CoolMOS™ Power Transistor

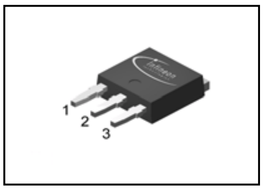
Features

- Lowest figure of merit R_{ON} x Q_g
- Ultra low gate charge
- Extreme dv/dt rated
- High peak current capability
- Pb-free lead plating; RoHS compliant
- Qualified for industrial grade applications according to JEDEC[1)]

Product Summary

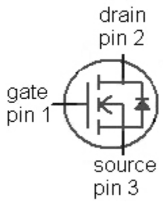
V_{DS} @T_{jmax}	550	V
$R_{DS(on),max}$	0.520	Ω
$Q_{g,typ}$	13	nC

PG-TO251



CoolMOS CP is specially designed for:

- Hard and softswitching SMPS for server power supplies
- DCM PFC for Lamp Ballast
- PWM-Stages Lamp Ballast, LCD and PDP TV



Type	Package	Marking
IPS50R520CP	PG-TO251	5R520P

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	T_C=25 °C	7.1	A
		T_C=100 °C	4.5	
Pulsed drain current[2)]	$I_{D,pulse}$	T_C=25 °C	15	
Avalanche energy, single pulse	E_{AS}	I_D=2.5 A, V_{DD}=50 V	166	mJ
Avalanche energy, repetitive t_{AR}[2),3)]	E_{AR}	I_D=2.5 A, V_{DD}=50 V	0.25	
Avalanche current, repetitive t_{AR}[2),3)]	I_{AR}		2.5	A
MOSFET dv/dt ruggedness	dv/dt	V_{DS}=0...400 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	66	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	3.8	A
Diode pulse current[2]	$I_{S,pulse}$		15	
Reverse diode d*v*/d*t*[4]	d*v*/d*t*		15	V/ns

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	1.9	K/W
Thermal resistance, junction - ambient	R_{thJA}	leaded	-	-	62	
Soldering temperature, wavesoldering 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	500	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=0.25 mA	2.5	3	3.5	
Zero gate voltage drain current	I_{DSS}	V_{DS}=500 V, V_{GS}=0 V, T_j=25 °C	-	-	1	µA
		V_{DS}=500 V, V_{GS}=0 V, T_j=150 °C	-	10	-	
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=3.8 A, T_j=25 °C	-	0.47	0.52	Ω
		V_{GS}=10 V, I_D=3.8 A, T_j=150 °C	-	1.20	-	
Gate resistance	R_G	*f*=1 MHz, open drain	-	2.2	-	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	-	680	-	pF
Output capacitance	C_{oss}		-	31	-	
Effective output capacitance, energy related[5]	$C_{o(er)}$	V_{GS}=0 V, V_{DS}=0 V to 400 V	-	29	-	
Effective output capacitance, time related[6]	$C_{o(tr)}$		-	63	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=400 V, V_{GS}=10 V, I_D=3.8 A, R_G=48.3 Ω	-	35	-	ns
Rise time	t_r		-	14	-	
Turn-off delay time	$t_{d(off)}$		-	80	-	
Fall time	t_f		-	17	-	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=400 V, I_D=3.8 A, V_{GS}=0 to 10 V	-	3	-	nC
Gate to drain charge	Q_{gd}		-	5	-	
Gate charge total	Q_g		-	13	17	
Gate plateau voltage	$V_{plateau}$		-	5.2	-	V
Reverse Diode						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=3.8 A, T_j=25 °C	-	0.9	1.2	V
Reverse recovery time	t_{rr}	V_R=400 V, I_F=I_S, di_F/dt=100 A/µs	-	240	-	ns
Reverse recovery charge	Q_{rr}		-	1.6	-	µC
Peak reverse recovery current	I_{rrm}		-	13	-	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 $P_{AV}=E_{AR}*f$.

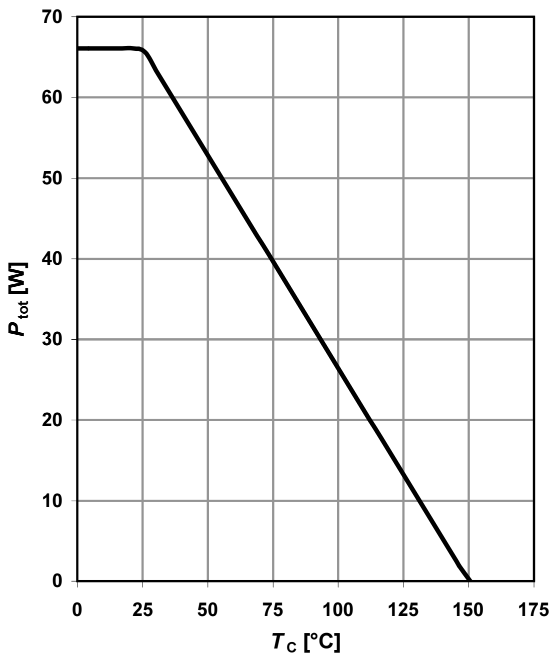
[4] $I_{SD} \leq I_D$, $di/dt \leq$400A/µs, V_{DClink}=400V, $V_{peak}<V_{(BR)DSS}$, $T_j<T_{jmax}$, identical low and high side switch

[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

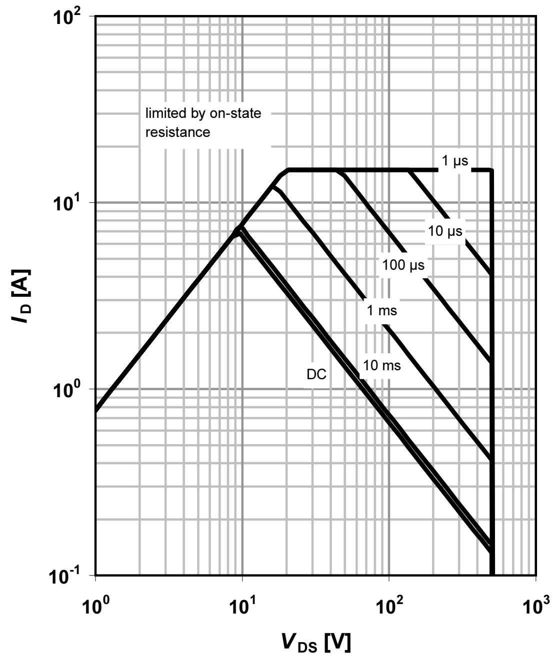
P_{tot}=f(T_C)



2 Safe operating area

I_D=f(V_{DS}); T_C=25 °C; D=0

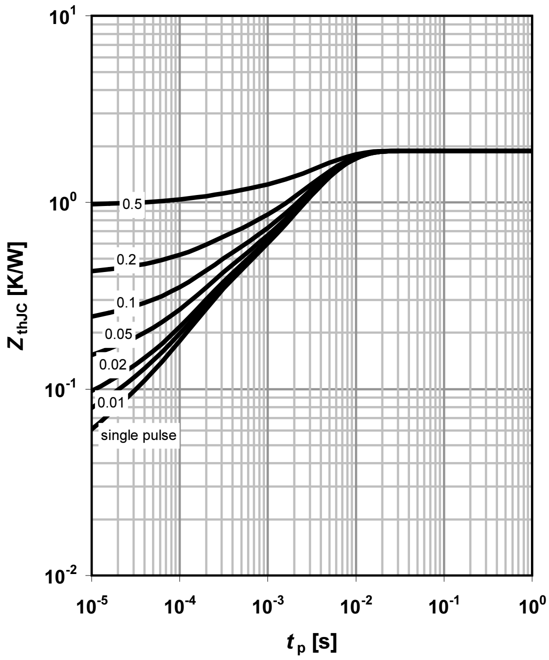
parameter: t_p



3 Max. transient thermal impedance

$Z_{(thJC)}$=f(t_p);

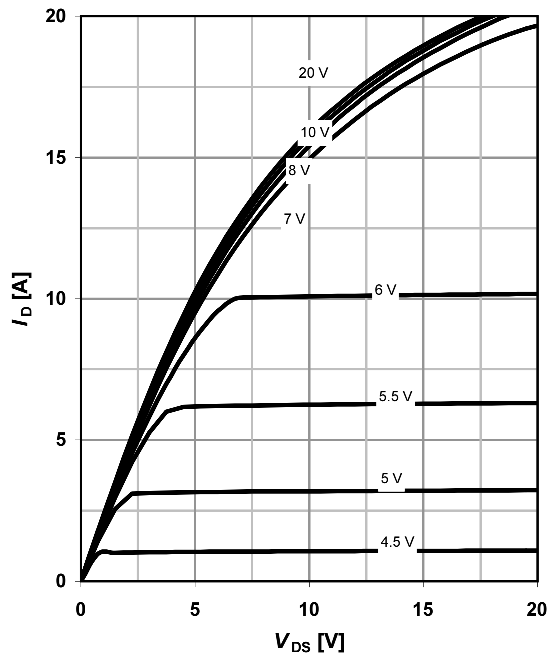
parameter: $D=t_p/T$



4 Typ. output characteristics

I_D=f(V_{DS}); T_j=25 °C

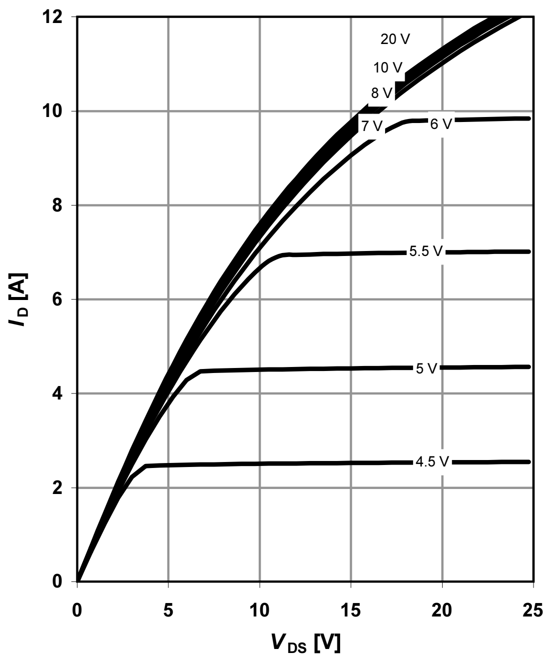
parameter: V_{GS}



5 Typ. output characteristics

I_D=f(V_{DS}); T_j=150 °C

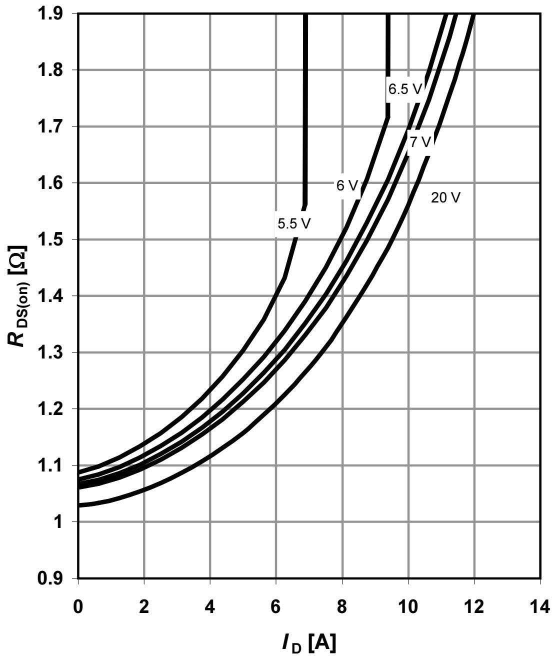
parameter: V_{GS}



6 Typ. drain-source on-state resistance

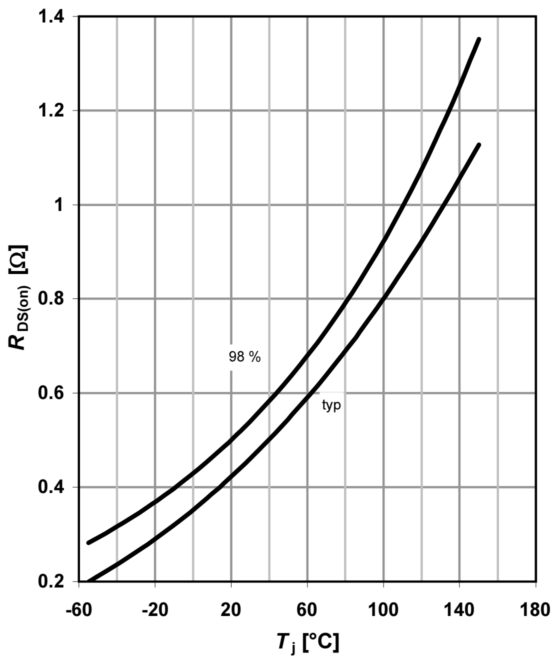
$R_{DS(on)}$=f(I_D); T_j=150 °C

parameter: V_{GS}



7 Drain-source on-state resistance

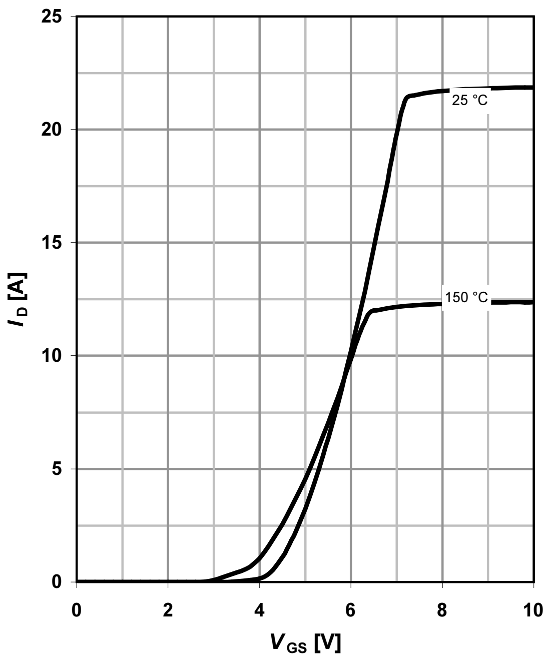
$R_{DS(on)}$=f(T_j); I_D=3.8 A; V_{GS}=10 V



8 Typ. transfer characteristics

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

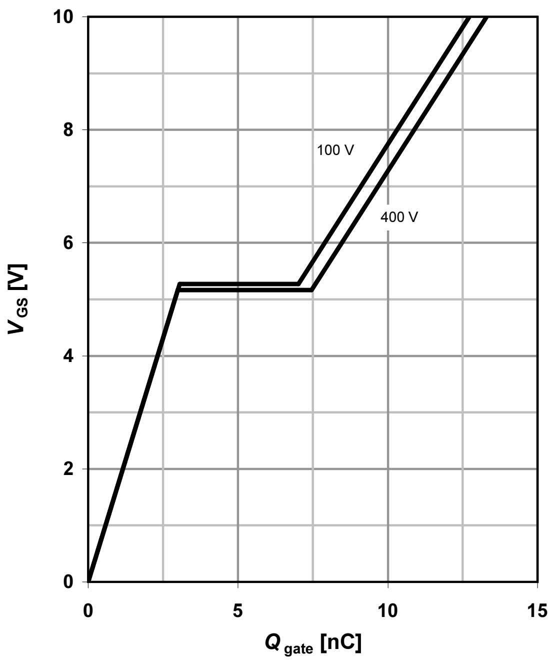
parameter: T_j



9 Typ. gate charge

V_{GS}=f(Q_{gate}); I_D=3.8 A pulsed

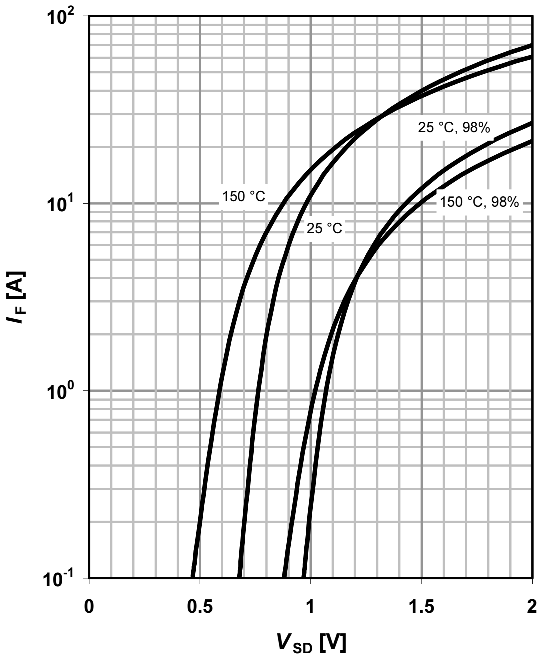
parameter: V_{DD}



10 Forward characteristics of reverse diode

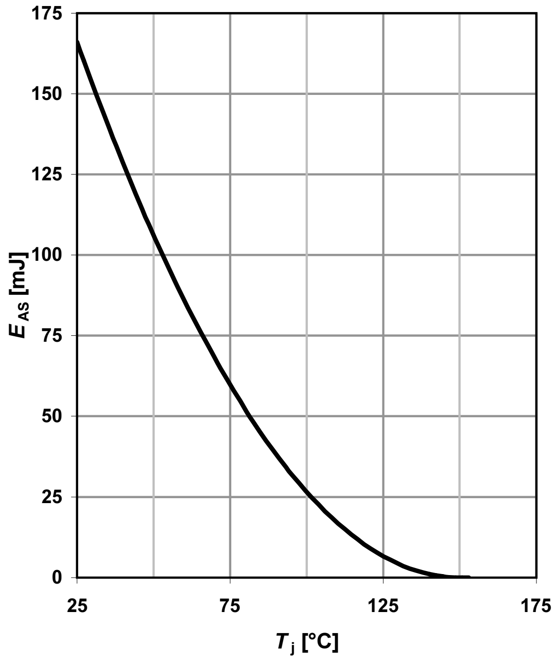
I_F=f(V_{SD})

parameter: T_j



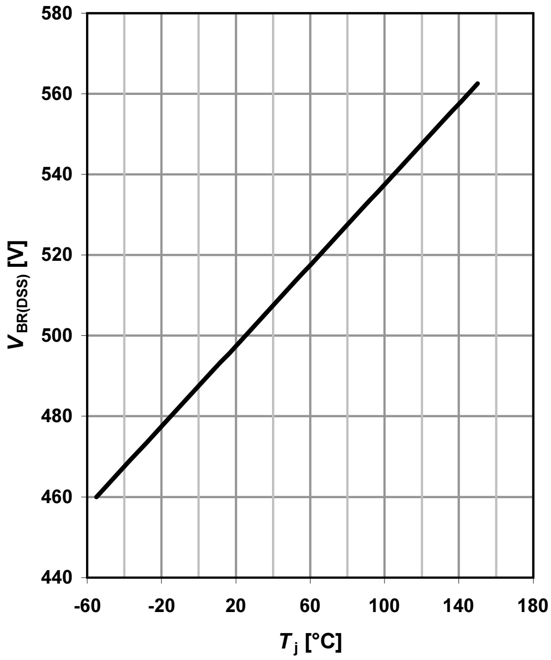
11 Avalanche energy

E_{AS}=f(T_j); I_D=2.5 A; V_{DD}=50 V



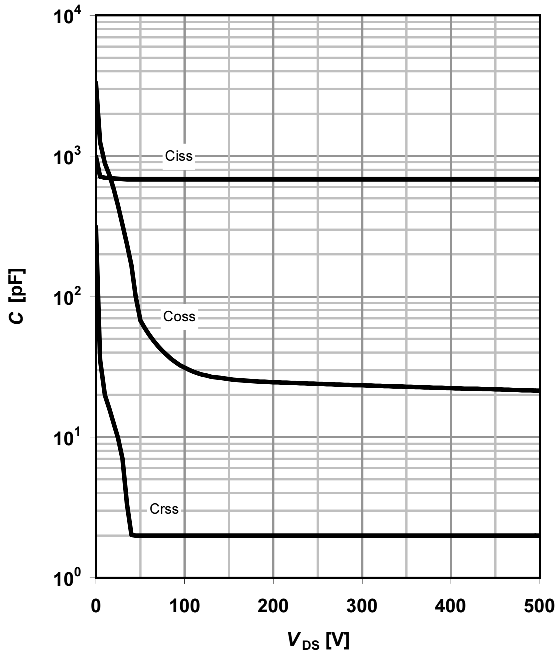
12 Drain-source breakdown voltage

$V_{BR(DSS)}$=f(T_j); I_D=0.25 mA



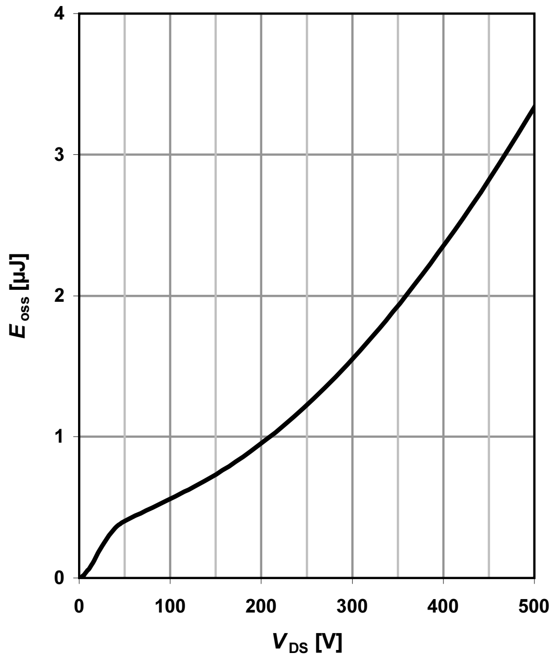
13 Typ. capacitances

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

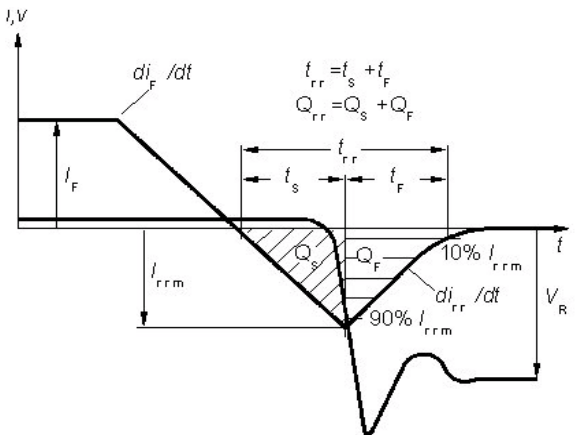


14 Typ. Coss stored energy

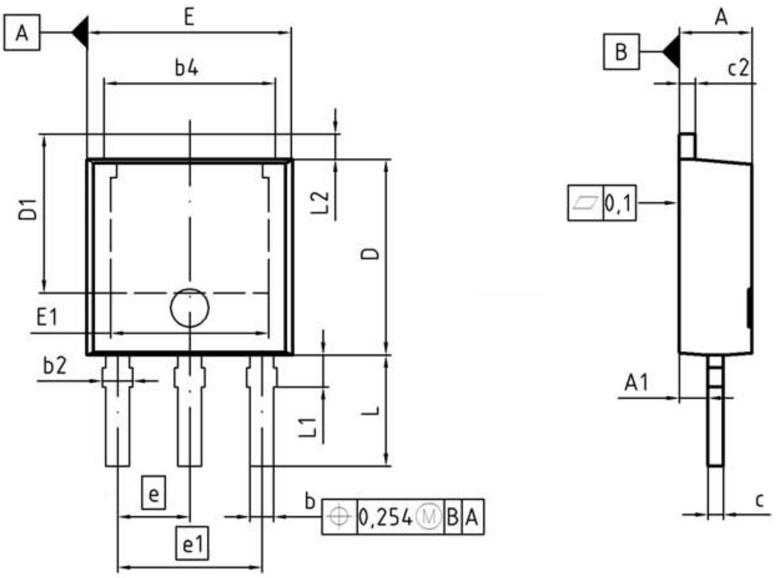
E_{oss}= f(V_{DS})



Definition of diode switching characteristics



PG-TO251-3-1-21-41 (I-PAK Short Leads)

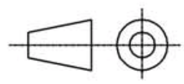


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.18	2.39	0.086	0.094
A1	0.80	1.14	0.031	0.045
b	0.64	0.89	0.025	0.035
b2	0.65	1.15	0.026	0.045
b4	4.95	5.50	0.195	0.217
c	0.46	0.58	0.018	0.023
c2	0.46	0.89	0.018	0.035
D	5.97	6.22	0.235	0.245
D1	5.04	5.44	0.198	0.214
E	6.35	6.73	0.250	0.265
E1	4.90	5.10	0.193	0.201
e	2.29		0.090	
e1	4.57		0.180	
N	3		3	
L	3.40	3.60	0.134	0.142
L1	0.90	1.10	0.035	0.043
L2	0.90	1.10	0.035	0.043

DOCUMENT NO.
Z8B00003329

SCALE 0 2.0 4mm

EUROPEAN PROJECTION



ISSUE DATE
17-01-2008

REVISION
03

Published by
Infineon Technologies AG
81726 Munich, 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.