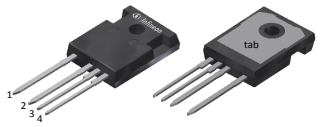
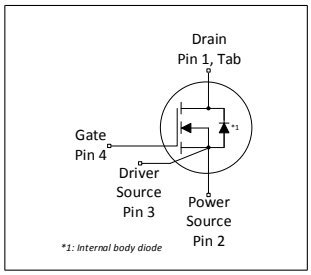
MOSFET

650V CoolMOS™ CFD7 SJ Power Device

PG-TO 247-4-3



The latest 650 V CoolMOS™ CFD7 extends the voltage class offering of the CFD7 family and is a successor to the 650 V CoolMOS™ CFD2. Resulting from improved switching performance and excellent thermal behavior, 650 V CooMOS™ CFD7 offers highest efficiency in resonant switching topologies, such as LLC and phase-shift-full-bridge (ZVS). As part of Infineon's fast body diode portfolio, this new product series blends all advantages of a fast switching technology together with superior hard commutation robustness. The CoolMOS™ CFD7 technology meets highest efficiency and reliability standards and furthermore supports high power density solutions.



Features

- Ultra-fast body diode
- 650V break down voltage
- Best-in-class $R_{DS(on)}$
- Reduced switching losses
- Low $R_{DS(on)}$ dependency over temperature

Benefits

- Excellent hard commutation ruggedness
- Extra safety margin for designs with increased bus voltage
- Enabling increased power density solutions
- Outstanding light load efficiency in industrial SMPS applications
- Improved full load efficiency in industrial SMPS applications
- Price competitiveness over previous CoolMOS™ families

Potential applications

Suitable for Soft Switching topologies
Optimized for phase-shift full-bridge (ZVS), LLC Applications – Server, Telecom, EV Charging, Solar

Product validation

Fully qualified according to JEDEC for Industrial Applications

Please note: The source and sense source pins are not exchangeable. Their exchange might lead to malfunction. For paralleling 4pin MOSFET devices the placement of the gate resistor is generally recommended to be on the Driver Source instead of the Gate.

Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS} @ $T_{j,max}$	700	V
$R_{DS(on),max}$	18	mΩ
$Q_{g,typ}$	234	nC
$I_{D,pulse}$	495	A
E_{oss} @ 400V	31.6	µJ
Body diode di_F/dt	1300	A/µs

Type / Ordering Code	Package	Marking	Related Links
IPZA65R018CFD7	PG-TO247-4-3	65R018F7	see Appendix A

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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	- -	- -	106 67	A	T_C=25°C T_C=100°C
Pulsed drain current[2)]	$I_{D,pulse}$	-	-	495	A	T_C=25°C
Avalanche energy, single pulse	E_{AS}	-	-	582	mJ	I_D=8.3A; V_{DD}=50V; see table 10
Avalanche energy, repetitive	E_{AR}	-	-	2.91	mJ	I_D=8.3A; V_{DD}=50V; see table 10
Avalanche current, single pulse	I_{AS}	-	-	8.3	A	-
MOSFET dv/dt ruggedness	dv/dt	-	-	120	V/ns	V_{DS}=0...400V
Gate source voltage (static)	V_{GS}	-20	-	20	V	static;
Gate source voltage (dynamic)	V_{GS}	-30	-	30	V	AC (f>1 Hz)
Power dissipation	P_{tot}	-	-	446	W	T_C=25°C
Storage temperature	T_{stg}	-55	-	150	°C	-
Operating junction temperature	T_j	-55	-	150	°C	-
Mounting torque	-	-	-	60	Ncm	M3 and M3.5 screws
Continuous diode forward current[1)]	I_S	-	-	106	A	T_C=25°C
Diode pulse current[2)]	$I_{S,pulse}$	-	-	495	A	T_C=25°C
Reverse diode dv/dt[3)]	dv/dt	-	-	70	V/ns	V_{DS}=0...400V, I_{SD}<=58.2A, T_j=25°C see table 8
Maximum diode commutation speed	di_F/dt	-	-	1300	A/µs	V_{DS}=0...400V, I_{SD}<=58.2A, T_j=25°C see table 8
Insulation withstand voltage	V_{ISO}	-	-	n.a.	V	V_{rms}, T_C=25°C, t=1min

[1)] Limited by $T_{j\,max}$.
[2)] Pulse width t_p limited by $T_{j,max}$
[3)] Identical low side and high side switch with identical R_G

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	0.28	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	62	°C/W	leaded
Thermal resistance, junction - ambient for SMD version	R_{thJA}	-	-	-	°C/W	n.a.
Soldering temperature, wavesoldering only allowed at leads	T_{sold}	-	-	260	°C	1.6mm (0.063 in.) from case for 10s

3 Electrical characteristics

at T_j=25°C, unless otherwise specified

Table 4 Static characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	650	-	-	V	V_{GS}=0V, I_D=1mA
Gate threshold voltage	$V_{(GS)th}$	3.5	4	4.5	V	V_{DS}=V_{GS}, I_D=2.91mA
Zero gate voltage drain current[1]	I_{DSS}	- -	- 44	1 88	µA	V_{DS}=650V, V_{GS}=0V, T_j=25°C V_{DS}=650V, V_{GS}=0V, T_j=125°C
Gate-source leakage current	I_{GSS}	-	-	100	nA	V_{GS}=20V, V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	0.015 0.033	0.018 -	Ω	V_{GS}=10V, I_D=58.2A, T_j=25°C V_{GS}=10V, I_D=58.2A, T_j=150°C
Gate resistance	R_G	-	2.7	-	Ω	f=1MHz, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	11660	-	pF	V_{GS}=0V, V_{DS}=400V, f=250kHz
Output capacitance	C_{oss}	-	167	-	pF	V_{GS}=0V, V_{DS}=400V, f=250kHz
Effective output capacitance, energy related[2]	$C_{o(er)}$	-	396	-	pF	V_{GS}=0V, V_{DS}=0...400V
Effective output capacitance, time related[3]	$C_{o(tr)}$	-	4144	-	pF	I_D=constant, V_{GS}=0V, V_{DS}=0...400V
Turn-on delay time	$t_{d(on)}$	-	50	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=58.2A, R_G=1.8Ω; see table 9
Rise time	t_r	-	8	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=58.2A, R_G=1.8Ω; see table 9
Turn-off delay time	$t_{d(off)}$	-	180	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=58.2A, R_G=1.8Ω; see table 9
Fall time	t_f	-	4	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=58.2A, R_G=1.8Ω; see table 9

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	67	-	nC	V_{DD}=400V, I_D=58.2A, V_{GS}=0 to 10V
Gate to drain charge	Q_{gd}	-	71	-	nC	V_{DD}=400V, I_D=58.2A, V_{GS}=0 to 10V
Gate charge total	Q_g	-	234	-	nC	V_{DD}=400V, I_D=58.2A, V_{GS}=0 to 10V
Gate plateau voltage	$V_{plateau}$	-	5.8	-	V	V_{DD}=400V, I_D=58.2A, V_{GS}=0 to 10V

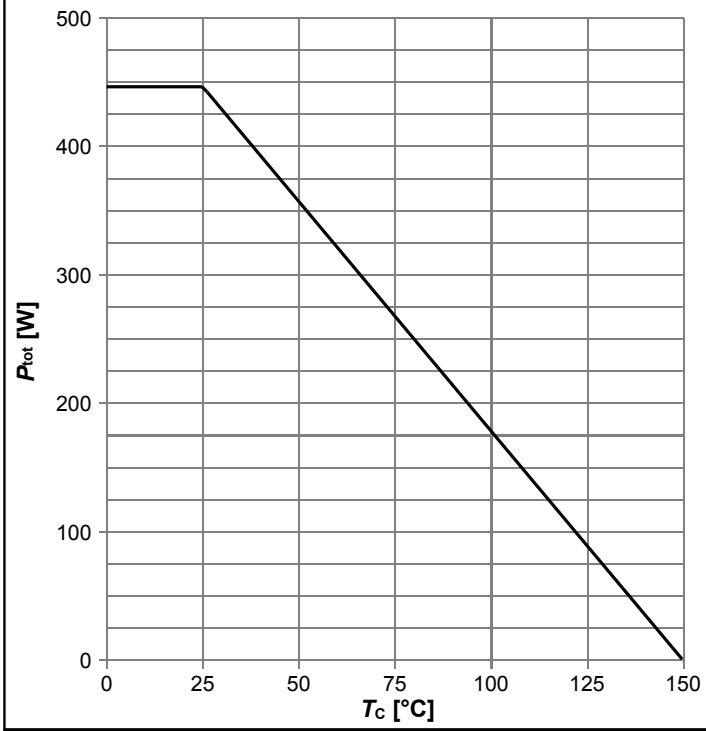
[1] Maximum specification is defined by calculated six sigma upper confidence bound
[2] $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 400V
[3] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} 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}	-	1.0	-	V	V_{GS}=0V, I_F=58.2A, T_j=25°C
Reverse recovery time	t_{rr}	-	236	354	ns	V_R=400V, I_F=58.2A, di_F/dt=100A/µs; see table 8
Reverse recovery charge	Q_{rr}	-	2.3	4.6	µC	V_R=400V, I_F=58.2A, di_F/dt=100A/µs; see table 8
Peak reverse recovery current	I_{rrm}	-	15	-	A	V_R=400V, I_F=58.2A, di_F/dt=100A/µs; see table 8

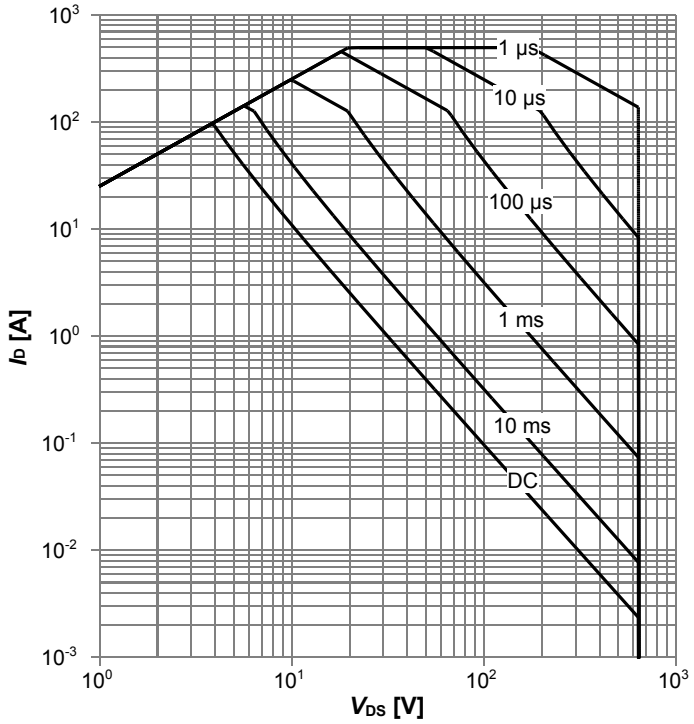
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



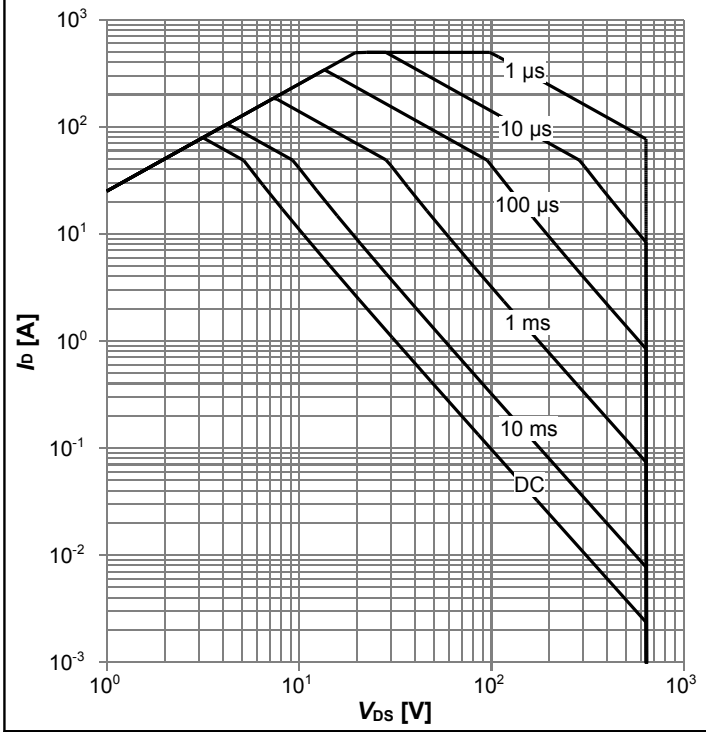
$P_{tot}=f(T_C)$

Diagram 2: Safe operating area



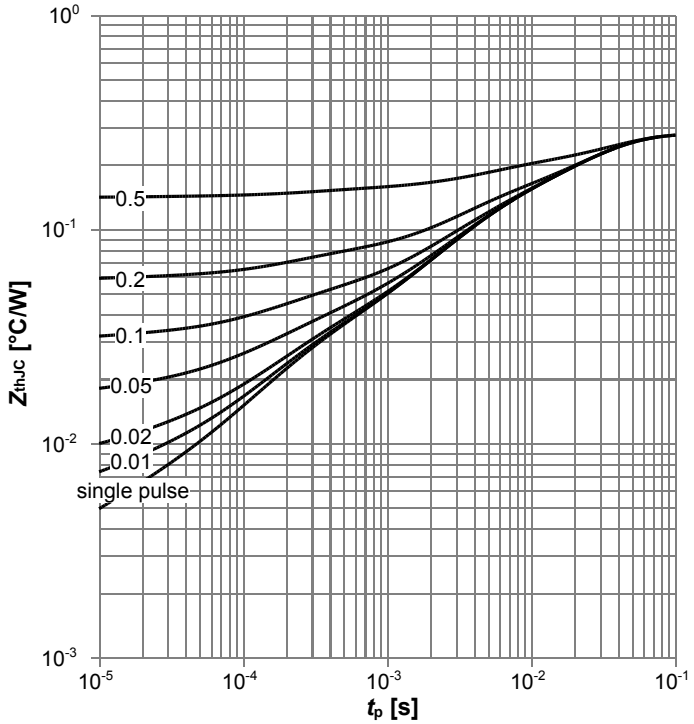
$I_D=f(V_{DS})$; T_C=25 °C; D=0; parameter: t_p

Diagram 3: Safe operating area



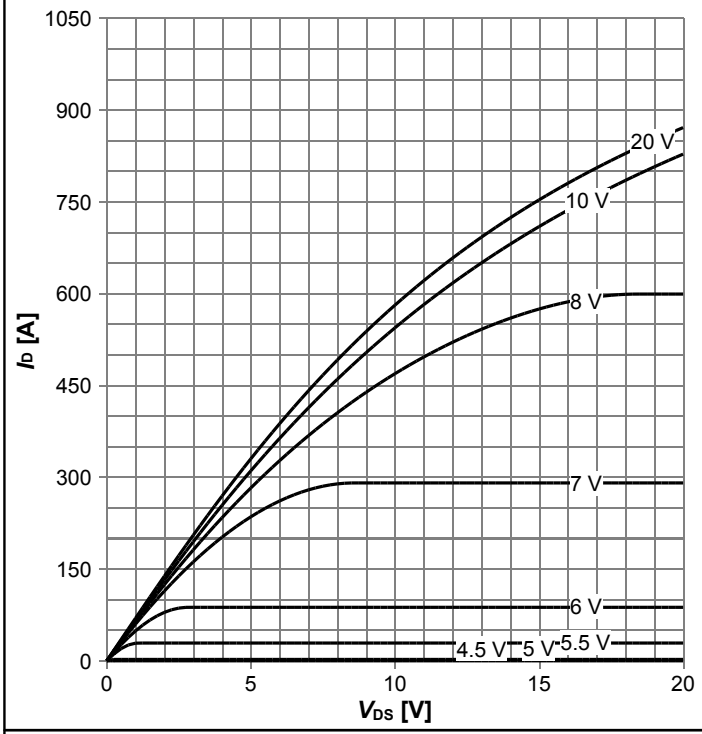
$I_D=f(V_{DS})$; T_C=80 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



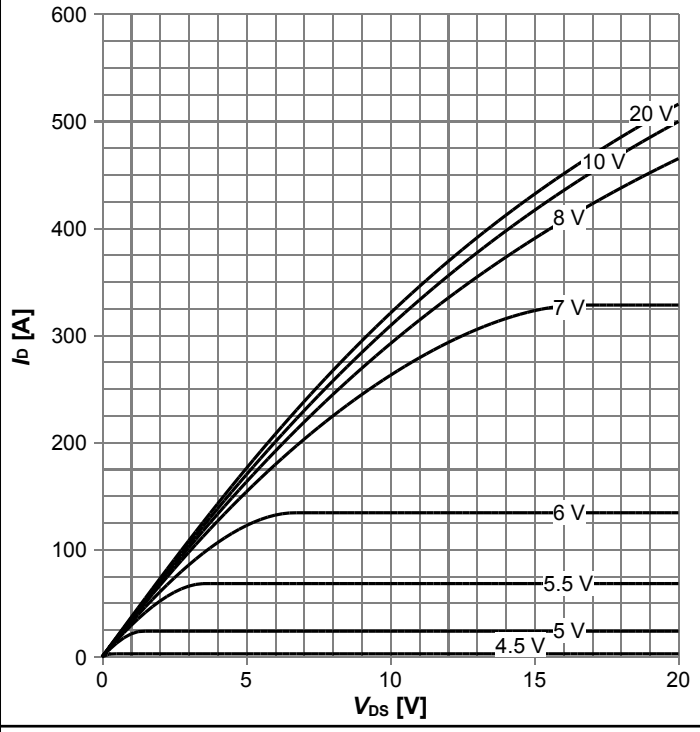
$Z_{thJC}=f(t_P)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



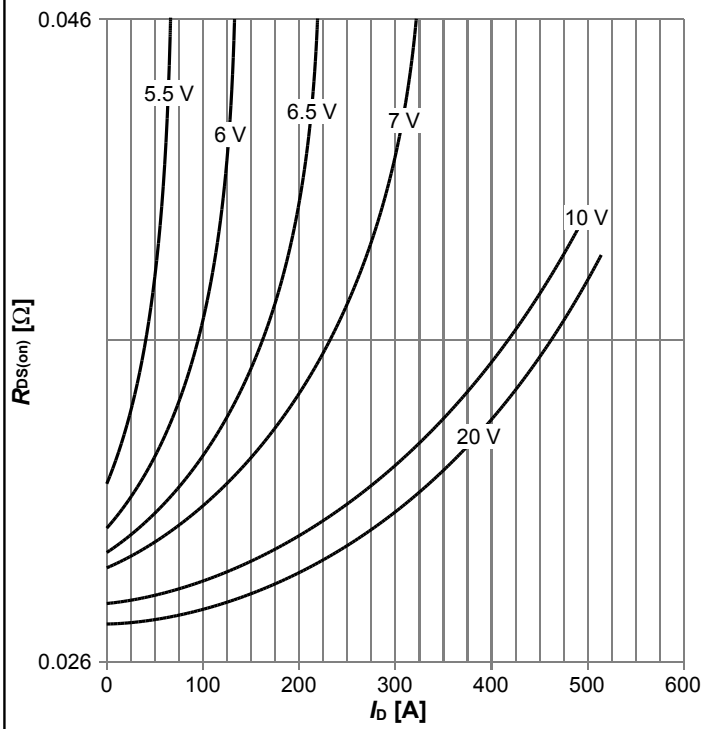
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. output characteristics



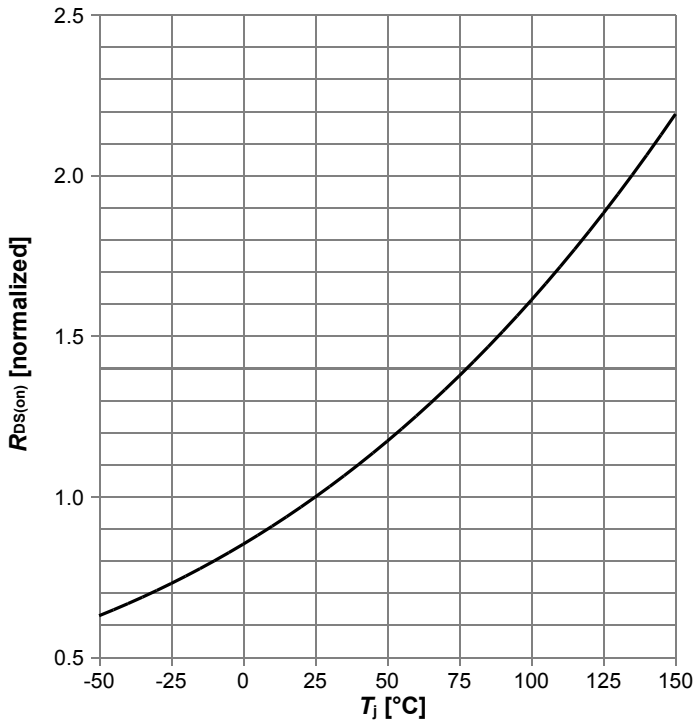
$I_D=f(V_{DS})$; $T_j=125$ °C; parameter: V_{GS}

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



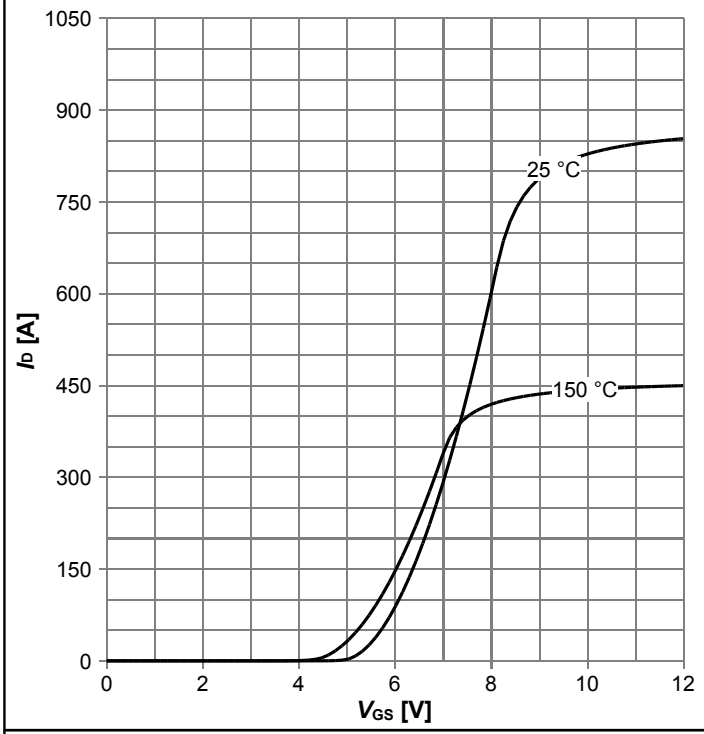
$R_{DS(on)}=f(I_D)$; $T_j=125$ °C; parameter: V_{GS}

Diagram 8: Drain-source on-state resistance



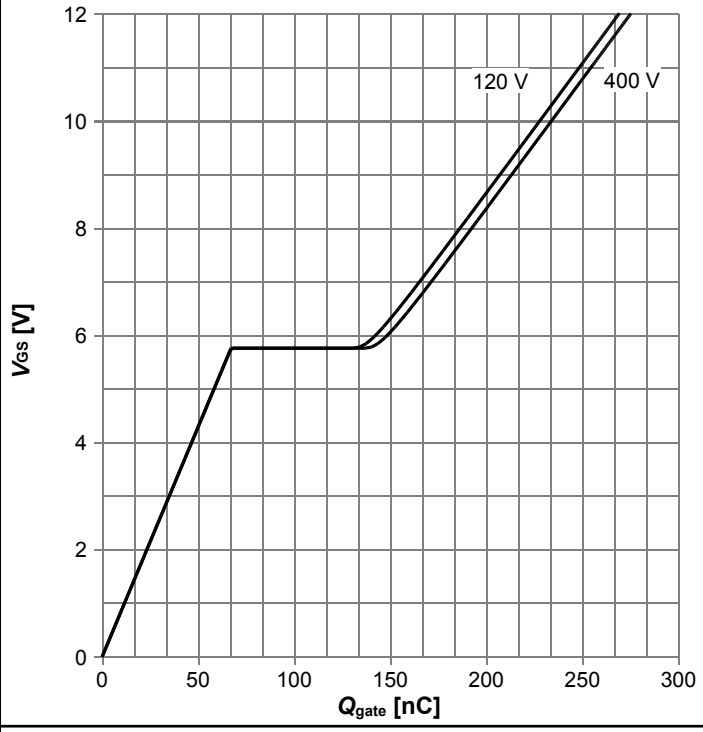
$R_{DS(on)}=f(T_j)$; $I_D=58.2$ A; $V_{GS}=10$ V

Diagram 9: Typ. transfer characteristics



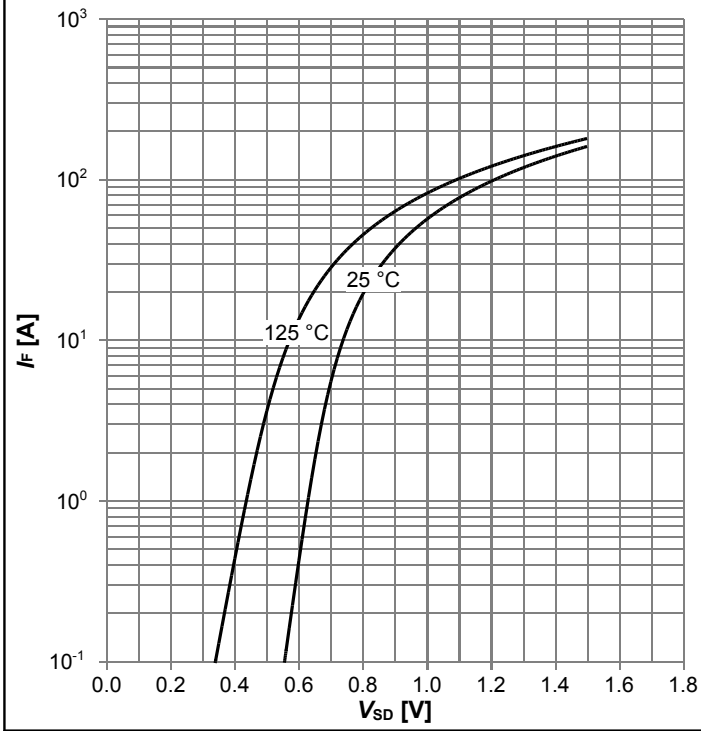
I_D=f(V_{GS}); V_{DS}=20V; parameter: T_j

Diagram 10: Typ. gate charge



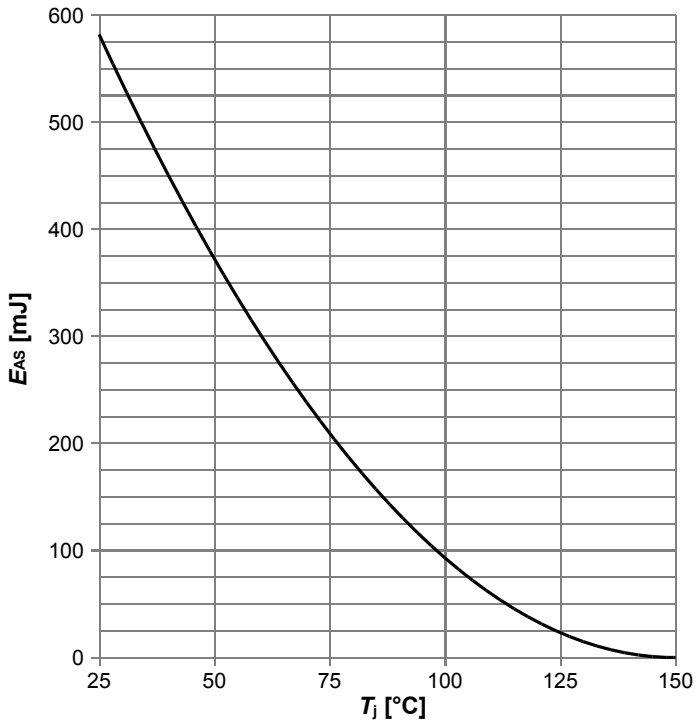
V_{GS}=f(Q_{gate}); I_D=58.2 A pulsed; parameter: V_{DD}

Diagram 11: Forward characteristics of reverse diode



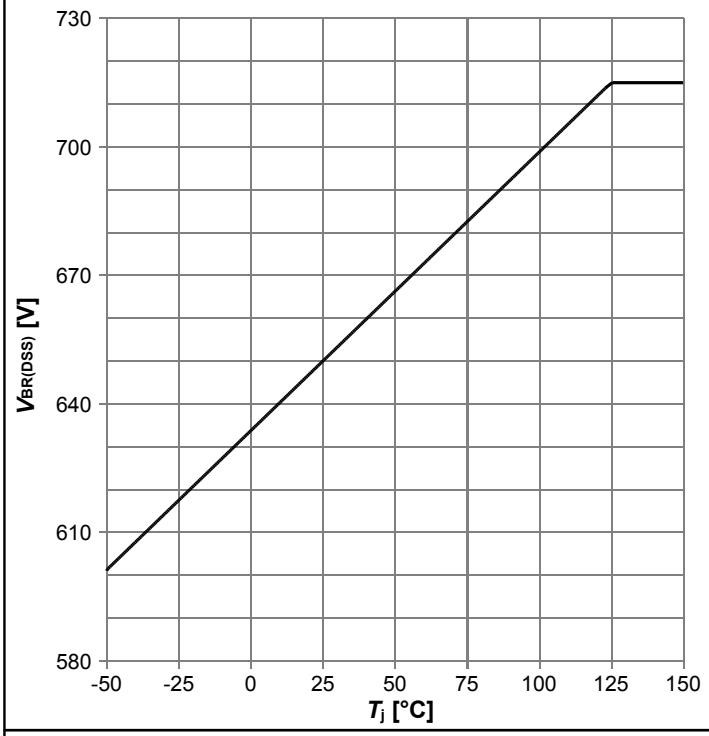
I_F=f(V_{SD}); parameter: T_j

Diagram 12: Avalanche energy



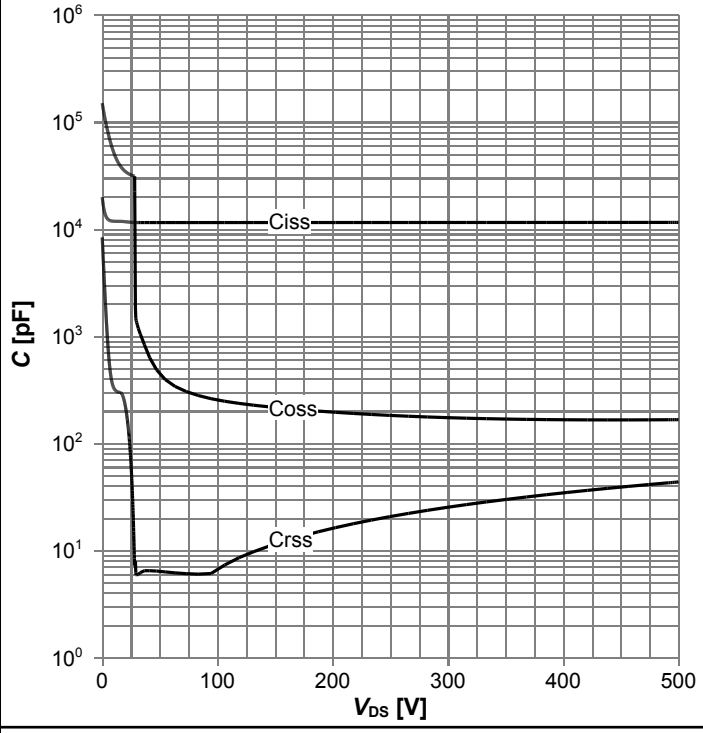
E_{AS}=f(T_j); I_D=8.3 A; V_{DD}=50 V

Diagram 13: Drain-source breakdown voltage



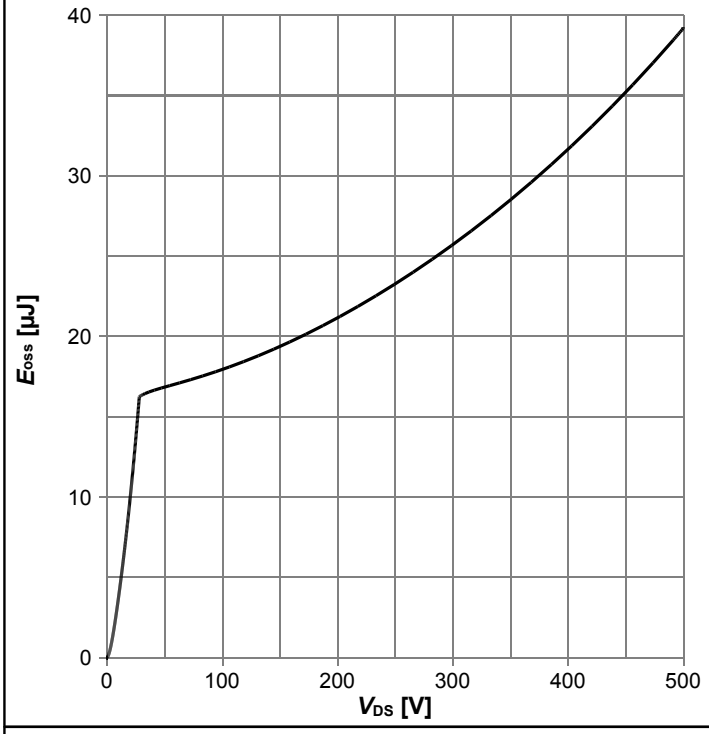
$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Diagram 14: Typ. capacitances



C=f(V_{DS}); V_{GS}=0 V; f=250 kHz

Diagram 15: Typ. Coss stored energy



E_{oss}=f(V_{DS})

5 Test Circuits

Table 8 Diode characteristics

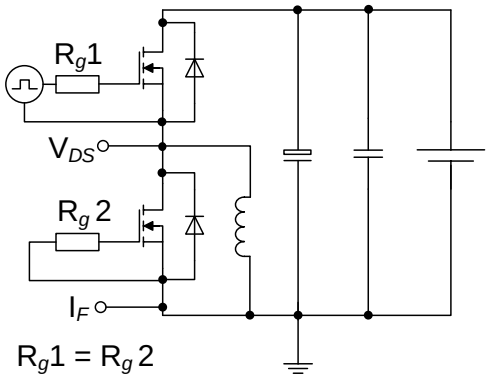
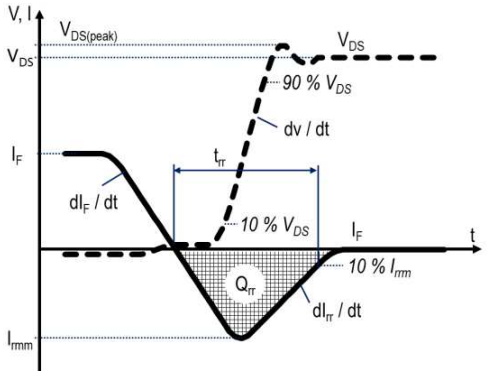
Test circuit for diode characteristics	Diode recovery waveform
	

Table 9 Switching times (ss)

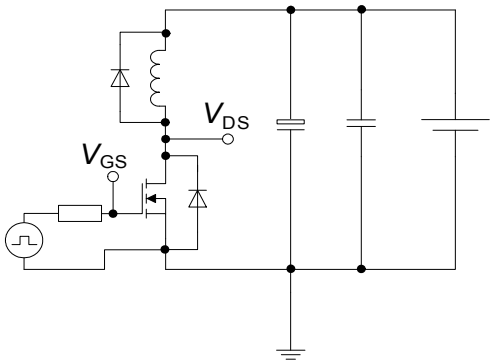
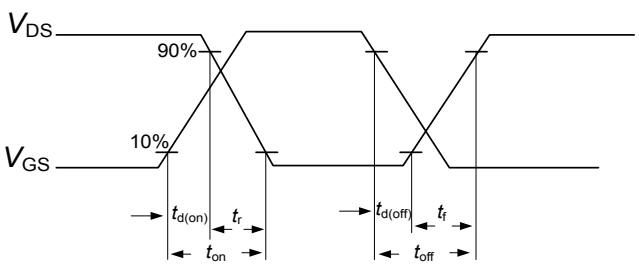
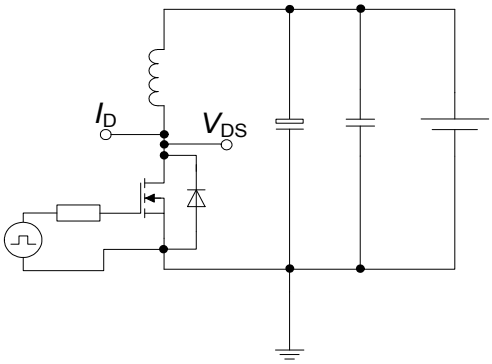
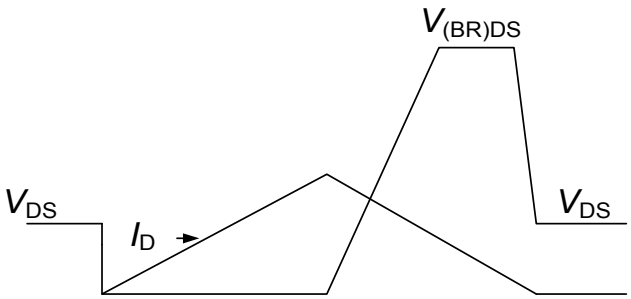
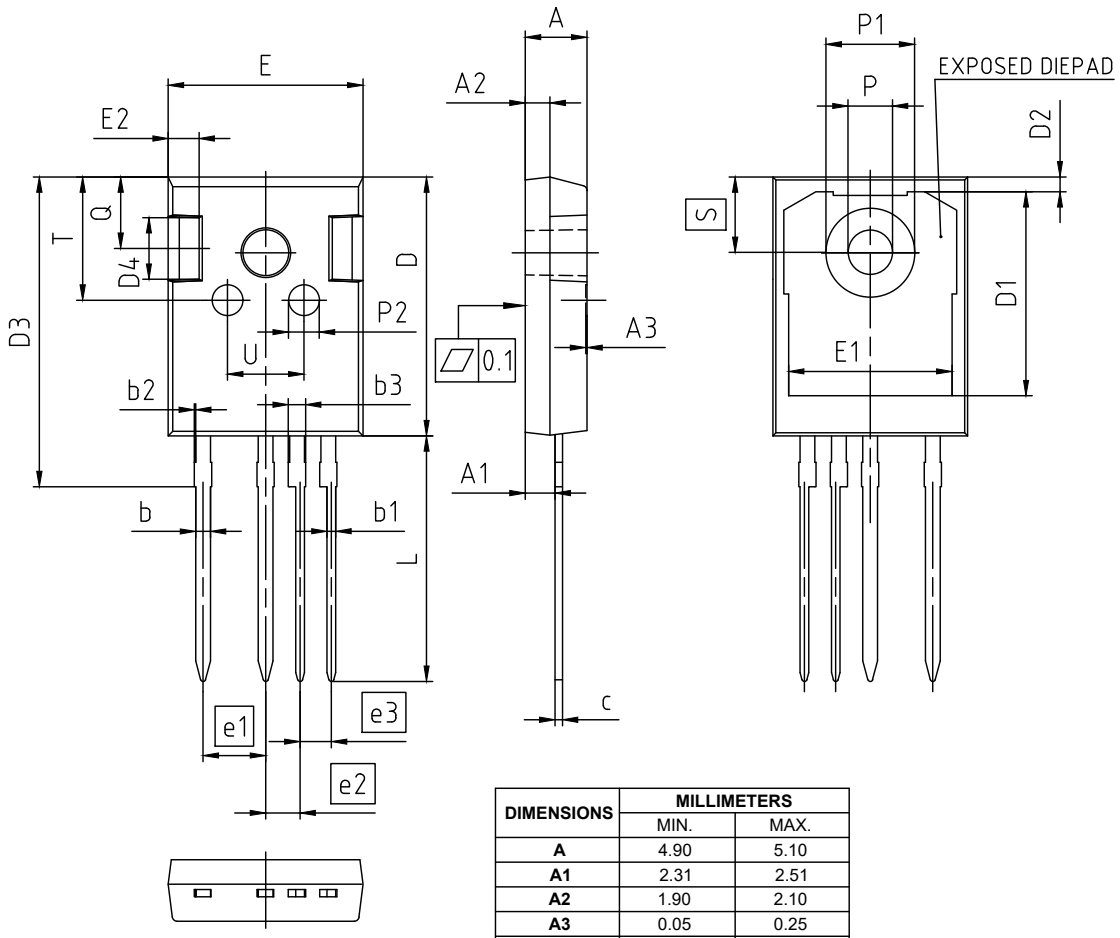
Switching times test circuit for inductive load	Switching times waveform
	

Table 10 Unclamped inductive load (ss)

Unclamped inductive load test circuit	Unclamped inductive waveform
	

6 Package Outlines



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

DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	4.90	5.10
A1	2.31	2.51
A2	1.90	2.10
A3	0.05	0.25
b	1.10	1.30
b1	0.65	0.79
b2	-	0.20
b3	1.34	1.44
c	0.58	0.66
D	20.90	21.10
D1	16.25	16.85
D2	1.05	1.35
D3	24.97	25.27
D4	4.90	5.10
E	15.70	15.90
E1	13.10	13.50
E2	2.40	2.60
e1	5.08	
e2	2.79	
e3	2.54	
L	19.80	20.10
L1	-	4.30
øP	3.50	3.70
øP1	7.00	7.40
øP2	2.40	2.60
Q	5.60	6.00
S	6.15	
T	9.80	10.20
U	6.00	6.40

DOCUMENT NO.
Z8B00184785

REVISION
03

SCALE 2:1
0 5 10mm

EUROPEAN PROJECTION

ISSUE DATE
21.08.2017

Figure 1 Outline PG-TO247-4-3, dimensions in mm

7 Appendix A

Table 11 Related Links

- **IFX CoolMOS CFD7 650V Webpage:** www.infineon.com
- **IFX CoolMOS CFD7 650V application note:** www.infineon.com
- **IFX CoolMOS CFD7 650V simulation model:** www.infineon.com
- **IFX Design tools:** www.infineon.com

Revision History

IPZA65R018CFD7

Revision: 2020-10-27, Rev. 2.0

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
2.0	2020-10-27	Release of final version

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Listede olmayan ya da yüksek adetli parçalar için teklif isteyin.

Teklif isteyin

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