

OptiMOS®-P2 Power-Transistor

Product Summary

V_{DS}	-40	V
$R_{DS(on)}$ (SMD Version)	4.4	m Ω
I_D	-80	A

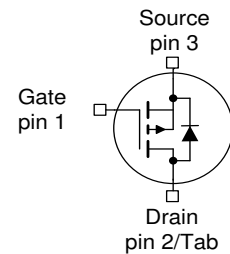
Features

- P-channel - Logic Level - Enhancement mode
- AEC qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green package (RoHS compliant)
- 100% Avalanche tested

PG-TO263-3-2 PG-TO262-3-1 PG-TO220-3-1



Type	Package	Marking
IPB80P04P4L-04	PG-TO263-3-2	4P04L04
IP180P04P4L-04	PG-TO262-3-1	4P04L04
IPP80P04P4L-04	PG-TO220-3-1	4P04L04


Maximum ratings, at $T_j=25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current ¹⁾	I_D	$T_C=25\text{ °C}$, $V_{GS}=-10\text{V}$	-80	A
		$T_C=100\text{ °C}$, $V_{GS}=-10\text{V}^{2)}$	-80	
Pulsed drain current ²⁾	$I_{D,pulse}$	$T_C=25\text{ °C}$	-320	
Avalanche energy, single pulse	E_{AS}	$I_D=-40\text{A}$	60	mJ
Avalanche current, single pulse	I_{AS}	-	-80	A
Gate source voltage	V_{GS}	-	+5/-16	V
Power dissipation	P_{tot}	$T_C=25\text{ °C}$	125	W
Operating and storage temperature	T_j, T_{stg}	-	-55 ... +175	°C
IEC climatic category; DIN IEC 68-1	-	-	55/175/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Thermal characteristics²⁾						
Thermal resistance, junction - case	R_{thJC}	-	-	-	1.2	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	-	62	
SMD version, device on PCB	R_{thJA}	minimal footprint	-	-	62	
		6 cm ² cooling area ³⁾	-	-	40	

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

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D = -1mA$	-40	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.2	-1.7	-2.2	
Zero gate voltage drain current	I_{DSS}	$V_{DS}=-32V, V_{GS}=0V, T_j=25^\circ\text{C}$	-	-0.05	-1	μA
		$V_{DS}=-32V, V_{GS}=0V, T_j=125^\circ\text{C}^{2)}$	-	-20	-200	
Gate-source leakage current	I_{GSS}	$V_{GS}=-16V, V_{DS}=0V$	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-80A$	-	5.6	7.1	m Ω
		$V_{GS}=-4.5V, I_D=-80A, \text{SMD version}$	-	5.3	6.8	
		$V_{GS}=-10V, I_D=-80A$	-	4.1	4.7	
		$V_{GS}=-10V, I_D=-80A, \text{SMD version}$	-	3.8	4.4	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics²⁾

Input capacitance	C_{iss}	$V_{GS}=0V, V_{DS}=-25V,$ $f=1MHz$	-	8900	11570	pF
Output capacitance	C_{oss}		-	2533	3800	
Reverse transfer capacitance	C_{rss}		-	100	200	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=-20V,$ $V_{GS}=-10V, I_D=-80A,$ $R_G=3.5\Omega$	-	28	-	ns
Rise time	t_r		-	13	-	
Turn-off delay time	$t_{d(off)}$		-	119	-	
Fall time	t_f		-	65	-	

Gate Charge Characteristics²⁾

Gate to source charge	Q_{gs}	$V_{DD}=-32V,$ $I_D=-80A,$ $V_{GS}=0$ to $-10V$	-	31	40	nC
Gate to drain charge	Q_{gd}		-	24	48	
Gate charge total	Q_g		-	135	176	
Gate plateau voltage	$V_{plateau}$		-	3.5	-	V

Reverse Diode

Diode continuous forward current ²⁾	I_S	$T_C=25^\circ C$	-	-	-80	A
Diode pulse current ²⁾	$I_{S,pulse}$		-	-	-320	
Diode forward voltage	V_{SD}	$V_{GS}=0V, I_F=-80A,$ $T_j=25^\circ C$	-	-1	-1.3	V
Reverse recovery time ²⁾	t_{rr}	$V_R=-20V, I_F=-50A,$ $di_F/dt=-100A/\mu s$	-	65	-	ns
Reverse recovery charge ²⁾	Q_{rr}		-	90	-	nC

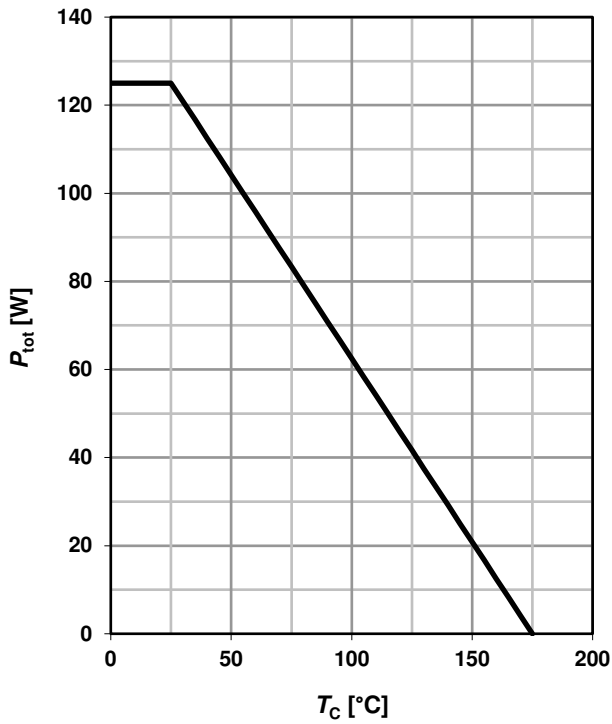
¹⁾ Current is limited by bondwire; with an $R_{thJC} = 1.2K/W$ the chip is able to carry -137A at 25°C.

²⁾ Defined by design. Not subject to production test.

³⁾ Device on 40 mm x 40 mm x 1.5 mm epoxy PCB FR4 with 6 cm² (one layer, 70 μm thick) copper area for drain connection. PCB is vertical in still air.

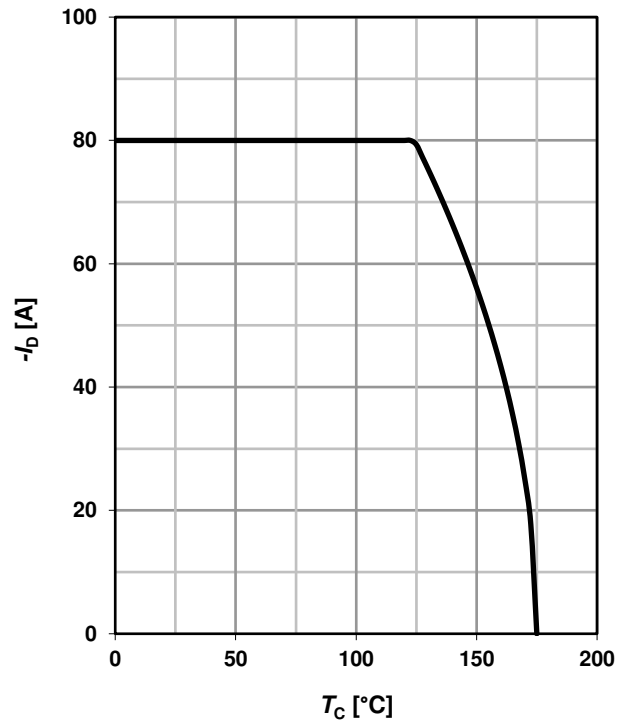
1 Power dissipation

$P_{tot} = f(T_C); V_{GS} \leq -6V$



2 Drain current

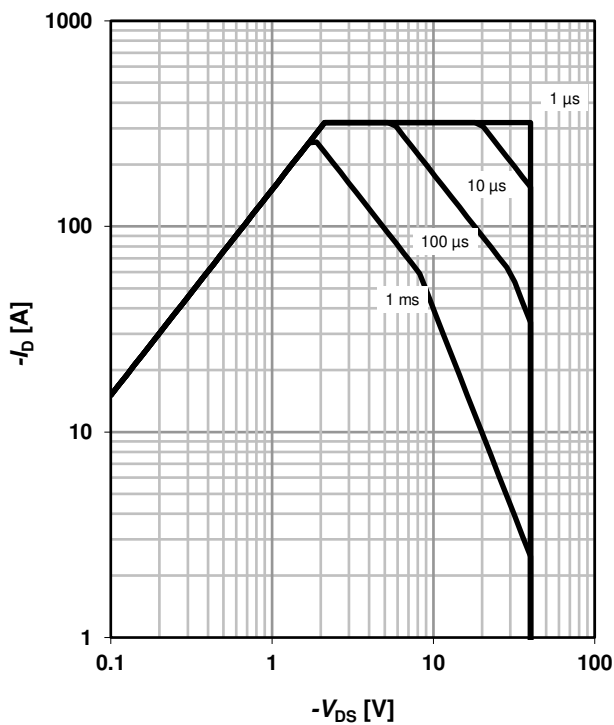
$I_D = f(T_C); V_{GS} \leq -6V; SMD$



3 Safe operating area

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

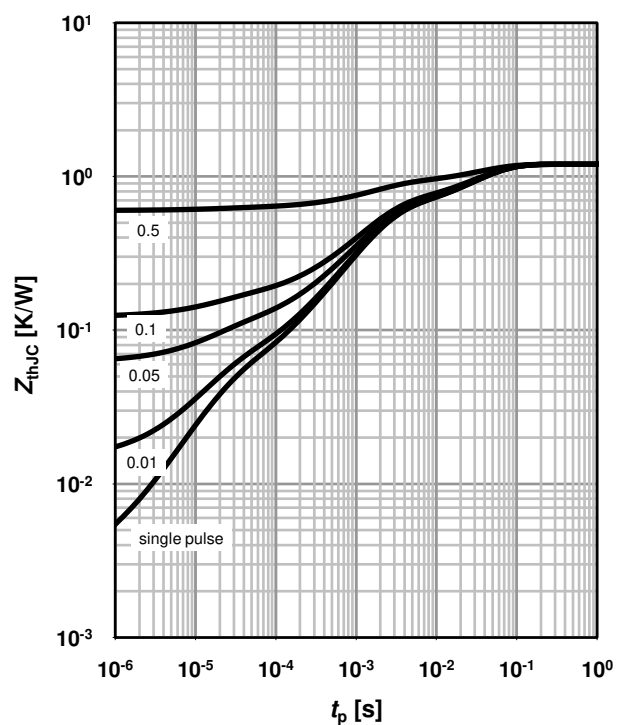
parameter: t_p



4 Max. transient thermal impedance

$Z_{thJC} = f(t_p)$

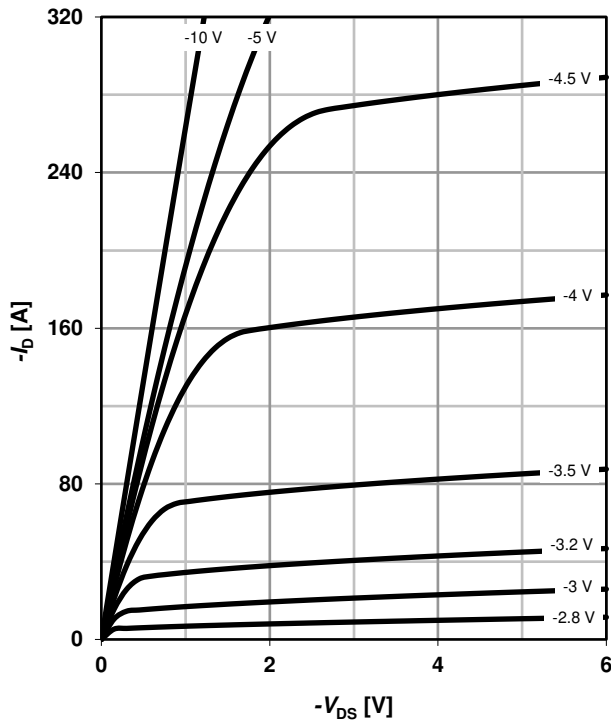
parameter: $D = t_p/T$



5 Typ. output characteristics

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

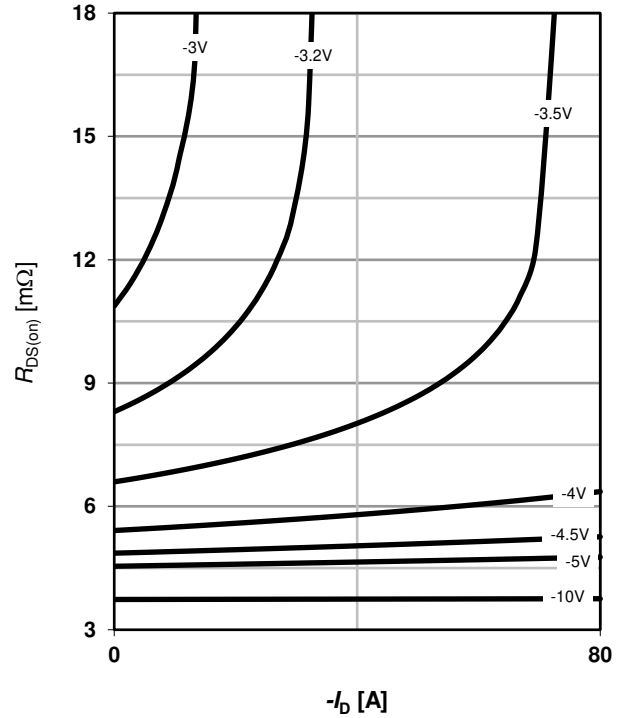
parameter: V_{GS}



6 Typ. drain-source on-state resistance

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

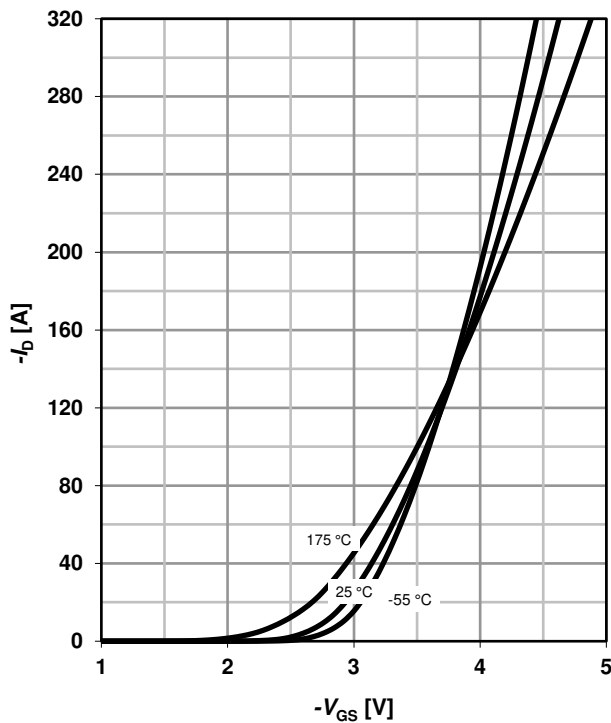
parameter: V_{GS}



7 Typ. transfer characteristics

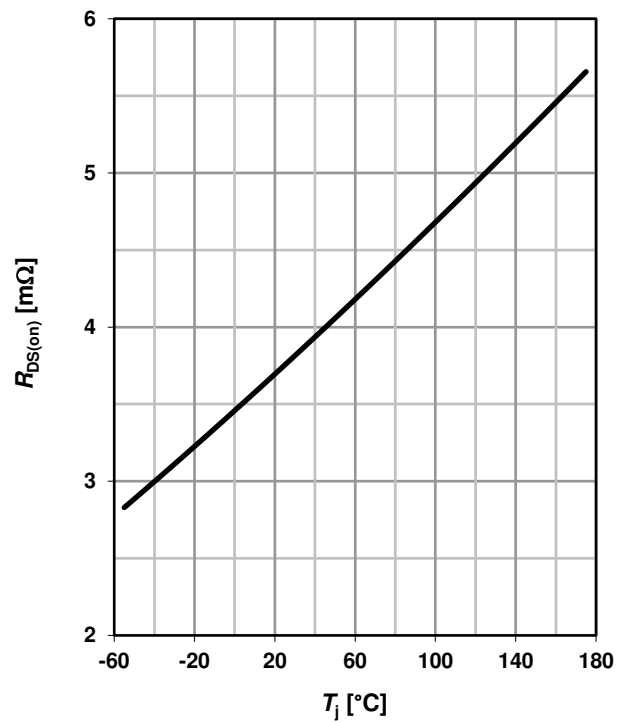
$I_D = f(V_{GS}); V_{DS} = -6\text{V}$

parameter: T_j



8 Typ. drain-source on-state resistance

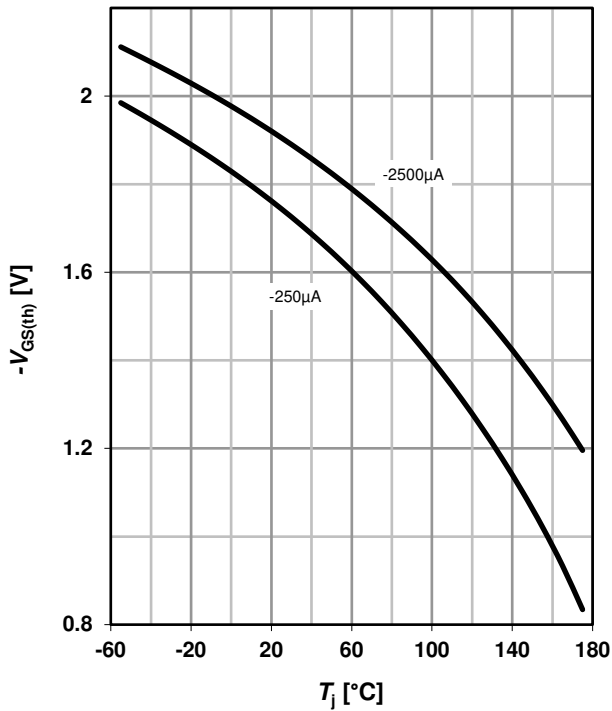
$R_{DS(on)} = f(T_j); I_D = -80\text{ A}; V_{GS} = -10\text{ V}; \text{SMD}$



9 Typ. gate threshold voltage

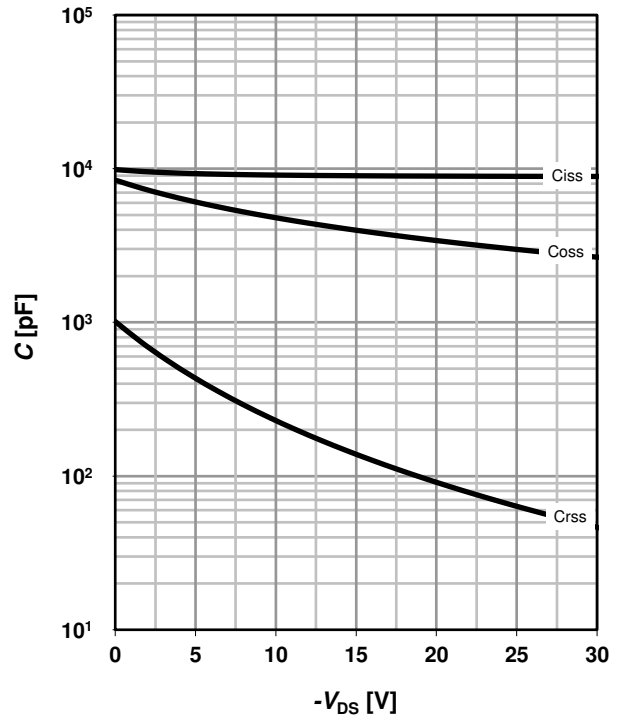
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter: I_D



10 Typ. capacitances

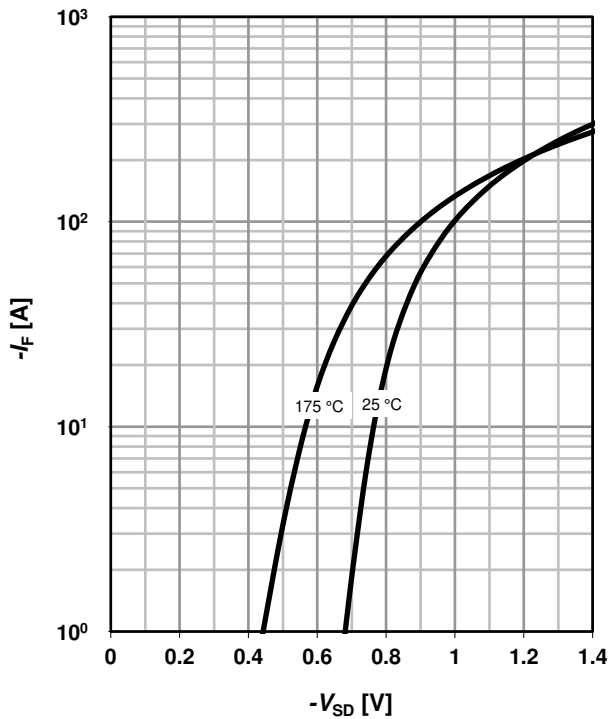
$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$



11 Typical forward diode characteristics

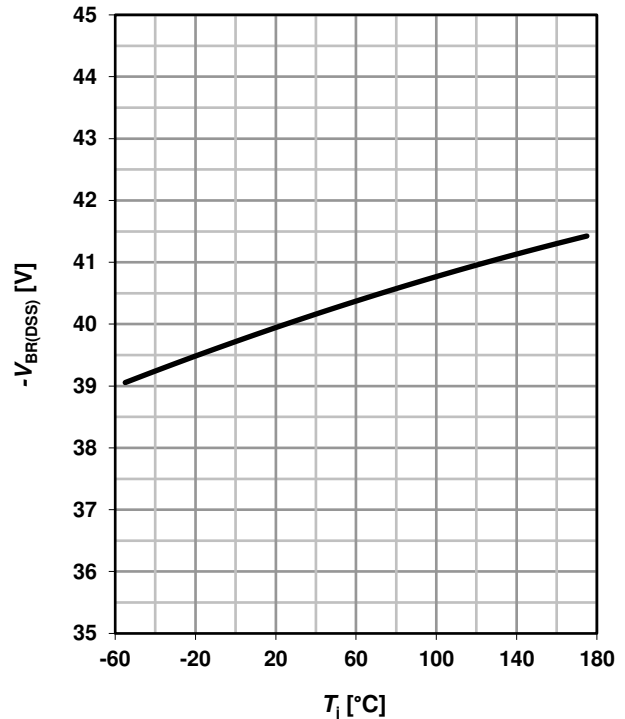
$I_F = f(V_{SD})$

parameter: T_j



12 Drain-source breakdown voltage

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

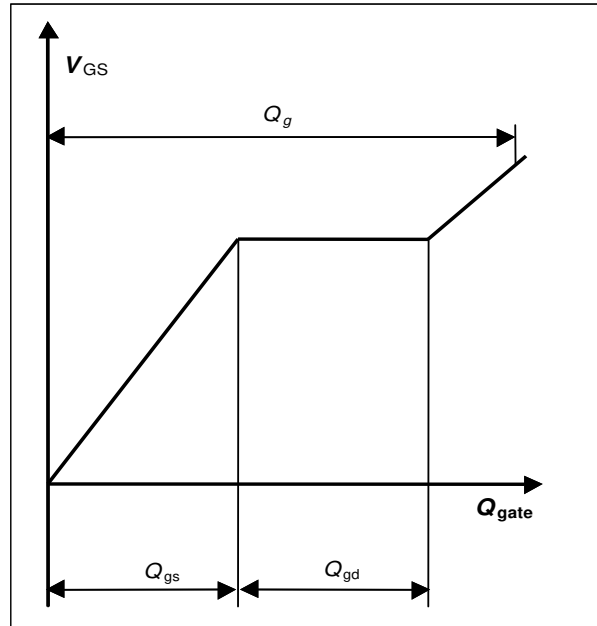
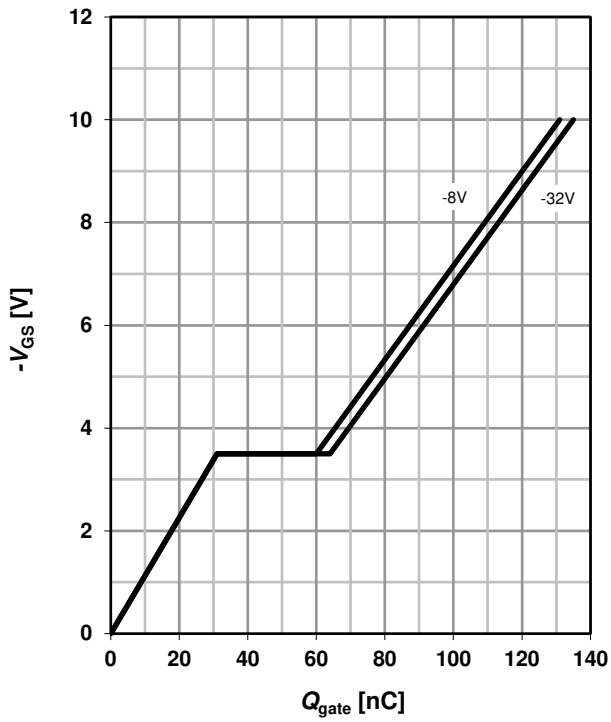


15 Typ. gate charge

$V_{GS} = f(Q_{gate}); I_D = -80$ A pulsed

parameter: V_{DD}

16 Gate charge waveforms



Published by
Infineon Technologies AG
81726 Munich, Germany

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If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

Revision History

Version	Date	Changes
1.0	28.01.2011	Final Data Sheet
1.1	03.07.2019	V _{GS} changed