CoolMOS™ Power Transistor

Features

- Intrinsic fast-recovery body diode
- Extremely low reverse recovery charge
- Ultra low gate charge
- Extreme d*v*/d*t* rated
- High peak current capability
- Qualified for industrial grade applications according to JEDEC[1)]
- **Halogen free mold compound**

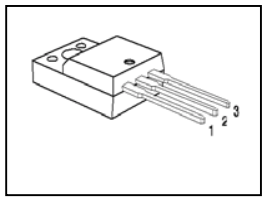
CoolMOS CFD designed for:

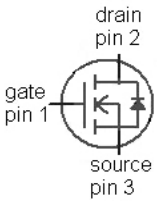
- Softswitching PWM Stages
- LCD & CRT TV

Product Summary

V_{DS} @ Tjmax	650	V
$R_{DS(on),max}$	0.330	Ω
I_D	13.4	A

PG-TO220FP





Type	Package	Marking
SPA15N60CFD	PG-TO220FP	15N60CFD

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current[2)]	I_D	T_C=25 °C	13.4	A
		T_C=100 °C	8.4	
Pulsed drain current[3)]	$I_{D,pulse}$	T_C=25 °C	33	
Avalanche energy, single pulse	E_{AS}	I_D=6.7 A, V_{DD}=50 V	460	mJ
Avalanche energy, repetitive[3),4)]	E_{AR}	I_D=13.4 A, V_{DD}=50 V	0.8	
Avalanche current, repetitive[3),4)]	I_{AR}		13.4	A
Drain source voltage slope	d*v*/d*t*	I_D=13.4 A, V_{DS}=480 V, T_j=125 °C	80	V/ns
Reverse diode d*v*/d*t*	d*v*/d*t*	I_S=13.4 A, V_{DS}=480 V, T_j=125 °C	40	V/ns
Maximum diode commutation speed	d*i*/d*t*		600	A/µs
Gate source voltage	V_{GS}	static	±20	V
		AC (*f*>1 Hz)	±30	
Power dissipation	P_{tot}	T_C=25 °C	34	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 150	°C
Mounting torque		M2.5 screws	50	Ncm

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	3.7	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 10 s	-	-	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	600	-	-	V
Avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS}=0 V, I_D=13.4 A	-	700	-	
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=750 µA	3	4	5	
Zero gate voltage drain current	I_{DSS}	V_{DS}=600 V, V_{GS}=0 V, T_j=25 °C	-	1.4	-	µA
		V_{DS}=600 V, V_{GS}=0 V, T_j=150 °C	-	1200	-	
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=9.4 A, T_j=25 °C	-	0.28	0.33	Ω
		V_{GS}=10 V, I_D=9.4 A, T_j=150 °C	-	0.78	-	
Gate resistance	R_G	f=1 MHz, open drain	-	1.3	-	
Transconductance	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=9.4 A	-	8	-	S

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics						
Input capacitance	C_{iss}	V_{GS}=0 V, V_{DS}=25 V, f=1 MHz	-	1820	-	pF
Output capacitance	C_{oss}		-	520	-	
Reverse transfer capacitance	C_{rss}		-	21	-	
Effective output capacitance, energy related[5)]	$C_{o(er)}$	V_{GS}=0 V, V_{DS}=0 V to 480 V	-	61	-	
Effective output capacitance, time related[6)]	$C_{o(tr)}$		-	110	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=400 V, V_{GS}=10 V, I_D=13.4 A, R_G=3.6 Ω	-	43	-	ns
Rise time	t_r		-	24	-	
Turn-off delay time	$t_{d(off)}$		-	47	-	
Fall time	t_f		-	5	-	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=480 V, I_D=13.4 A, V_{GS}=0 to 10 V	-	11	-	nC
Gate to drain charge	Q_{gd}		-	38	-	
Gate charge total	Q_g		-	63	84	
Gate plateau voltage	$V_{plateau}$		-	7.3	-	V

[1)] J-STD20 and JESD22

[2)] Limited only by maximum temperature

[3)] Pulse width t_p limited by $T_{j,max}$

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

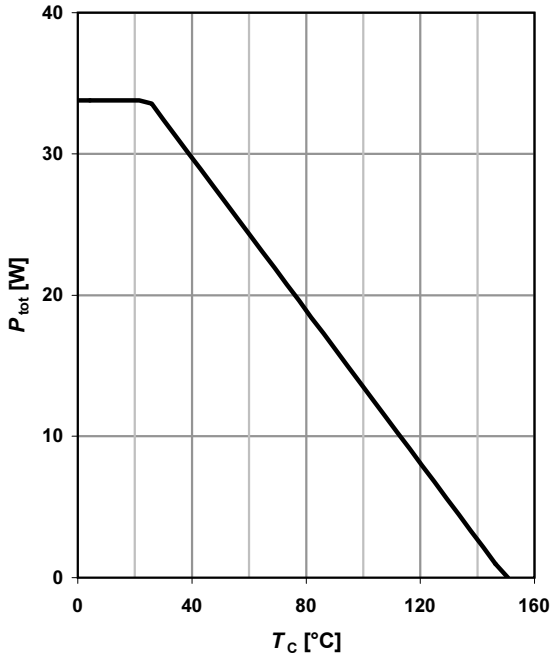
[5)] $C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

[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}.

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Reverse Diode						
Diode continuous forward current[2)]	I_S	T_C=25 °C	-	-	13.4	A
Diode pulse current[3)]	$I_{S,pulse}$		-	-	33	
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=I_S, T_j=25 °C	-	1.0	1.2	V
Reverse recovery time	t_{rr}	V_R=480 V, I_F=I_S, di_F/dt=100 A/µs	-	147	-	ns
Reverse recovery charge	Q_{rr}		-	1	-	µC
Peak reverse recovery current	I_{rrm}		-	12	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt	T_j=25 °C	-	1200	-	A/µs

1 Power dissipation

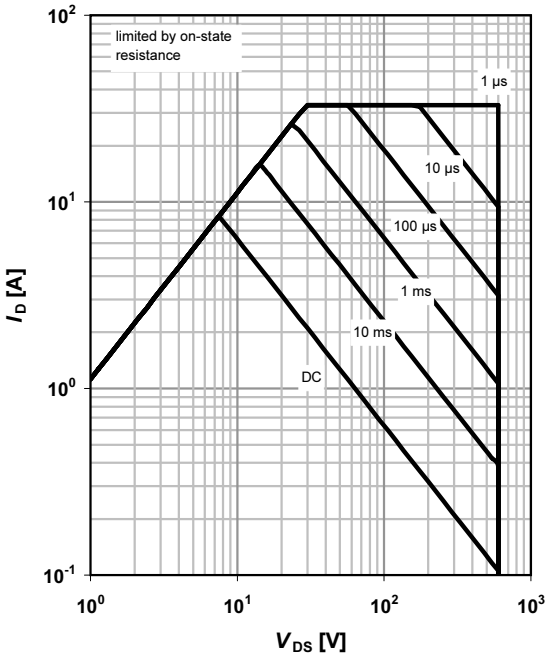
$P_{tot}=f(T_C)$



2 Safe operating area

$I_D=f(V_{DS})$; $T_C=25$ °C; $D=0$

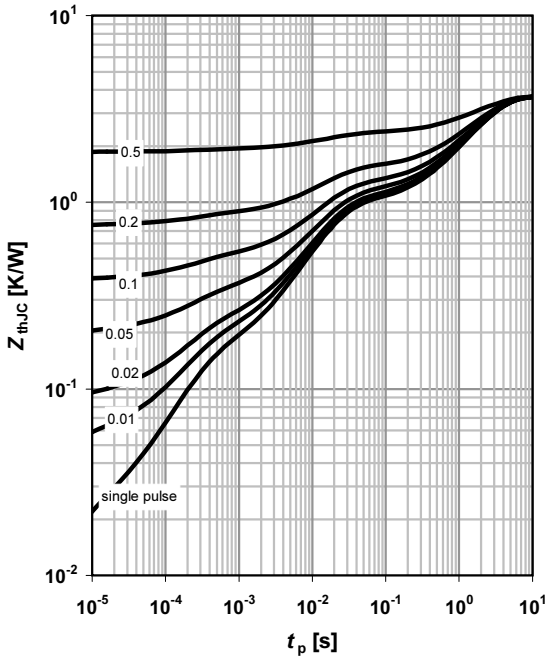
parameter: t_p



3 Max. transient thermal impedance

$I_D=f(V_{DS})$; $T_j=25$ °C

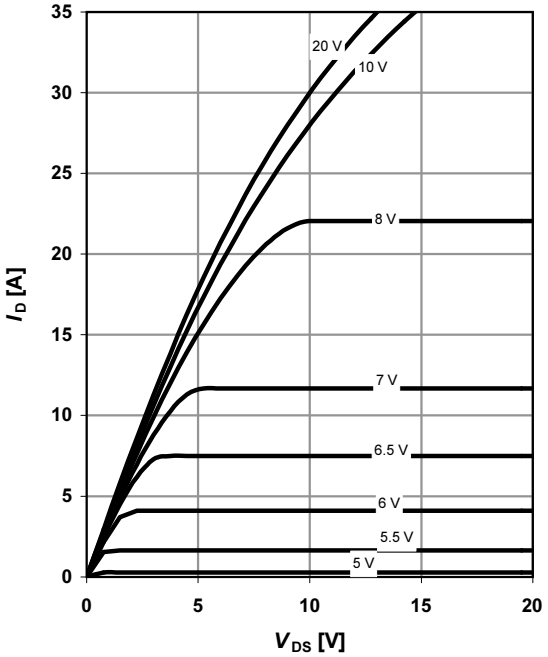
parameter: $D=t_p/T$



4 Typ. output characteristics

$I_D=f(V_{DS})$; $T_j=25$ °C

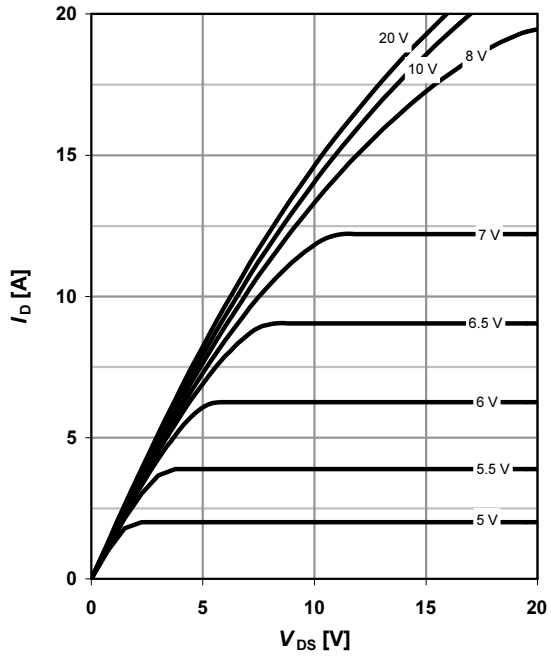
parameter: V_{GS}



5 Typ. output characteristics

I_D=f(V_{DS}); T_j=150 °C

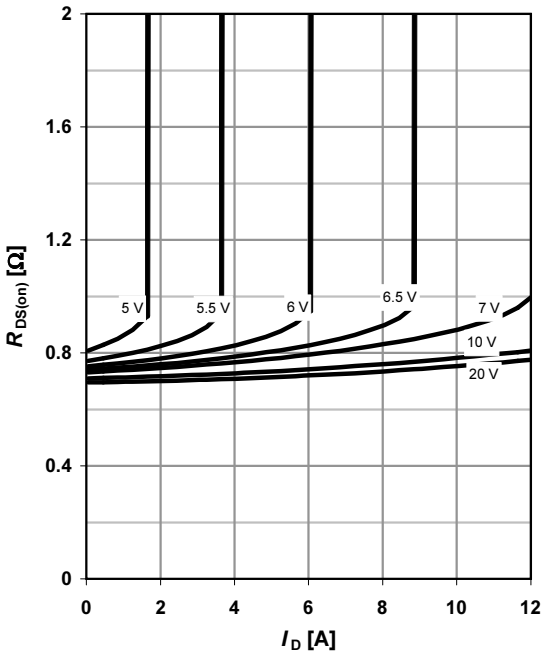
parameter: V_{GS}



6 Typ. drain-source on-state resistance

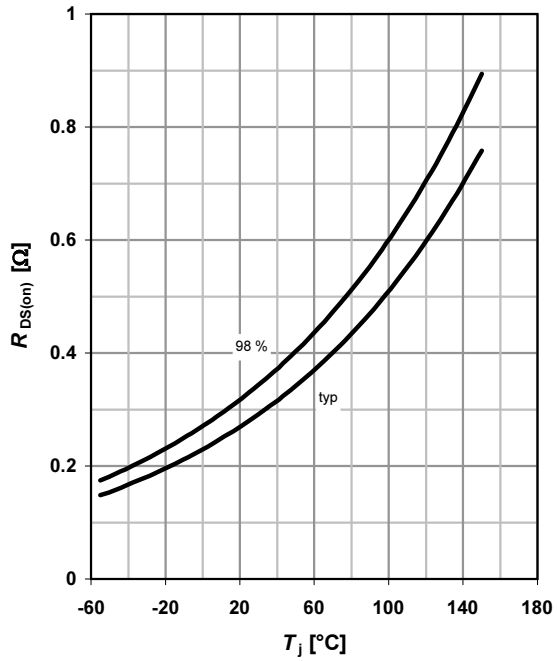
$R_{DS(on)}$=f(I_D); T_j=150 °C

parameter: V_{GS}



7 Drain-source on-state resistance

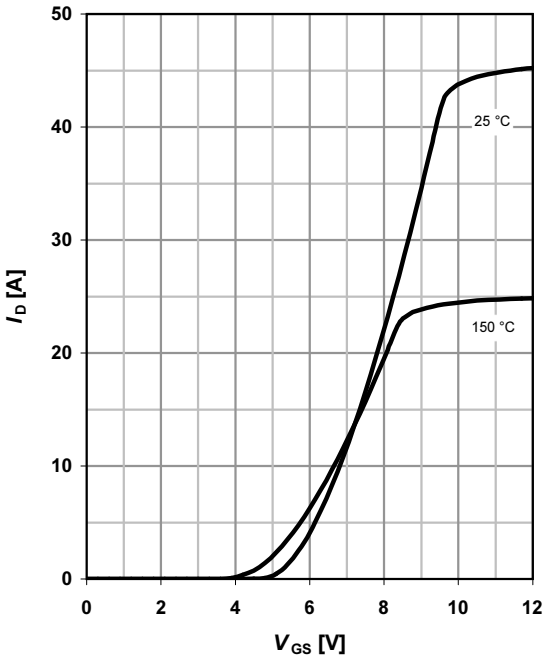
$R_{DS(on)}$=f(T_j); I_D=9.4 A; V_{GS}=10 V



8 Typ. transfer characteristics

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

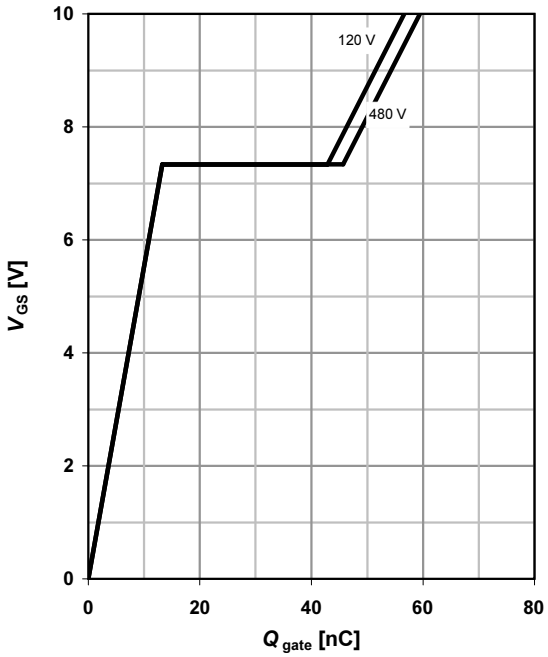
parameter: T_j



9 Typ. gate charge

V_{GS}=f(Q_{gate}); I_D=13.4 A pulsed

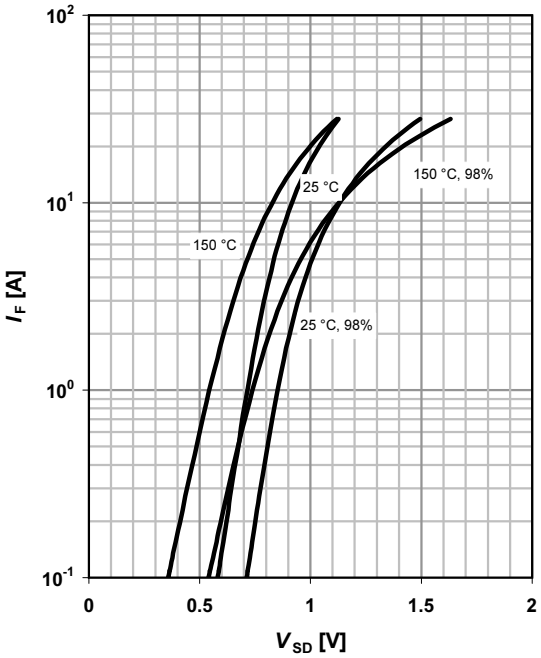
parameter: V_{DD}



10 Forward characteristics of reverse diode

I_F=f(V_{SD})

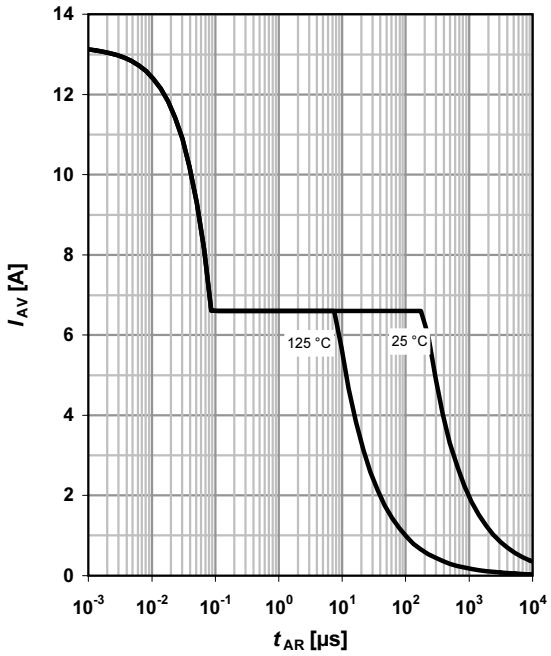
parameter: T_j



11 Avalanche SOA

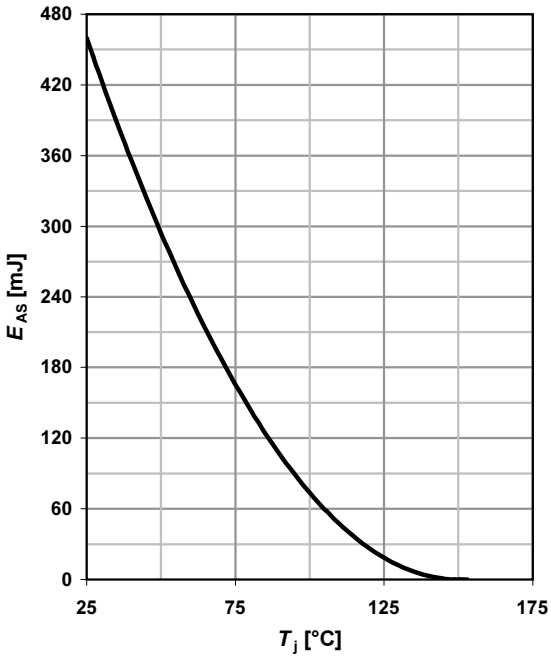
I_{AR}=f(t_{AR})

parameter: $T_{j(start)}$



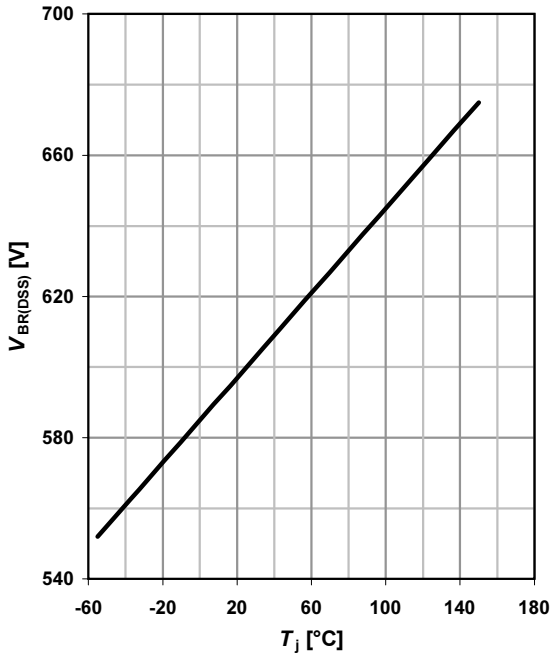
12 Avalanche energy

E_{AS}=f(T_j); I_D=6.7 A; V_{DD}=50 V



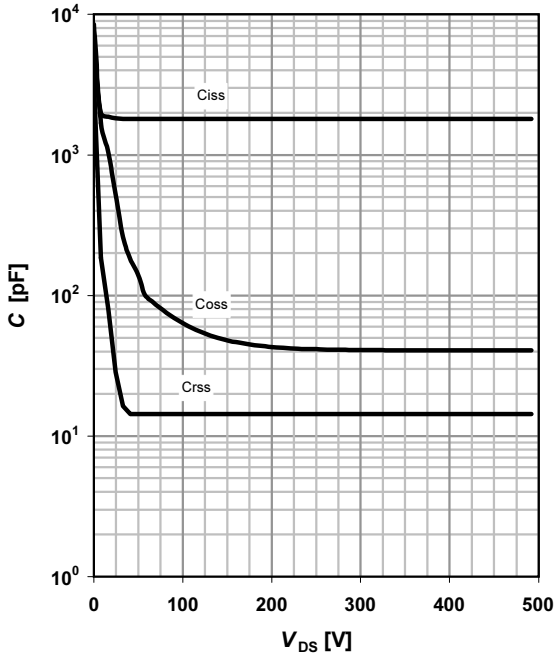
13 Drain-source breakdown voltage

$V_{BR(DSS)}=f(T_j)$



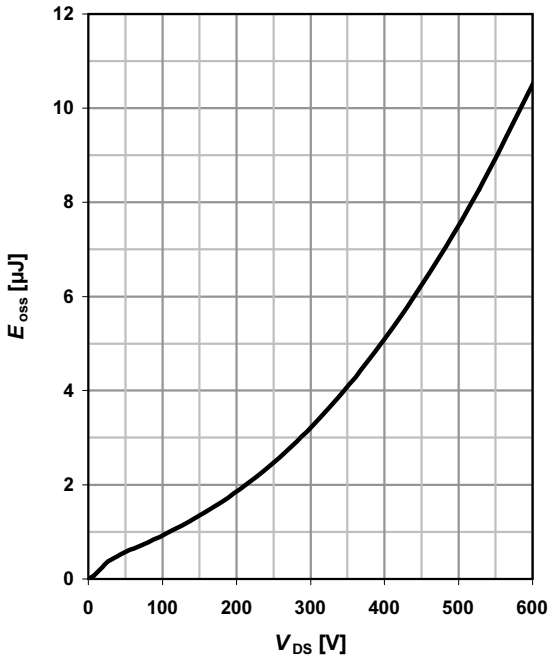
14 Typ. capacitances

$C=f(V_{DS})$; $V_{GS}=0$ V; $f=1$ MHz



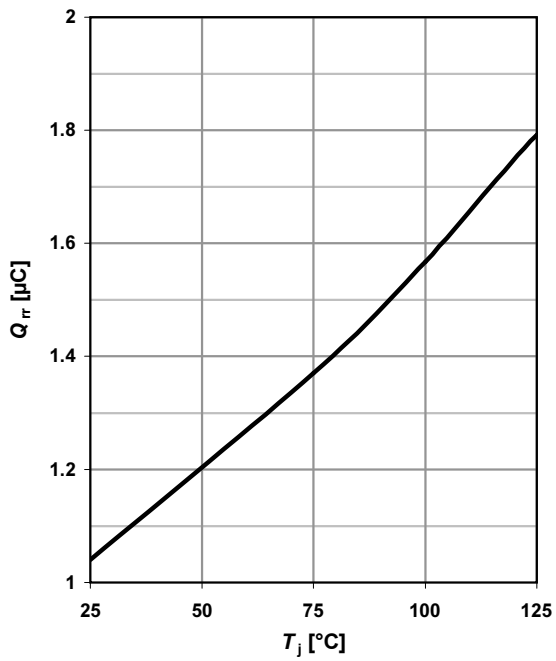
15 Typ. C_{oss} stored energy

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



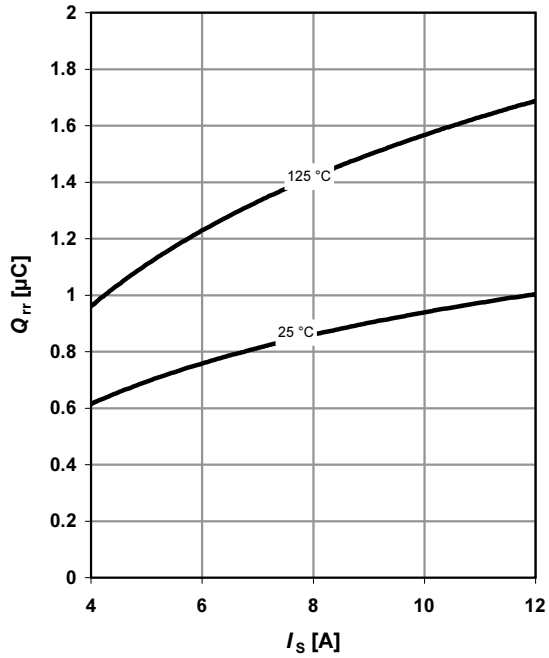
16 Typ. reverse recovery charge

$Q_{rr}=f(T_j)$;parameter: I_D =13.4 A



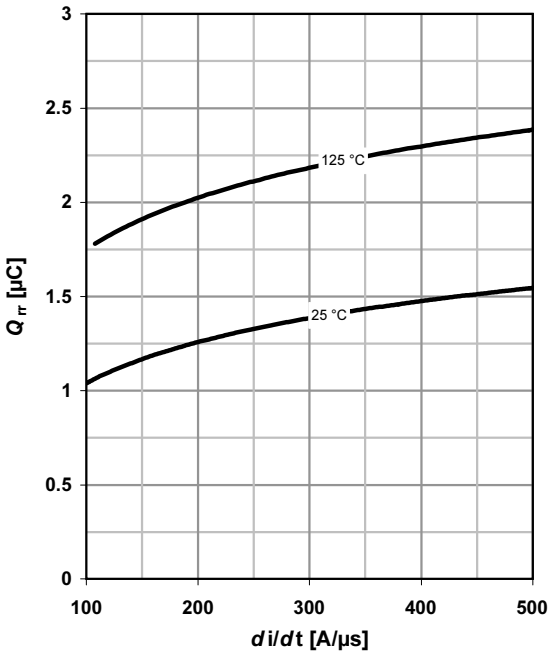
17 Typ. reverse recovery charge

$Q_{rr}=f(I_S)$; parameter: $di/dt=100$ A/µs

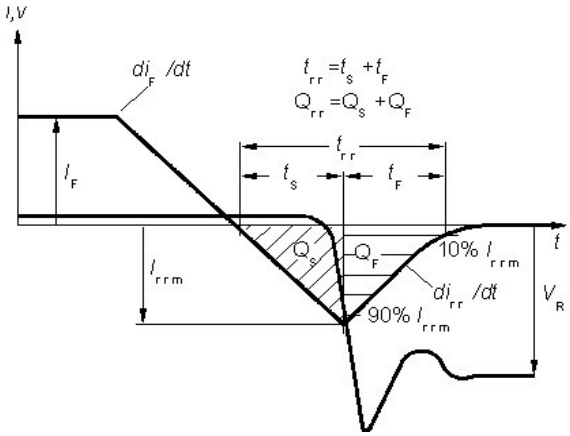


18 Typ. reverse recovery charge

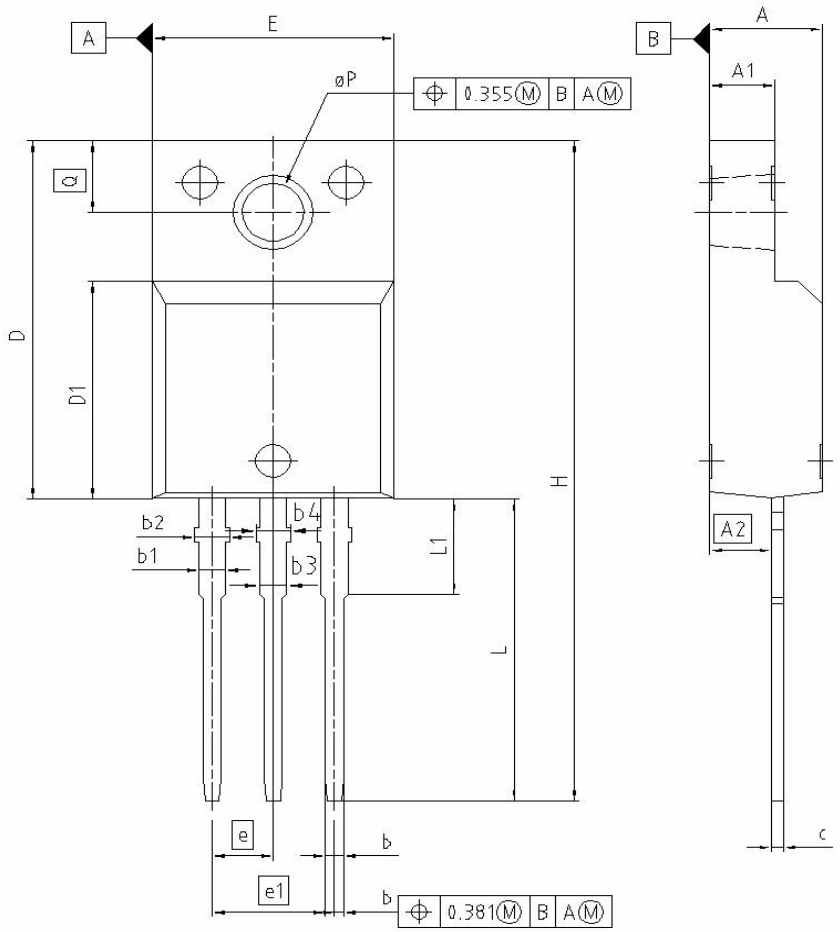
$Q_{rr}=f(di/dt)$; parameter: $I_D=13.4$ A



Definition of diode switching characteristics



PG-TO-220-3--31; -3-111: Outlines/Fully isolated package (2500VAC; 1minute)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.55	4.85	0.179	0.191
A1	2.55	2.85	0.100	0.112
A2	2.42	2.72	0.095	0.107
b	0.65	0.85	0.026	0.033
b1	0.95	1.33	0.037	0.052
b2	0.95	1.51	0.037	0.059
b3	0.65	1.33	0.026	0.052
b4	0.65	1.51	0.026	0.059
c	0.40	0.63	0.016	0.025
D	15.85	16.15	0.624	0.636
D1	9.53	9.83	0.375	0.387
E	10.35	10.65	0.407	0.419
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H	29.45	29.75	1.159	1.171
L	13.45	13.75	0.530	0.541
L1	3.15	3.45	0.124	0.136
øP	2.95	3.20	0.116	0.126
Q	3.15	3.50	0.124	0.138

REFERENCE	../..
SCALE	0 2.5 0 2.5 5mm
EUROPEAN PROJECTION	
ISSUE DATE	08-01-2007
FILE	TO220_2

Dimensions in mm/ inches

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. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, 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.

Information
For further information on technology, delivery terms and conditions and prices, please contact the 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.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Infineon:

SPA15N60CFD