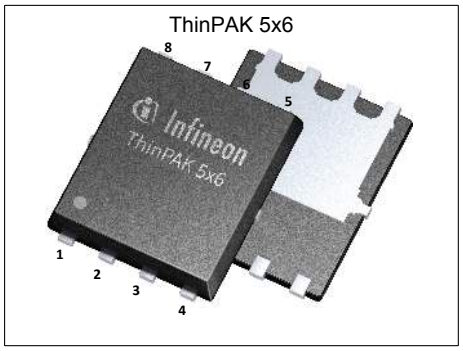
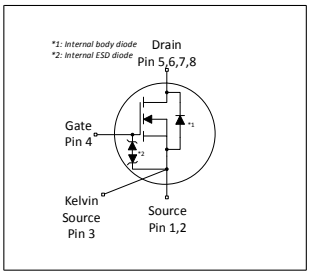
MOSFET

800V CoolMOS™ P7 Power Device

The latest 800V CoolMOS™ P7 series sets a new benchmark in 800V super junction technologies and combines best-in-class performance with state of the art ease-of-use, resulting from Infineon's over 18 years pioneering super junction technology innovation.





Features

- Best-in-class FOM $R_{DS(on)}$ * E_{oss}; reduced Q_g, C_{iss}, and C_{oss}
- Best-in-class DPAK $R_{DS(on)}$
- Best-in-class $V_{(GS)th}$ of 3V and smallest $V_{(GS)th}$ variation of ±0.5V
- Integrated Zener Diode ESD protection
- Fully optimized portfolio

Benefits

- Best-in-class performance
- Enabling higher power density designs, BOM savings and lower assembly costs
- Easy to drive and to parallel
- Better production yield by reducing ESD related failures
- Less production issues and reduced field returns
- Easy to select right parts for fine tuning of designs

Potential applications

Recommended for hard and soft switching flyback topologies for low power Chargers and Adapters.

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.comment For MOSFET paralleling the use of ferrite beads on the gate or seperate totem poles is generally recommended.

Table 1 Key Performance Parameters

Parameter	Value	Unit
V_{DS} @ $T_{j=25°C}$	800	V
$R_{DS(on),max}$	2.0	Ω
$Q_{g,typ}$	9	nC
I_D	3	A
E_{oss} @ 500V	0.85	µJ
$V_{GS(th),typ}$	3	V
ESD class (HBM)	1C	-

Type / Ordering Code	Package	Marking	Related Links
IPLK80R2K0P7	ThinPAK 5x6 SMD	80R2K0P7	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	- -	- -	3 1.9	A	T_C=25°C T_C=100°C
Pulsed drain current[2]	$I_{D,pulse}$	-	-	6.0	A	T_C=25°C
Avalanche energy, single pulse	E_{AS}	-	-	6	mJ	I_D=0.4A; V_{DD}=50V
Avalanche energy, repetitive	E_{AR}	-	-	0.05	mJ	I_D=0.4A; V_{DD}=50V
Avalanche current, repetitive	I_{AR}	-	-	0.4	A	-
MOSFET dv/dt ruggedness	dv/dt	-	-	100	V/ns	V_{DS}=0 to 400V
Gate source voltage	V_{GS}	-20 -30	- -	20 30	V	static; AC (f>1 Hz)
Power dissipation	P_{tot}	-	-	28	W	T_C=25°C
Operating and storage temperature	T_j, T_{stg}	-55	-	150	°C	-
Continuous diode forward current	I_S	-	-	2.3	A	T_C=25°C
Diode pulse current[2]	$I_{S,pulse}$	-	-	6.0	A	T_C=25°C
Reverse diode dv/dt[3]	dv/dt	-	-	1	V/ns	V_{DS}=0 to 400V, I_{SD}<=0.47A, T_j=25°C
Maximum diode commutation speed[3]	di_f/dt	-	-	50	A/µs	V_{DS}=0 to 400V, I_{SD}<=0.47A, T_j=25°C

2 Thermal characteristics

Table 3 Thermal characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	-	4.5	°C/W	-
Thermal resistance, junction - ambient	R_{thJA}	-	-	62	°C/W	Device on PCB, minimal footprint
Thermal resistance, junction - ambient for SMD version	R_{thJA}	-	35	45	°C/W	Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm^2 (one layer 70µm thickness) copper area for drain connection and cooling. PCB is vertical without airflow.
Soldering temperature, wave- & reflow soldering allowed	T_{sold}	-	-	260	°C	reflow MSL1

[1] Limited by $T_{j\,max}$. Maximum duty cycle D=0.5
[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; t_{cond}<2µs

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	$V_{(BR)DSS}$	800	-	-	V	V_{GS}=0V, I_D=1mA
Gate threshold voltage	$V_{GS(th)}$	2.5	3	3.5	V	V_{DS}=V_{GS}, I_D=0.05mA
Zero gate voltage drain current	I_{DSS}	- -	- 10	1 -	µA	V_{DS}=800V, V_{GS}=0V, T_j=25°C V_{DS}=800V, V_{GS}=0V, T_j=150°C
Gate-source leakage curent incl. zener diode	I_{GSS}	-	-	1	µA	V_{GS}=20V, V_{DS}=0V
Drain-source on-state resistance	$R_{DS(on)}$	- -	1.7 4.4	2.0 -	Ω	V_{GS}=10V, I_D=0.94A, T_j=25°C V_{GS}=10V, I_D=0.94A, T_j=150°C
Gate resistance	R_G	-	4.0	-	Ω	f=250kHz, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}	-	175	-	pF	V_{GS}=0V, V_{DS}=500V, f=250kHz
Output capacitance	C_{oss}	-	4.0	-	pF	V_{GS}=0V, V_{DS}=500V, f=250kHz
Effective output capacitance, energy related[1)]	$C_{o(er)}$	-	7	-	pF	V_{GS}=0V, V_{DS}=0 to 500V
Effective output capacitance, time related[2)]	$C_{o(tr)}$	-	61	-	pF	I_D=constant, V_{GS}=0V, V_{DS}=0 to 500V
Turn-on delay time	$t_{d(on)}$	-	10	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=0.94A, R_G=33Ω
Rise time	t_r	-	8	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=0.94A, R_G=33Ω
Turn-off delay time	$t_{d(off)}$	-	40	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=0.94A, R_G=33Ω
Fall time	t_f	-	20	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=0.94A, R_G=33Ω

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	0.6	-	nC	V_{DD}=640V, I_D=0.94A, V_{GS}=0 to 10V
Gate to drain charge	Q_{gd}	-	4	-	nC	V_{DD}=640V, I_D=0.94A, V_{GS}=0 to 10V
Gate charge total	Q_g	-	9	-	nC	V_{DD}=640V, I_D=0.94A, V_{GS}=0 to 10V
Gate plateau voltage	$V_{plateau}$	-	4.5	-	V	V_{DD}=640V, I_D=0.94A, V_{GS}=0 to 10V

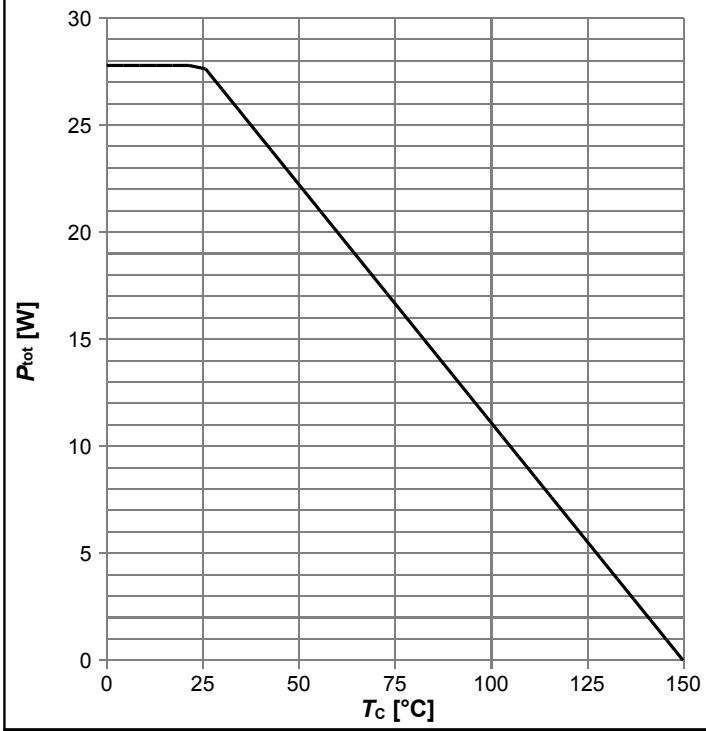
[1)] $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 500V
[2)] $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 500V

Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}	-	0.9	-	V	V_{GS}=0V, I_F=0.94A, T_f=25°C
Reverse recovery time	t_{rr}	-	650	-	ns	V_R=400V, I_F=0.47A, di_F/dt=50A/µs
Reverse recovery charge	Q_{rr}	-	3.2	-	µC	V_R=400V, I_F=0.47A, di_F/dt=50A/µs
Peak reverse recovery current	I_{rrm}	-	7	-	A	V_R=400V, I_F=0.47A, di_F/dt=50A/µs

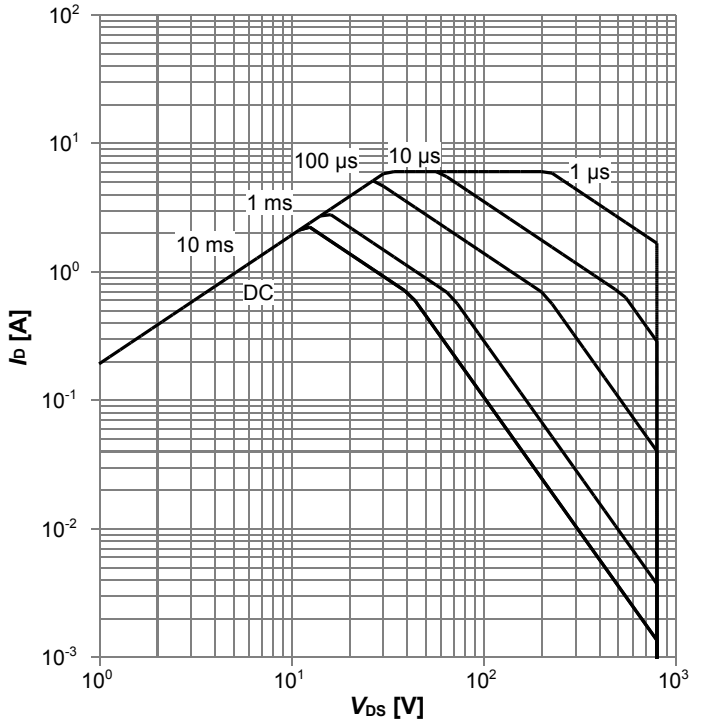
4 Electrical characteristics diagrams

Diagram 1: Power dissipation



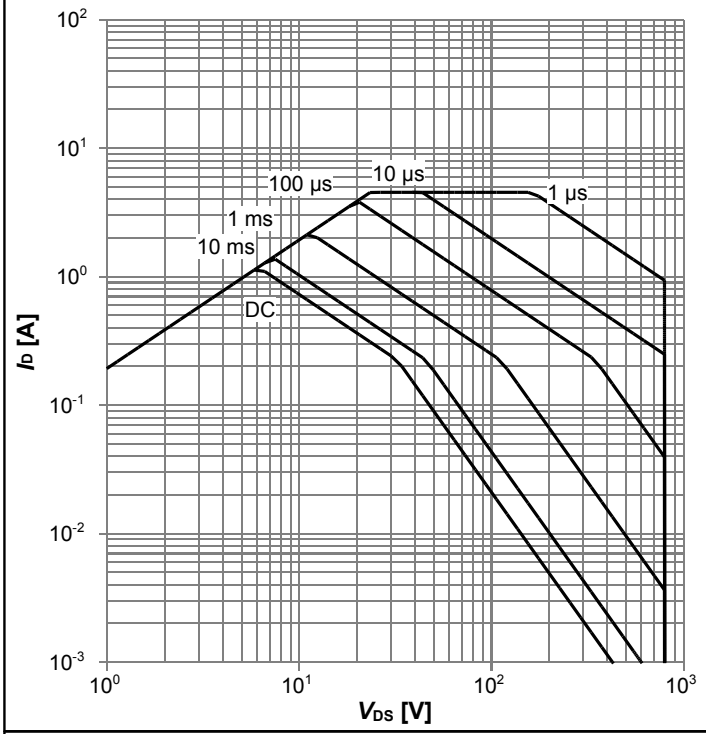
$P_{tot}=f(T_C)$

Diagram 2: Safe operating area



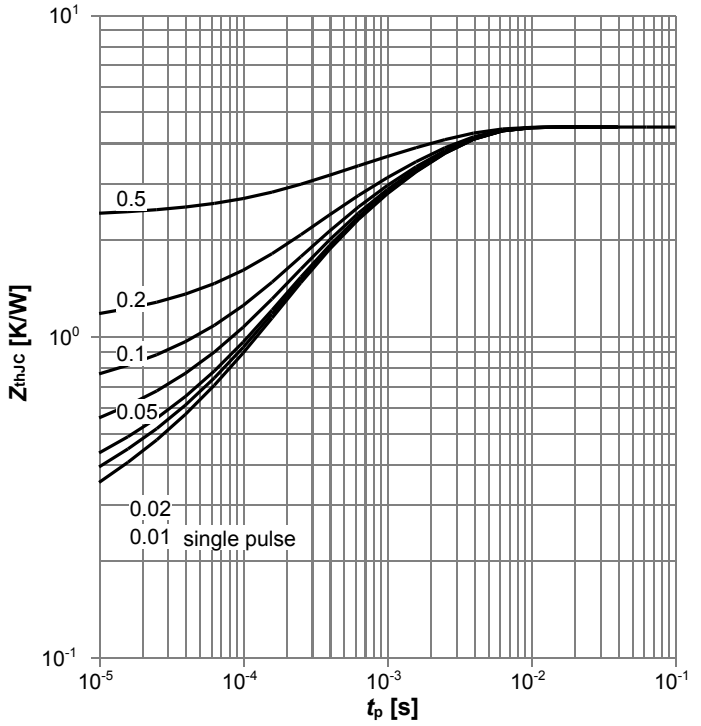
$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$; parameter: t_p

Diagram 3: Safe operating area



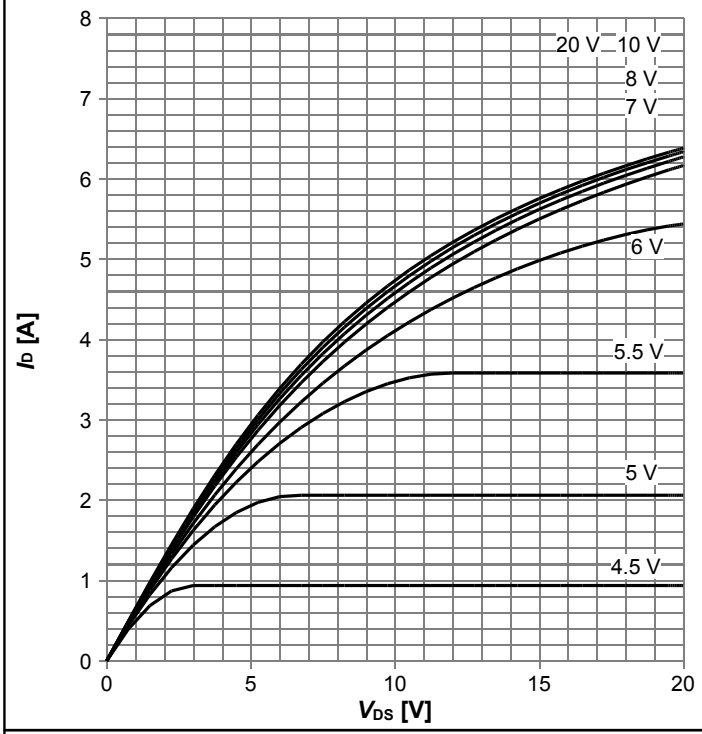
$I_D=f(V_{DS})$; $T_C=80$ °C; $D=0$; parameter: t_p

Diagram 4: Max. transient thermal impedance



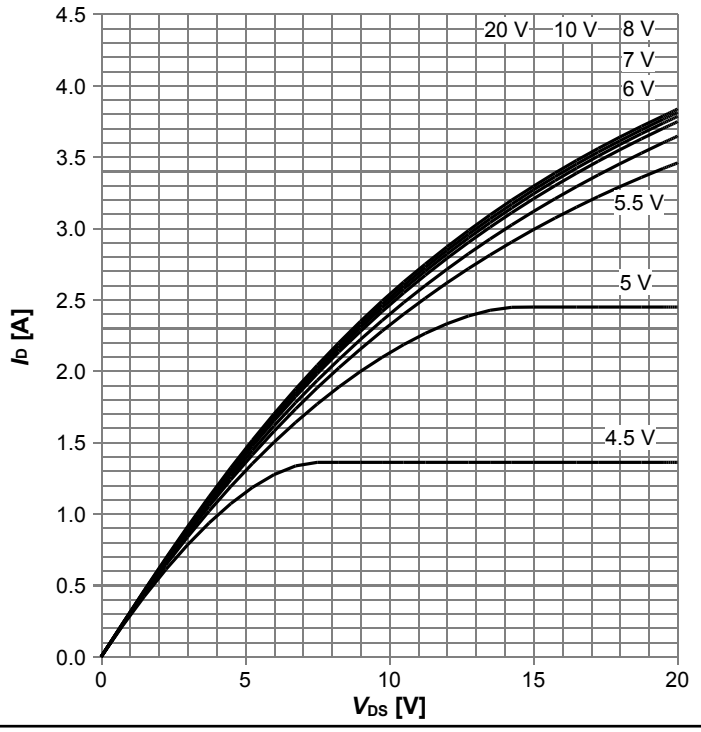
$Z_{thJC}=f(t_P)$; parameter: $D=t_p/T$

Diagram 5: Typ. output characteristics



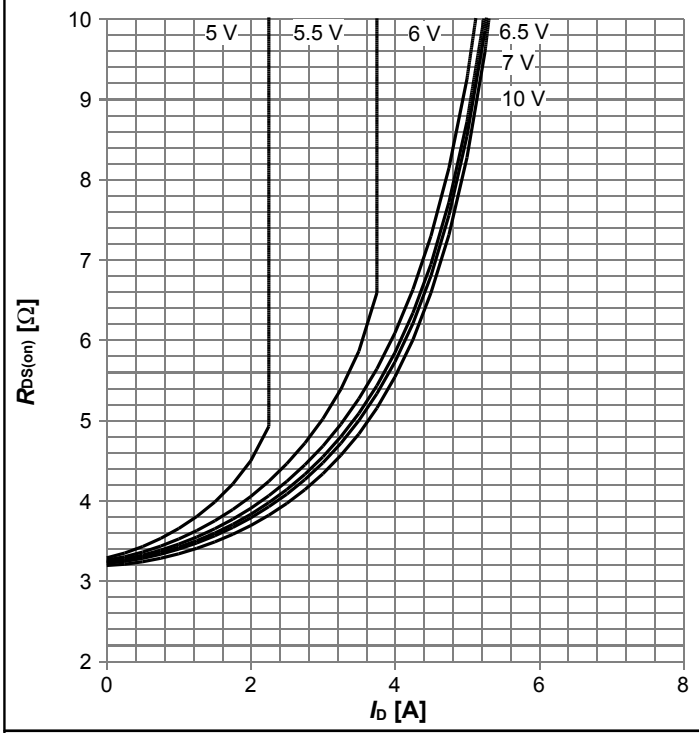
$I_D=f(V_{DS})$; $T_j=25$ °C; parameter: V_{GS}

Diagram 6: Typ. output characteristics



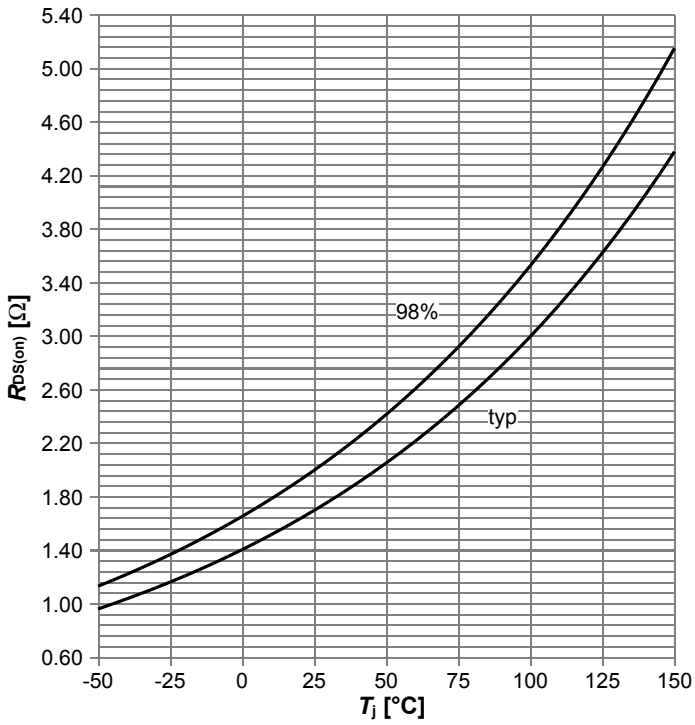
$I_D=f(V_{DS})$; $T_j=125$ °C; parameter: V_{GS}

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



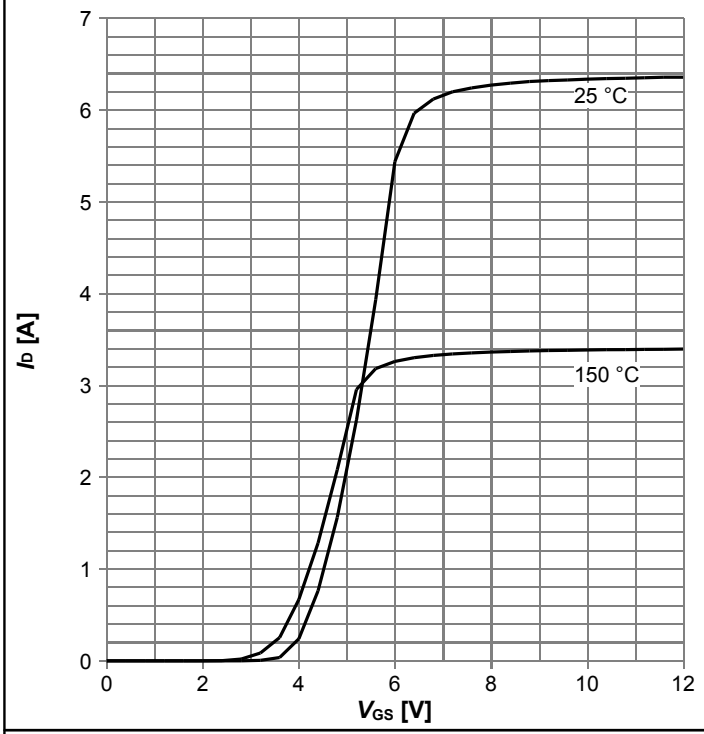
$R_{DS(on)}=f(I_D)$; $T_j=125$ °C; parameter: V_{GS}

Diagram 8: Drain-source on-state resistance



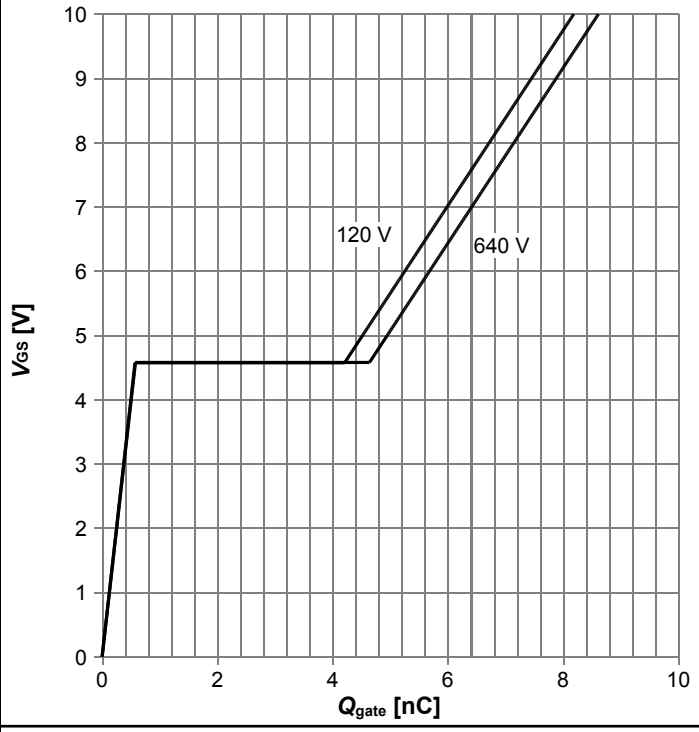
$R_{DS(on)}=f(T_j)$; $I_D=0.94$ A; $V_{GS}=10$ V

Diagram 9: Typ. transfer characteristics



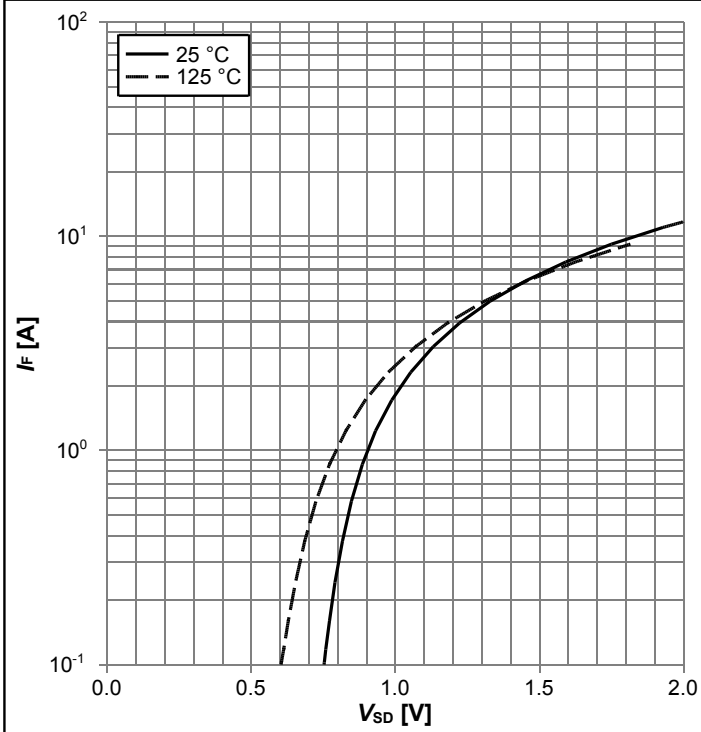
I_D=f(V_{GS}); V_{DS}=20V; parameter: T_j

Diagram 10: Typ. gate charge



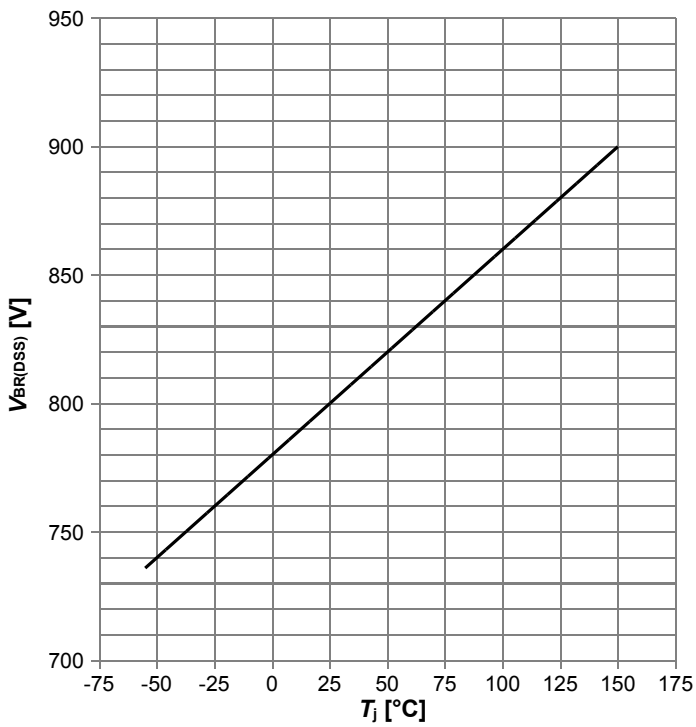
V_{GS}=f(Q_{gate}); I_D=0.94 A pulsed; parameter: V_{DD}

Diagram 11: Forward characteristics of reverse diode



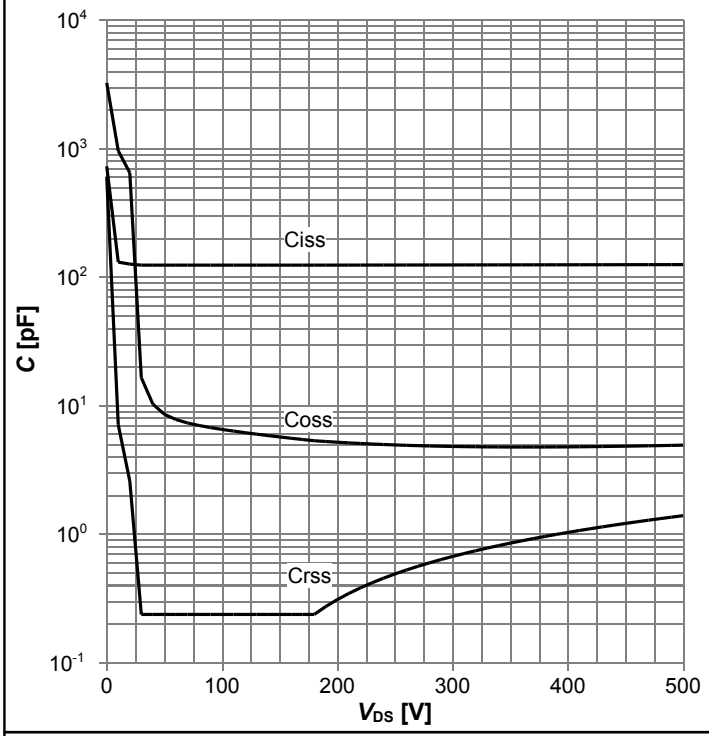
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Drain-source breakdown voltage



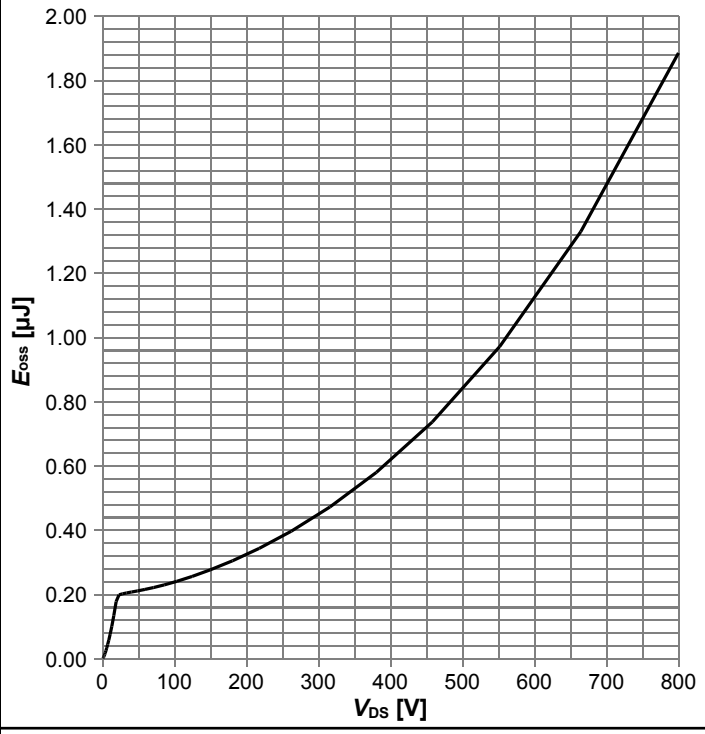
$V_{BR(DSS)}$=f(T_j); I_D=1 mA

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

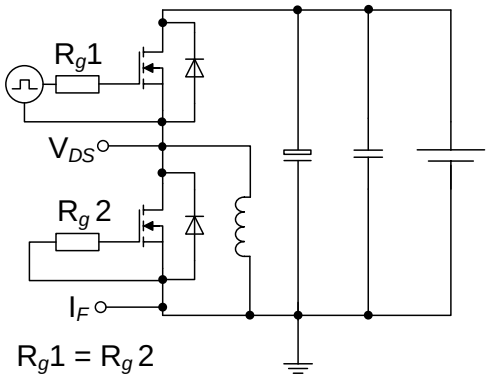
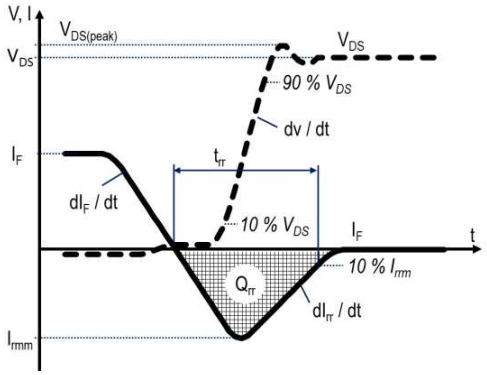
Test circuit for diode characteristics	Diode recovery waveform
	

Table 9 Switching times

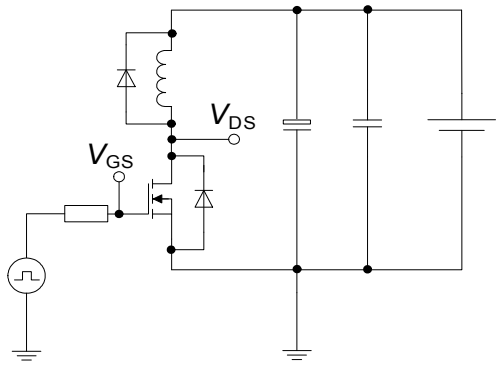
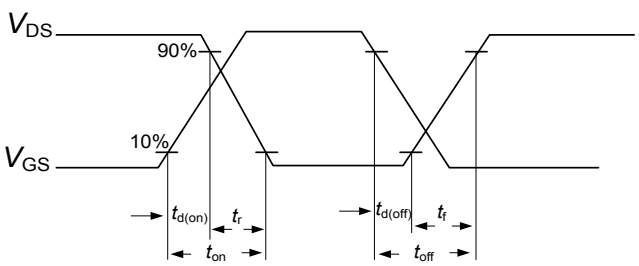
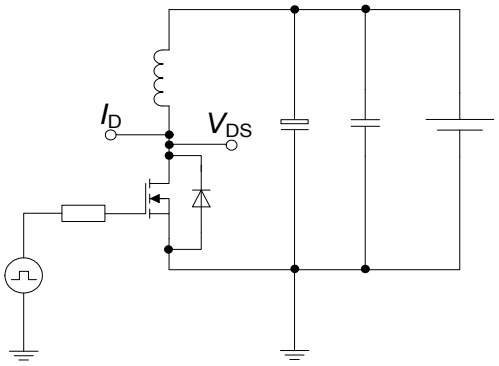
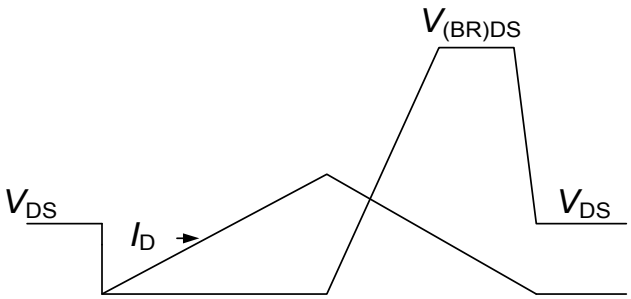
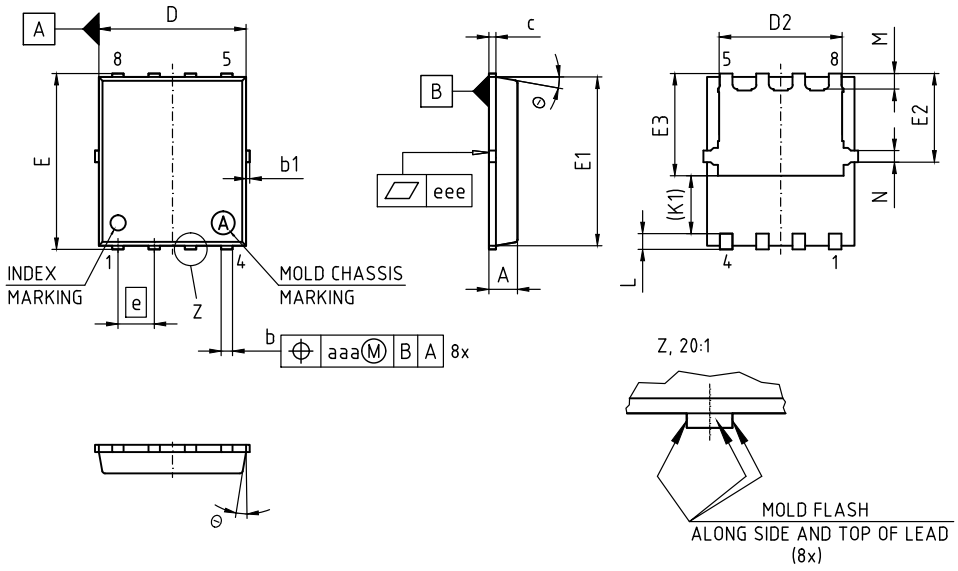
Switching times test circuit for inductive load	Switching times waveform
	

Table 10 Unclamped inductive load

Unclamped inductive load test circuit	Unclamped inductive waveform
	

6 Package Outlines



DIMENSION b DOES NOT INCLUDE MOLD FLASH

AT PACKAGE SIDE NEAR DIMENSION b1:
REMOVAL OF MOLD GATE.
INTRUSION 0.1 MAX.
PROTRUSION 0.1 MAX.

ALL METAL SURFACES ARE PLATED; EXCEPT AREA OF CUT

DIMENSIONS	MILLIMETERS	
	MIN.	MAX.
A	0.90	1.10
b	0.30	0.50
b1	0.03	0.23
c	0.15	0.35
D	4.95	5.35
D2	4.20	4.40
E	6.02	6.42
E1	5.70	6.10
E2	3.04	3.24
E3	3.52	3.72
e	1.27	
K1	(2.02)	
L	0.49	0.69
M	0.49	0.69
N	0.30	0.50
ϴ	8.5°	11.5°
aaa	0.25	
eee	0.05	

DOCUMENT NO. Z8B00181453
REVISION 03
SCALE 5:1 0 1 2 3 4 5mm
EUROPEAN PROJECTION
ISSUE DATE 24.07.2017

Figure 1 Outline ThinPAK 5x6 SMD, dimensions in mm

7 Appendix A

Table 11 Related Links

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

Revision History

IPLK80R2K0P7

Revision: 2021-07-23, Rev. 2.1

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
2.0	2020-07-17	Release of final version
2.1	2021-07-23	Update of maximum Operation temperature

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