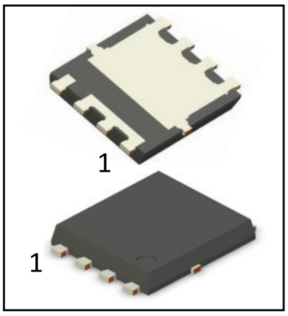
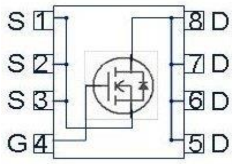
OptiMOS™ - 6 Power-Transistor

Product Summary

V_{DS}	40	V
$R_{DS(on),max}$	4.0	mΩ
I_D	60	A

PG-TDSON-8





Features

- OptiMOS™ - power MOSFET for automotive applications
- N-channel - Enhancement mode - Logic Level
- AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green Product (RoHS compliant)
- 100% Avalanche tested

Type	Package	Marking
IAUC60N04S6L039	PG-TDSON-8	6N04L039

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

Parameter	**Symbol**	**Conditions**	**Value**	**Unit**
Continuous drain current[1)]	I_D	T_C=25°C, V_{GS}=10V	60	A
		T_C=100°C, V_{GS}=10V[2)]	54	
Pulsed drain current[2)]	$I_{D,pulse}$	T_C=25°C	240	
Avalanche energy, single pulse[2)]	E_{AS}	I_D=12A, $R_{G,min}$=25Ω	48.0	mJ
Avalanche current, single pulse	I_{AS}	$R_{G,min}$=25Ω	12	A
Gate source voltage	V_{GS}	-	±16	V
Power dissipation	P_{tot}	T_C=25°C	42	W
Operating and storage temperature	T_j, T_{stg}	-	-55 ... +175	°C

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics[2)]						
Thermal resistance, junction - case	R_{thJC}	-	-	-	3.6	K/W
Thermal resistance, junction - ambient	R_{thJA}	6 cm^2 cooling area[3)]	-	-	50	

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

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Static characteristics						
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D= 1mA	40	-	-	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=14µA	1.2	1.6	2.0	
Zero gate voltage drain current	I_{DSS}	V_{DS}=40V, V_{GS}=0V, T_j=25°C	-	-	1	µA
		V_{DS}=40V, V_{GS}=0V, T_j=125°C[2)]	-	-	5	
Gate-source leakage current	I_{GSS}	V_{GS}=16V, V_{DS}=0V	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=4.5V, I_D=30A	-	4.71	5.90	mΩ
		V_{GS}=10V, I_D=30A	-	3.28	4.02	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Dynamic characteristics[2]						
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	907	1179	pF
Output capacitance	C_{oss}		-	259	337	
Reverse transfer capacitance	C_{rss}		-	20	30	
Turn-on delay time	$t_{d(on)}$	V_{DD}=20V, V_{GS}=10V, I_D=60A, R_G=3.5Ω	-	2	-	ns
Rise time	t_r		-	1	-	
Turn-off delay time	$t_{d(off)}$		-	7	-	
Fall time	t_f		-	3	-	
Gate Charge Characteristics[2]						
Gate to source charge	Q_{gs}	V_{DD}=32V, I_D=60A, V_{GS}=0 to 10V	-	2.9	3.9	nC
Gate to drain charge	Q_{gd}		-	3.1	4.7	
Gate charge total	Q_g		-	15	20	
Gate plateau voltage	$V_{plateau}$		-	3.2	-	V
Reverse Diode						
Diode continous forward current[2]	I_S	T_C=25°C	-	-	60	A
Diode pulse current[2]	$I_{S,pulse}$		-	-	240	
Diode forward voltage	V_{SD}	V_{GS}=0V, I_F=30A, T_j=25°C	-	0.8	1.1	V
Reverse recovery time[2]	t_{rr}	V_R=20V, I_F=50A, di_F/dt=100A/µs	-	31	-	ns
Reverse recovery charge[2]	Q_{rr}		-	18	-	nC

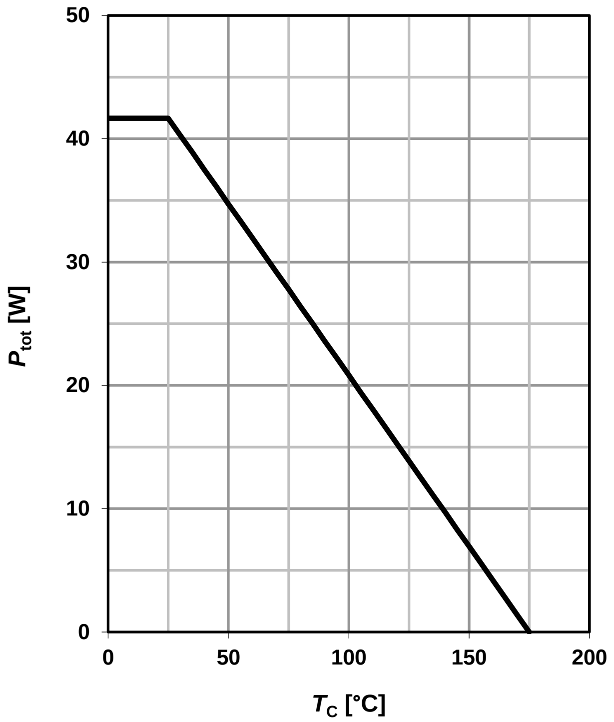
[1] Current is limited by package; with an R_{thJC} = 3.6 K/W the chip is able to carry 76 A at 25°C.

[2] The parameter is not subject to production test- verified by design/characterization.

[3] Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm^2 (one layer, 70 µm thick) copper area for drain connection. PCB is vertical in still air.

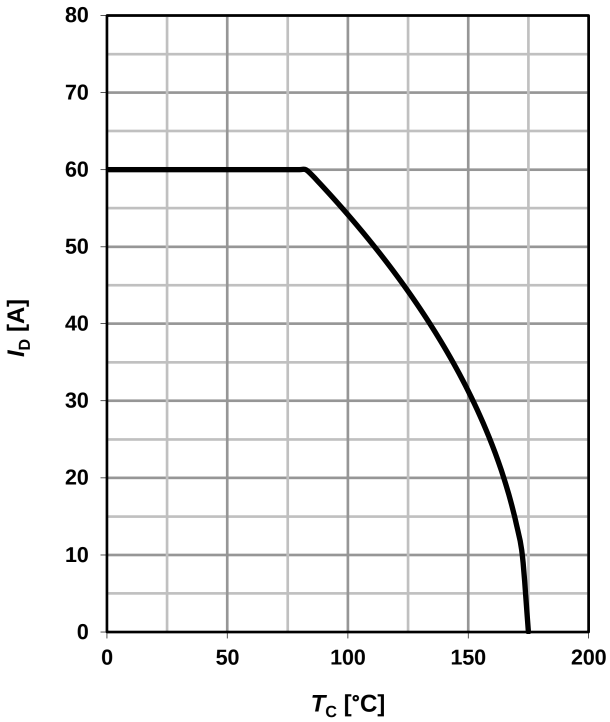
1 Power dissipation

$P_{tot} = f(T_C)$; $V_{GS} = 10$ V



2 Drain current

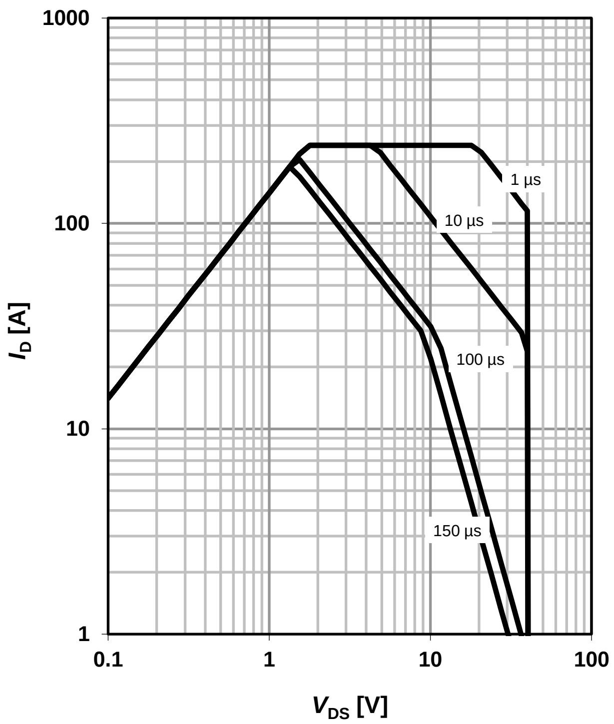
$I_D = f(T_C)$; $V_{GS} = 10$ V



3 Safe operating area

$I_D = f(V_{DS})$; $T_C = 25$ °C; $D = 0$

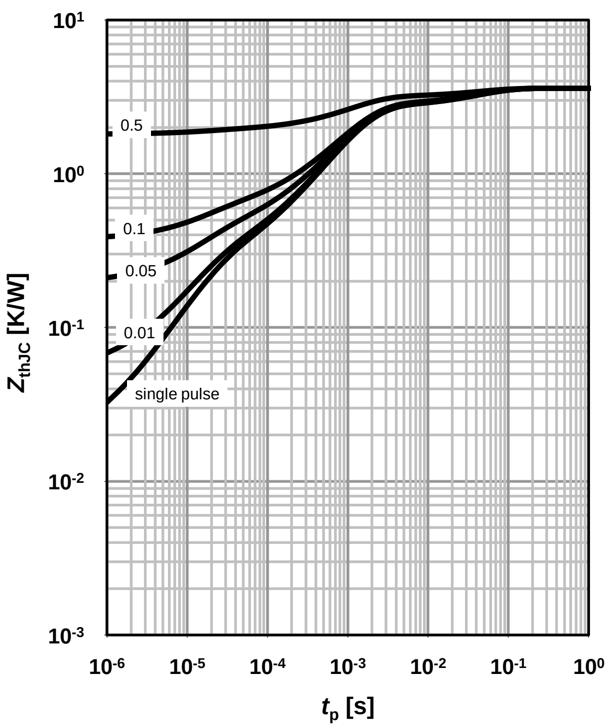
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$

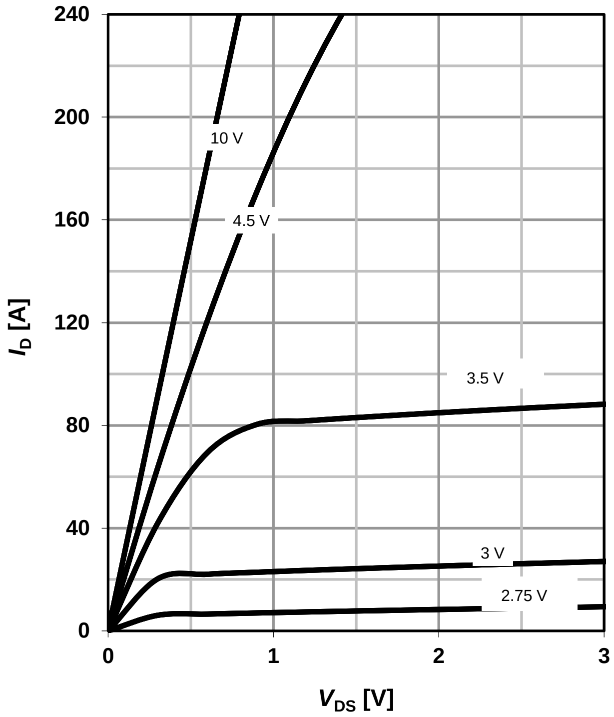
parameter: $D = t_p/T$



5 Typ. output characteristics

$I_D = f(V_{DS})$; $T_j = 25\ °C$

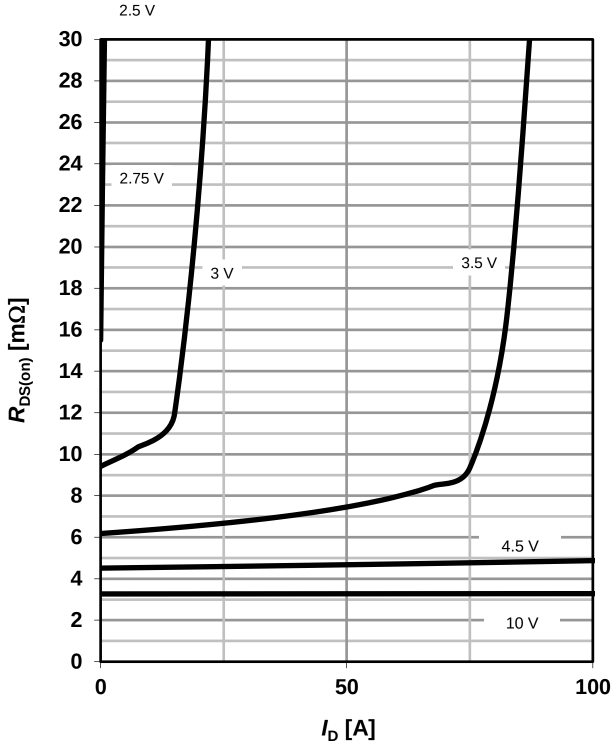
parameter: V_{GS}



6 Typ. drain-source on-state resistance

$R_{DS(on)} = f(I_D)$; $T_j = 25\ °C$

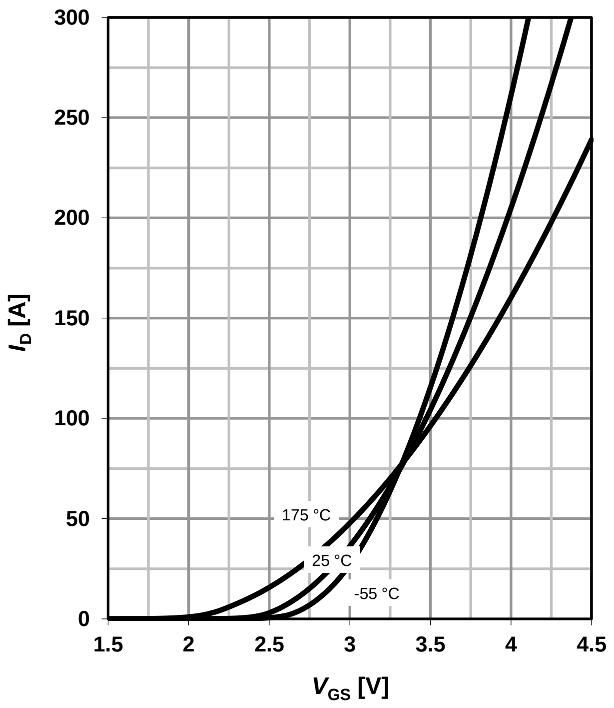
parameter: V_{GS}



7 Typ. transfer characteristics

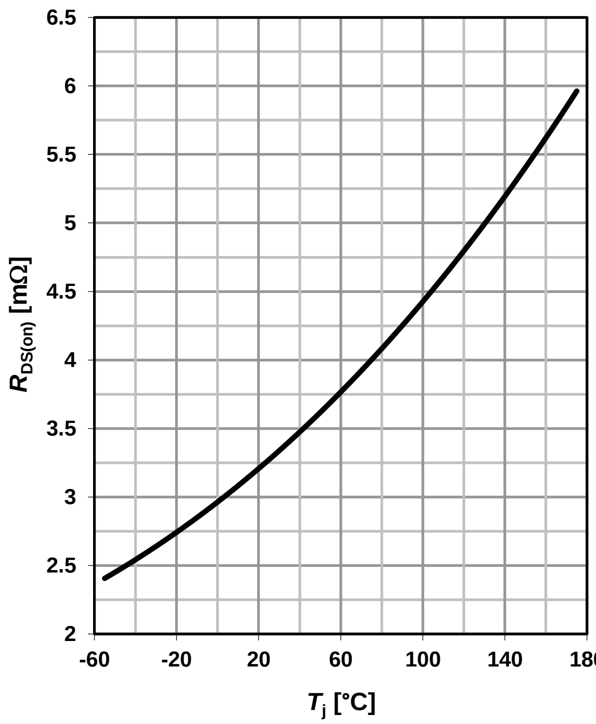
$I_D = f(V_{GS})$; $V_{DS} = 6V$

parameter: T_j



8 Typ. drain-source on-state resistance

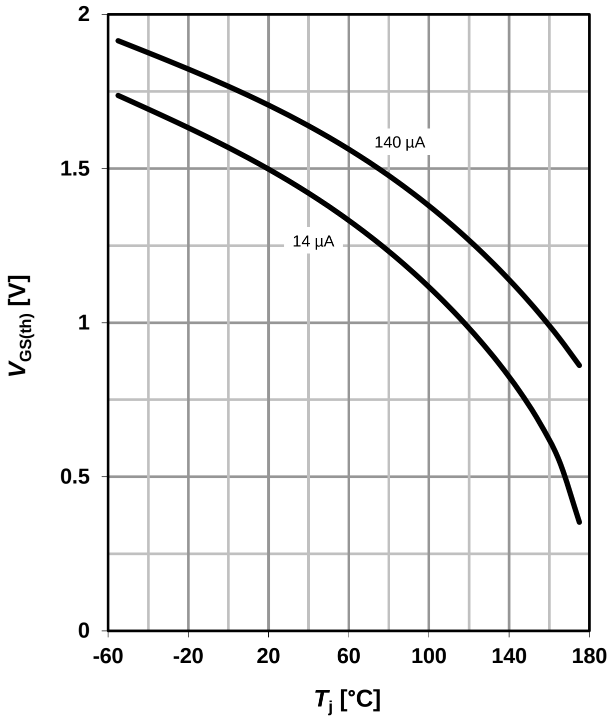
$R_{DS(on)} = f(T_j)$; $I_D = 30\ A$; $V_{GS} = 10\ V$



9 Typ. gate threshold voltage

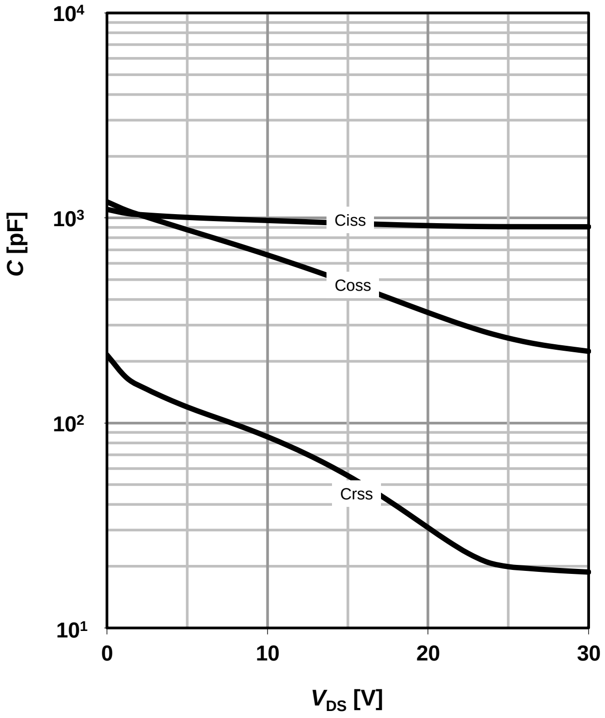
$V_{GS(th)} = f(T_j)$; $V_{GS} = V_{DS}$

parameter: I_D



10 Typ. capacitances

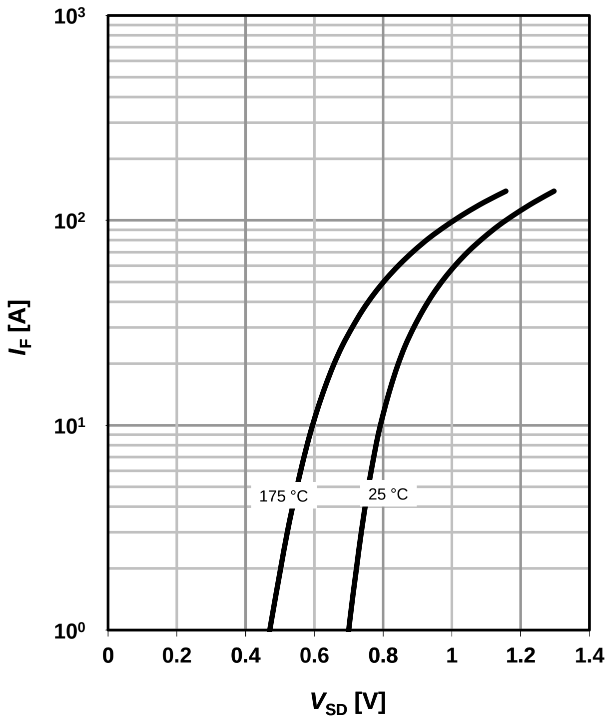
$C = f(V_{DS})$; $V_{GS} = 0$ V; $f = 1$ MHz



11 Typical forward diode characteristicis

IF = f(V_{SD})

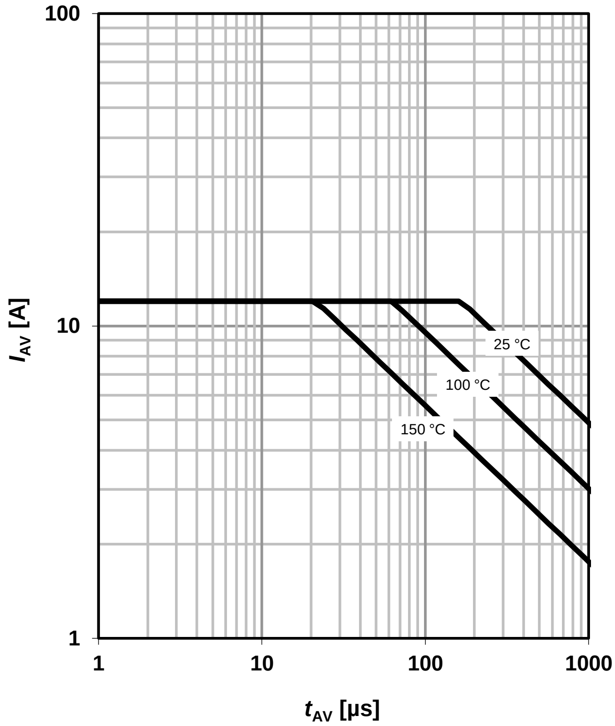
parameter: T_j



12 Avalanche characteristics

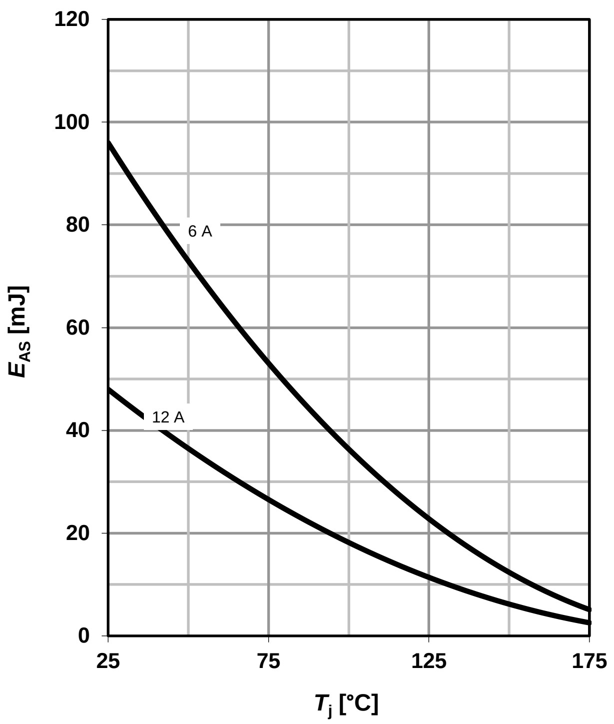
$I_{AS} = f(t_{AV})$

parameter: $T_{j(start)}$



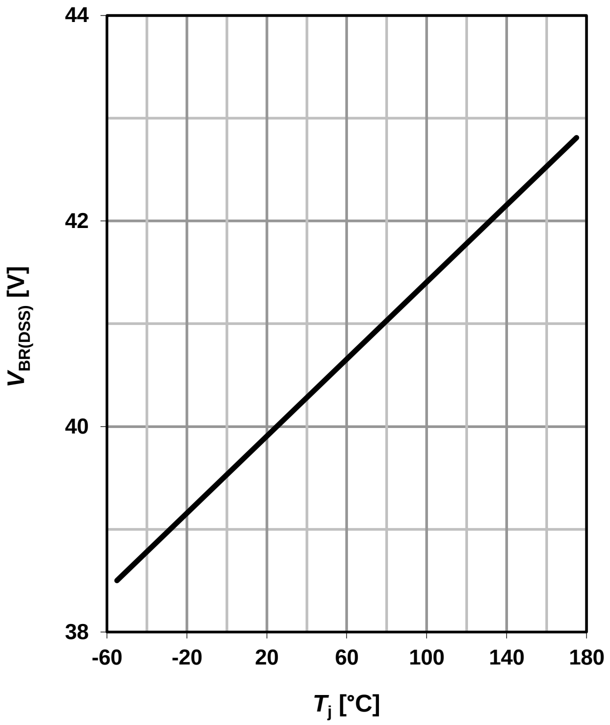
13 Avalanche energy

$E_{AS} = f(T_j)$



14 Drain-source breakdown voltage

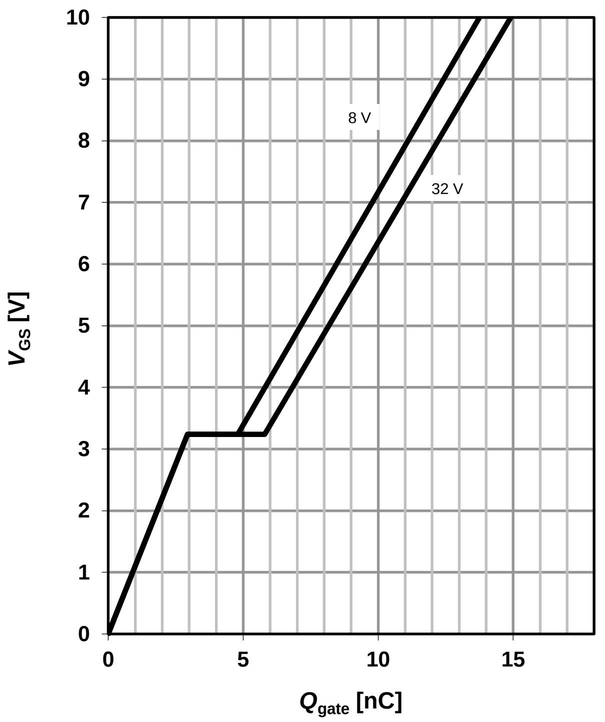
$V_{BR(DSS)} = f(T_j)$; $I_D = 1$ mA



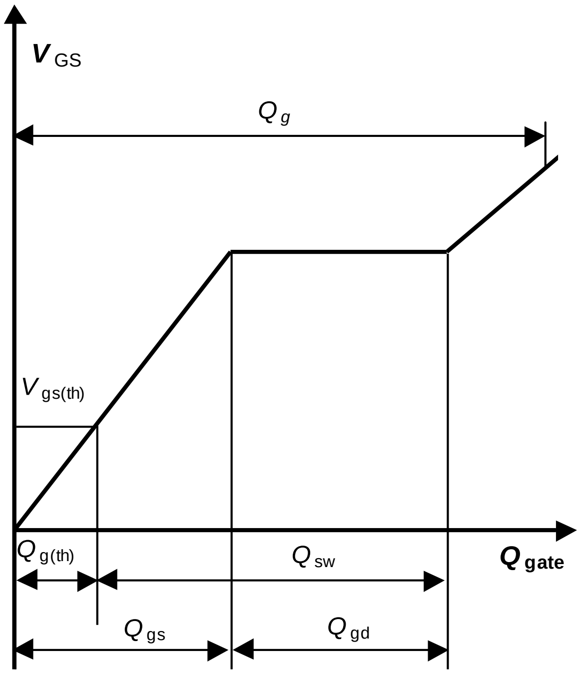
15 Typ. gate charge

$V_{GS} = f(Q_{gate})$; $I_D = 60$ A pulsed

parameter: V_{DD}



16 Gate charge waveforms



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Revision History

Version	Date	Changes