

OptiMOS™ Buck converter series

Feature

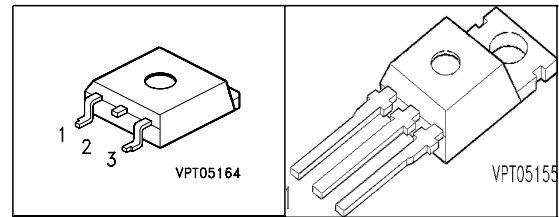
- N-Channel
- Logic Level
- Low on-resistance $R_{DS(on)}$
- Excellent Gate Charge x $R_{DS(on)}$ product (FOM)
- Superior thermal resistance
- 175°C operating temperature
- dv/dt rated
- Ideal for fast switching buck converters

Product Summary

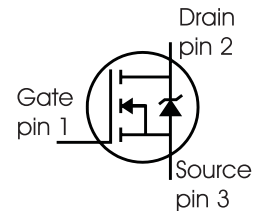
V_{DS}	30	V
$R_{DS(on)}$ max. SMD version	5.9	mΩ
I_D	80	A

P-TO263-3-2

P-TO220-3-1



Type	Package	Ordering Code	Marking
IPP07N03L	P-TO220-3-1	Q67042-S4051	07N03L
IPB07N03L	P-TO263-3-2	Q67042-S4082	07N03L



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

Parameter	Symbol	Value	Unit
Continuous drain current $T_C = 25^\circ\text{C}$, ¹⁾ $T_C = 100^\circ\text{C}$	I_D	80 80	A
Pulsed drain current $T_C = 25^\circ\text{C}$	I_D puls	320	
Avalanche energy, single pulse $I_D = 20\text{A}$, $V_{DD} = 25\text{V}$, $R_{GS} = 25\Omega$	E_{AS}	30	mJ
Reverse diode dv/dt $I_S = 80\text{A}$, $V_{DS} = 24\text{V}$, $di/dt = 200\text{A}/\mu\text{s}$, $T_{jmax} = 175^\circ\text{C}$	dv/dt	6	kV/ μs
Gate source voltage	V_{GS}	± 20	V
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	125	W
Operating and storage temperature	T_j , T_{stg}	-55... +175	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1		55/175/56	

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Characteristics					
Thermal resistance, junction - case	R_{thJC}	-	-	1	K/W
SMD version, device on PCB:	R_{thJA}				
@ min. footprint		-	-	62	
@ 6 cm ² cooling area ²⁾		-	-	40	

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Static Characteristics					
Drain-source breakdown voltage $V_{GS}=0V, I_D=1mA$	$V_{(BR)DSS}$	30	-	-	V
Gate threshold voltage, $V_{GS} = V_{DS}$ $I_D = 80\text{ }\mu A$	$V_{GS(th)}$	1.2	1.6	2	
Zero gate voltage drain current $V_{DS}=30V, V_{GS}=0V, T_j=25^\circ C$ $V_{DS}=30V, V_{GS}=0V, T_j=125^\circ C$	I_{DSS}	-	0.01	1	μA
		-	10	100	
Gate-source leakage current $V_{GS}=20V, V_{DS}=0V$	I_{GSS}	-	1	100	nA
Drain-source on-state resistance $V_{GS}=4.5V, I_D=50A$ $V_{GS}=4.5V, I_D=50A, \text{ SMD version}$	$R_{DS(on)}$	-	7.1	10	m Ω
		-	6.8	9.7	
Drain-source on-state resistance ³⁾ $V_{GS}=10V, I_D=50A$ $V_{GS}=10V, I_D=50A, \text{ SMD version}$	$R_{DS(on)}$	-	4.8	6.2	
		-	4.5	5.9	

¹Current limited by bondwire; with a $R_{thJC} = 1\text{ K/W}$ the chip is able to carry $I_D = 135A$ and calculated with max. source pin temperature of $85^\circ C$.

²Device on 40mm*40mm*1.5mm epoxy PCB FR4 with 6cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical without blown air.

³Diagrams are related to straight lead versions

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

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic Characteristics						
Transconductance	g_{fs}	$V_{DS} \geq 2 \cdot I_D \cdot R_{DS(on)max}$, $I_D = 80\text{A}$	44	88	-	S
Input capacitance	C_{iss}	$V_{GS} = 0\text{V}$, $V_{DS} = 25\text{V}$, $f = 1\text{MHz}$	-	1890	2360	pF
Output capacitance	C_{oss}		-	750	940	
Reverse transfer capacitance	C_{rss}		-	170	258	
Gate resistance	R_G		-	2.2	-	Ω
Turn-on delay time	$t_{d(on)}$	$V_{DD} = 15\text{V}$, $V_{GS} = 10\text{V}$, $I_D = 20\text{A}$, $R_G = 3.6\Omega$	-	10.4	15.6	ns
Rise time	t_r		-	59	88	
Turn-off delay time	$t_{d(off)}$		-	73	109	
Fall time	t_f		-	61	91	

Gate Charge Characteristics

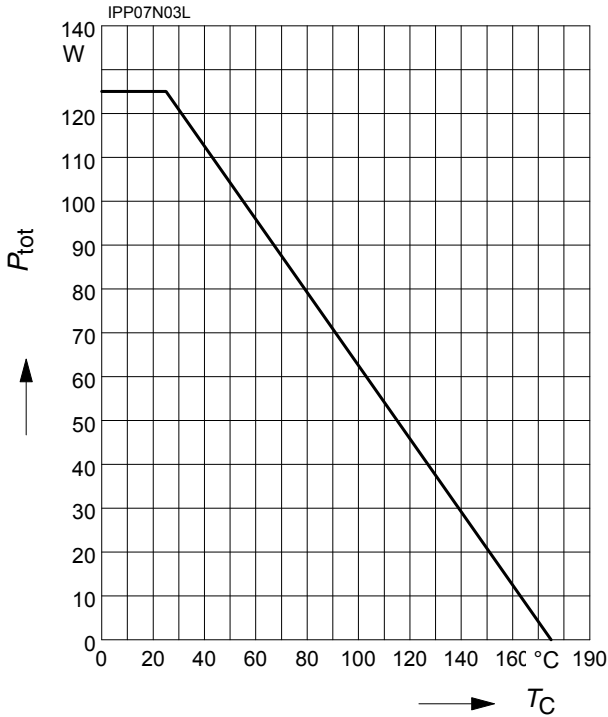
Gate to source charge	Q_{gs}	$V_{DD} = 15\text{V}$, $I_D = 20\text{A}$	-	5.4	6.8	nC
Gate to drain charge	Q_{gd}		-	16.4	24.6	
Gate charge total	Q_g	$V_{DD} = 15\text{V}$, $I_D = 20\text{A}$, $V_{GS} = 0$ to 5V	-	27.4	34.3	
Output charge	Q_{oss}		$V_{DS} = 15\text{V}$, $I_D = 20\text{A}$, $V_{GS} = 0\text{V}$	-	26.4	
Gate plateau voltage	$V_{(plateau)}$	$V_{DD} = 15\text{V}$, $I_D = 20\text{A}$	-	3.1	-	V

Reverse Diode

Inverse diode continuous forward current	I_S	$T_C = 25\text{ }^\circ\text{C}$	-	-	80	A
Inverse diode direct current, pulsed	I_{SM}		-	-	320	
Inverse diode forward voltage	V_{SD}	$V_{GS} = 0\text{V}$, $f_F = 80\text{A}$	-	0.9	1.3	V
Reverse recovery time	t_{rr}	$V_R = 15\text{V}$, $f_F = 5$, $di_F/dt = 100\text{A}/\mu\text{s}$	-	33	40	ns
Reverse recovery charge	Q_{rr}		-	32	40	nC

1 Power dissipation

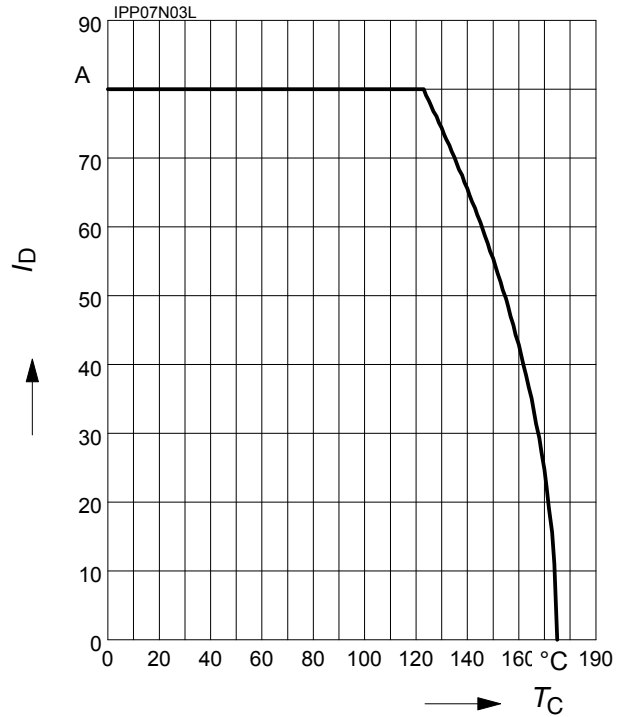
$$P_{tot} = f(T_C)$$



2 Drain current

$$I_D = f(T_C)$$

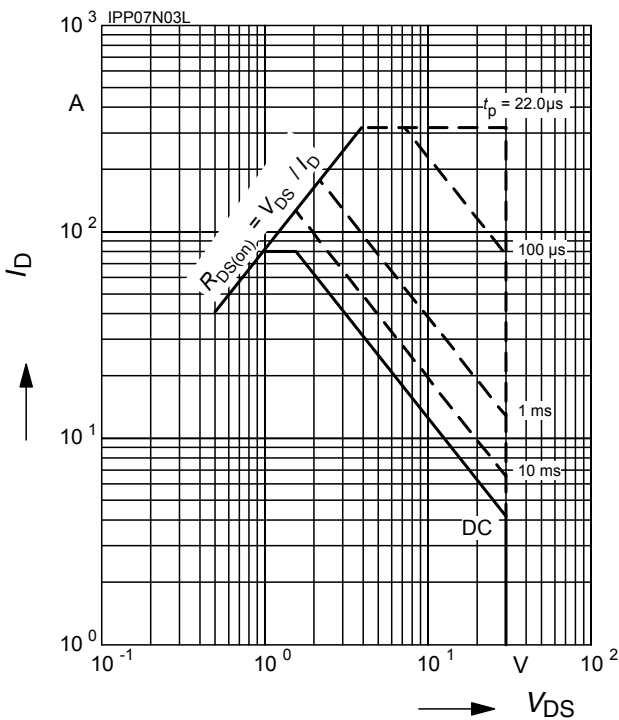
parameter: $V_{GS} \geq 10 \text{ V}$



3 Safe operating area

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

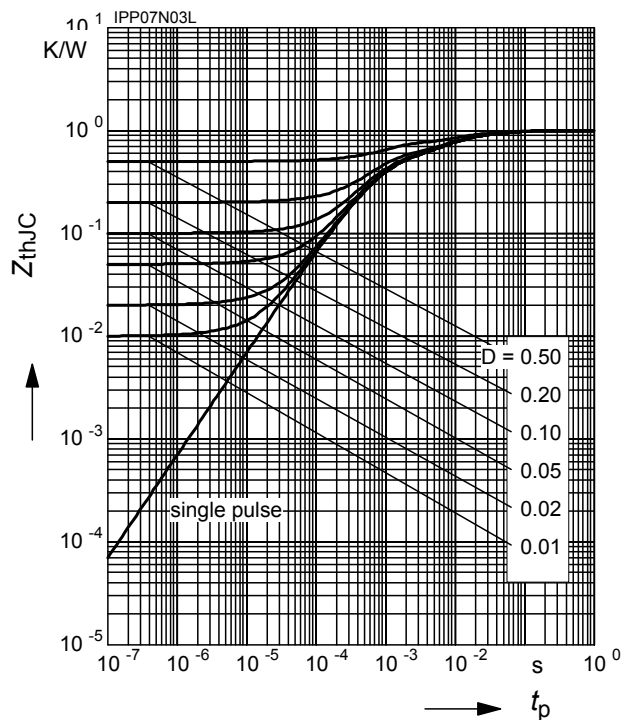
parameter: $D = 0$, $T_C = 25 \text{ °C}$



4 Transient thermal impedance

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

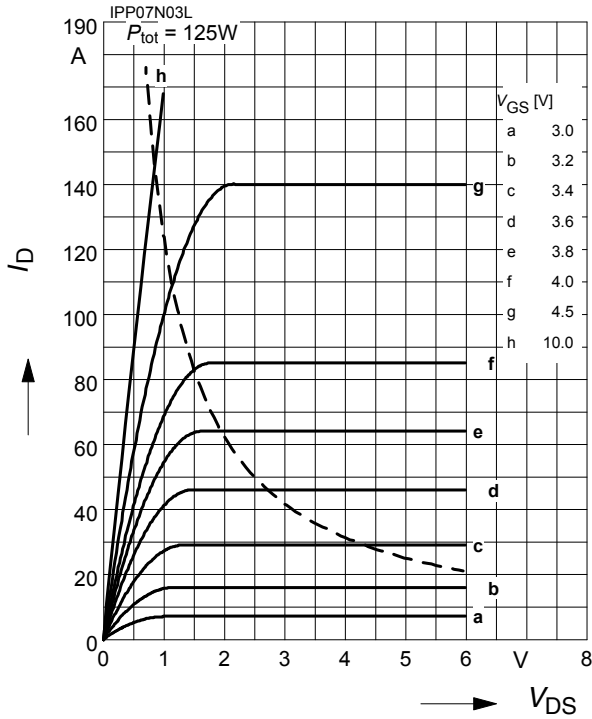
parameter: $D = t_p/T$



5 Typ. output characteristic

$I_D = f(V_{DS}); T_j = 25^\circ\text{C}$

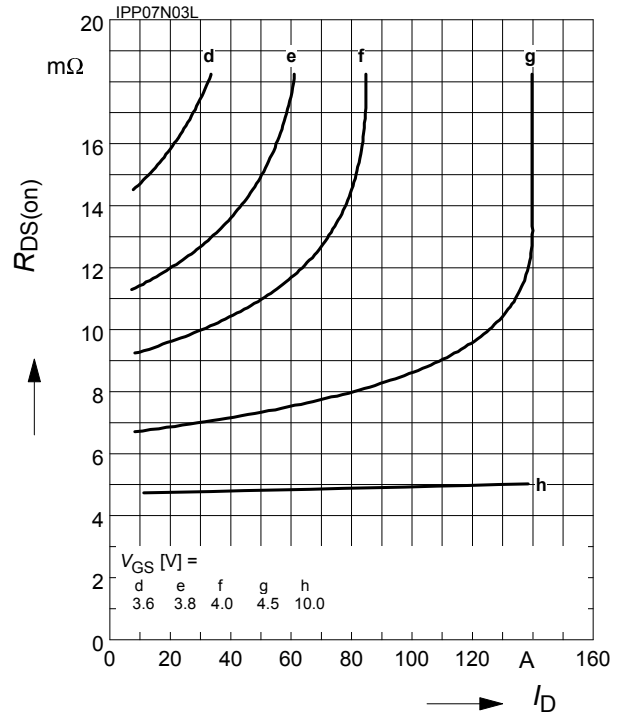
parameter: $t_p = 80 \mu\text{s}$



6 Typ. drain-source on resistance

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

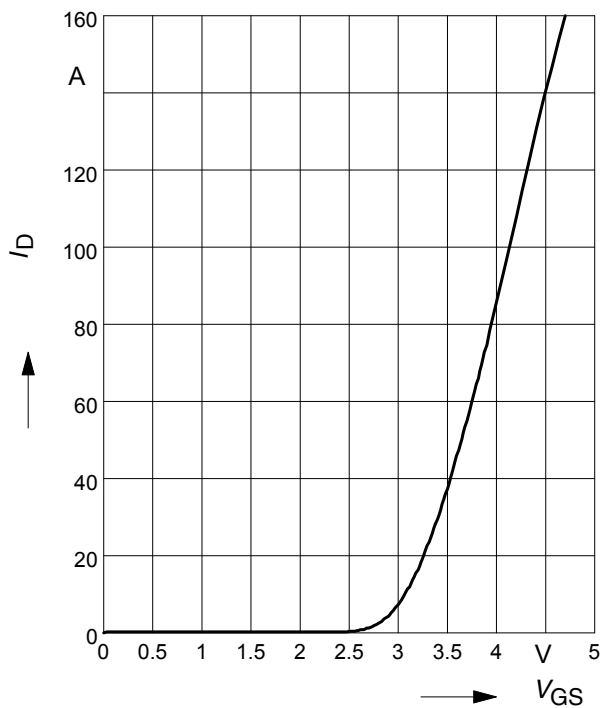
parameter: V_{GS}



7 Typ. transfer characteristics

$I_D = f(V_{GS}); V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$

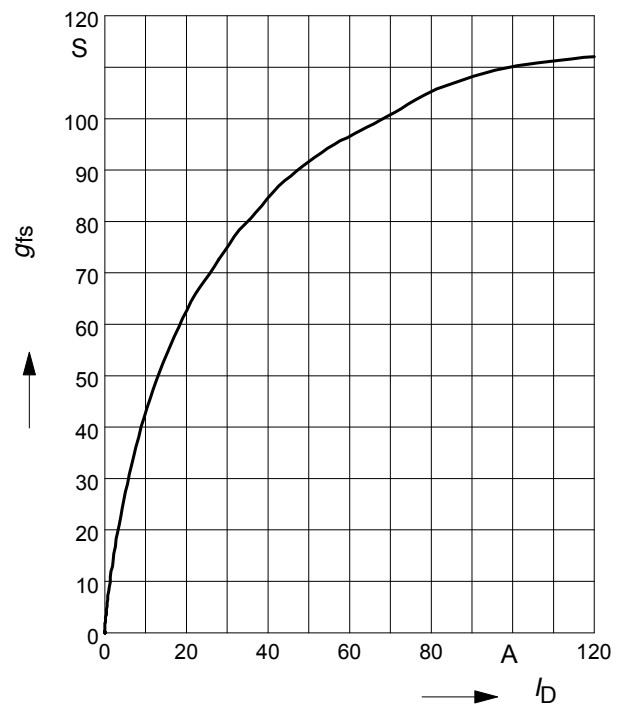
parameter: $t_p = 80 \mu\text{s}$



8 Typ. forward transconductance

$g_{fs} = f(I_D); T_j = 25^\circ\text{C}$

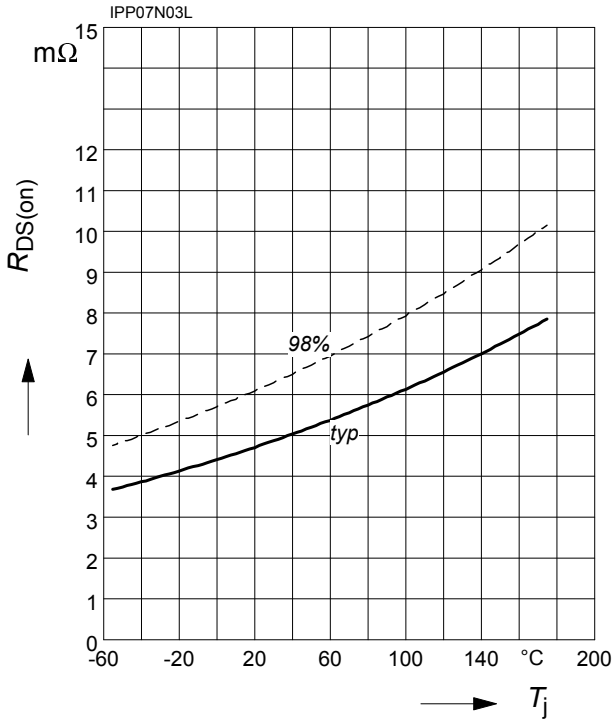
parameter: g_{fs}



9 Drain-source on-state resistance

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

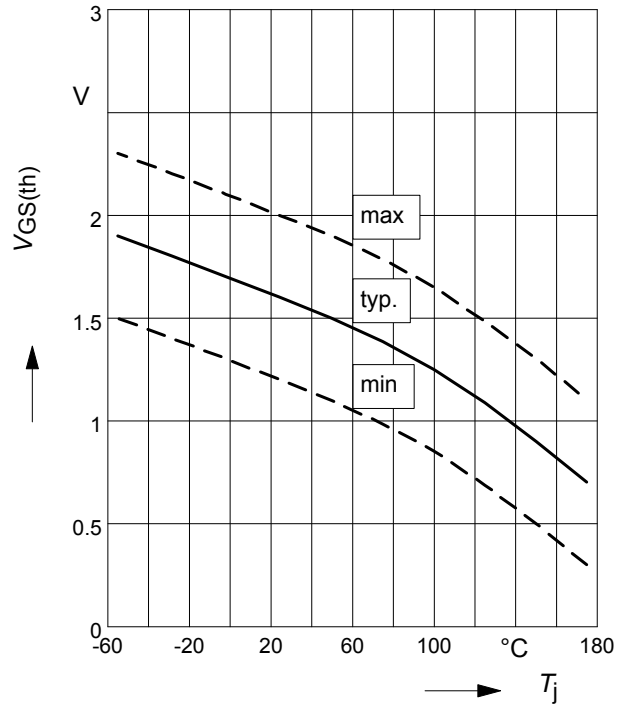
parameter : $I_D = 50 \text{ A}$, $V_{GS} = 10 \text{ V}$



10 Gate threshold voltage

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

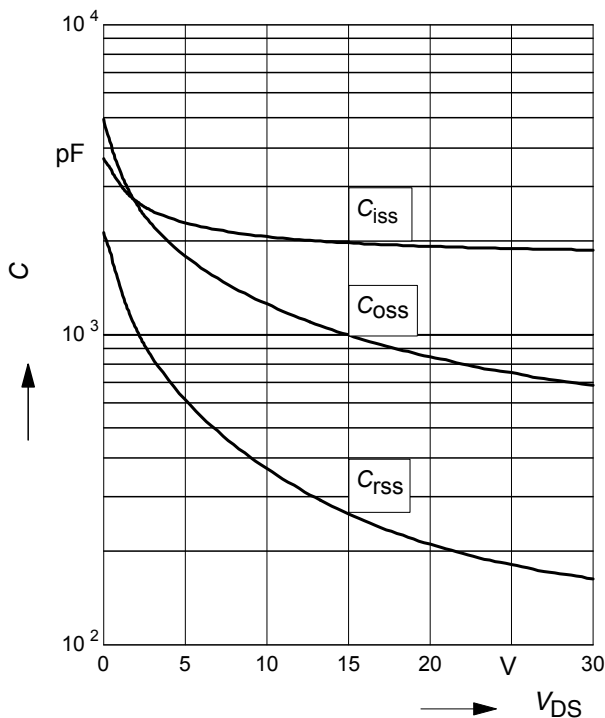
parameter: $V_{GS} = V_{DS}$, $I_D = 80 \mu\text{A}$



11 Typ. capacitances

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

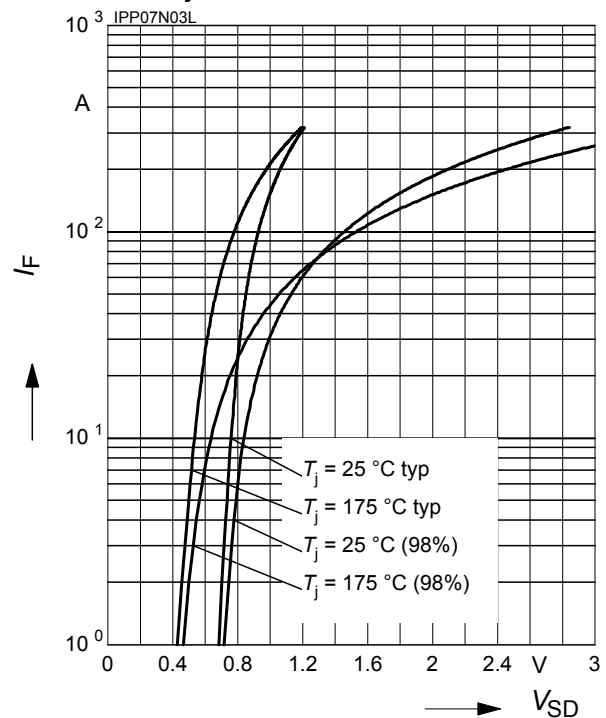
parameter: $V_{GS}=0\text{V}$, $f=1 \text{ MHz}$



12 Forward character. of reverse diode

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

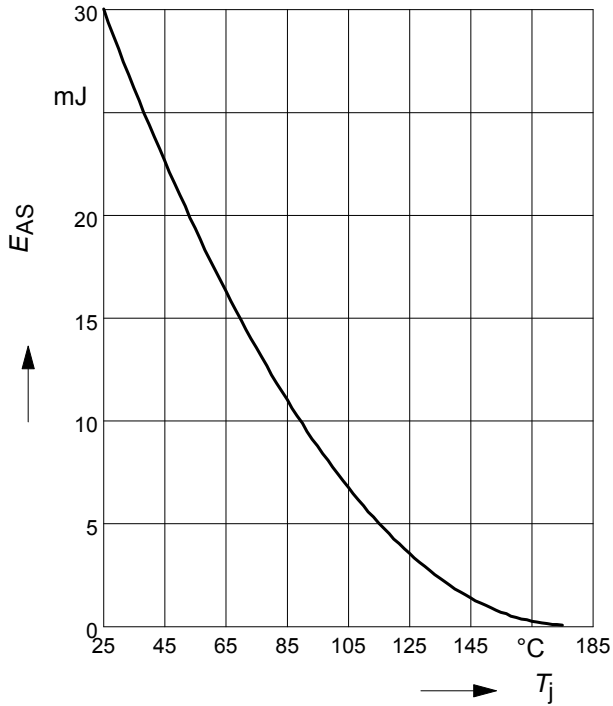
parameter: T_j , $t_p = 80 \mu\text{s}$



13 Typ. avalanche energy

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

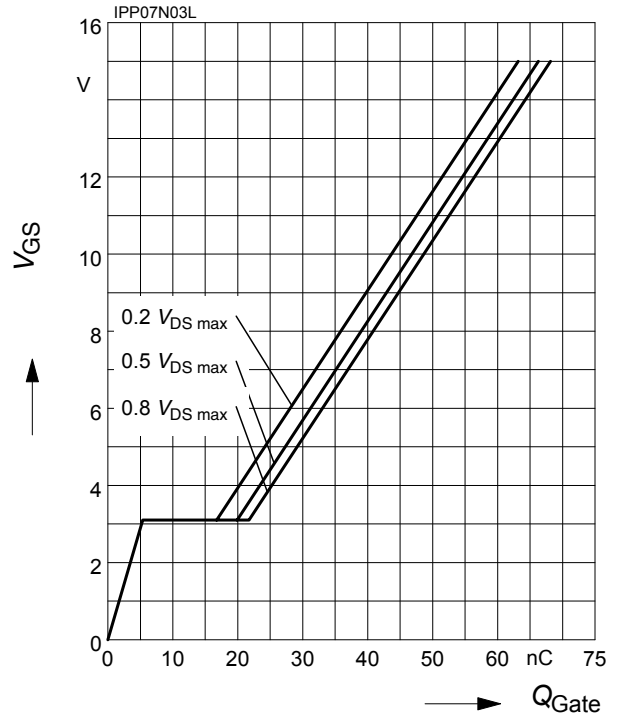
par.: $I_D = 20\text{ A}$, $V_{DD} = 25\text{ V}$, $R_{GS} = 25\ \Omega$



14 Typ. gate charge

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

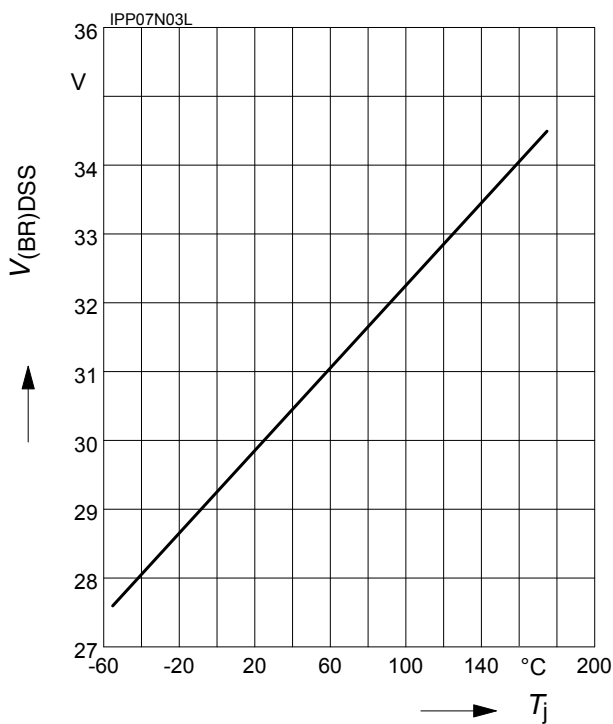
parameter: $I_D = 80\text{ A}$ pulsed



15 Drain-source breakdown voltage

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

parameter: $I_D = 10\text{ mA}$



Published by
Infineon Technologies AG,
Bereichs Kommunikation
St.-Martin-Strasse 53,
D-81541 München
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