CoolMOS™ Power Transistor

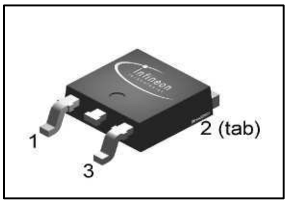
Features

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

Product Summary

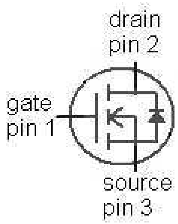
V_{DS}	800	V
$R_{DS(on)max}$ @ T_j = 25°C	0.9	Ω
$Q_{g,typ}$	31	nC

PG-TO252-3



CoolMOS™ 800V designed for:

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



Type	Package	Marking
SPD06N80C3	PG-TO252-3	06N80C3

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	I_D	T_A=25 °C	6	A
		T_A=100 °C	3.8	
Pulsed drain current[2)]	$I_{D,pulse}$	T_A=25 °C	18	
Avalanche energy, single pulse	E_{AS}	I_D=1.2 A, V_{DD}=50 V	230	mJ
Avalanche energy, repetitive t_{AR}[2),3)]	E_{AR}	I_D=6 A, V_{DD}=50 V	0.2	
Avalanche current, repetitive t_{AR}[2),3)]	I_{AR}		6	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_A=25 °C	83	W
Operating and storage temperature	T_j, T_{stg}		-55 ... 150	°C

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

Parameter	Symbol	Conditions	Value	Unit
Continuous diode forward current	I_S	T_A=25 °C	6	A
Diode pulse current[2)]	$I_{S,pulse}$		18	
Reverse diode dv/dt[4)]	dv/dt		4	V/ns

Parameter	Symbol	Conditions	Values min.	Values typ.	Values max.	Unit
Thermal characteristics						
Thermal resistance, junction - case	R_{thJC}		-	-	1.5	K/W
Thermal resistance, junction - ambient	R_{thJA}	SMD version, device on PCB, minimal footprint	-	-	62	
		SMD version, device on PCB, 6 cm^2 cooling area[5)]	-	35	-	
Soldering temperature, reflow soldering	T_{sold}	reflow MSL1	-	-	260	°C

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

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
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=6 A	-	870	-	
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=0.25 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	-	-	10	µA
		V_{DS}=800 V, V_{GS}=0 V, T_j=150 °C	-	50	-	
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	-	0.78	0.9	Ω
		V_{GS}=10 V, I_D=3.8 A, T_j=150 °C	-	2.1	-	
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	-	785	-	pF
Output capacitance	C_{oss}		-	33	-	
Effective output capacitance, energy related[6]	$C_{o(er)}$	V_{GS}=0 V, V_{DS}=0 V to 480 V	-	26	-	
Effective output capacitance, time related[7]	$C_{o(tr)}$		-	69	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=400 V, V_{GS}=0/10 V, I_D=6 A, R_G=15 ? , T_j= 25°C	-	25	-	ns
Rise time	t_r		-	15	-	
Turn-off delay time	$t_{d(off)}$		-	72	-	
Fall time	t_f		-	8	-	
Gate Charge Characteristics						
Gate to source charge	Q_{gs}	V_{DD}=640 V, I_D=6 A, V_{GS}=0 to 10 V	-	4	-	nC
Gate to drain charge	Q_{gd}		-	15	-	
Gate charge total	Q_g		-	31	41	
Gate plateau voltage	$V_{plateau}$		-	5.5	-	V
Reverse Diode						
Diode forward voltage	V_{SD}	V_{GS}=0 V, I_F=I_S=6 A, T_j=25 °C	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=400 V, I_F=I_S=6 A, di_F/dt=100 A/µs	-	520	-	ns
Reverse recovery charge	Q_{rr}		-	5	-	µC
Peak reverse recovery current	I_{rrm}		-	18	-	A

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

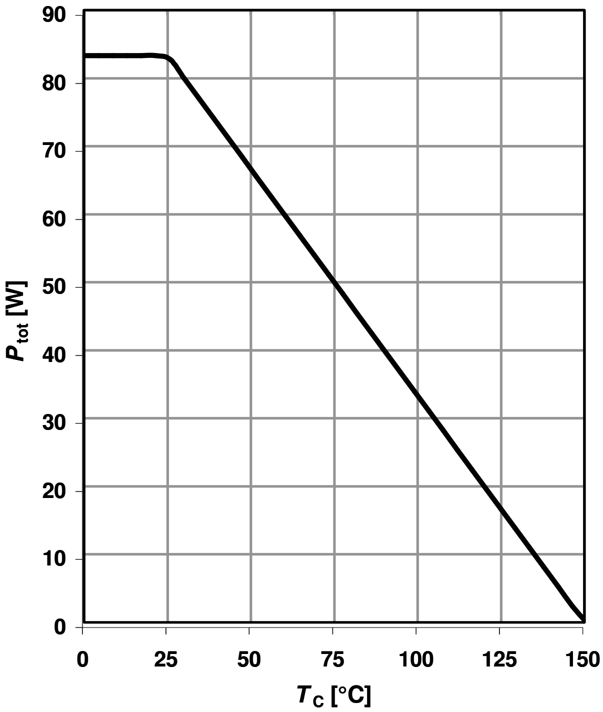
5) Device on 40mm*40mm*1.5 epoxy PCB FR4 with 6cm² (one layer, 70µm thick) copper area for drain connection. PCB is vertical without blown air

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

7) $C_{o(tr)}$ 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

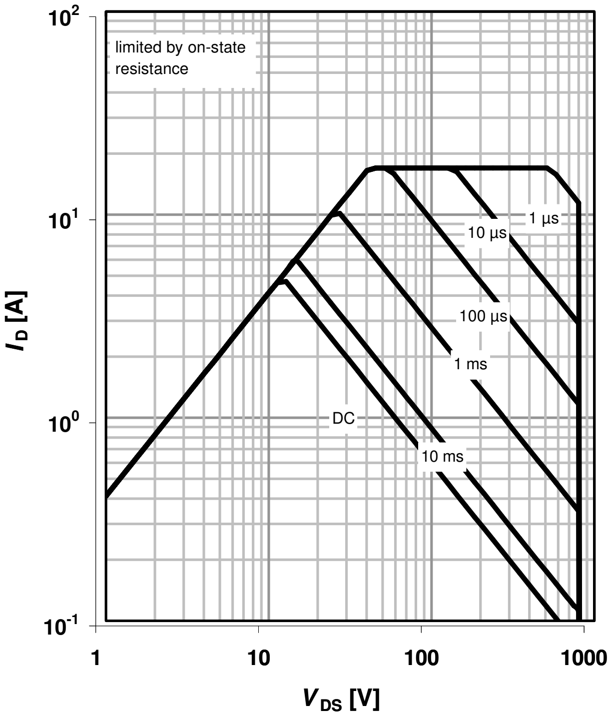
P_{tot}=f(T_C)



2 Safe operating area

I_D=f(V_{DS}); T_C=25 °C; D=0

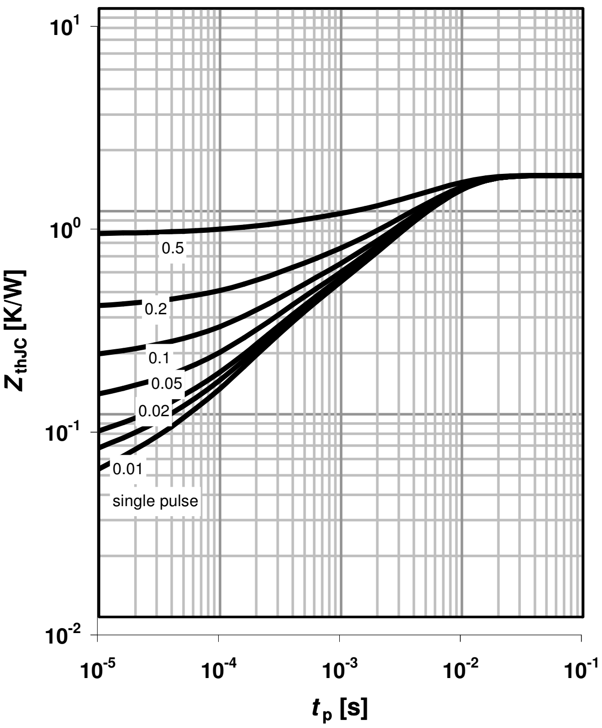
parameter: t_p



3 Max. transient thermal impedance

Z_{thJC}=f(t_P)

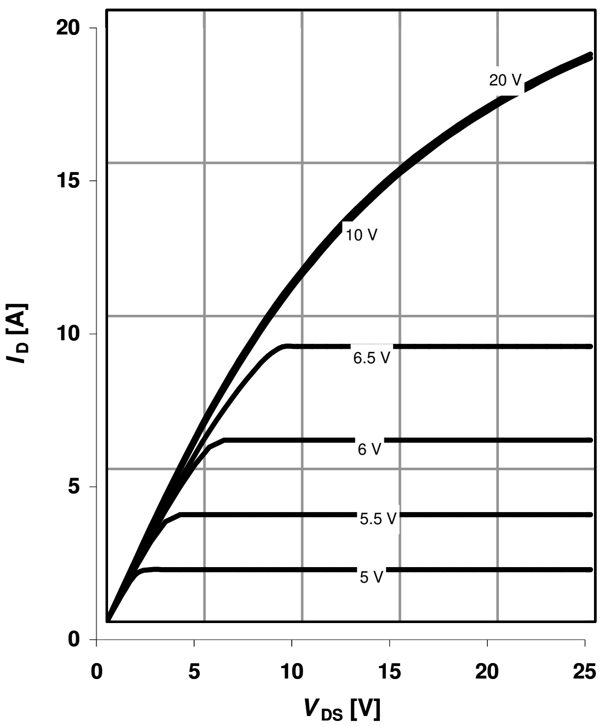
parameter: D=t_p/T



4 Typ. output characteristics

I_D=f(V_{DS}); T_j=25 °C; t_p=10 µs

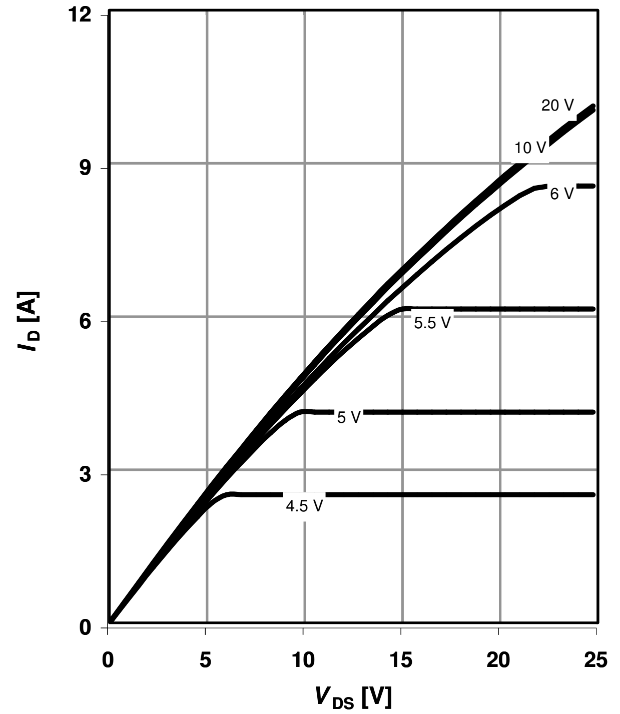
parameter: V_{GS}



5 Typ. output characteristics

I_D=f(V_{DS}); T_j=150 °C; t_p=10 µs

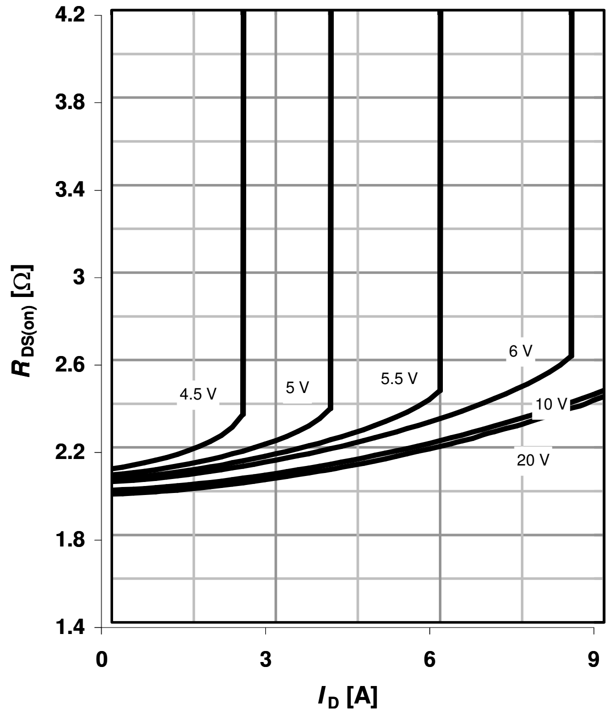
parameter: V_{GS}



6 Typ. drain-source on-state resistance

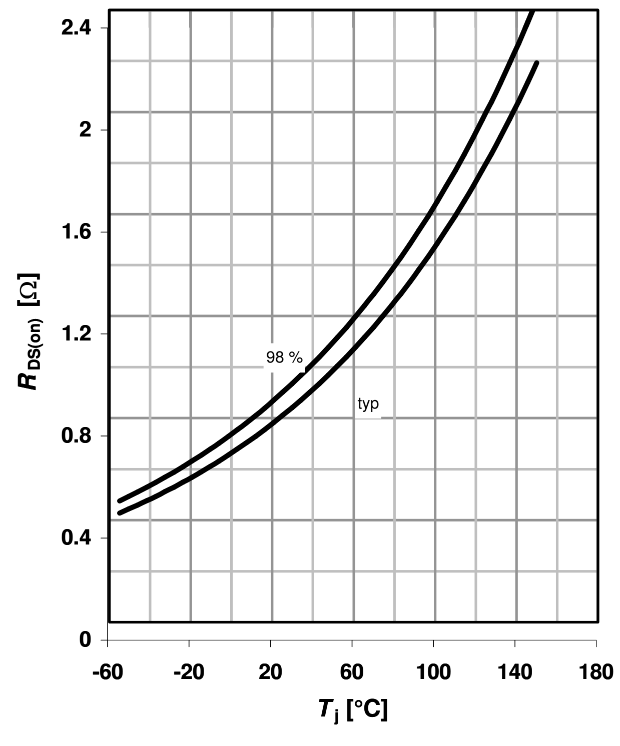
$R_{DS(on)}$=f(I_D); T_j=150 °C

parameter: V_{GS}



7 Drain-source on-state resistance

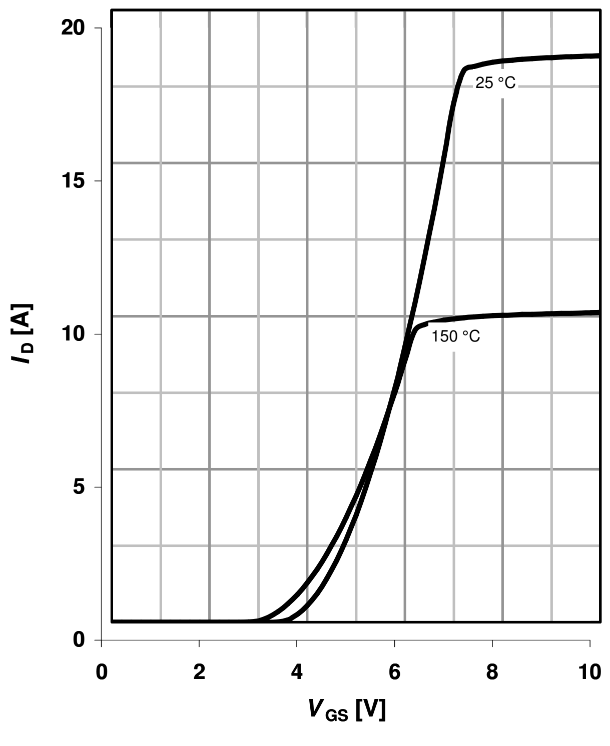
$R_{DS(on)}$=f(T_j); I_D=3.8 A; V_{GS}=10 V



8 Typ. transfer characteristics

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

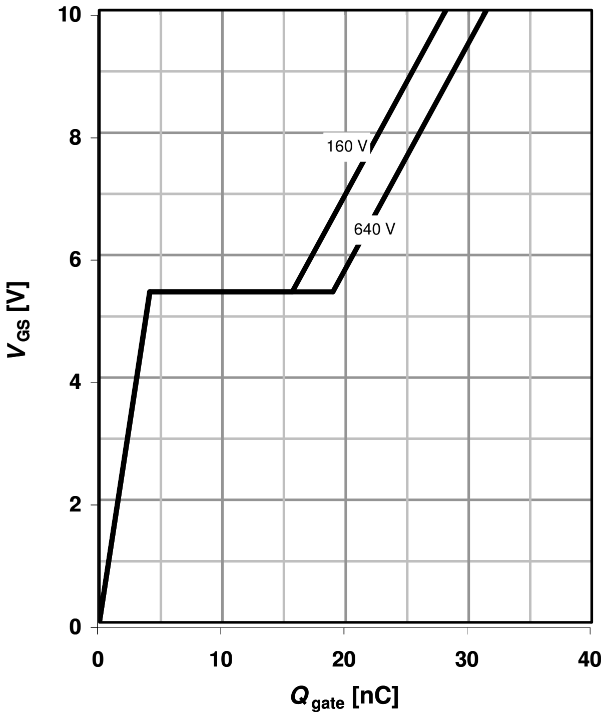
parameter: T_j



9 Typ. gate charge

V_{GS}=f(Q_{gate}); I_D=6 A pulsed

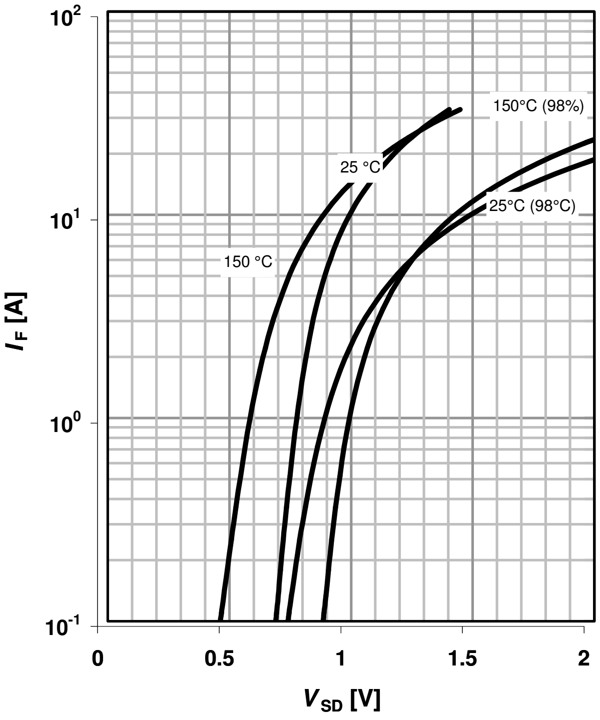
parameter: V_{DD}



10 Forward characteristics of reverse diode

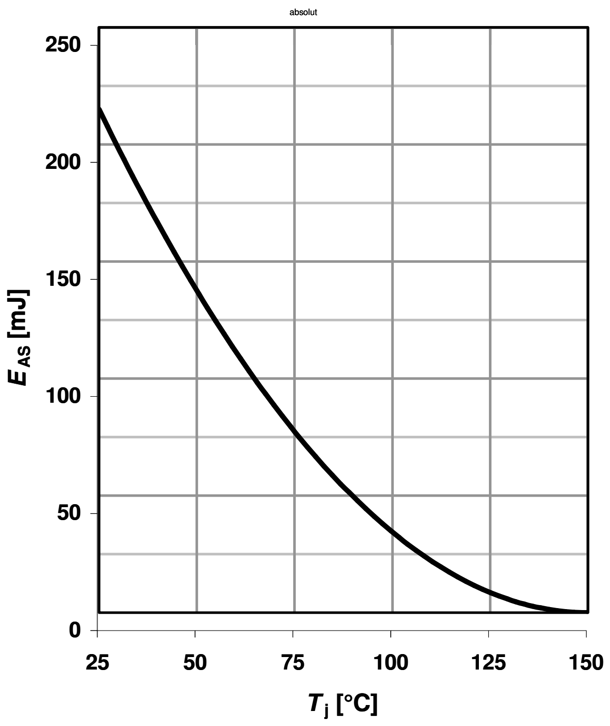
I_F=f(V_{SD}); t_p=10 µs

parameter: T_j



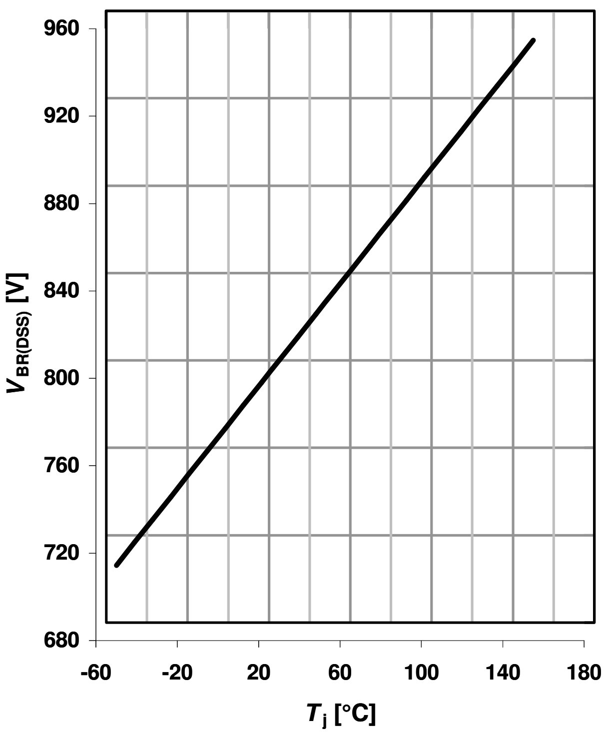
11 Avalanche energy

E_{AS}=f(T_j); I_D=1.2 A; V_{DD}=50 V



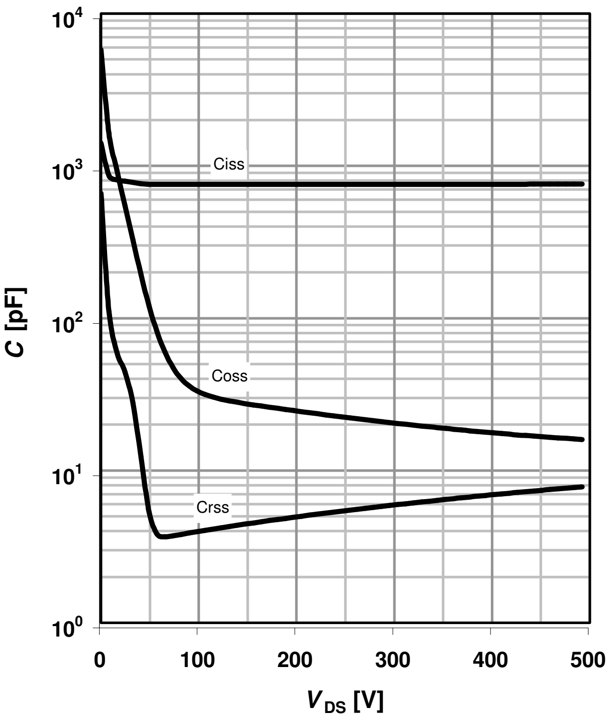
12 Drain-source breakdown voltage

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



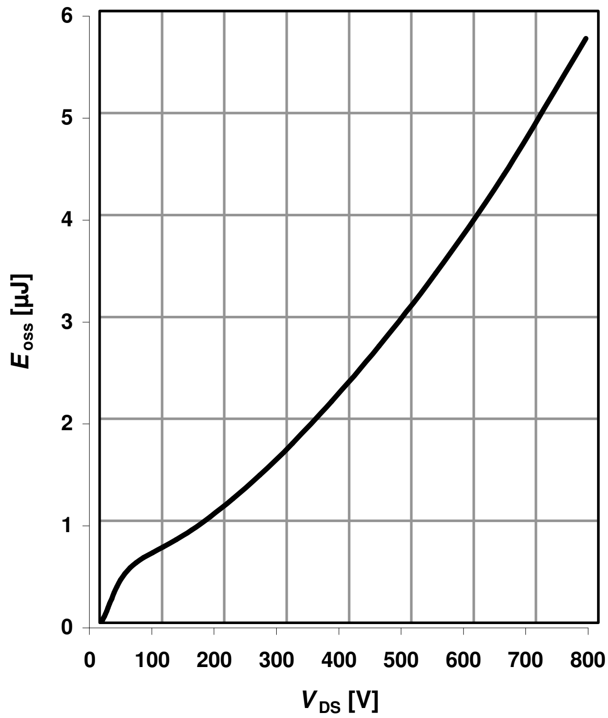
13 Typ. capacitances

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

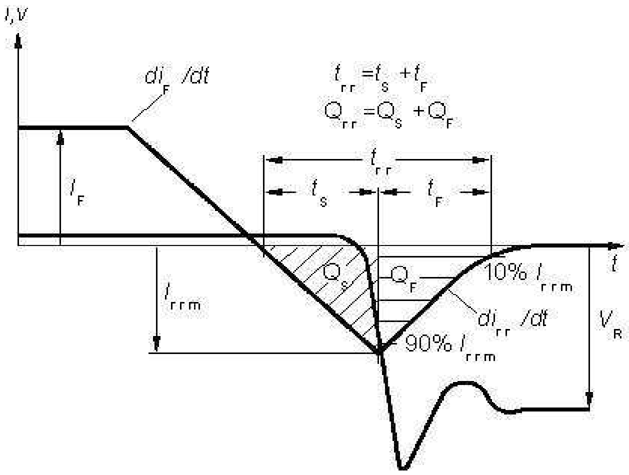


14 Typ. Coss stored energy

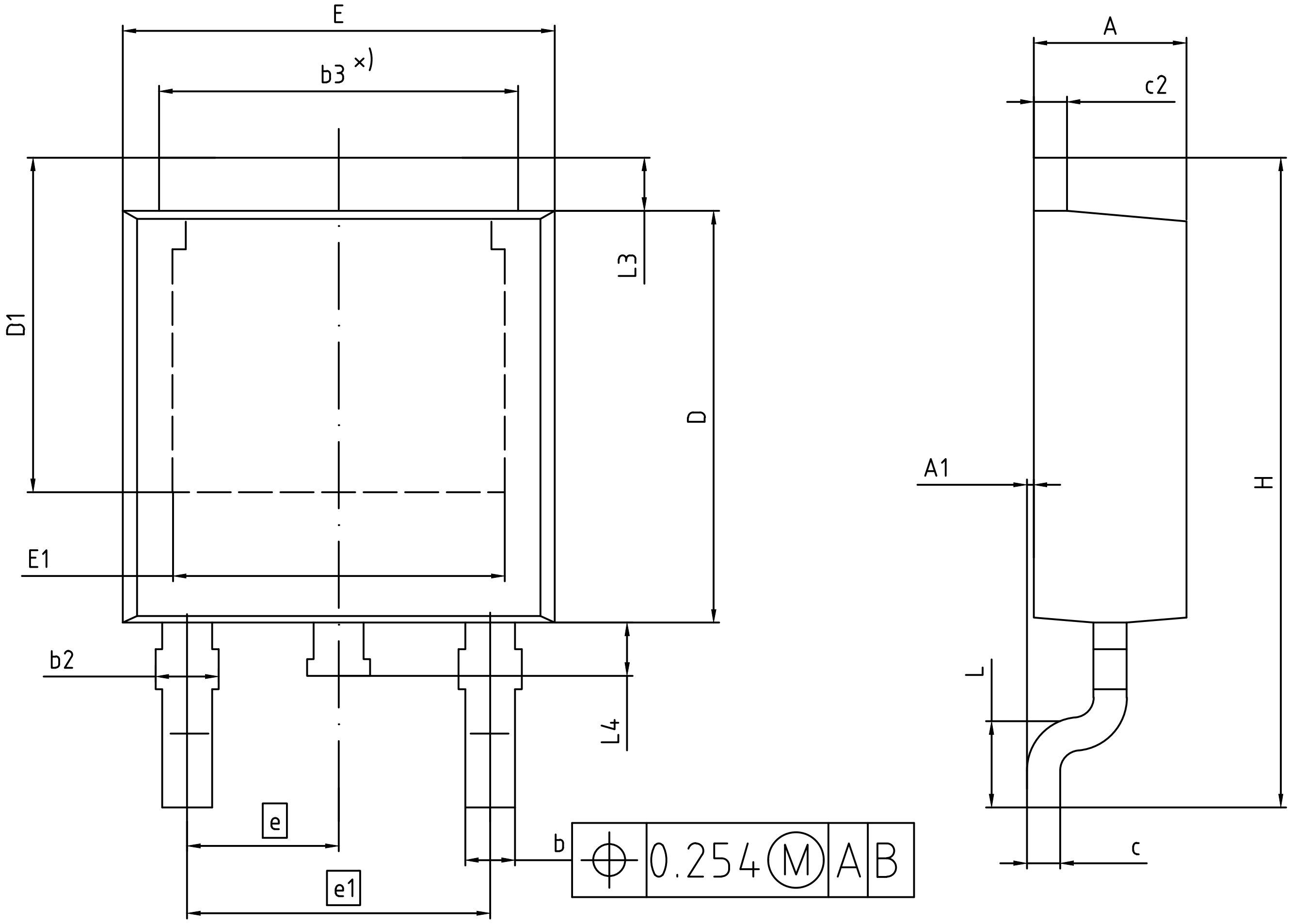
E_{oss}= f(V_{DS})

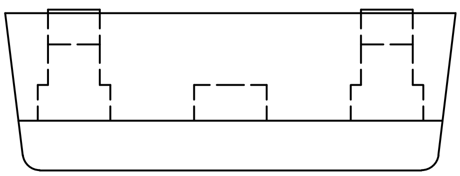


Definition of diode switching characteristics



PG-TO252-3: Outline





ALL DIMENSIONS REFER TO JEDEC
STANDARD TO-252 AND DO NOT INCLUDE MOLD
FLASH OR PROTRUSIONS.

DIMENSION	MILLIMETERS	
	MIN.	MAX.
A	2.16	2.41
A1	0.00	0.15
b	0.64	0.89
b2	0.65	1.15
b3	4,95	5.50
c	0.46	0.61
c2	0.40	0.98
D	5.97	6.22
D1	5.02	5.84
E	6.35	6.73
E1	4.32	5.50
e	2.29	
e1	4.57	
N	3	
H	9.40	10.48
L	1.18	1.78
L3	0.89	1.27
L4	0.51	1.02

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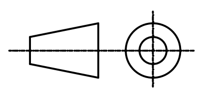
REVISION 07
SCALE: 10:1 0 1 2mm
EUROPEAN PROJECTION 
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Revision History

SPD06N80C3

Revision: 2020-05-26, Rev. 2.94

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.93	2016-04-19	Non-halogen free version discontinued (creation:2016-04-13)
2.94	2020-05-26	Update package outline

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