# SIEMENS

SIPMOS ® Power Transistor

• N channel

• Enhancement mode

• Logic Level

• Avalanche-rated

• dv/dt rated

• 175°C operating temperature

• also in SMD available
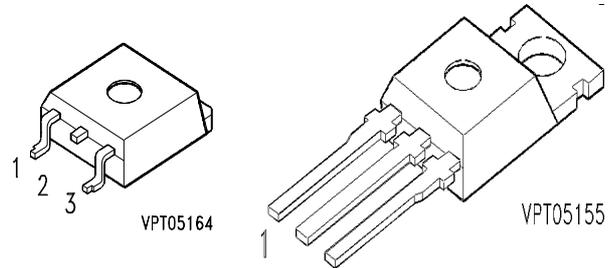
	Pin 1	Pin 2	Pin 3
	G	D	S

Type	V_{DS}	I_D	$R_{DS(on)}$	Package	Ordering Code
BUZ 104 SL	55 V	12.5 A	0.12 Ω	TO-220 AB	Q67040-S4006-A2

Maximum Ratings

Parameter	Symbol	Values	Unit
Continuous drain current	I_D		A
T_C = 25 °C		12.5	
T_C = 100 °C		8.8	
Pulsed drain current	I_{Dpuls}		
T_C = 25 °C		50	
Avalanche energy, single pulse	E_{AS}		mJ
I_D = 12.5 A, V_{DD} = 25 V, R_{GS} = 25 Ω			
L = 666 µH, T_j = 25 °C		52	
Avalanche current,limited by T_{jmax}	I_{AR}	12.5	A
Avalanche energy,periodic limited by T_{jmax}	E_{AR}	3.5	mJ
Reverse diode dv/dt	dv/dt		kV/µs
I_S = 12.5 A, V_{DS} = 40 V, di_F/dt = 200 A/µs			
T_{jmax} = 175 °C		6	
Gate source voltage	V_{GS}	± 14	V
Power dissipation	P_{tot}		W
T_C = 25 °C		35	

Maximum Ratings

Parameter	Symbol	Values	Unit
Operating temperature	T_j	-55 ... + 175	°C
Storage temperature	T_{stg}	-55 ... + 175	
Thermal resistance, junction - case	R_{thJC}	≤ 4.3	K/W
Thermal resistance, junction - ambient	R_{thJA}	≤ 62	
IEC climatic category, DIN IEC 68-1		55 / 175 / 56	

Electrical Characteristics, at $T_j = 25°C$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain- source breakdown voltage	$V_{(BR)DSS}$				V
$V_{GS} = 0$ V, $I_D = 0.25$ mA, $T_j = 25$ °C		55	-	-	
Gate threshold voltage	$V_{GS(th)}$				
$V_{GS} = V_{DS}, I_D = 20$ µA		1.2	1.6	2	
Zero gate voltage drain current	I_{DSS}				µA
$V_{DS} = 50$ V, $V_{GS} = 0$ V, $T_j = -40$ °C		-	-	0.1	
$V_{DS} = 50$ V, $V_{GS} = 0$ V, $T_j = 25$ °C		-	0.1	1	
$V_{DS} = 50$ V, $V_{GS} = 0$ V, $T_j = 150$ °C		-	-	100	
Gate-source leakage current	I_{GSS}				nA
$V_{GS} = 20$ V, $V_{DS} = 0$ V		-	10	100	
Drain-Source on-resistance	$R_{DS(on)}$				Ω
$V_{GS} = 4.5$ V, $I_D = 8.8$ A		-	0.105	0.12	
$V_{GS} = 10$ V, $I_D = 8.8$ A		-	0.062	0.07	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Transconductance	g_{fs}				S
$V_{DS} \geq 2 * I_D * R_{DS(on)max}$, I_D = 8.8 A		5	-	-	
Input capacitance	C_{iss}				pF
V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		-	317	400	
Output capacitance	C_{oss}				
V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		-	97	120	
Reverse transfer capacitance	C_{rss}				
V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		-	54	70	
Turn-on delay time	$t_{d(on)}$				ns
V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 12.5 A R_G = 16 Ω		-	14.5	22	
Rise time	t_r				
V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 12.5 A R_G = 16 Ω		-	106	160	
Turn-off delay time	$t_{d(off)}$				
V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 12.5 A R_G = 16 Ω		-	11	17	
Fall time	t_f				
V_{DD} = 30 V, V_{GS} = 4.5 V, I_D = 12.5 A R_G = 16 Ω		-	13.5	20	
Gate charge at threshold	$Q_{g(th)}$				nC
V_{DD} = 40 V, $I_D \geq$ 0.1 A, V_{GS} =0 to 1 V		-	0.37	0.56	
Gate charge at 5.0 V	$Q_{g(5)}$				
V_{DD} = 40 V, I_D = 12.5 A, V_{GS} =0 to 5 V		-	7.85	12	
Gate charge total	$Q_{g(total)}$				
V_{DD} = 40 V, I_D = 12.5 A, V_{GS} =0 to 10 V		-	13.44	20	
Gate plateau voltage	$V_{(plateau)}$				V
V_{DD} = 40 V, I_D = 12.5 A		-	4	-	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Reverse Diode					
Inverse diode continuous forward current	I_S				A
T_C = 25 °C		-	-	12.5	
Inverse diode direct current,pulsed	I_{SM}				
T_C = 25 °C		-	-	50	
Inverse diode forward voltage	V_{SD}				V
V_{GS} = 0 V, I_F = 25 A		-	1.14	1.8	
Reverse recovery time	t_{rr}				ns
V_R = 30 V, I_F=I_S, di_F/dt = 100 A/µs		-	50	75	
Reverse recovery charge	Q_{rr}				µC
V_R = 30 V, I_F=I_S, di_F/dt = 100 A/µs		-	0.1	0.15	

Power dissipation

$P_{tot} = f(T_C)$
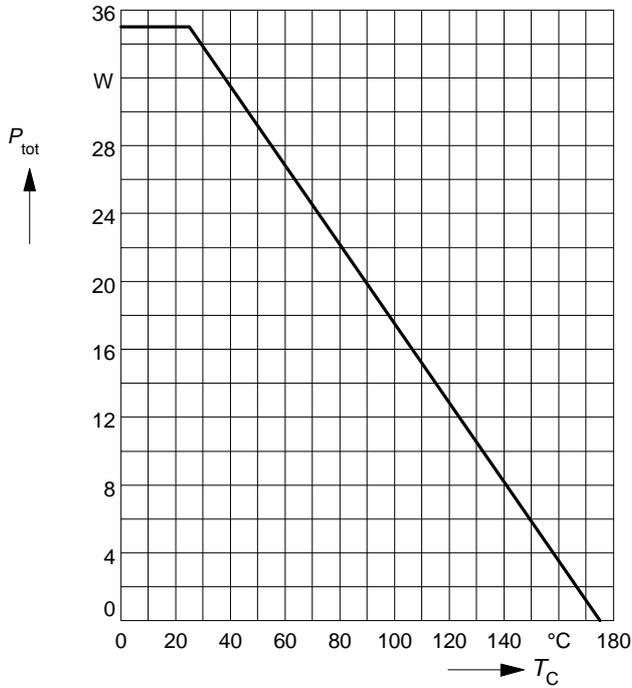
Drain current

$I_D = f(T_C)$
parameter: $V_{GS} \geq 4$ V
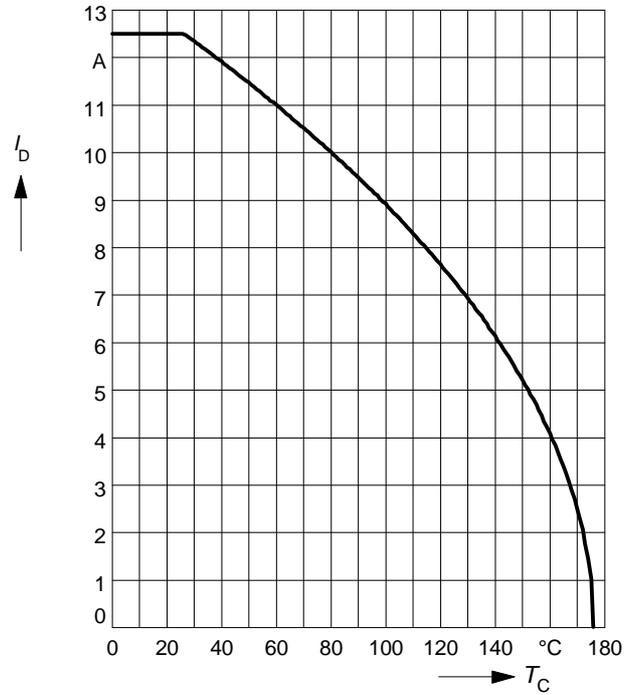
Safe operating area

$I_D = f(V_{DS})$
parameter: $D = 0$, $T_C = 25°C$
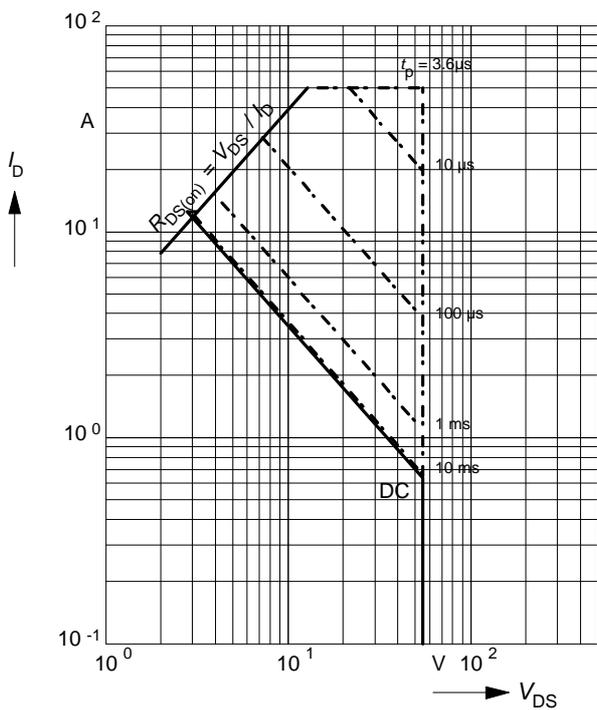
Transient thermal impedance

$Z_{th\ JC} = f(t_p)$
parameter: $D = t_p / T$
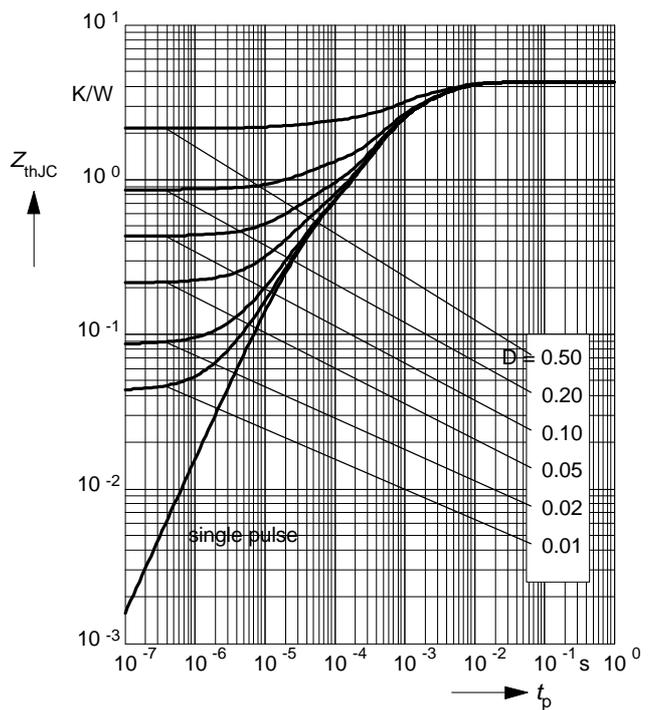
Typ. output characteristics

$I_D = f(V_{DS})$
parameter: $t_p = 80$ µs , $T_j = 25$ °C
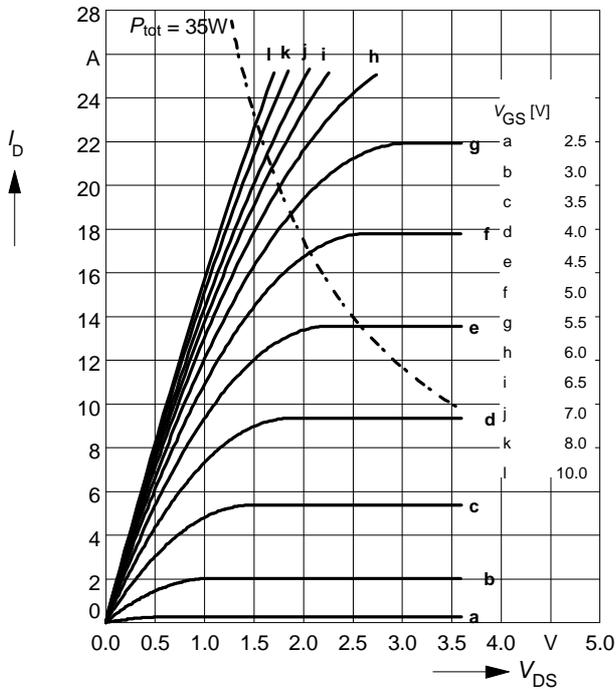

Typ. drain-source on-resistance

$R_{DS (on)} = f(I_D)$
parameter: $t_p = 80$ µs, $T_j = 25$ °C
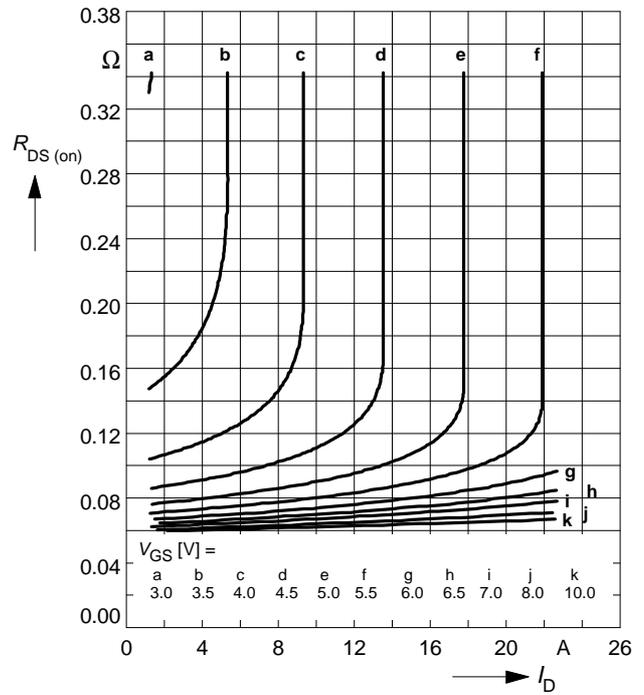
Typ. transfer characteristics $I_D = f(V_{GS})$

parameter: $t_p = 80$ µs

$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$
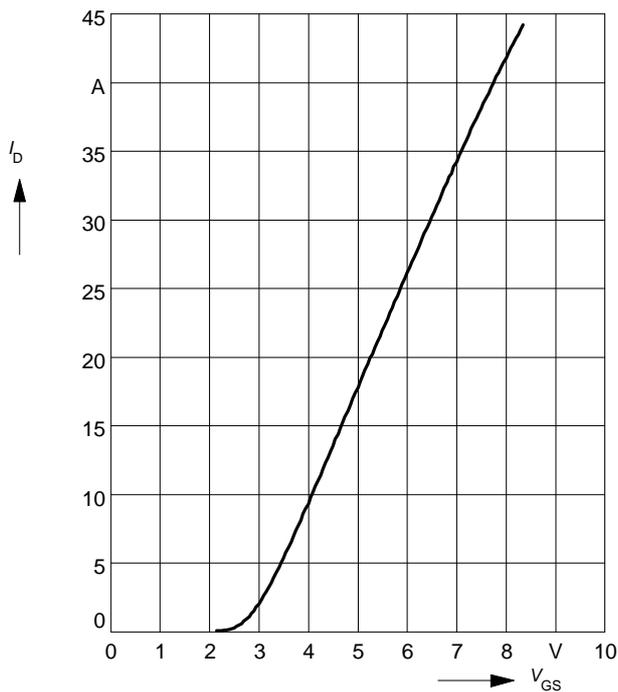
Drain-source on-resistance

$R_{DS\,(on)} = f(T_j)$
parameter: $I_D = 8.8$ A, $V_{GS} = 4.5$ V
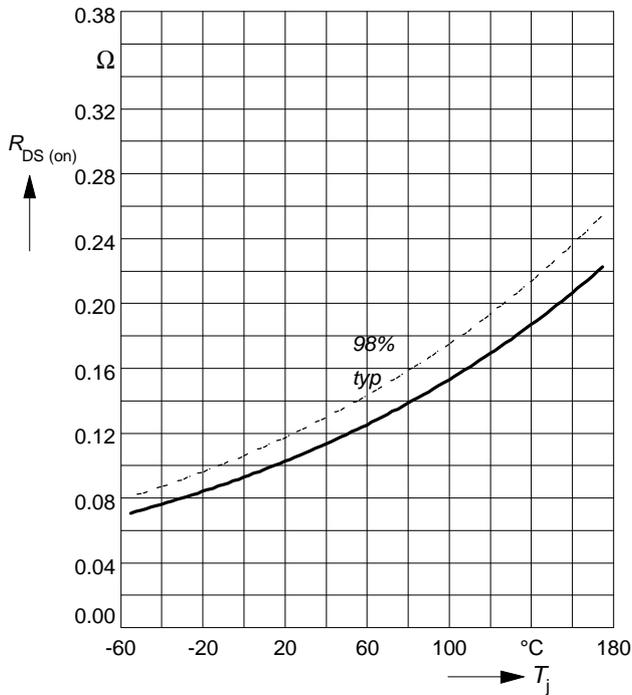
Gate threshold voltage

$V_{GS(th)} = f(T_j)$
parameter: $V_{GS} = V_{DS}, I_D = 20\mu A$
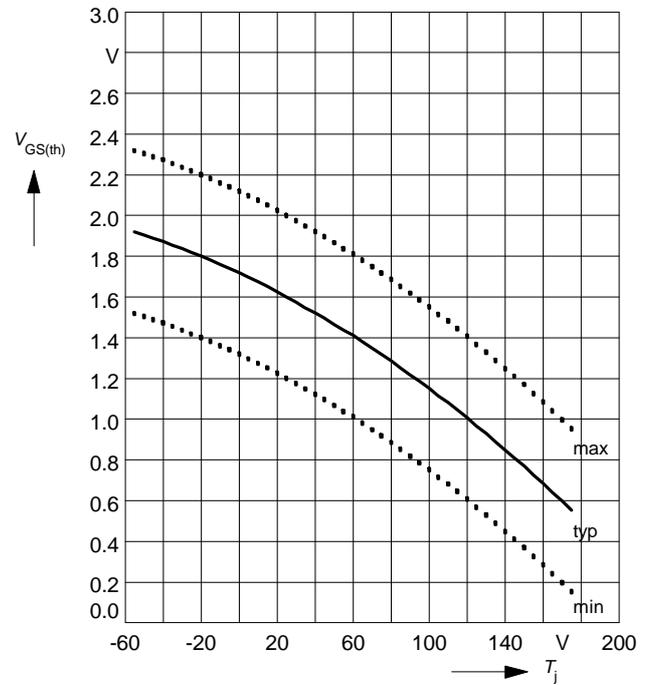
Typ. capacitances

$C = f(V_{DS})$
parameter: $V_{GS} = 0$V, $f = 1$MHz
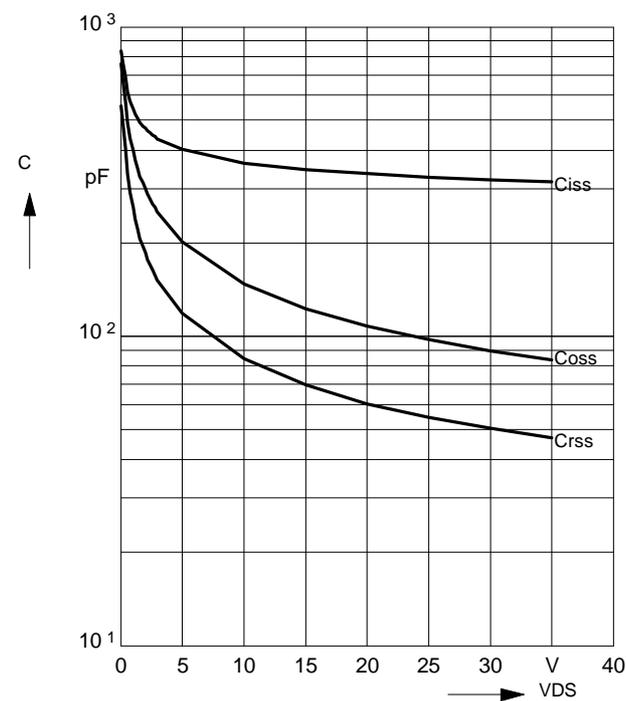
Forward characteristics of reverse diode

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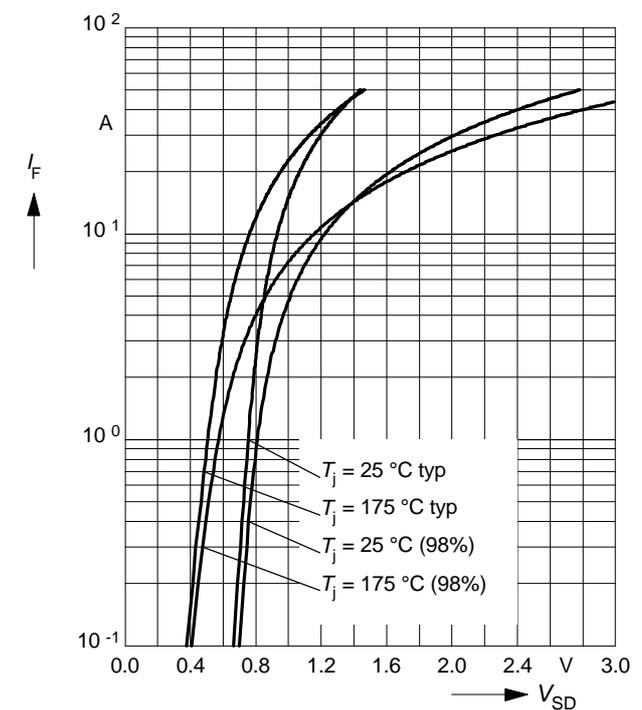
Avalanche energy $E_{AS} = f(T_j)$

parameter: I_D=12.5 A, V_{DD} =25 V

R_{GS} =25 Ω , L = 666 µH
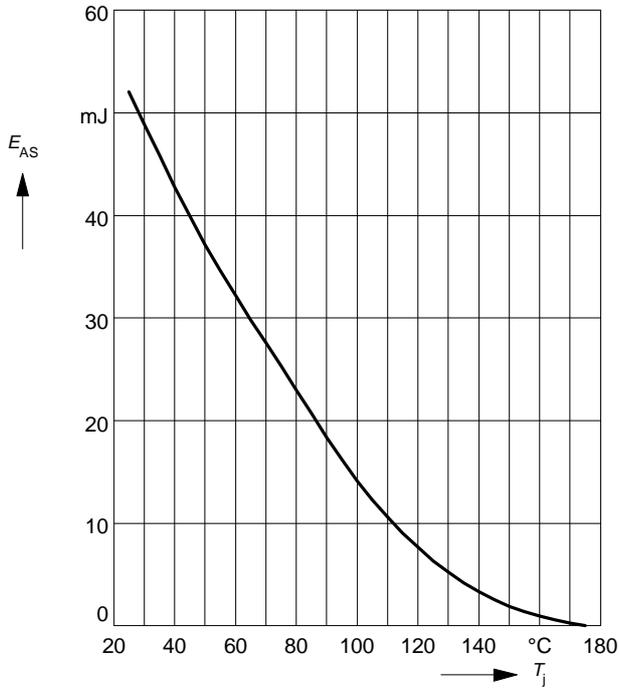
Typ. gate charge

$V_{GS} = f(Q_{Gate})$
parameter: $I_{D\ puls}$ = 12 A

Drain-source breakdown voltage

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