SIEMENS

SIPMOS® Power Transistor

- N channel
- Enhancement mode
- Avalanche-rated

VPT05381
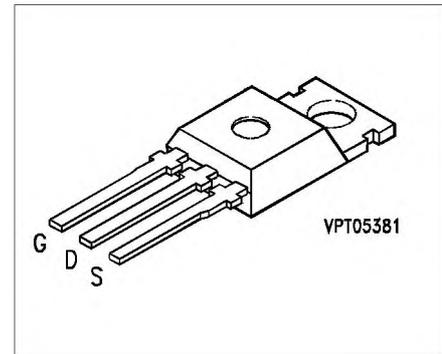
Type	V_{DS}	I_D	$R_{DS (on)}$	Package [1]	Ordering Code
BUZ 31	200 V	13.5 A	0.2 Ω	TO-220 AB	C67078-S1304-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Continuous drain current, T_C = 28 °C	I_D	13.5	A
Pulsed drain current, T_C = 25 °C	$I_{D \, puls}$	54	
Avalanche current, limited by $T_{j \, max}$	I_{AR}	13.5	
Avalanche energy, periodic limited by $T_{j \, (max)}$	E_{AR}	9	mJ
Avalanche energy, single pulse I_D = 13.5 A, V_{DD} = 50 V, R_{GS} = 25 Ω L = 1.65 mH, T_j = 25 °C	E_{AS}	200	
Gate-source voltage	V_{GS}	± 20	V
Power dissipation, T_C = 25 °C	P_{tot}	75	W
Operating and storage temperature range	T_j , T_{stg}	– 55 ... + 150	°C

Thermal resistance, chip-case	$R_{th \, JC}$	≤ 1.67	K/W
DIN humidity category, DIN 40 040		E	–
IEC climatic category, DIN IEC 68-1		55/150/56	

1) See chapter Package Outlines.

Electrical Characteristics

at $T_j = 25 \,^\circ C$, unless otherwise specified.

Parameter	Symbol	min.	typ.	max.	Unit
Static characteristics					
Drain-source breakdown voltage $V_{GS} = 0$ V, $I_D = 0.25$ mA	$V_{(BR)DSS}$	200	–	–	V
Gate threshold voltage $V_{GS} = V_{DS}$, $I_D = 1$ mA	$V_{GS(th)}$	2.1	3.0	4.0	
Zero gate voltage drain current $V_{DS} = 200$ V, $V_{GS} = 0$ V $T_j = 25\,^\circ C$ $T_j = 125\,^\circ C$	I_{DSS}	– –	0.1 10	1.0 100	µA
Gate-source leakage current $V_{GS} = 20$ V, $V_{DS} = 0$ V	I_{GSS}	–	10	100	nA
Drain-source on-resistance $V_{GS} = 10$ V, $I_D = 8.5$ A	$R_{DS(on)}$	–	0.16	0.2	Ω
Dynamic characteristics					
Forward transconductance $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$, $I_D = 8.5$ A	g_{fs}	5.0	10.0	–	S
Input capacitance $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz	C_{iss}	–	960	1250	pF
Output capacitance $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz	C_{oss}	–	200	330	
Reverse transfer capacitance $V_{GS} = 0$ V, $V_{DS} = 25$ V, $f = 1$ MHz	C_{rss}	–	100	170	
Turn-on time t_{on}, ($t_{on} = t_{d(on)} + t_r$) $V_{DD} = 30$ V, $V_{GS} = 10$ V, $I_D = 3$ A, $R_{GS} = 50$ Ω	$t_{d(on)}$ t_r	– –	20 45	30 70	ns
Turn-off time t_{off}, ($t_{off} = t_{d(off)} + t_f$) $V_{DD} = 30$ V, $V_{GS} = 10$ V, $I_D = 3$ A, $R_{GS} = 50$ Ω	$t_{d(off)}$ t_f	– –	180 60	230 80	

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Electrical Characteristics (cont'd)

at $T_j = 25$ °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse diode					
Continuous reverse drain current $T_C = 25$ °C	I_S	–	–	13.5	A
Pulsed reverse drain current $T_C = 25$ °C	I_{SM}	–	–	54	
Diode forward on-voltage $I_S = 27$ A, $V_{GS} = 0$ V	V_{SD}	–	1.1	1.6	V
Reverse recovery time $V_R = 100$ V, $I_F = I_S$, $di_F / dt = 100$ A/µs	t_{rr}	–	180	–	ns
Reverse recovery charge $V_R = 100$ V, $I_F = I_S$, $di_F / dt = 100$ A/µs	Q_{rr}	–	1.2	–	µC

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Characteristics at T_i = 25 °C, unless otherwise specified.

Total power dissipation

$P_{tot} = f(T_C)$
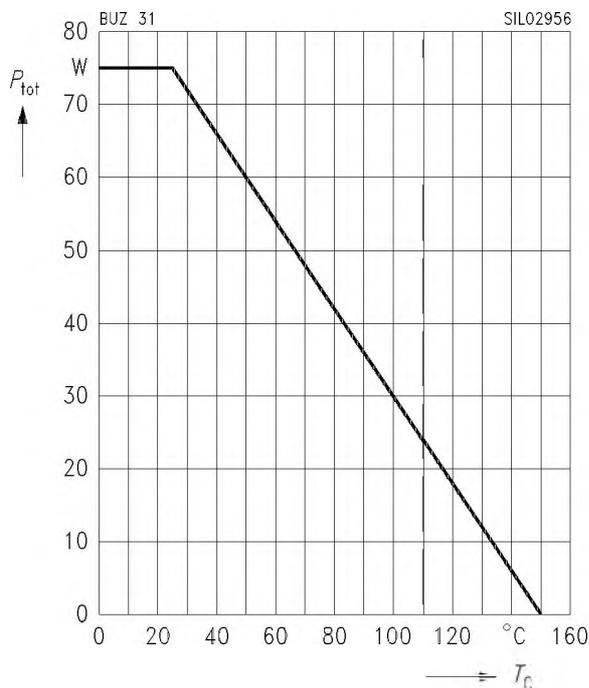
Typ. output characteristics

$I_D = f(V_{DS})$

parameter: t_p = 80 μs
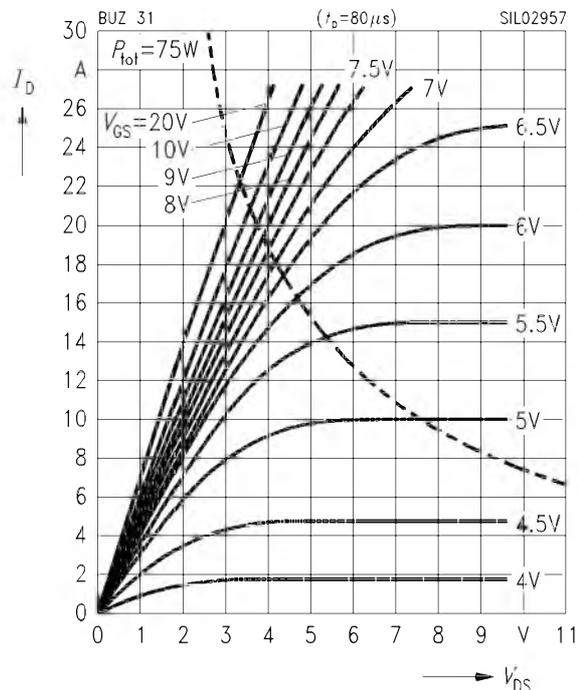
Safe operating area

$I_D = f(V_{DS})$

parameter: D = 0.01, T_C = 25 °C
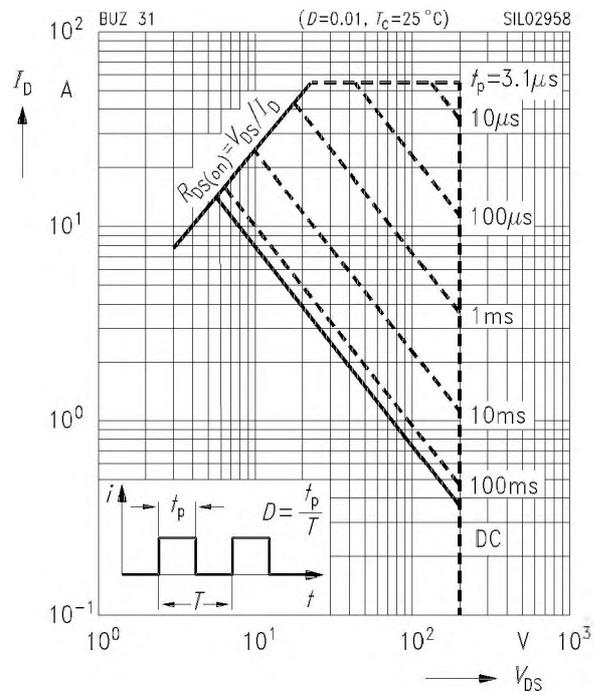
Typ. transfer characteristics

$I_D = f(V_{GS})$

parameter: t_p = 80 μs, V_{DS} = 25 V
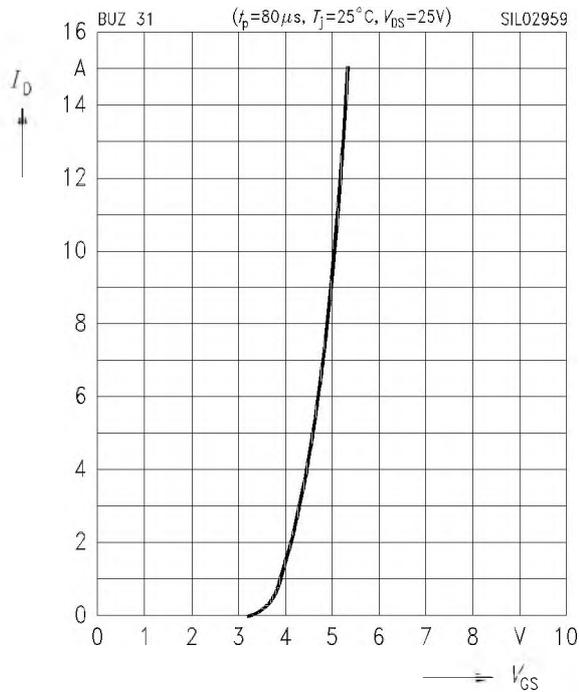
Typ. drain-source on-resistance

$R_{DS(on)} = f(I_D)$
parameter: V_{GS}
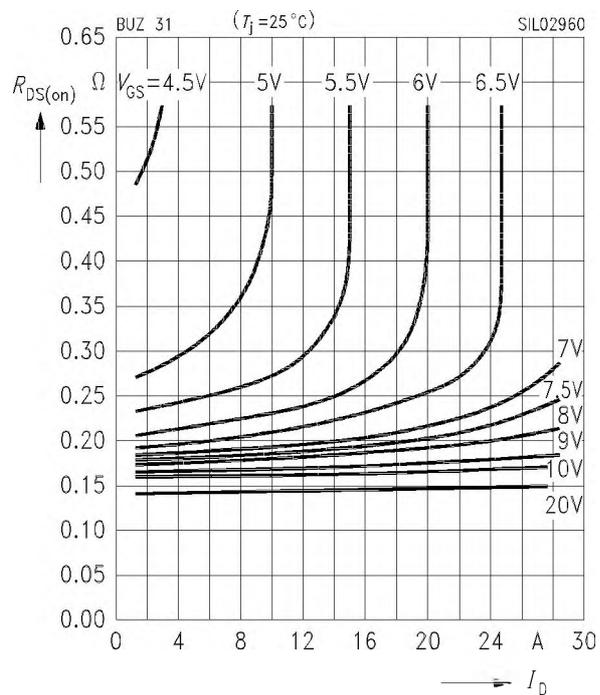
Drain-source on-resistance

$R_{DS(on)} = f(T_j)$
parameter: I_D = 8.5 A, V_{GS} = 10 V, (spread)
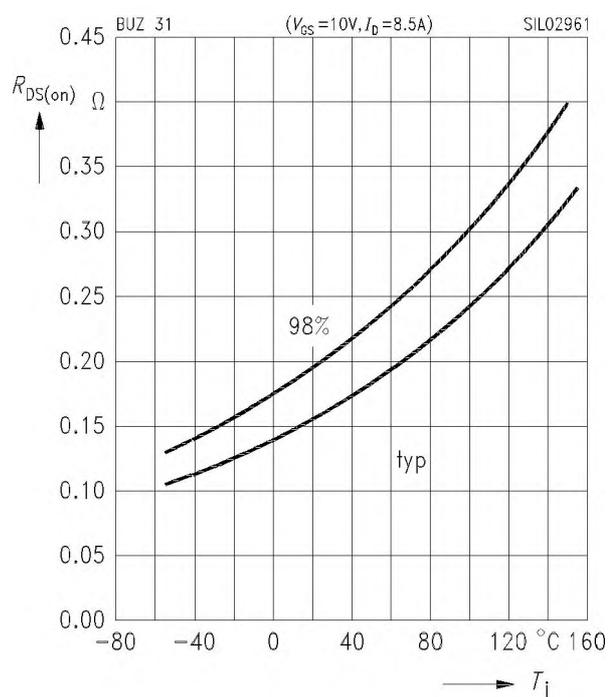

Typ. forward transconductance

$g_{fs} = f(I_D)$
parameter: t_p = 80 µs
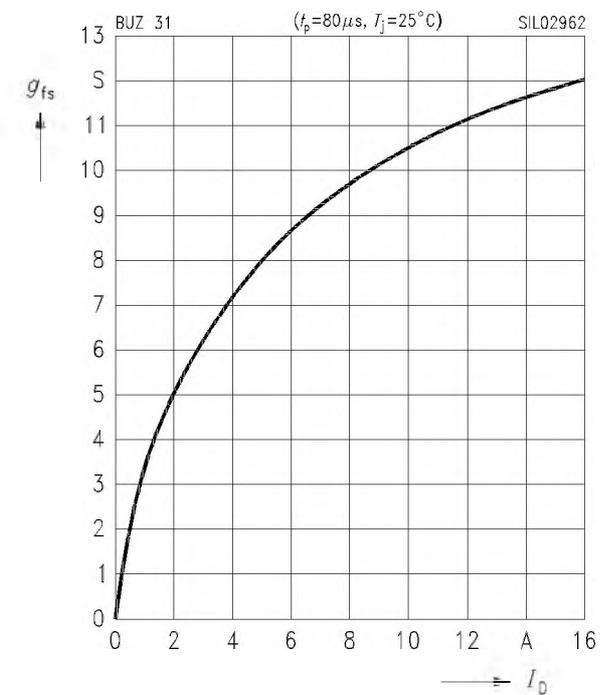

Gate threshold voltage

$V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}$, I_D = 1 mA, (spread)
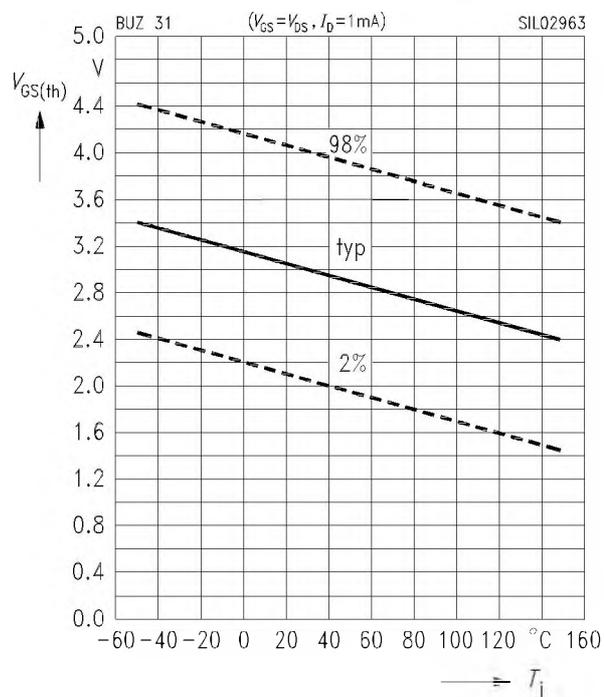
Typ. capacitances

$C = f(V_{DS})$
parameter: $V_{GS} = 0$ V, $f = 1$ MHz
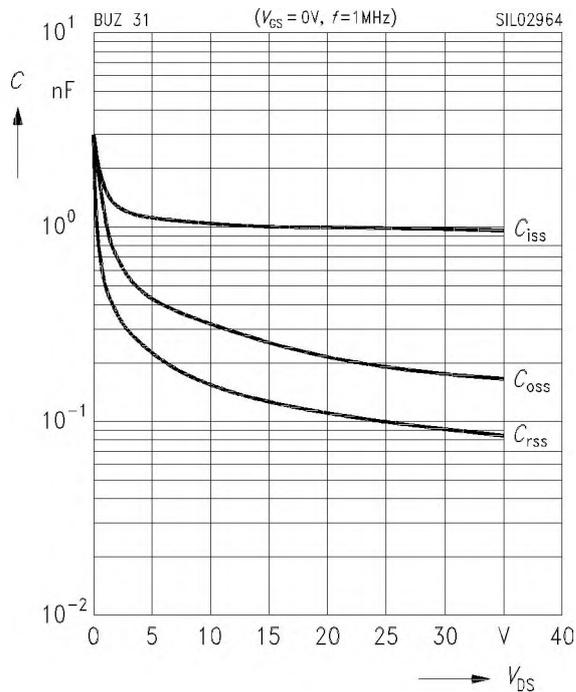
Drain current

$I_D = f(T_C)$
parameter: $V_{GS} \geq 10$ V
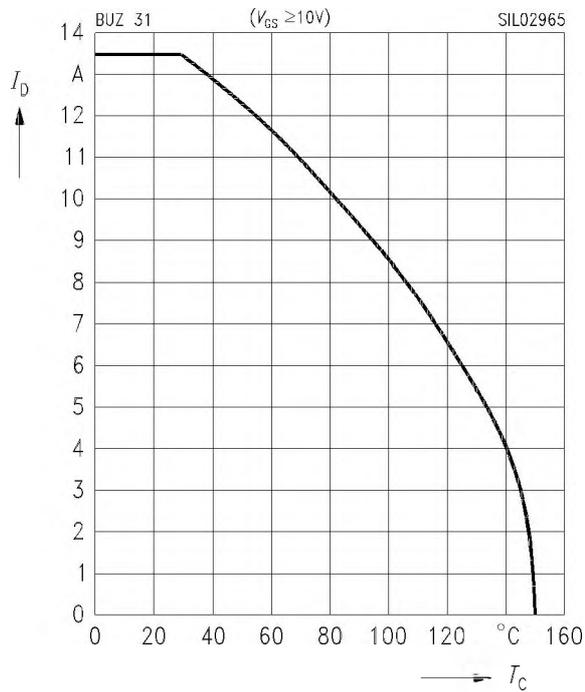
## Forward characteristics of reverse diode

$I_F = f(V_{SD})$
parameter: T_j, $t_p = 80$ µs, (spread)
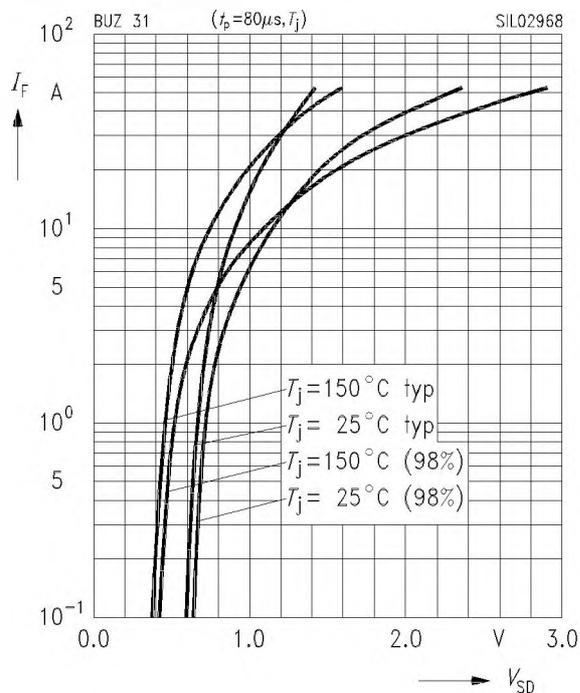
Avalanche energy $E_{AS} = f(T_j)$

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

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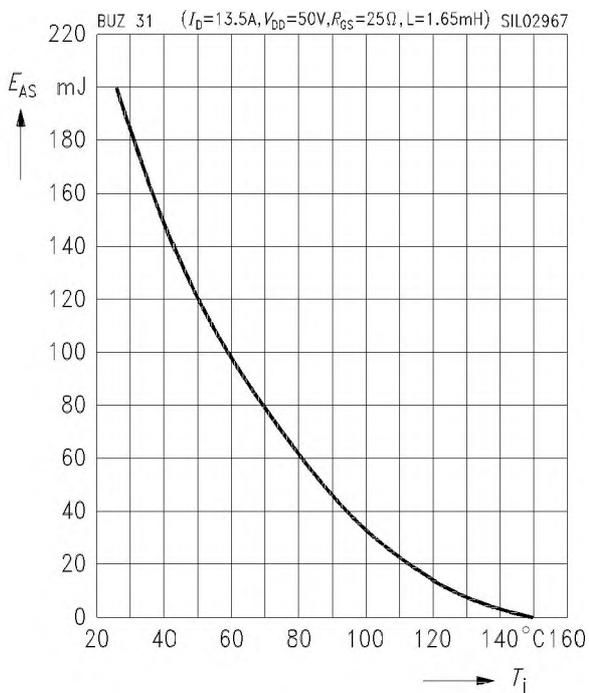
Transient thermal impedance

$Z_{th\,JC} = f(t_p)$

parameter: $D = t_p / T$
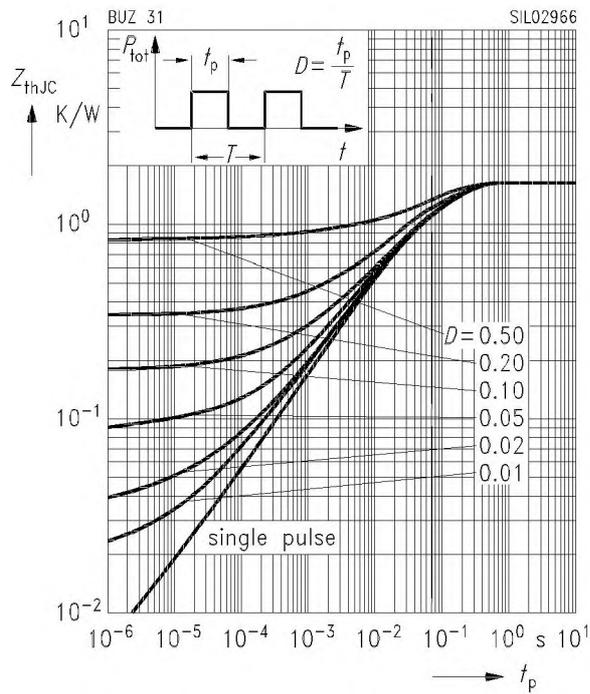
Typ. gate charge

$V_{GS} = f(Q_{Gate})$

parameter: $I_{D\,puls} = 20.3$ A