

MOSFET

650V CoolMOS™ C6 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™ C6 series combines the experience of the leading SJ MOSFET supplier with high class innovation. The resulting devices provide all benefits of a fast switching SJ MOSFET while not sacrificing ease of use. Extremely low switching and conduction losses make switching applications even more efficient, more compact, lighter and cooler.

Features

- Extremely low losses due to very low FOM $R_{ds(on)} \cdot Q_g$ and E_{oss}
- Very high commutation ruggedness
- Easy to use/drive
- Pb-free plating, Halogen free mold compound
- Qualified for industrial grade applications according to JEDEC (J-STD20 and JESD22)

Potential applications

PFC stages, hard switching PWM stages and resonant switching PWM stages for e.g. PC Silverbox, Adapter, LCD & PDP TV, Lighting, Server, Telecom, UPS and Solar.

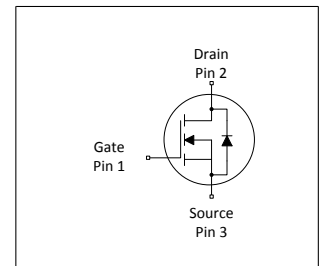
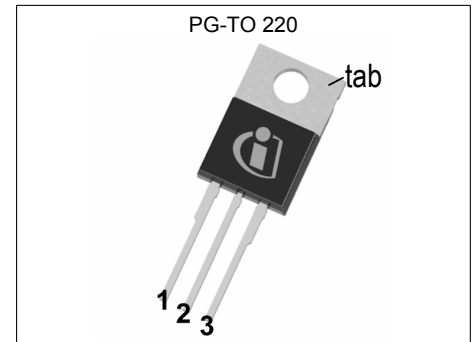


Table 1 Key Performance Parameters

Parameter	Value	Unit
$V_{DS} @ T_{j,max}$	700	V
$R_{DS(on),max}$	0.074	Ω
Q_g,typ	138	nC
$I_D,pulse$	151	A
$E_{oss} @ 400V$	10.8	μJ
Body diode di/dt	300	A/ μs

Type / Ordering Code	Package	Marking	Related Links
IPP65R074C6	PG-TO 220-3	65C6074	see Appendix A

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1 Maximum ratings

at $T_j = 25^\circ\text{C}$, unless otherwise specified

Table 2 Maximum ratings

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current ¹⁾	I_D			57.7	A	$T_C = 25^\circ\text{C}$
				31.6		$T_C = 100^\circ\text{C}$
Pulsed drain current ²⁾	$I_{D,pulse}$			151	A	$T_C = 25^\circ\text{C}$
Avalanche energy, single pulse	E_{AS}			915	mJ	$I_D = 8.1\text{A}$, $V_{DD} = 50\text{V}$
Avalanche energy, repetitive	E_{AR}			1.40	mJ	$I_D = 8.1\text{A}$, $V_{DD} = 50\text{V}$
Avalanche current, repetitive	I_{AR}			8.1	A	
MOSFET dv/dt ruggedness	dv/dt			50	V/ns	$V_{DS} = 0 \dots 480\text{V}$
Gate source voltage	V_{GS}	-20		20	V	static
		-30		30		AC ($f > 1\text{ Hz}$)
Power dissipation (non FullPAK) PG-TO 220	P_{tot}			480.8	W	$T_C = 25^\circ\text{C}$
Operating and storage temperature	T_j, T_{stg}	-55		150	$^\circ\text{C}$	
Mounting torque (non FullPAK) PG-TO 220				60	Ncm	M3 and M3.5 screws
Continuous diode forward current	I_S			50.0	A	$T_C = 25^\circ\text{C}$
Diode pulse current	$I_{S,pulse}$			151	A	$T_C = 25^\circ\text{C}$
Reverse diode dv/dt ³⁾	dv/dt			15	V/ns	$V_{DS} = 0 \dots 480\text{V}$, $I_{SD} \leq I_D$, $T_j = 25^\circ\text{C}$
Maximum diode commutation speed	di_f/dt			300	A/ μs	

¹⁾ Limited by $T_{j,max}$. Maximum duty cycle $D=0.75$

²⁾ Pulse width t_p limited by $T_{j,max}$

³⁾ $V_{peak} < V_{(BR)DSS}$, $T_j < T_{j,max}$, identical low side and high side switch with same R_g

2 Thermal characteristics

Table 3 Thermal characteristics PG-TO 220

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}			0.26	°C/W	
Thermal resistance, junction - ambient	R_{thJA}			62	°C/W	leaded
Soldering temperature, wavesoldering only allowed at leads	T_{sold}			260	°C	1.6 mm (0.063 in.) from case for 10s

3 Electrical characteristics

at $T_j = 25^\circ\text{C}$, 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	$V_{GS(th)}$	2.5	3	3.5	V	$V_{DS} = V_{GS}, I_D = 1.4mA$
Zero gate voltage drain current	I_{DSS}			5	μA	$V_{DS} = 650V, V_{GS} = 0V, T_j = 25^\circ\text{C}$
			50			$V_{DS} = 650V, V_{GS} = 0V, T_j = 150^\circ\text{C}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS} = 20V, V_{DS} = 0V$
Drain-source on-state resistance	$R_{DS(on)}$		0.067	0.074	Ω	$V_{GS} = 10V, I_D = 13.9A, T_j = 25^\circ\text{C}$
			0.173			$V_{GS} = 10V, I_D = 13.9A, T_j = 150^\circ\text{C}$
Gate resistance	R_G		0.6		Ω	$f = 1\text{MHz}$, open drain

Table 5 Dynamic characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance	C_{iss}		3020		pF	$V_{GS} = 0V, V_{DS} = 100V, f = 1\text{MHz}$
Output capacitance	C_{oss}		170		pF	
Effective output capacitance, energy related ¹⁾	$C_{o(er)}$		118		pF	$V_{GS} = 0V, V_{DS} = 0 \dots 480V$
Effective output capacitance, time related ²⁾	$C_{o(tr)}$		580		pF	$I_D = \text{constant}, V_{GS} = 0V, V_{DS} = 0 \dots 480V$
Turn-on delay time	$t_{d(on)}$		11		ns	$V_{DD} = 400V, V_{GS} = 13V, I_D = 20.8A, R_G = 1.8\Omega$
Rise time	t_r		7		ns	
Turn-off delay time	$t_{d(off)}$		56		ns	
Fall time	t_f		4		ns	

Table 6 Gate charge characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}		17		nC	$V_{DD} = 480V, I_D = 20.8A, V_{GS} = 0 \text{ to } 10V$
Gate to drain charge	Q_{gd}		71		nC	
Gate charge total	Q_g		138		nC	
Gate plateau voltage	$V_{plateau}$		5.5		V	

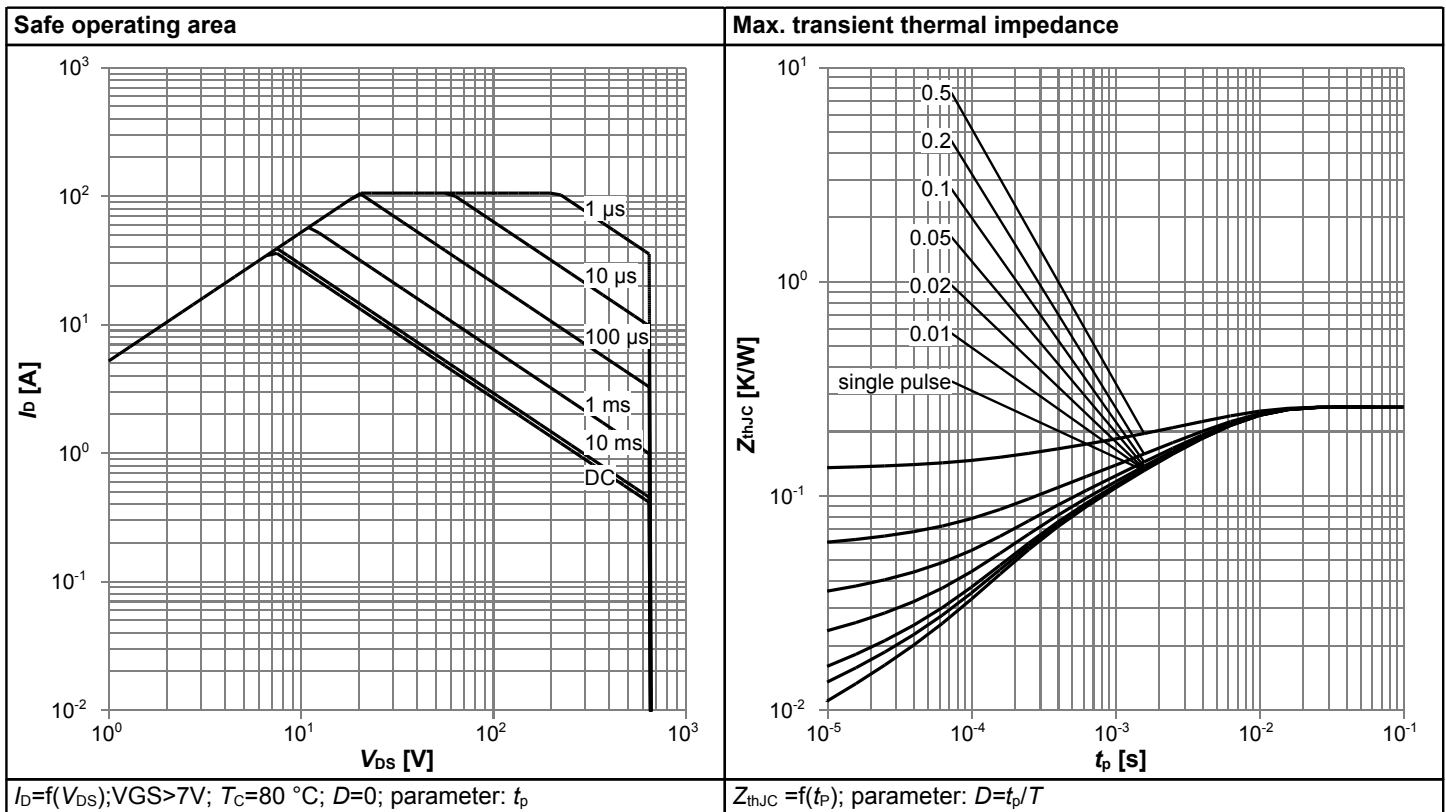
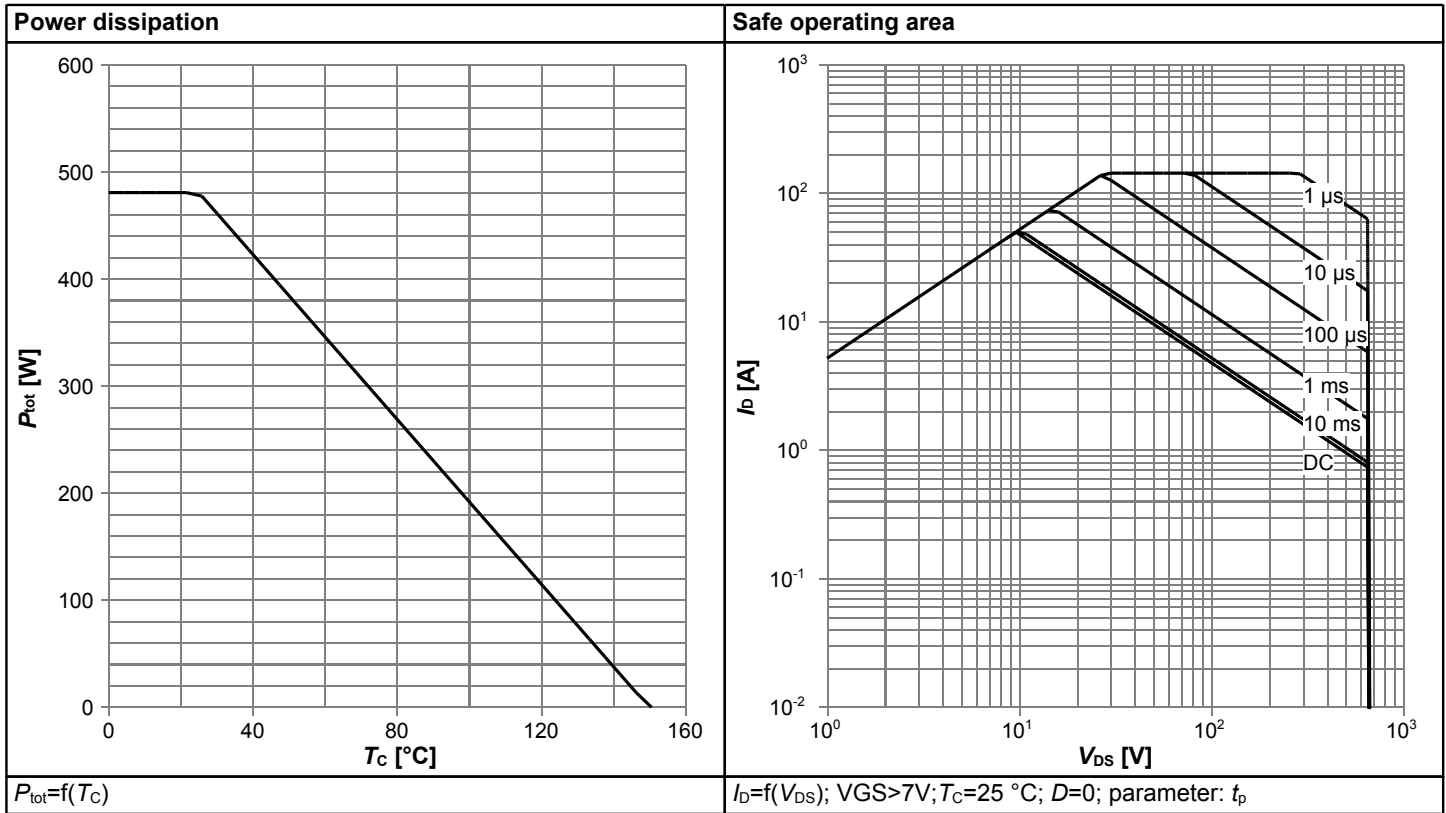
¹⁾ $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% $V_{(BR)DSS}$

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% $V_{(BR)DSS}$

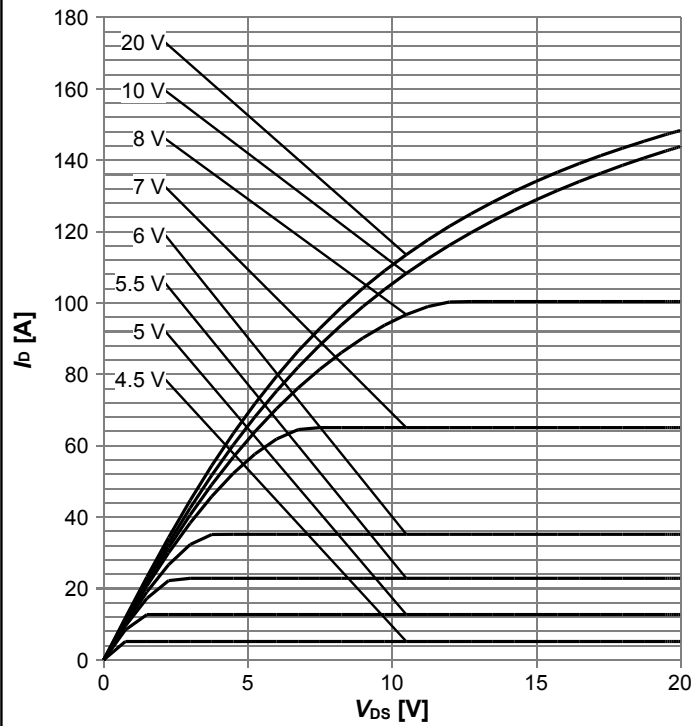
Table 7 Reverse diode characteristics

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode forward voltage	V_{SD}		0.9		V	$V_{GS} = 0V, I_F = 20.8A, T_j = 25^\circ C$
Reverse recovery time	t_{rr}		560		ns	$V_R = 400V, I_F = 20.8A,$ $di_F/dt = 100A/\mu s$
Reverse recovery charge	Q_{rr}		12		μC	
Peak reverse recovery current	I_{rrm}		40		A	

4 Electrical characteristics diagrams

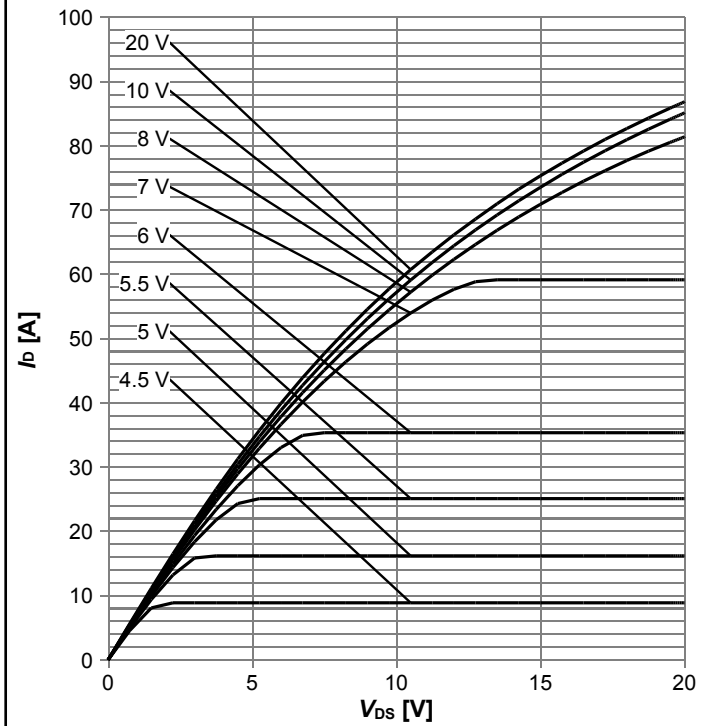


Typ. output characteristics



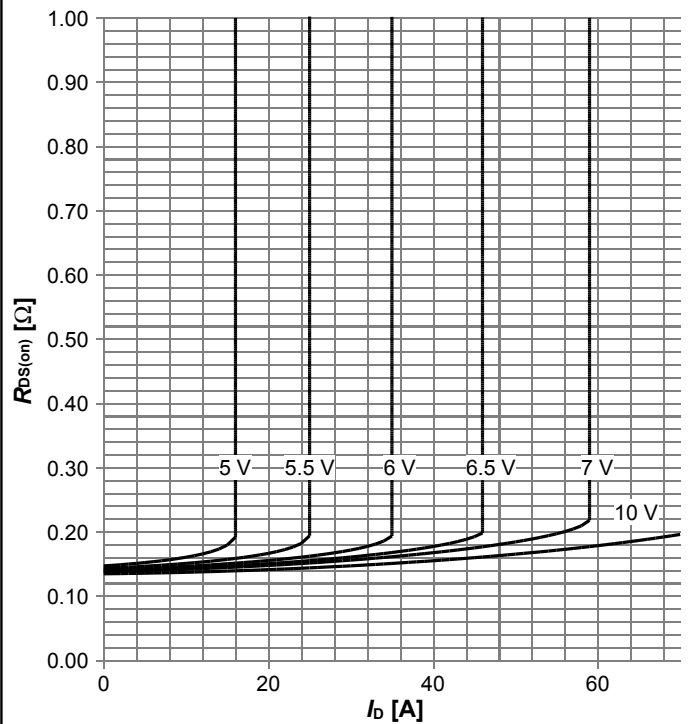
$I_D=f(V_{DS})$; $T_j=25\text{ °C}$; parameter: V_{GS}

Typ. output characteristics



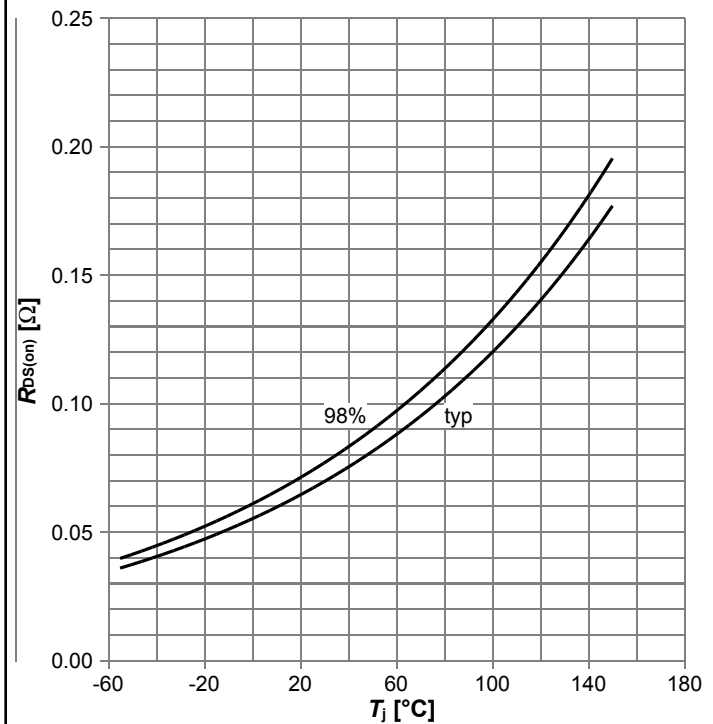
$I_D=f(V_{DS})$; $T_j=125\text{ °C}$; parameter: V_{GS}

Typ. drain-source on-state resistance

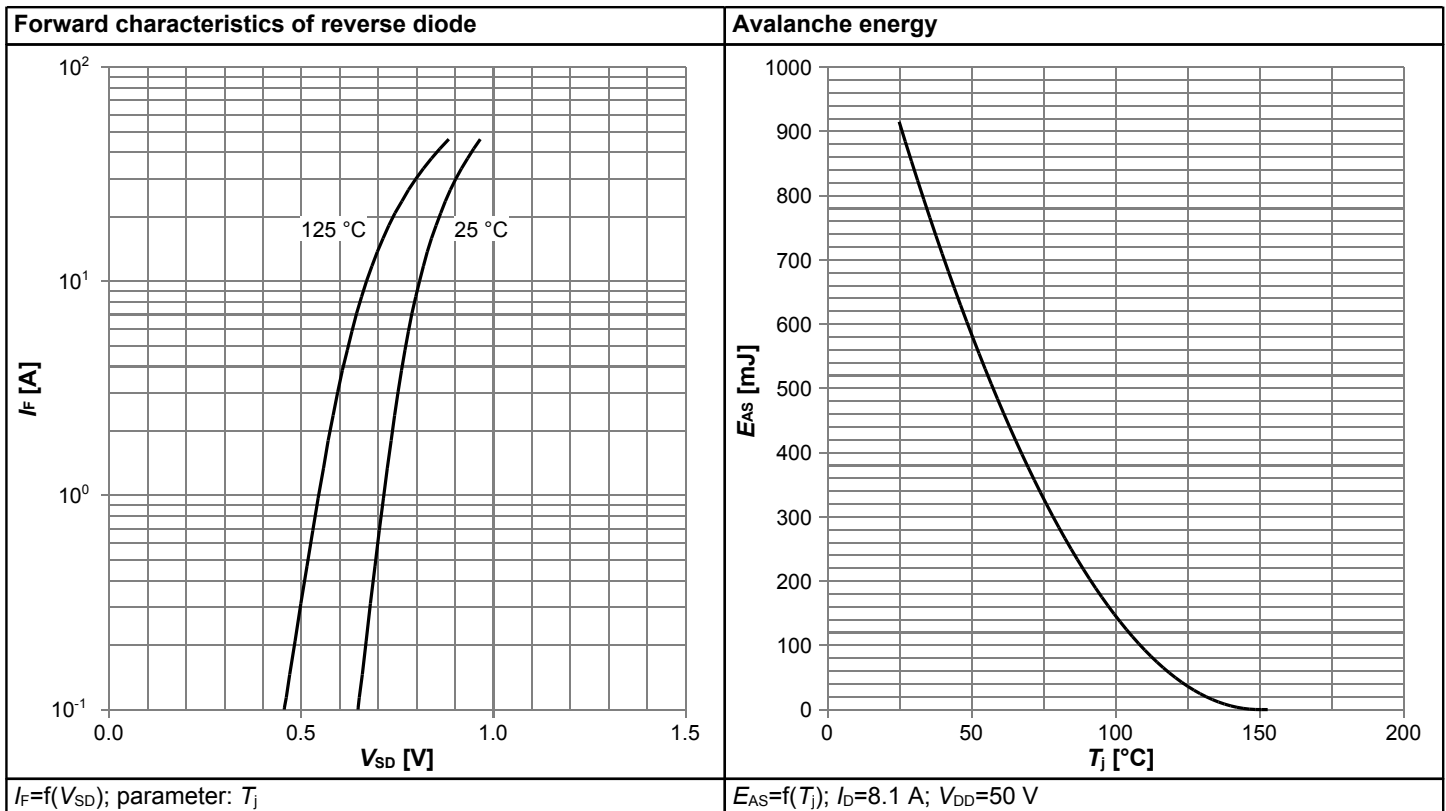
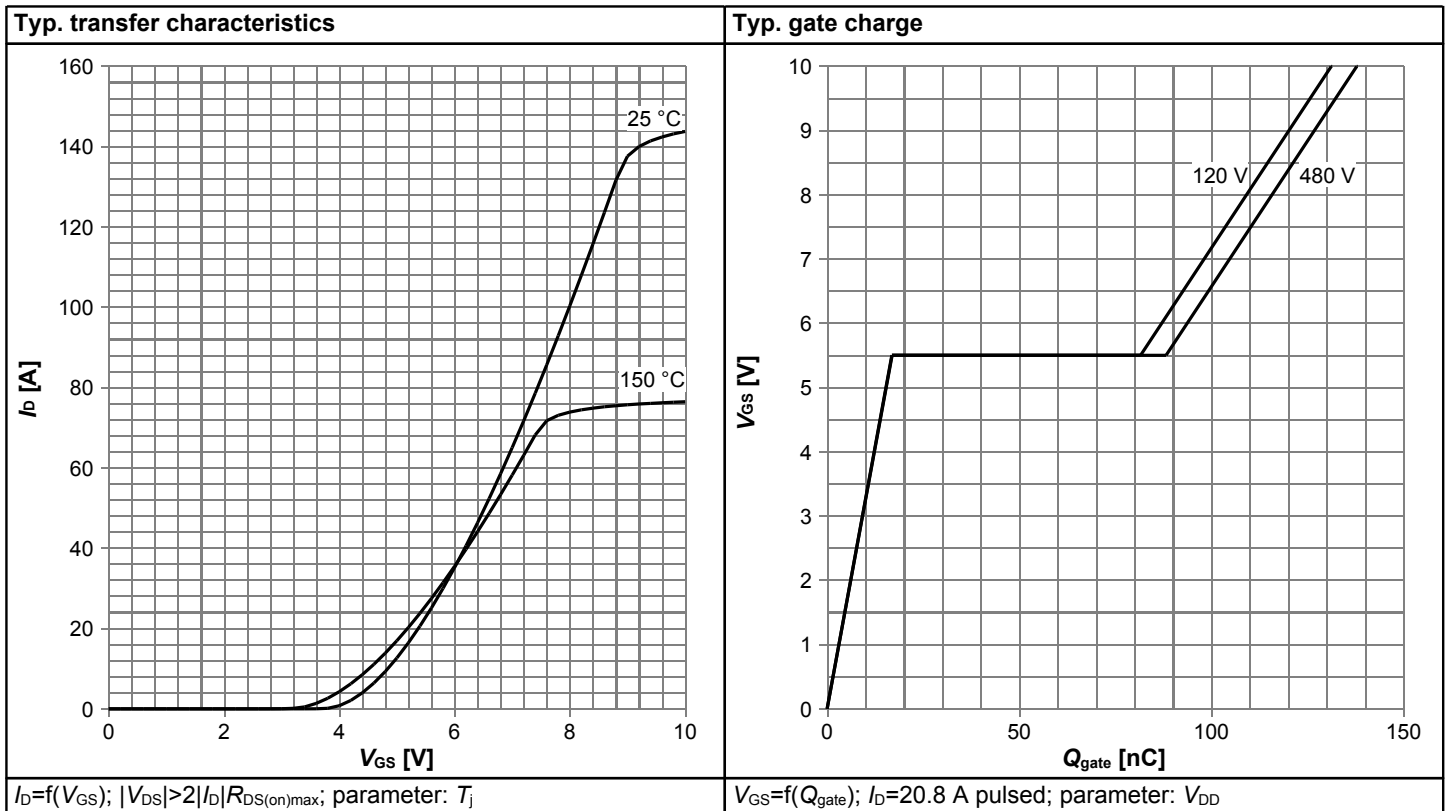


$R_{DS(on)}=f(I_D)$; $T_j=125\text{ °C}$; parameter: V_{GS}

Drain-source on-state resistance

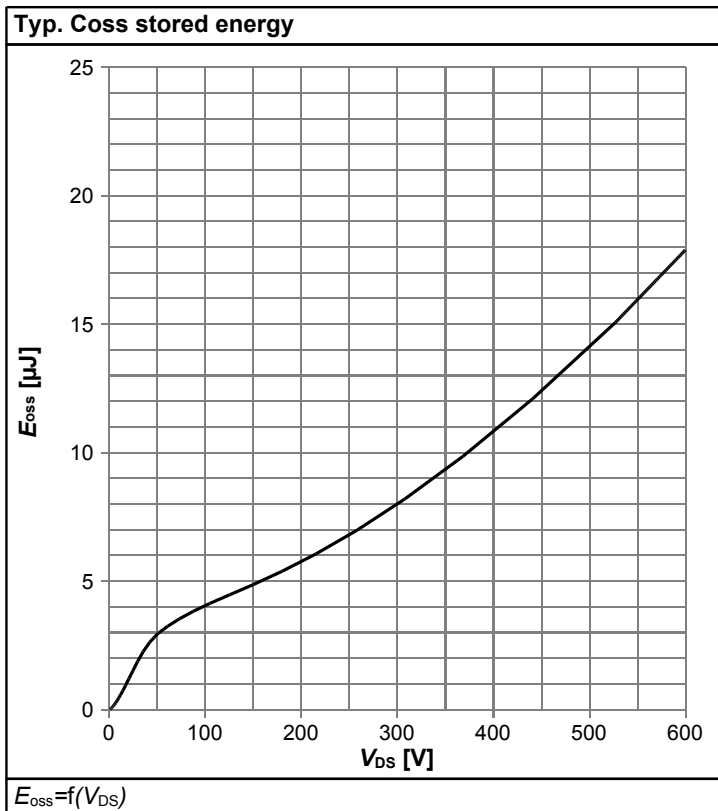
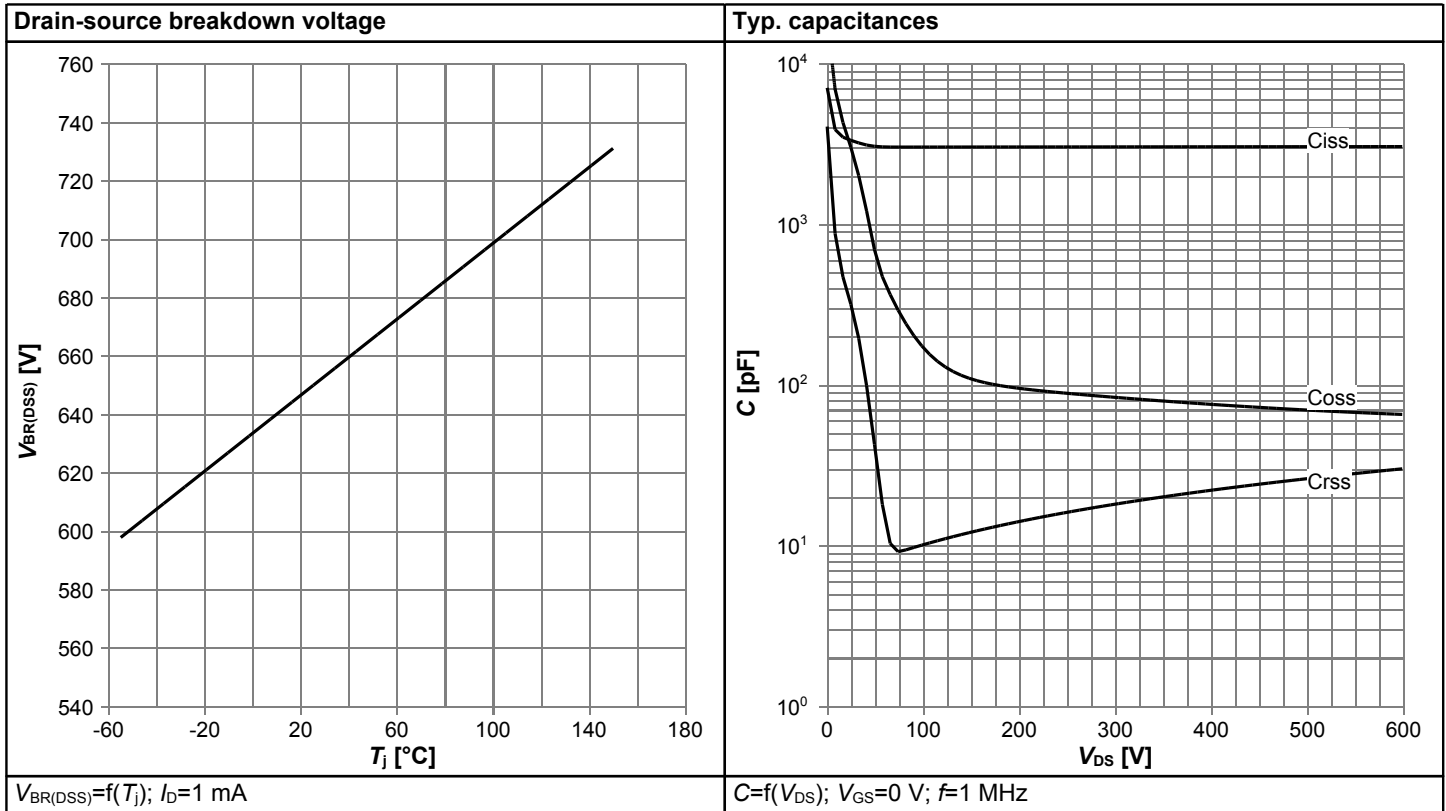


$R_{DS(on)}=f(T_j)$; $I_D=13.9\text{ A}$; $V_{GS}=10\text{ V}$



650V CoolMOS™ C6 Power Transistor

IPP65R074C6



5 Test Circuits

Table 8 Diode characteristics



Table 9 Switching times



Table 10 Unclamped inductive load



6 Package Outlines



Figure 1 Outline PG-TO 220-3, dimensions in mm/inches

7 Appendix A

Table 11 Related Links

- **IFX C6 Product Brief:** www.infineon.com
- **IFX C6 Portfolio:** www.infineon.com
- **IFX CoolMOS Webpage:** www.infineon.com
- **IFX Design Tools:** www.infineon.com

Revision History

IPP65R074C6

Revision: 2018-01-29, Rev. 2.2

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.1	2011-09-14	Final Datasheet Release
2.2	2018-01-29	Changed I_GSS Test condition in Table 4, Page 6

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