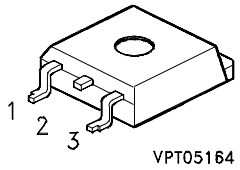
SIEMENS

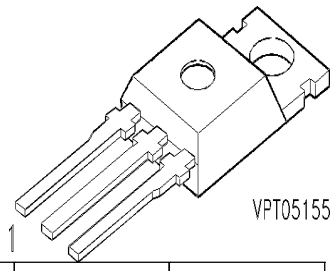
Preliminary data

SPP46N03
SPB46N03

SIPMOS® Power Transistor

- N-Channel
- Enhancement mode
- Avalanche rated
- d*v*/d*t* rated
- 175°C operating temperature





Pin 1	Pin 2	Pin 3
G	D	S

Type	V_{DS}	I_D	$R_{DS(on)}$	@ V_{GS}	Package	Ordering Code
SPP46N03	30 V	46 A	0.015 Ω	V_{GS} = 10 V	P-TO220-3-1	Q67040-S4145-A2
SPB46N03					P-TO263-3-2	Q67040-S4742-A3

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

Parameter	Symbol	Value	Unit
Continuous drain current	I_D		A
T_C = 25 °C, 1)		46	
T_C = 100 °C		46	
Pulsed drain current	$I_{D\ puls}$	184	
T_C = 25 °C			
Avalanche energy, single pulse	E_{AS}	250	mJ
I_D = 46 A, V_{DD} = 25 V, R_{GS} = 25 Ω			
Avalanche current,periodic limited by T_{jmax}	I_{AR}	46	A
Avalanche energy,periodic limited by $T_{j(max)}$	E_{AR}	12	mJ
Reverse diode d*v*/d*t*	d*v*/d*t*	6	kV/µs
I_S = 46 A, V_{DS} = 24 V, d*i*/d*t* = 200 A/µs,			
T_{jmax} = 175 °C			
Gate source voltage	V_{GS}	±20	V
Power dissipation	P_{tot}	120	W
T_C = 25 °C			
Operating temperature	T_j	-55 ... +175	°C
Storage temperature	T_{stg}	-55 ... +175	
IEC climatic category; DIN IEC 68-1		55/175/56	

[1]current limited by bond wire

Electrical Characteristics

Parameter at T_j = 25 °C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Thermal Characteristics					
Thermal resistance, junction - case	R_{thJC}	-		1.25	K/W
Thermal resistance, junction - ambient	R_{thJA}	-	62	-	
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	tbd	-	
@ 6 cm^2 cooling area[1)]		-	tbd	-	

Static Characteristics

Drain- source breakdown voltage V_{GS} = 0 V, I_D = 0.25 mA	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, V_{GS} = V_{DS} I_D = 80 µA, T_j = 25 °C	$V_{GS(th)}$	2.1	3	4	
Zero gate voltage drain current	I_{DSS}				µA
V_{DS} = 30 V, V_{GS} = 0 V, T_j = 25 °C		-	0.1	1	
V_{DS} = 30 V, V_{GS} = 0 V, T_j = 150 °C		-	-	100	
Gate-source leakage current V_{GS} = 20 V, V_{DS} = 0 V	I_{GSS}	-	10	100	nA
Drain-Source on-state resistance V_{GS} = 10 V, I_D = 46 A	$R_{DS(on)}$	-	0.009	0.015	Ω

1 Device on 50mm*50mm*1.5mm epoxy PCB FR4 with 6 cm2 (one layer, 70µm thick) copper area for drain connection. PCB is vertical without blown air.

Electrical Characteristics

Parameter at T_j = 25 °C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Transconductance $V_{DS} \geq 2 * I_D * R_{DS(on)max}$, I_D = 46 A	g_{fs}	20	39	-	S
Input capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{iss}	-	1400	1750	pF
Output capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{oss}	-	645	810	
Reverse transfer capacitance V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	C_{rss}	-	260	325	
Turn-on delay time V_{DD} = 15 V, V_{GS} = 10 V, I_D = 46 A, R_G = 6.8 Ω	$t_{d(on)}$	-	13	20	ns
Rise time V_{DD} = 15 V, V_{GS} = 10 V, I_D = 46 A, R_G = 6.8 Ω	t_r	-	24	36	
Turn-off delay time V_{DD} = 15 V, V_{GS} = 10 V, I_D = 46 A, R_G = 6.8 Ω	$t_{d(off)}$	-	27	42	
Fall time V_{DD} = 15 V, V_{GS} = 10 V, I_D = 46 A, R_G = 6.8 Ω	t_f	-	24	36	

Electrical Characteristics

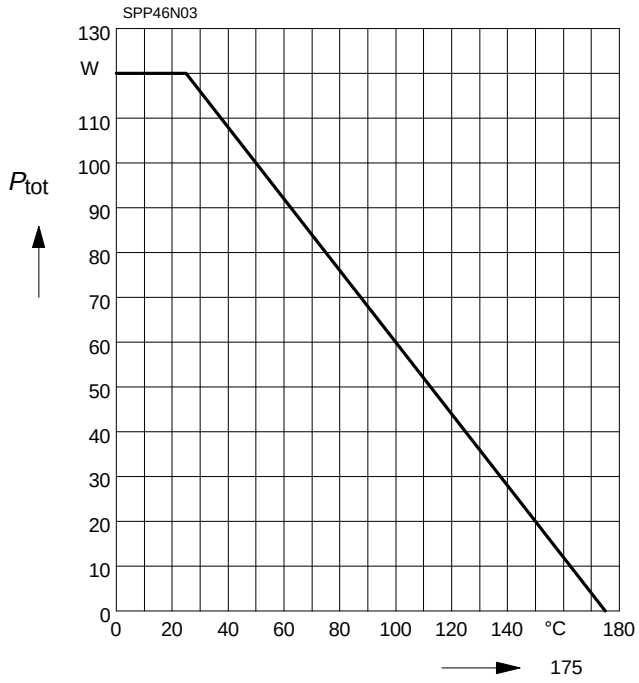
Parameter at T_j = 25 °C, unless otherwise specified	Symbol	Values			Unit
		min.	typ.	max.	
Dynamic Characteristics					
Gate charge at threshold V_{DD} = 24 V, I_D≥0,1 A, V_{GS} = 0 to 1 V	$Q_{G(th)}$	-	2.4	3.6	nC
Gate charge at V_{gs}=7V V_{DD} = 24 V, I_D = 46 A, V_{GS} = 0 to 7 V	$Q_{g(7)}$	-	30.2	45	nC
Gate charge total V_{DD} = 24 V, I_D = 46 A, V_{GS} = 0 to 10 V	Q_g	-	39	60	
Gate plateau voltage V_{DD} = 24 V, I_D = 46 A	$V_{(plateau)}$	-	5.5	-	V

Reverse Diode

Inverse diode continuous forward current T_C = 108 °C	I_S	-	-	46	A
Inverse diode direct current,pulsed T_C = 25 °C	I_{SM}	-	-	184	
Inverse diode forward voltage V_{GS} = 0 V, I_F = 92 A	V_{SD}	-	1.06	1.7	V
Reverse recovery time V_R = 15 V, I_F=I_S , di_F/dt = 100 A/µs	t_{rr}	-	40	60	ns
Reverse recovery charge V_R = 15 V, I_F=I_S , di_F/dt = 100 A/µs	Q_{rr}	-	0.04	0.06	µC

Power Dissipation

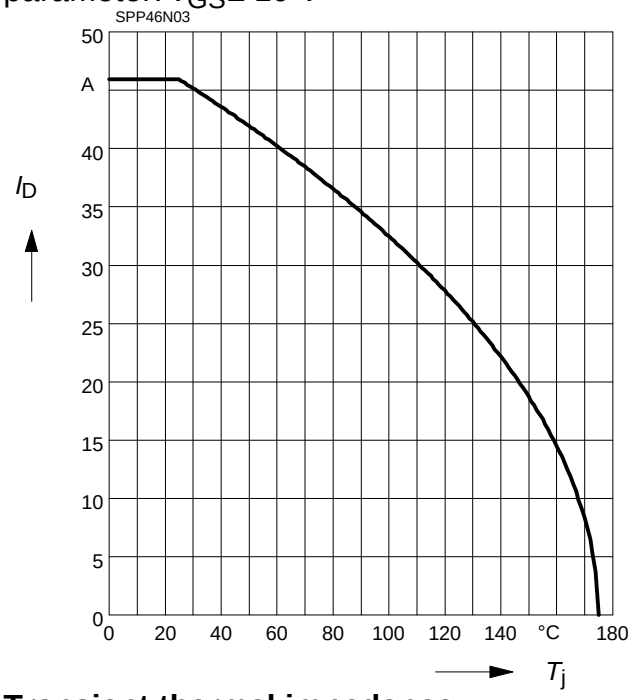
$P_{tot} = f(T_C)$



Drain current

$I_D = f(T_C)$

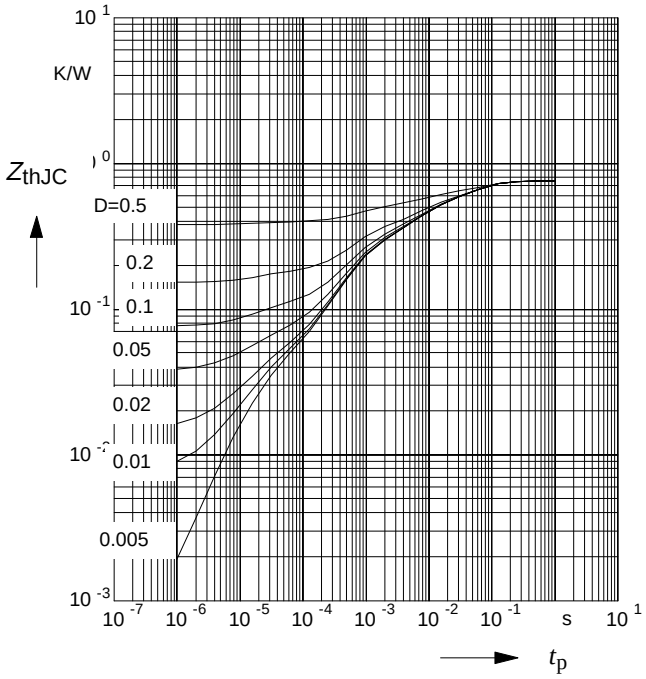
parameter: $V_{GS} \geq 10$ V



Transient thermal impedance

$Z_{thJC} = f(t_p)$

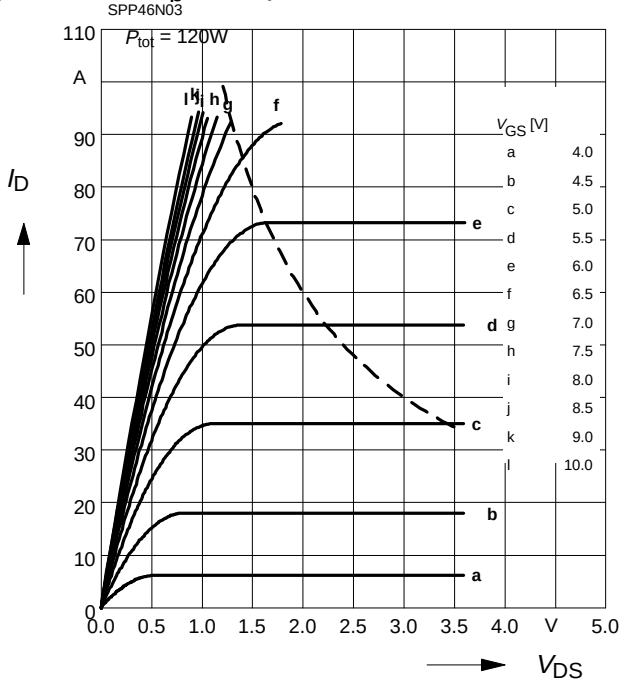
parameter: D = tp/T



Typ. output characteristics

$I_D = f(V_{DS})$

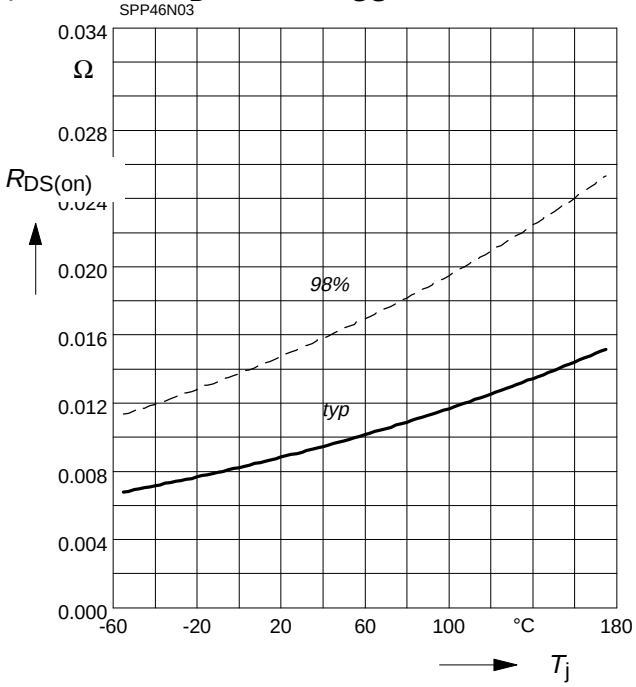
parameter: t_p = 80 µs



Drain-source on-resistance

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

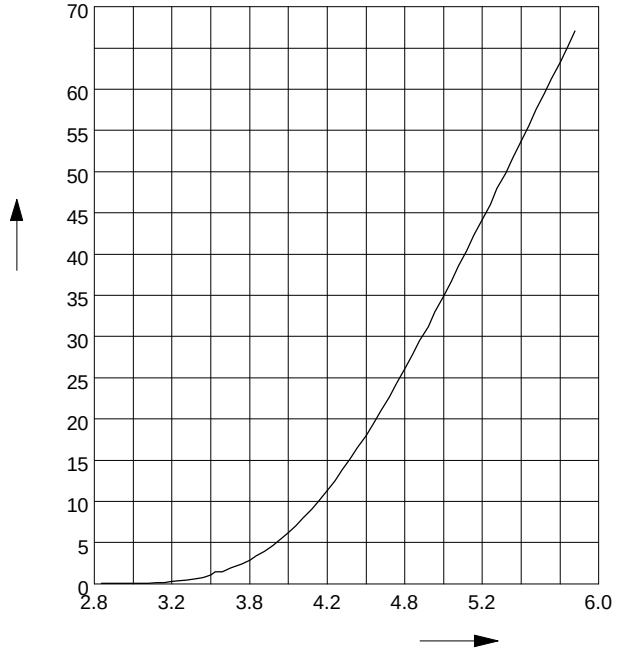
parameter : I_D = 46 A, V_{GS} = 10 V



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

parameter: t_p = 80 µs

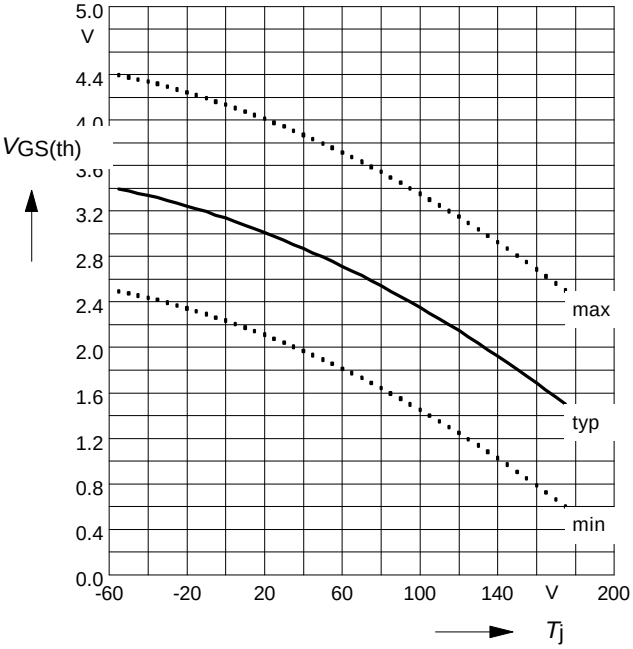
$V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$



Gate threshold voltage

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

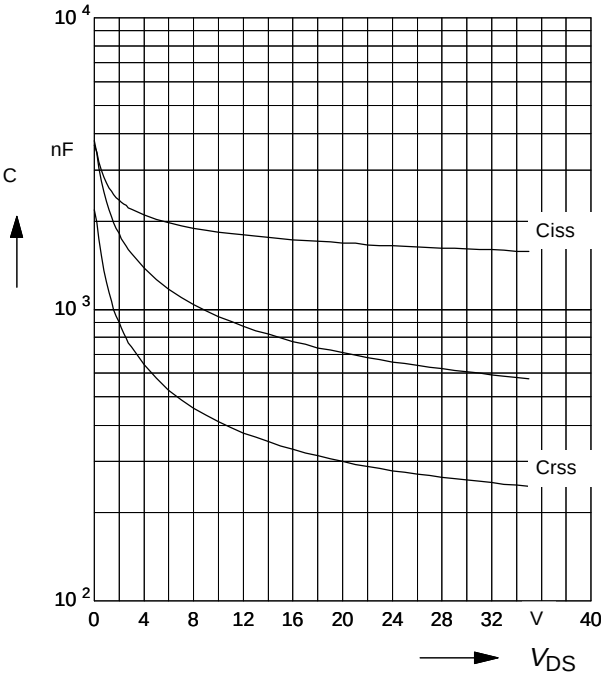
parameter : $V_{GS} = V_{DS}$, I_D = 80 µA



Typ. capacitances

$C = f(V_{DS})$

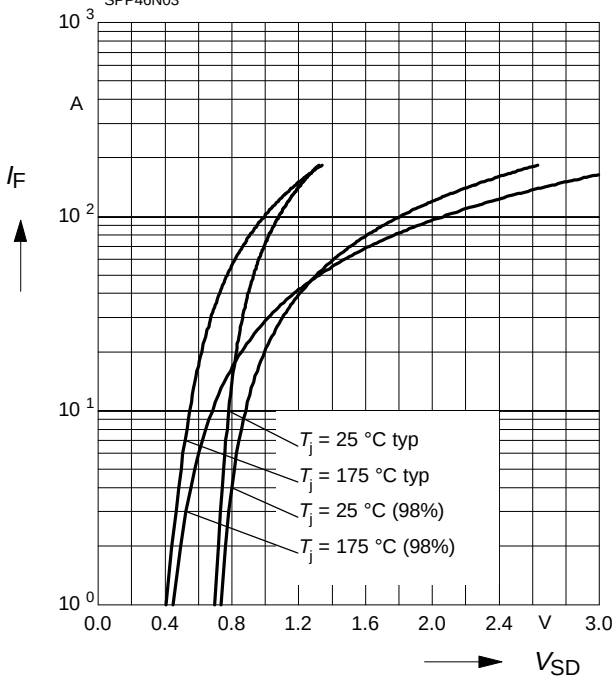
Parameter: V_{GS}=0 V, f=1 MHz



Forward characteristics of reverse diode

$I_F = f(V_{SD})$

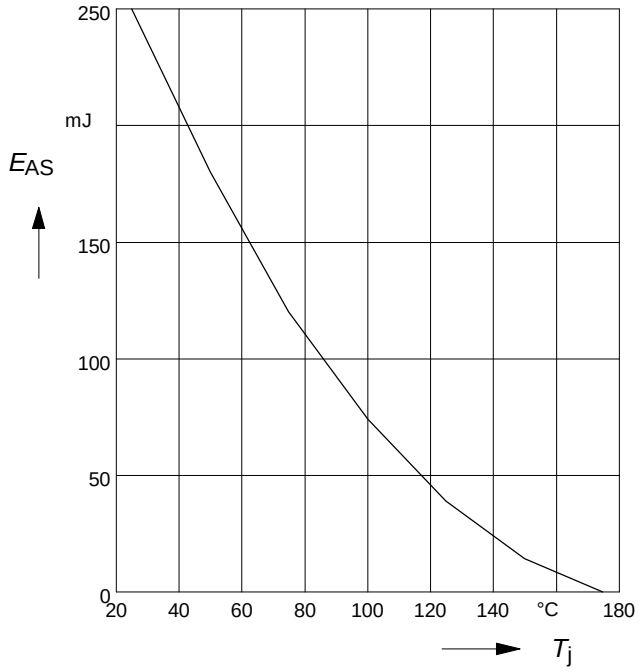
parameter: T_j , tp = 80 µs



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

parameter: I_D = 46 A, V_{DD} = 25 V

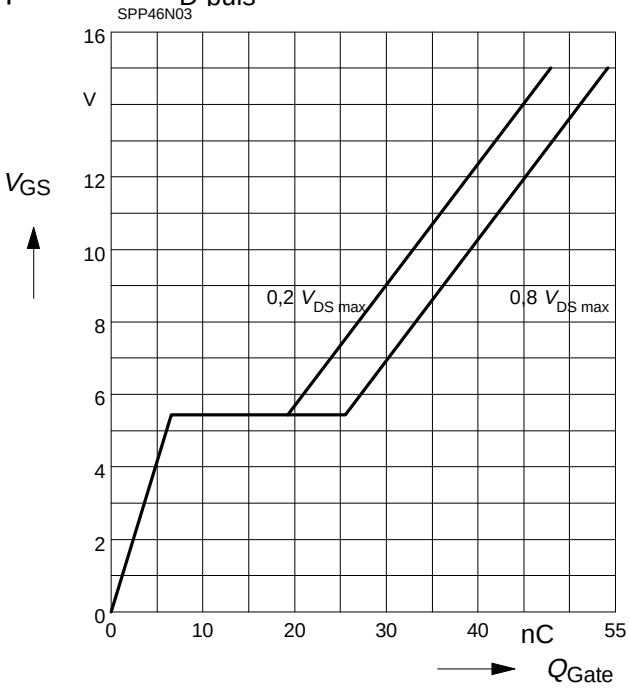
R_{GS} = 25 Ω



Typ. gate charge

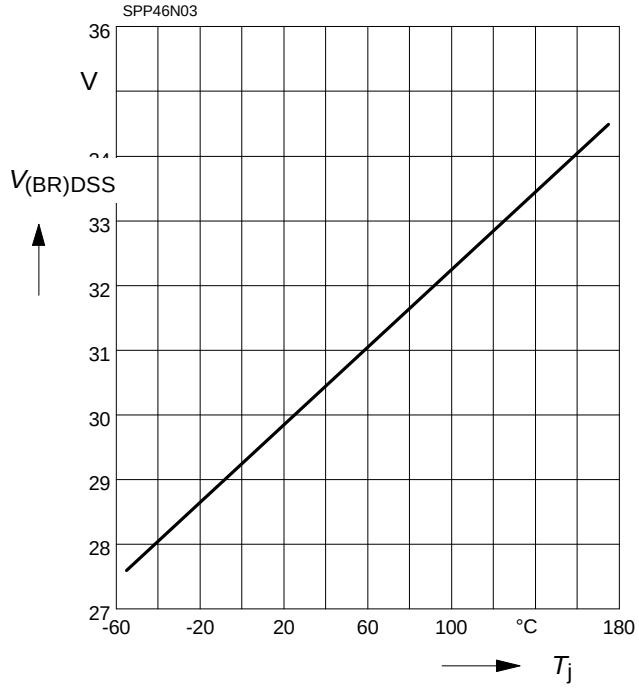
$V_{GS} = f(Q_{Gate})$

parameter: $I_{D\ puls}$ =46A



Drain-source breakdown voltage

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



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