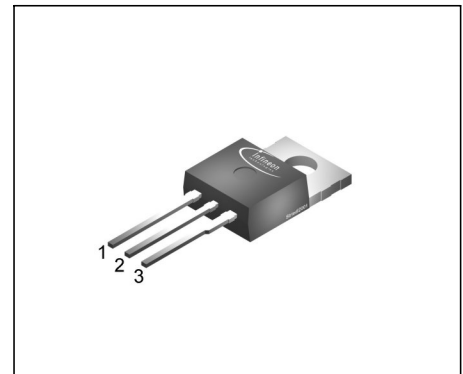


SIPMOS[®] Power Transistor

BUZ 31L

- N channel
- Enhancement mode
- Avalanche-rated
- Logic Level
- Pb-free lead plating; RoHS compliant



Pin 1	Pin 2	Pin 3
G	D	S

Type	V_{DS}	I_D	$R_{DS(on)}$	Package	Pb-free
BUZ 31 L	200 V	13.5 A	0.2 Ω	PG-TO220-3	Yes

Maximum Ratings

Parameter	Symbol	Values	Unit
Continuous drain current $T_C = 28^\circ\text{C}$	I_D	13.5	A
Pulsed drain current $T_C = 25^\circ\text{C}$	I_{Dpuls}	54	
Avalanche current, limited by T_{jmax}	I_{AR}	13.5	
Avalanche energy, periodic limited by T_{jmax}	E_{AR}	9	mJ
Avalanche energy, single pulse $I_D = 13.5\text{ A}$, $V_{DD} = 50\text{ V}$, $R_{GS} = 25\ \Omega$ $L = 1.65\text{ mH}$, $T_j = 25^\circ\text{C}$	E_{AS}	200	
Gate source voltage	V_{GS}	± 20	V
ESD-Sensitivity HBM as per MIL-STD 883		Class 1	
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	95	W
Operating temperature	T_j	-55 ... + 150	
Storage temperature	T_{stg}	-55 ... + 150	K/W
Thermal resistance, chip case	R_{thJC}	≤ 1.32	
Thermal resistance, chip to ambient	R_{thJA}	75	
DIN humidity category, DIN 40 040		E	
IEC climatic category, DIN IEC 68-1		55 / 150 / 56	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

Static Characteristics

Drain- source breakdown voltage $V_{GS} = 0\text{ V}$, $I_D = 0.25\text{ mA}$, $T_j = 25^\circ\text{C}$	$V_{(BR)DSS}$	200	-	-	V
Gate threshold voltage $V_{GS} = V_{DS}$, $I_D = 1\text{ mA}$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 25^\circ\text{C}$ $V_{DS} = 200\text{ V}$, $V_{GS} = 0\text{ V}$, $T_j = 125^\circ\text{C}$	I_{DSS}	- -	0.1 10	1 100	μA
Gate-source leakage current $V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$	I_{GSS}	-	10	100	
Drain-Source on-resistance $V_{GS} = 5\text{ V}$, $I_D = 7\text{ A}$	$R_{DS(on)}$	-	0.16	0.2	Ω

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

Dynamic Characteristics

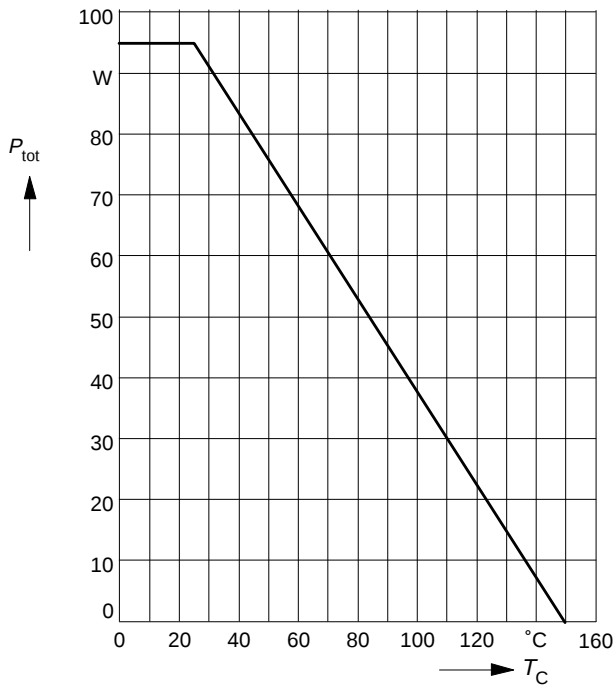
Transconductance $V_{DS} \geq 2 * I_D * R_{DS(on)max}$, $I_D = 7\text{ A}$	g_{fs}	5	12	-	S
Input capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	C_{iss}	-	1200	1600	pF
Output capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	C_{oss}	-	200	300	
Reverse transfer capacitance $V_{GS} = 0\text{ V}$, $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$	C_{rss}	-	100	150	
Turn-on delay time $V_{DD} = 30\text{ V}$, $V_{GS} = 5\text{ V}$, $I_D = 3\text{ A}$ $R_{GS} = 50\ \Omega$	$t_{d(on)}$	-	25	40	ns
Rise time $V_{DD} = 30\text{ V}$, $V_{GS} = 5\text{ V}$, $I_D = 3\text{ A}$ $R_{GS} = 50\ \Omega$	t_r	-	80	120	
Turn-off delay time $V_{DD} = 30\text{ V}$, $V_{GS} = 5\text{ V}$, $I_D = 3\text{ A}$ $R_{GS} = 50\ \Omega$	$t_{d(off)}$	-	210	270	
Fall time $V_{DD} = 30\text{ V}$, $V_{GS} = 5\text{ V}$, $I_D = 3\text{ A}$ $R_{GS} = 50\ \Omega$	t_f	-	65	85	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current $T_C = 25\text{ }^{\circ}\text{C}$	I_S	-	-	13.5	A
Inverse diode direct current,pulsed $T_C = 25\text{ }^{\circ}\text{C}$	I_{SM}	-	-	54	
Inverse diode forward voltage $V_{GS} = 0\text{ V}$, $I_F = 27\text{ A}$	V_{SD}	-	1.2	1.6	V
Reverse recovery time $V_R = 100\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$	t_{rr}	-	180	-	ns
Reverse recovery charge $V_R = 100\text{ V}$, $I_F = I_S$, $di_F/dt = 100\text{ A}/\mu\text{s}$	Q_{rr}	-	1.2	-	μC

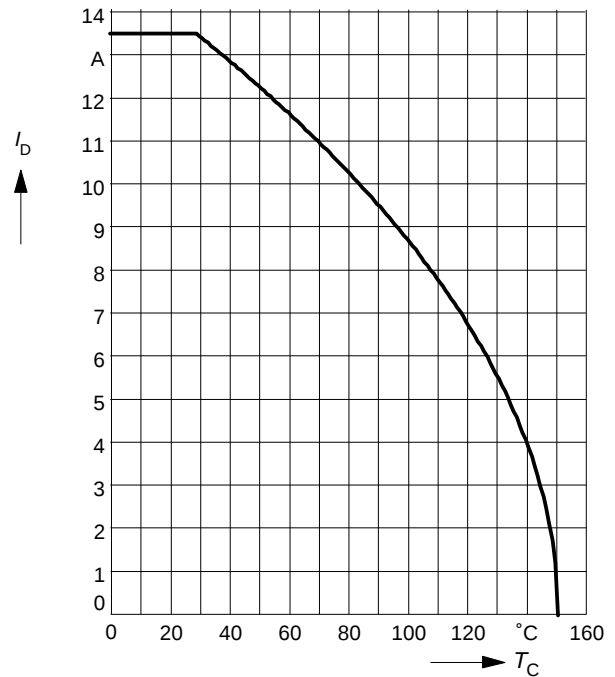
Power dissipation

$$P_{\text{tot}} = f(T_C)$$


Drain current

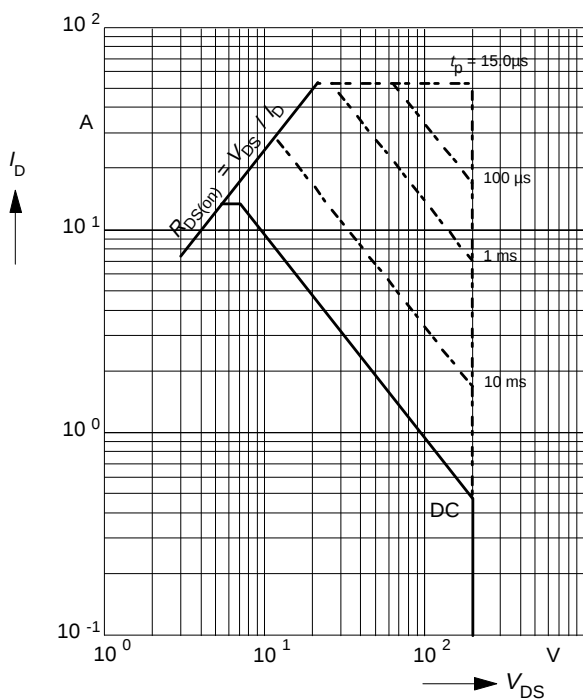
$$I_D = f(T_C)$$

parameter: $V_{GS} \geq 5 \text{ V}$


Safe operating area

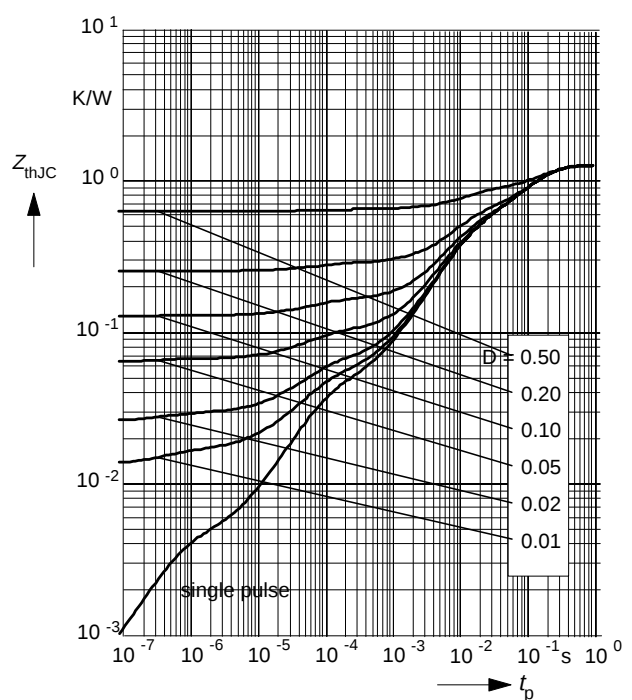
$$I_D = f(V_{DS})$$

parameter: $D = 0.01$, $T_C = 25^\circ\text{C}$


Transient thermal impedance

$$Z_{\text{thJC}} = f(t_p)$$

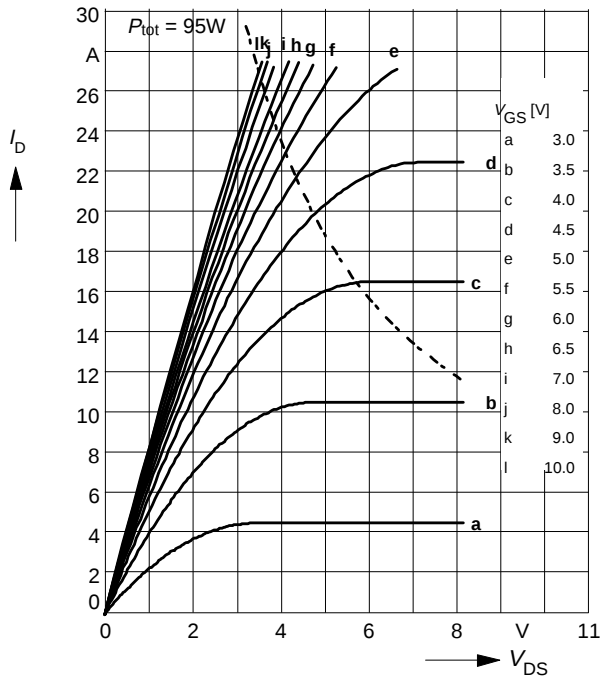
parameter: $D = t_p / T$



Typ. output characteristics

$$I_D = f(V_{DS})$$

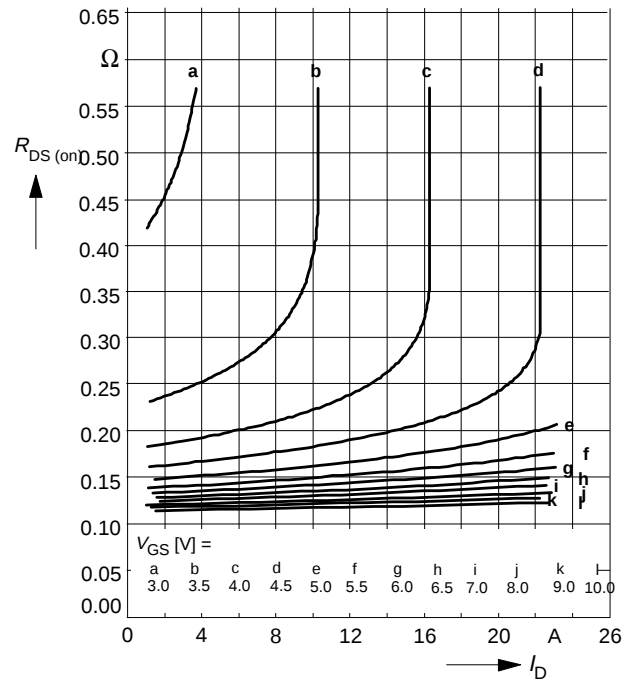
parameter: $t_p = 80 \mu s$, $T_j = 25^\circ C$



Typ. drain-source on-resistance

$$R_{DS(on)} = f(I_D)$$

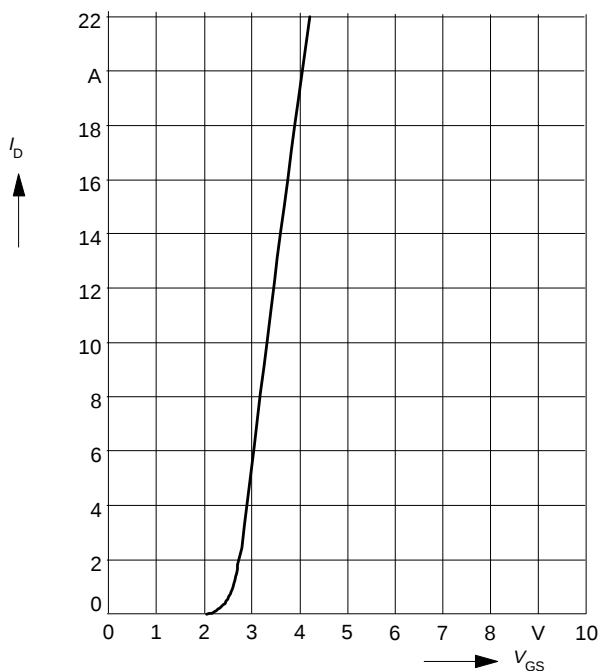
parameter: $t_p = 80 \mu s$, $T_j = 25^\circ C$



Typ. transfer characteristics $I_D = f(V_{GS})$

parameter: $t_p = 80 \mu s$

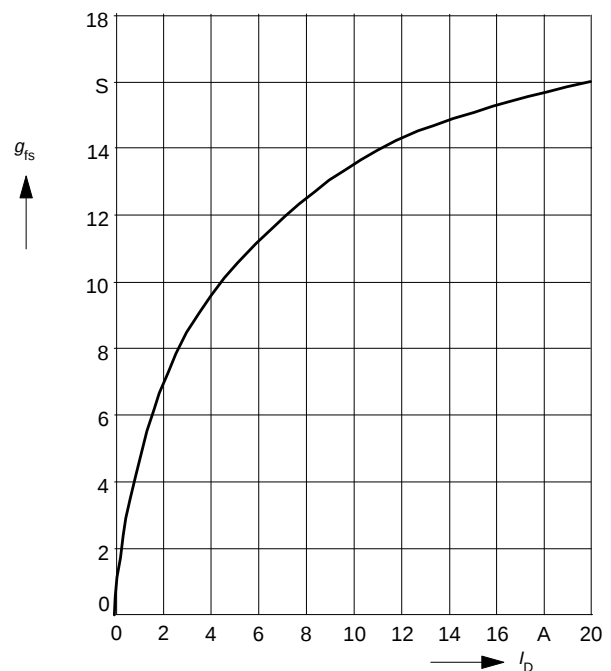
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$



Typ. forward transconductance $g_{fs} = f(I_D)$

parameter: $t_p = 80 \mu s$,

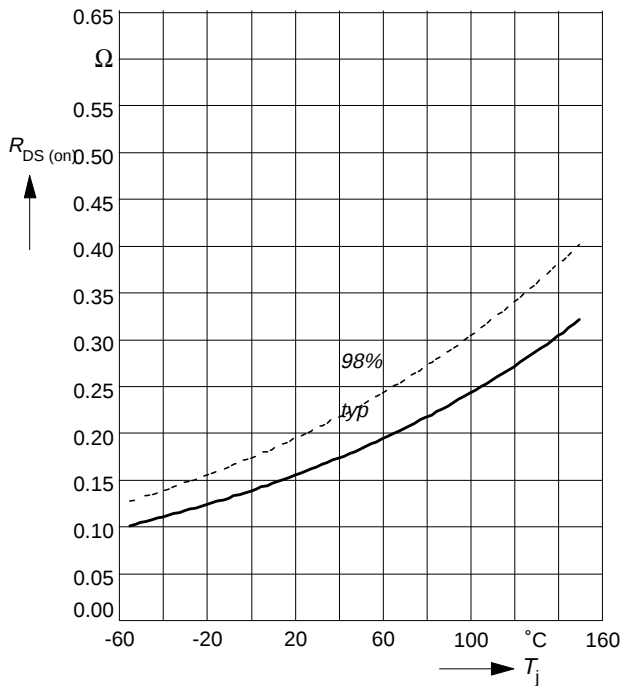
$$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$$



Drain-source on-resistance

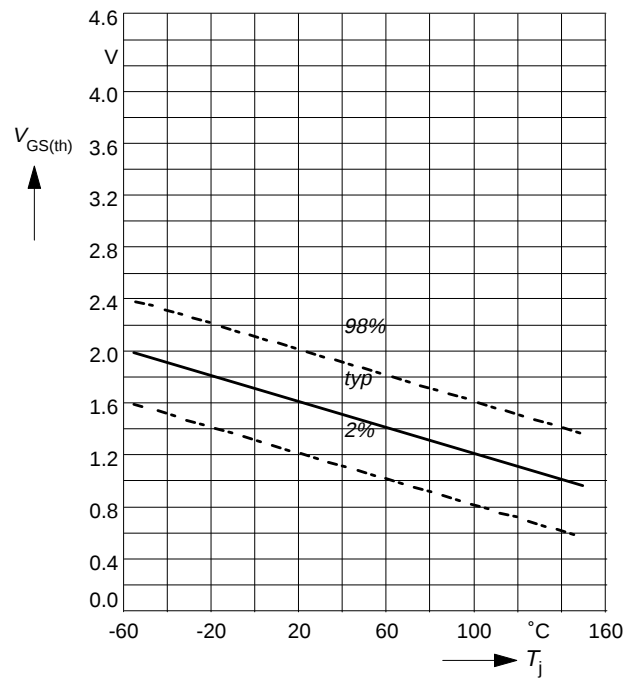
$$R_{DS(on)} = f(T_j)$$

parameter: $I_D = 7\text{ A}$, $V_{GS} = 5\text{ V}$


Gate threshold voltage

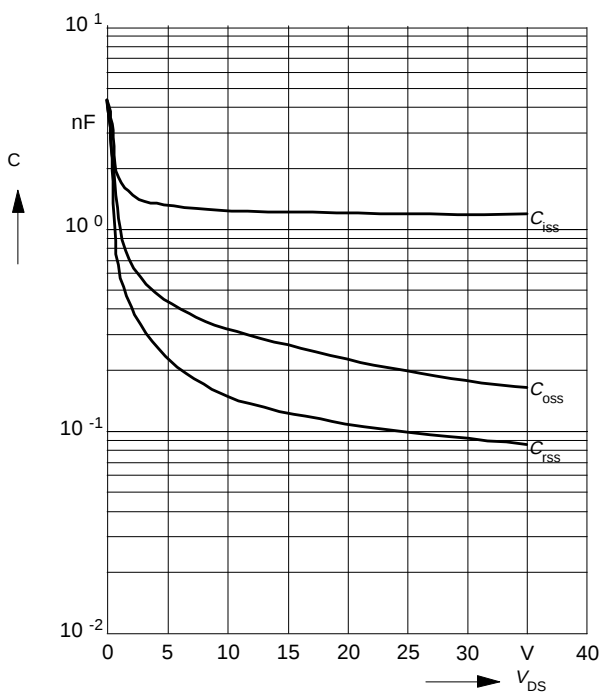
$$V_{GS(th)} = f(T_j)$$

parameter: $V_{GS} = V_{DS}$, $I_D = 1\text{ mA}$


Typ. capacitances

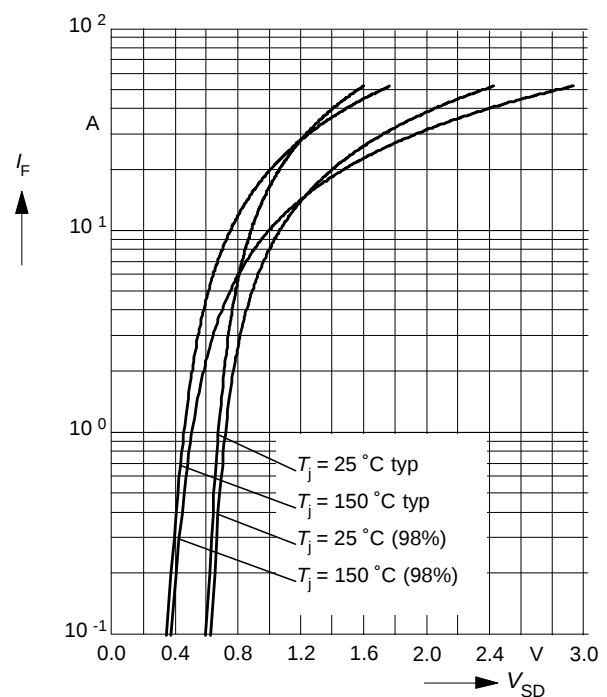
$$C = f(V_{DS})$$

parameter: $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$

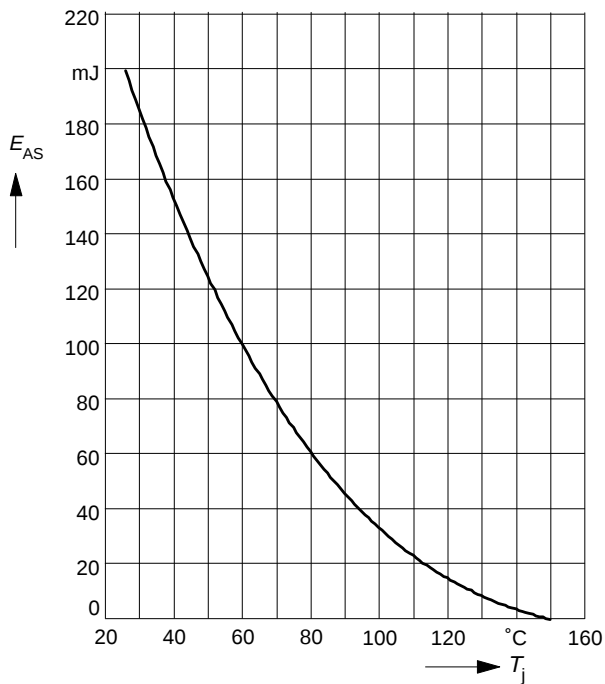

Forward characteristics of reverse diode

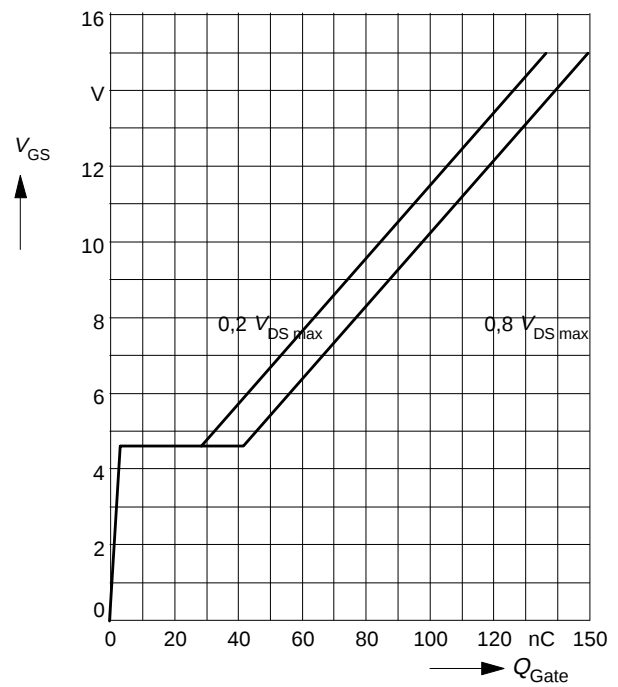
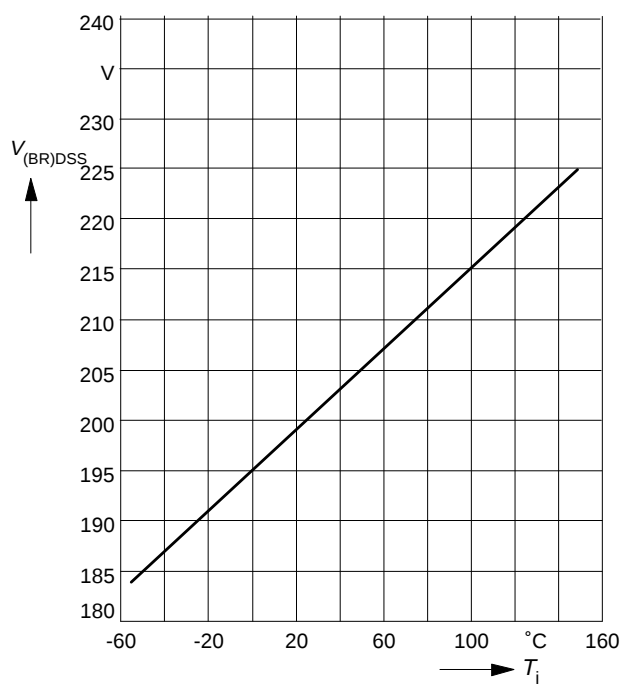
$$I_F = f(V_{SD})$$

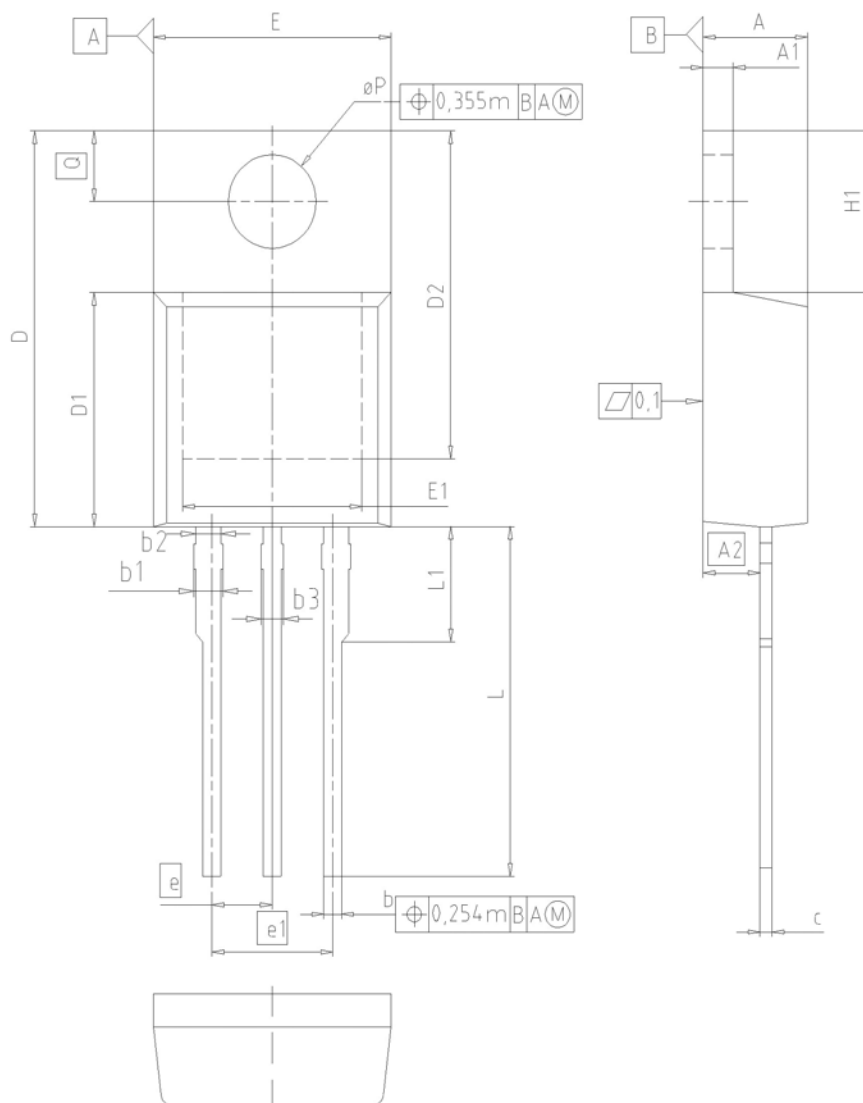
parameter: T_j , $t_p = 80\text{ }\mu\text{s}$



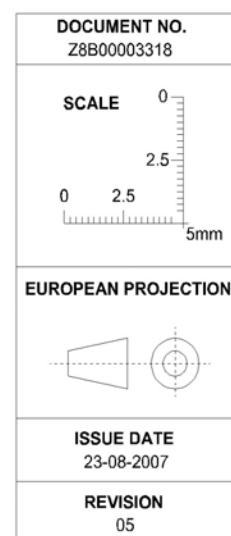
Avalanche energy $E_{AS} = f(T_j)$

 parameter: $I_D = 13.5 \text{ A}$, $V_{DD} = 50 \text{ V}$
 $R_{GS} = 25 \text{ } \Omega$, $L = 1.65 \text{ mH}$

Typ. gate charge
 $V_{GS} = f(Q_{Gate})$

 parameter: $I_{D \text{ puls}} = 21 \text{ A}$

Drain-source breakdown voltage
 $V_{(BR)DSS} = f(T_j)$


PG-TO220-3


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.30	4.57	0.169	0.180
A1	1.17	1.40	0.046	0.055
A2	2.15	2.72	0.085	0.107
b	0.65	0.86	0.026	0.034
b1	0.95	1.40	0.037	0.055
b2	0.95	1.15	0.037	0.045
b3	0.65	1.15	0.026	0.045
c	0.33	0.60	0.013	0.024
D	14.81	15.95	0.583	0.628
D1	8.51	9.45	0.335	0.372
D2	12.19	13.10	0.480	0.516
E	9.70	10.36	0.382	0.408
E1	6.50	8.60	0.256	0.339
e	2.54		0.100	
e1	5.08		0.200	
N	3		3	
H1	5.90	6.90	0.232	0.272
L	13.00	14.00	0.512	0.551
L1	-	4.80	-	0.189
ØP	3.60	3.89	0.142	0.153
Q	2.60	3.00	0.102	0.118



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