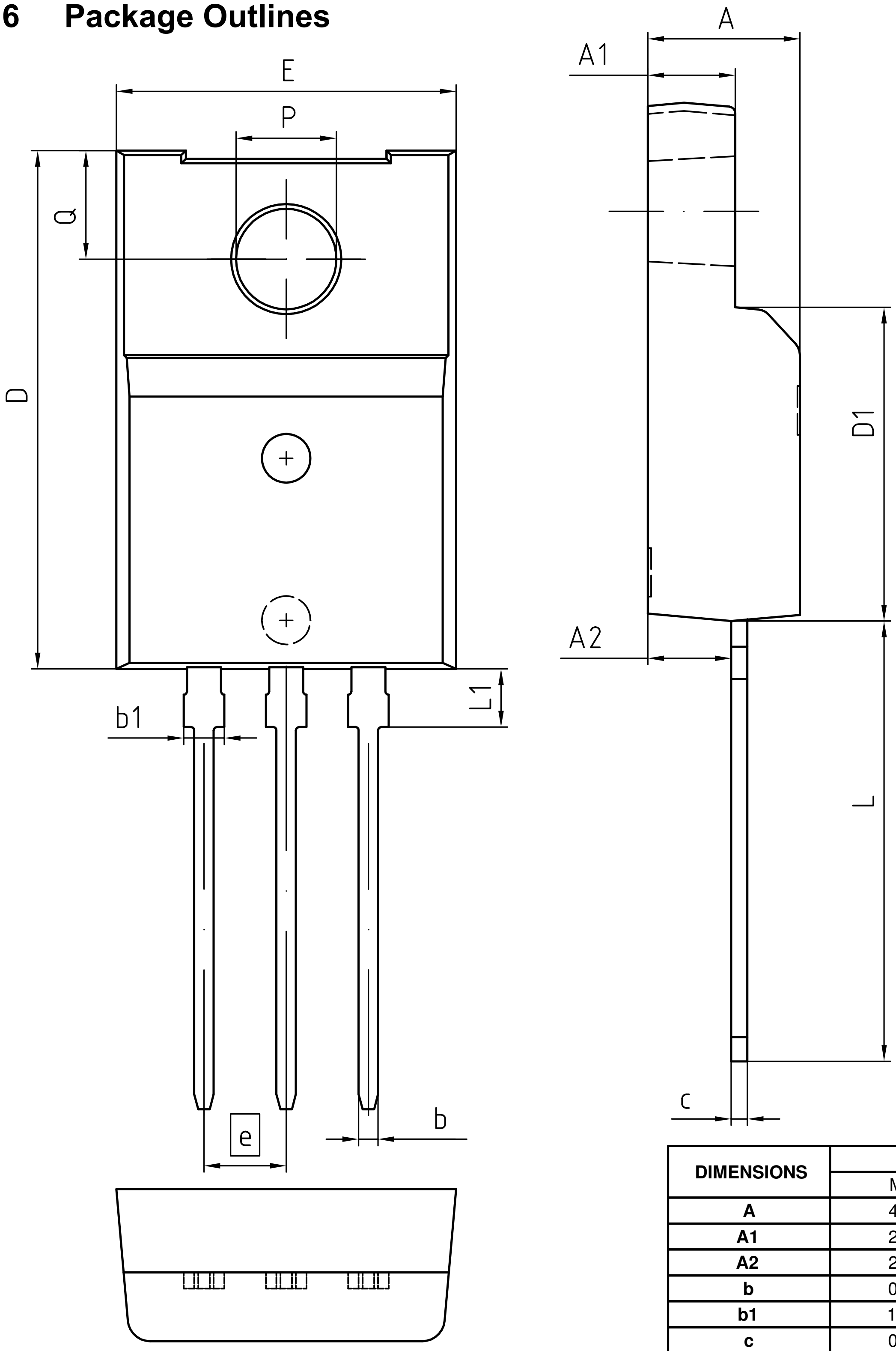
Switching times test circuit for inductive load	Switching times waveform
	

Table 10 Unclamped inductive load

Unclamped inductive load test circuit	Unclamped inductive waveform
	

6 Package Outlines



DOCUMENT NO.
Z8B00188573
REVISION 01
SCALE 5:1 (0 1 2 3 4 5mm)
EUROPEAN PROJECTION
ISSUE DATE 22.03.2018

NOTES:
ALL DIMENSIONS DO NOT INCLUD
MOLD FLASH OR PROTRUSIONS.

DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.60	4.80
A1	2.60	2.80
A2	2.47	2.67
b	0.56	0.69
b1	1.01	1.15
c	0.46	0.59
D	15.90	16.10
D1	9.58	9.78
E	10.40	10.60
e	2.54	
N	3	
L	13.45	13.75
L1	1.70	1.91
øP	3.00	3.20
Q	3.25	3.45

Figure 1 Outline PG-TO 220 FullPAK - Narrow Lead, dimensions in mm

7 Appendix A

Table 11 Related Links

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

Revision History

IPAN50R500CE

Revision: 2018-05-14, Rev. 2.4

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2016-06-13	Updated ID ratings
2.2	2016-11-28	Revised package drawing on page 11
2.3	2018-04-26	Revised package drawing
2.4	2018-05-14	Part Marking update

We Listen to Your Comments
Any information within this document that you feel is wrong, unclear or missing at all? Your feedback will help us to continuously improve the quality of this document. Please send your proposal (including a reference to this document) to:
erratum@infineon.com

Published by
Infineon Technologies AG
81726 München, Germany

Legal Disclaimer
The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie") .

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.
In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.
The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Information
For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office (**www.infineon.com**).

Warnings
Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.
The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

单击下面可查看定价，库存，交付和生命周期等信息

>>Infineon(英飞凌)