CoolMOS™ Power Transistor

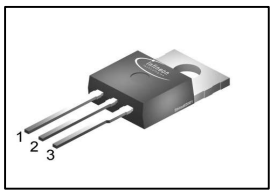
Features

- New revolutionary high voltage technology
- Extreme dv/dt rated
- High peak current capability
- Qualified according to JEDEC[1)] for target applications
- Pb-free lead plating; RoHS compliant
- Ultra low gate charge
- Ultra low effective capacitances

Product Summary

V_{DS}	800	V
$R_{DS(on)max}$ @ T_j = 25°C	0.65	Ω
$Q_{g,typ}$	45	nC

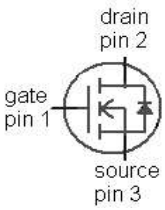
PG-TO220-3



CoolMOS™ 800V designed for:

- Industrial application with high DC bulk voltage
- Switching Application (i.e. active clamp forward)

Type	Package	Marking
SPP08N80C3	PG-TO220-3	08N80C3



Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	T_C=25 °C	8	A
		T_C=100 °C	5.1	
Pulsed drain current[2)]	$I_{D,pulse}$	T_C=25 °C	24	
Avalanche energy, single pulse	E_{AS}	I_D=1.6 A, V_{DD}=50 V	340	mJ
Avalanche energy, repetitive t_{AR}[2),3)]	E_{AR}	I_D=8 A, V_{DD}=50 V	0.2	
Avalanche current, repetitive t_{AR}[2),3)]	I_{AR}		8	A
MOSFET dv/dt ruggedness	dv/dt	V_{DS}=0…640 V	50	V/ns
Gate source voltage	V_{GS}	static	±20	V
		AC (f>1 Hz)	±30	
Power dissipation	P_{tot}	T_C=25 °C	104	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 150	°C
Mounting torque		M3 and M3.5 screws	60	Ncm

Maximum ratings, at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous diode forward current	I_S	T_C=25 °C	8	A
Diode pulse current[2)]	$I_{S,pulse}$		24	
Reverse diode dv/dt[4)]	dv/dt		4	V/ns

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	1.2	K/W
Thermal resistance, junction - ambient	R_{thJA}	leaded	-	-	62	
Soldering temperature, wave soldering only allowed at leads	T_{sold}	1.6 mm (0.063 in.) from case for 10s	-	-	260	°C

Electrical characteristics, at T_j=25 °C, unless otherwise specified

Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=250 µA	800	-	-	V
Avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS}=0 V, I_D=8 A	-	870	-	
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=0.47 mA	2.1	3	3.9	
Zero gate voltage drain current	I_{DSS}	V_{DS}=800 V, V_{GS}=0 V, T_j=25 °C	-	-	20	µA
		V_{DS}=800 V, V_{GS}=0 V, T_j=150 °C	-	100	-	
Gate-source leakage current	I_{GSS}	V_{GS}=20 V, V_{DS}=0 V	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=5.1 A, T_j=25 °C	-	0.56	0.65	Ω
		V_{GS}=10 V, I_D=5.1 A, T_j=150 °C	-	1.5	-	
Gate resistance	R_G	f=1 MHz, open drain	-	1.2	-	Ω

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=100 V, f=1 MHz	-	1100	-	pF
Output capacitance	C_{oss}		-	46	-	
Effective output capacitance, energy related[5)]	$C_{o(er)}$	V_{GS}=0 V, V_{DS}=0 V to 480 V	-	36	-	
Effective output capacitance, time related[6)]	$C_{o(tr)}$		-	99	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=400 V, V_{GS}=0/10 V, I_D=8 A, R_G=10 ? , T_j=25 °C	-	25	-	ns
Rise time	t_r		-	15	-	
Turn-off delay time	$t_{d(off)}$		-	72	-	
Fall time	t_f		-	10	-	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=640 V, I_D=8 A, V_{GS}=0 to 10 V	-	6	-	nC
Gate to drain charge	Q_{gd}		-	22	-	
Gate charge total	Q_g		-	45	60	
Gate plateau voltage	$V_{plateau}$		-	5.5	-	V
Reverse Diode						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=I_S=8 A, T_j=25 °C	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=400 V, I_F=I_S=8 A, di_F/dt=100 A/µs	-	550	-	ns
Reverse recovery charge	Q_{rr}		-	7	-	µC
Peak reverse recovery current	I_{rrm}		-	24	-	A

1) J-STD20 and JESD22

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

3) Repetitive avalanche causes additional power losses that can be calculated as $P_{AV}=E_{AR}*f$.

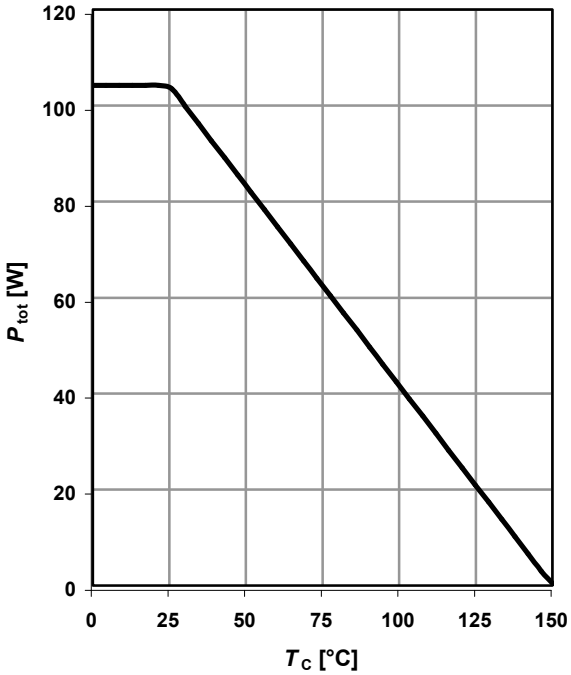
4) $I_{SD}=I_D$, di/dt=400A/µs, V_{DClink} = 400V, $V_{peak}<V_{(BR)DSS}$, $T_j<T_{jmax}$, identical low side and high side switch

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

6) $C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

1 Power dissipation

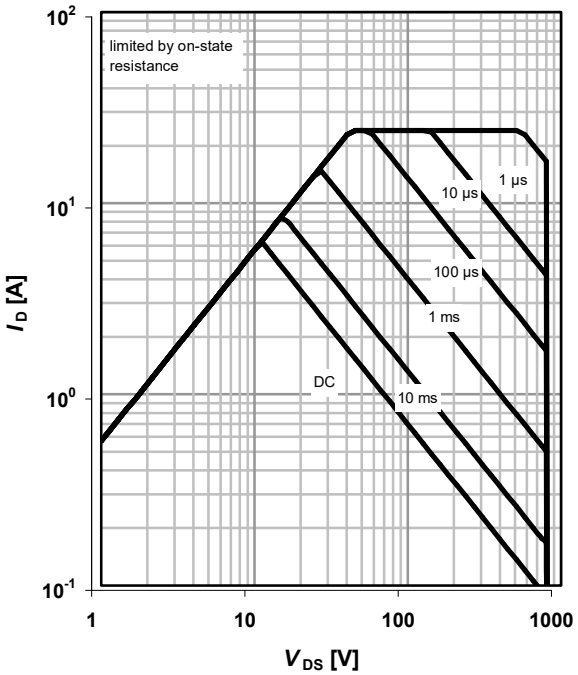
P_{tot}=f(T_C)



2 Safe operating area

I_D=f(V_{DS}); T_C=25 °C; D=0

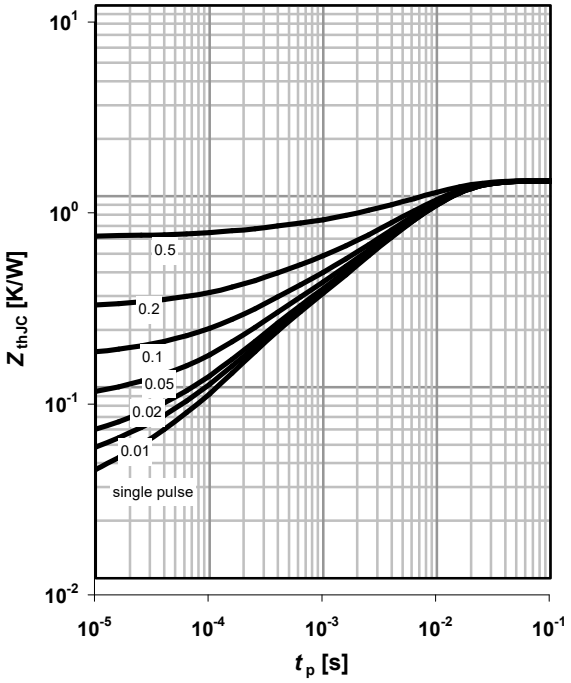
parameter: t_p



3 Max. transient thermal impedance

Z_{thJC}=f(t_P)

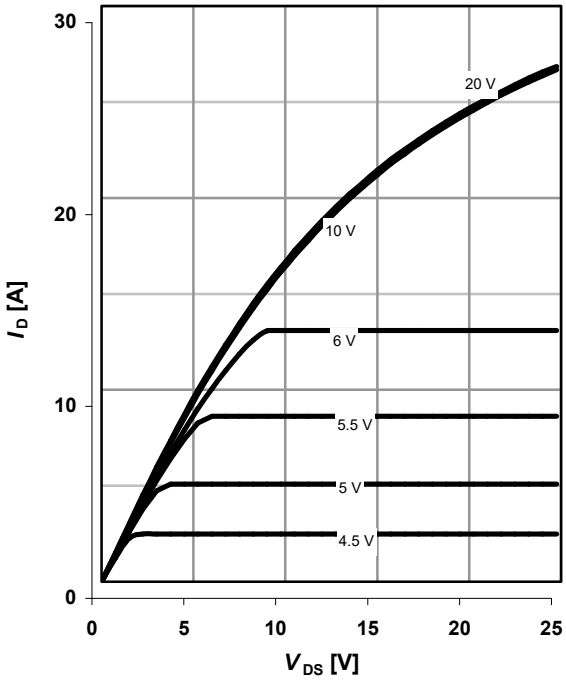
parameter: D=t_p/T



4 Typ. output characteristics

I_D=f(V_{DS}); T_j=25 °C; t_p=10µs

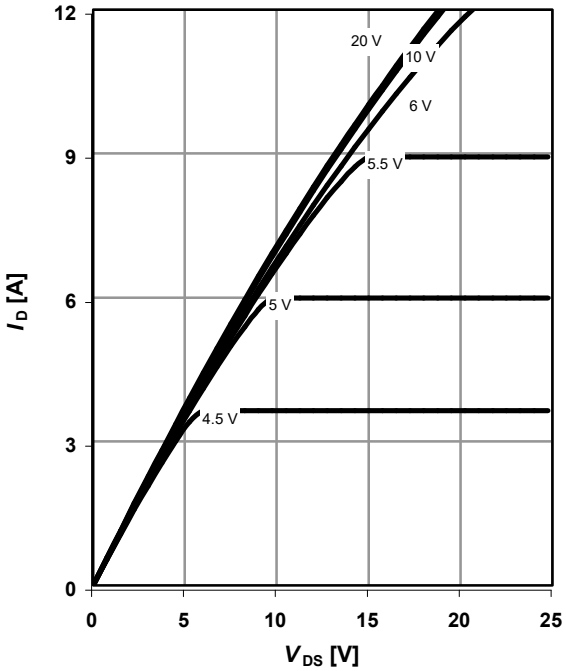
parameter: V_{GS}



5 Typ. output characteristics

I_D=f(V_{DS}); T_j=150 °C; t_p=10µs

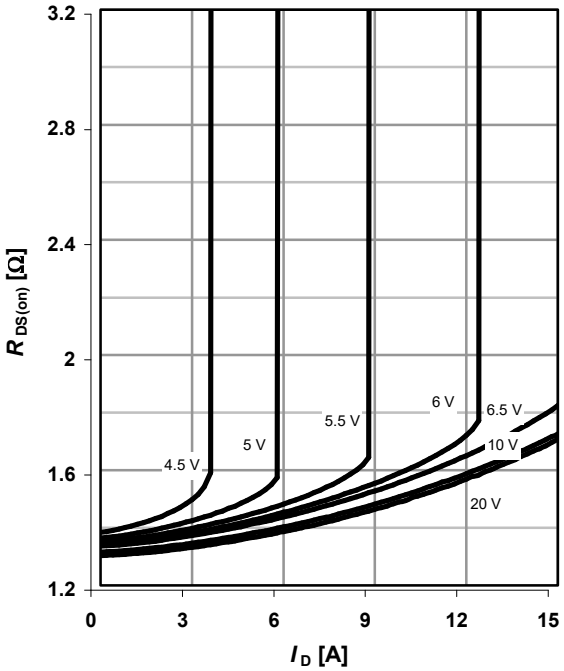
parameter: V_{GS}



6 Typ. drain-source on-state resistance

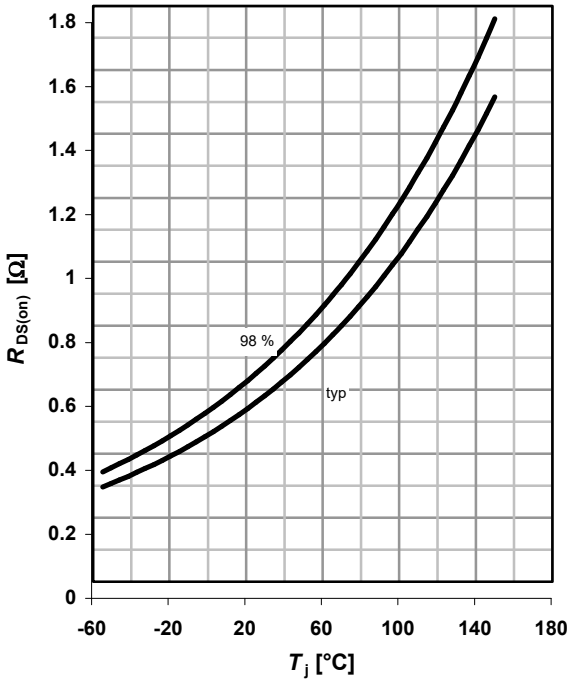
$R_{DS(on)}$=f(I_D); T_j=150 °C

parameter: V_{GS}



7 Drain-source on-state resistance

$R_{DS(on)}$=f(T_j); I_D=5.1 A; V_{GS}=10 V



8 Typ. transfer characteristics

I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; t_p=10µs

parameter: T_j