

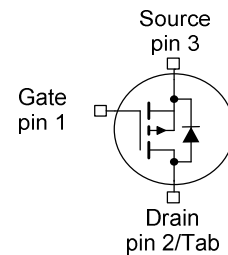
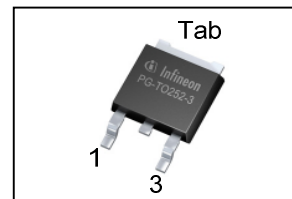
**OptiMOS®-P2 Power-Transistor**

**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

**Product Summary**

$V_{DS}$	-40	V
$R_{DS(on)}$	7.8	m $\Omega$
$I_D$	-70	A

**PG-TO252-3-313**


Type	Package	Marking
IPD70P04P4L-08	PG-TO252-3-313	4P04L08

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current	$I_D$	$T_C=25^\circ\text{C}$ , $V_{GS}=-10\text{V}$	-70	A
		$T_C=100^\circ\text{C}$ , $V_{GS}=-10\text{V}^{1)}$	-55	
Pulsed drain current <sup>1)</sup>	$I_{D,pulse}$	$T_C=25^\circ\text{C}$	-280	
Avalanche energy, single pulse <sup>1)</sup>	$E_{AS}$	$I_D=-35\text{A}$	24	mJ
Avalanche current, single pulse	$I_{AS}$	-	-70	A
Gate source voltage	$V_{GS}$	-	$\pm 16^{2)}$	V
Power dissipation	$P_{tot}$	$T_C=25^\circ\text{C}$	75	W
Operating and storage temperature	$T_j, T_{stg}$	-	-55 ... +175	$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1	-	-	55/175/56	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
<b>Thermal characteristics<sup>1)</sup></b>						
Thermal resistance, junction - case	$R_{thJC}$	-	-	-	2.0	K/W
SMD version, device on PCB	$R_{thJA}$	minimal footprint	-	-	62	
		6 cm <sup>2</sup> cooling area <sup>3)</sup>	-	-	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	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=-120\mu A$	-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	$\mu A$
		$V_{DS}=-32V, V_{GS}=0V, T_j=125^\circ\text{C}^{1)}$	-	-20	-200	
Gate-source leakage current	$I_{GSS}$	$V_{GS}=-16V, V_{DS}=0V$	-	-	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	$V_{GS}=-4.5V, I_D=-40A$	-	9.0	12.9	m $\Omega$
		$V_{GS}=-10V, I_D=-70A$	-	5.7	7.8	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics<sup>1)</sup>**

Input capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=-25V,$ $f=1MHz$	-	4177	5430	pF
Output capacitance	$C_{oss}$		-	1185	1778	
Reverse transfer capacitance	$C_{rss}$		-	45	90	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=-20V,$ $V_{GS}=-10V, I_D=-70A,$ $R_G=3.5\Omega$	-	12	-	ns
Rise time	$t_r$		-	10	-	
Turn-off delay time	$t_{d(off)}$		-	50	-	
Fall time	$t_f$		-	41	-	

**Gate Charge Characteristics<sup>1)</sup>**

Gate to source charge	$Q_{gs}$	$V_{DD}=-32V, I_D=-70A,$ $V_{GS}=0$ to $-10V$	-	14	18	nC
Gate to drain charge	$Q_{gd}$		-	10	20	
Gate charge total	$Q_g$		-	71	92	
Gate plateau voltage	$V_{plateau}$		-	-3.5	-	V

**Reverse Diode**

Diode continuous forward current <sup>1)</sup>	$I_S$	$T_C=25^\circ C$	-	-	-70	A
Diode pulse current <sup>1)</sup>	$I_{S,pulse}$		-	-	-280	
Diode forward voltage	$V_{SD}$	$V_{GS}=0V, I_F=-70A,$ $T_j=25^\circ C$	-	-1	-1.3	V
Reverse recovery time <sup>1)</sup>	$t_{rr}$	$V_R=-20V, I_F=-50A,$ $di_F/dt=-100A/\mu s$	-	46	-	ns
Reverse recovery charge <sup>1)</sup>	$Q_{rr}$		-	43	-	nC

<sup>1)</sup> Defined by design. Not subject to production test.

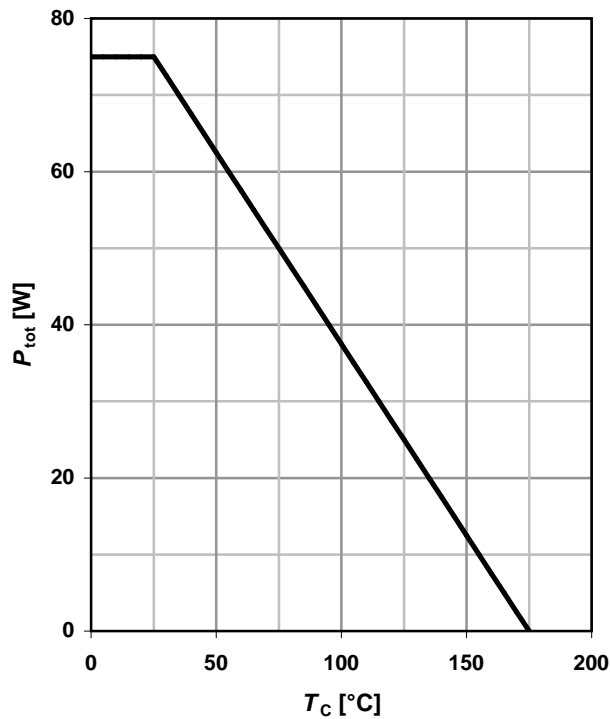
<sup>2)</sup>  $V_{GS}=+5V/-16V$  according AEC;

$V_{GS}=+16V$  for max 168h at  $T_i=175^\circ C$

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

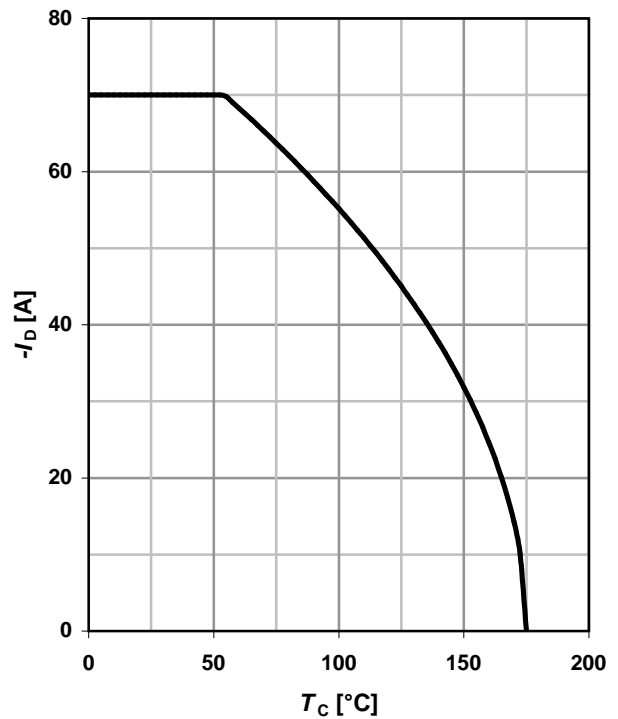
### 1 Power dissipation

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



### 2 Drain current

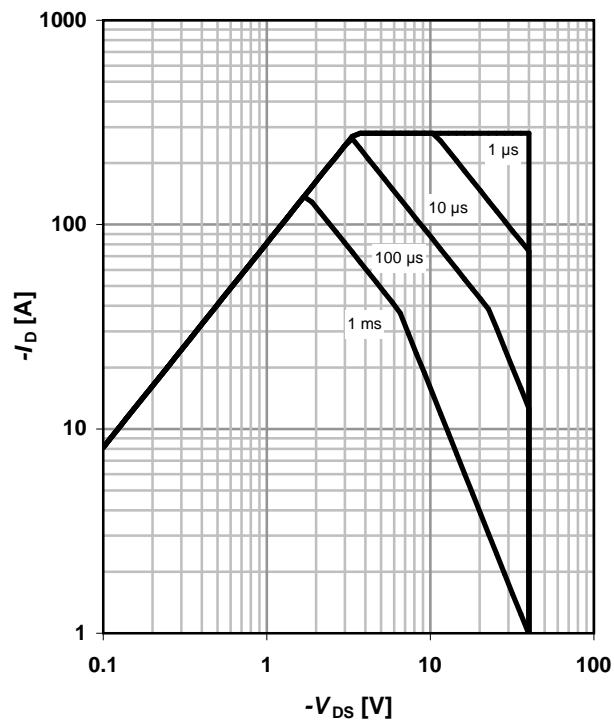
$$I_D = f(T_C); V_{\text{GS}} = -10\text{V}$$



### 3 Safe operating area

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

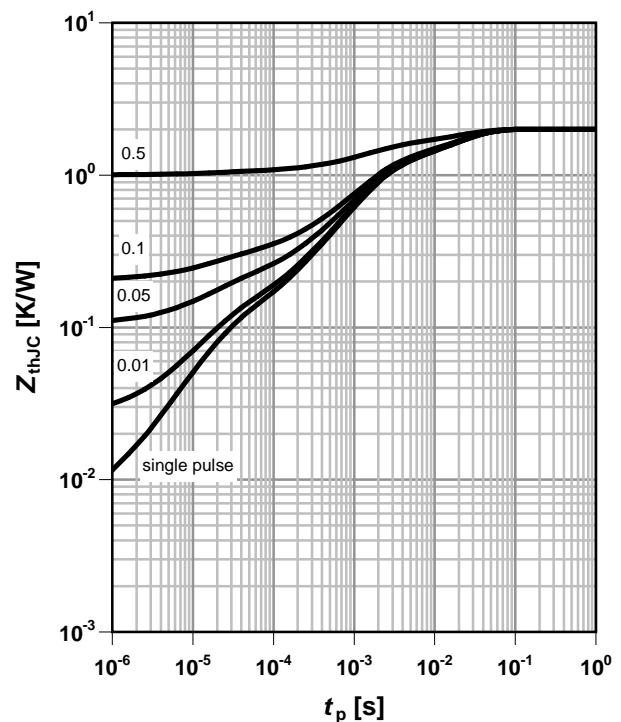
parameter:  $t_p$



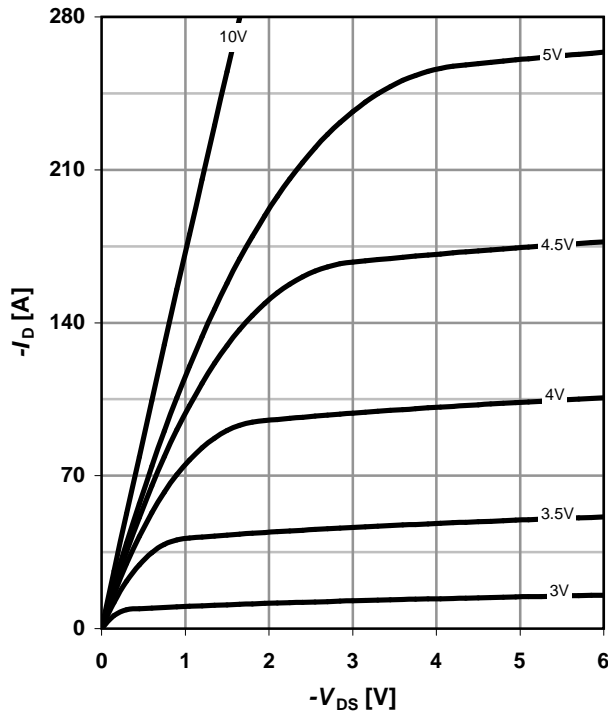
### 4 Max. transient thermal impedance

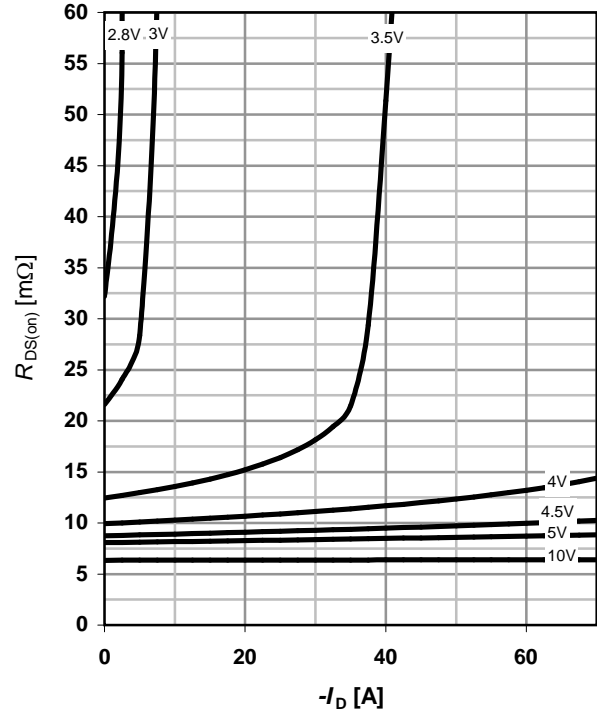
$$Z_{\text{thJC}} = f(t_p)$$

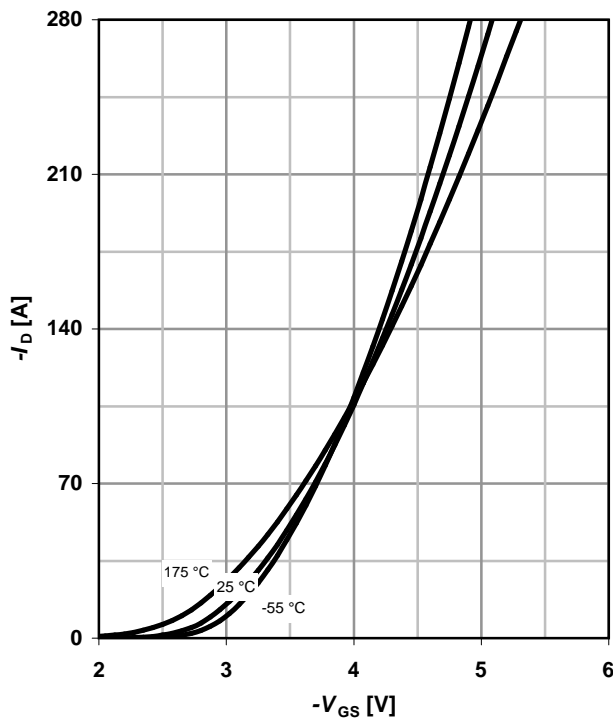
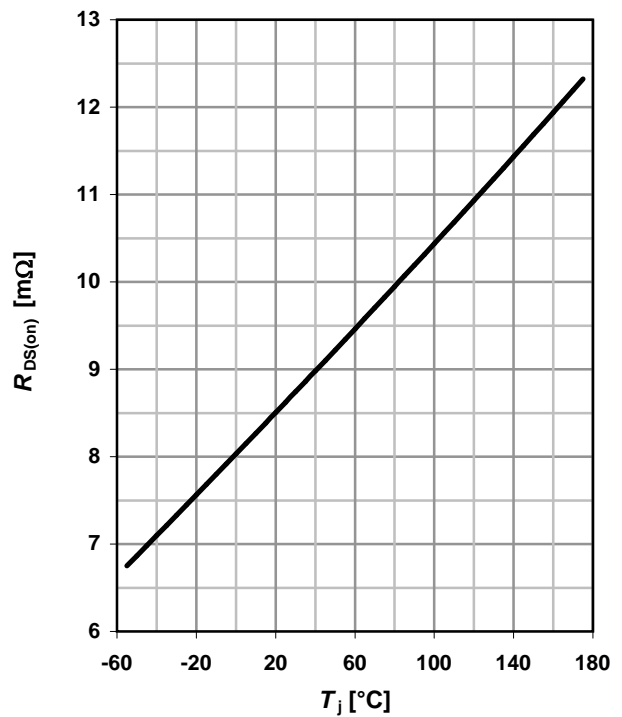
parameter:  $D = t_p/T$



**5 Typ. output characteristics**
 $I_D = f(V_{DS}); T_j = 25\text{ °C}$ 

 parameter:  $-V_{GS}$ 

**6 Typ. drain-source on-state resistance**
 $R_{DS(on)} = f(I_D); T_j = 25\text{ °C}$ 

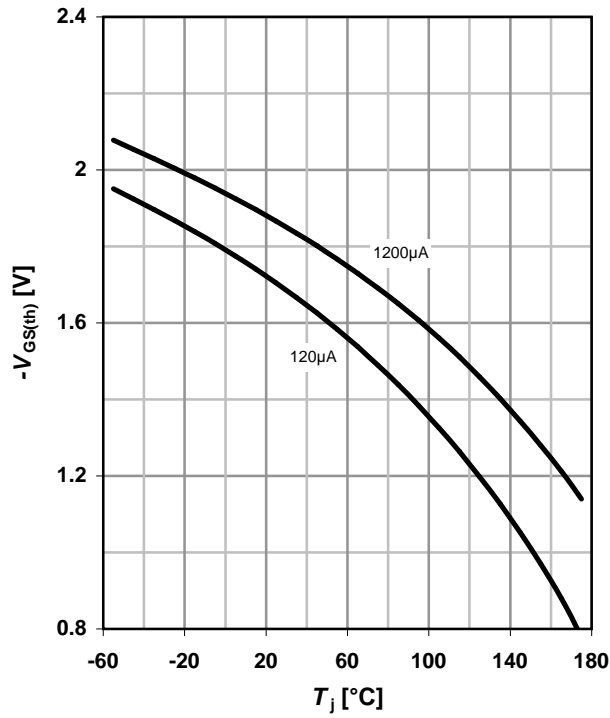
 parameter:  $-V_{GS}$ 

**7 Typ. transfer characteristics**
 $I_D = f(V_{GS}); V_{DS} = -6V$ 

 parameter:  $T_j$ 

**8 Typ. drain-source on-state resistance**
 $R_{DS(on)} = f(T_j); I_D = -70\text{ A}; V_{GS} = -10\text{ V}$ 


**9 Typ. gate threshold voltage**

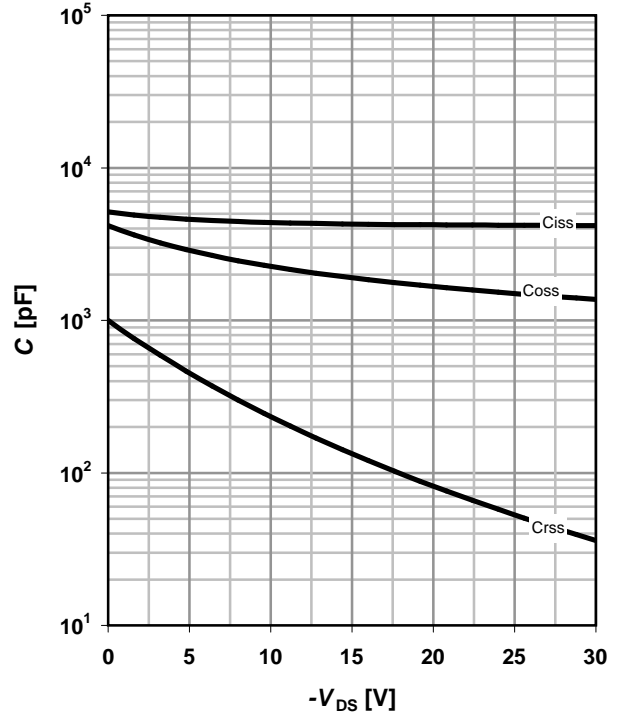
$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$

parameter:  $-I_D$



**10 Typ. capacitances**

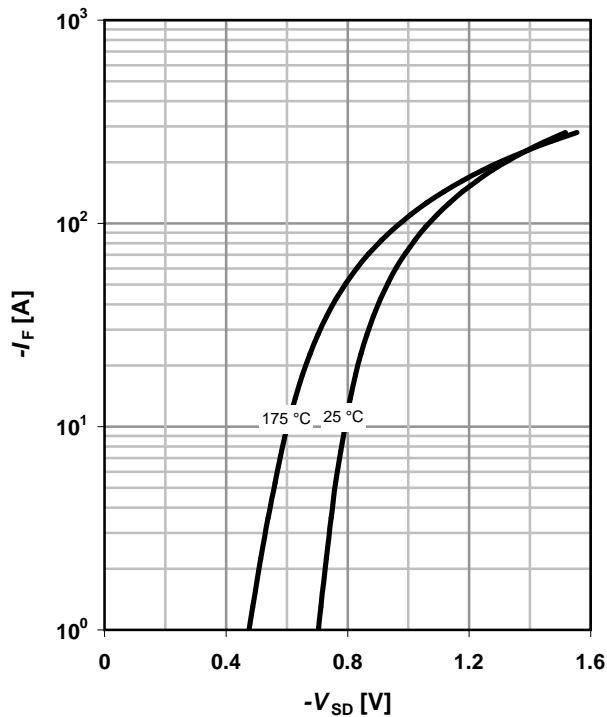
$C = f(V_{DS}); V_{GS} = 0 V; f = 1 MHz$



**11 Typical forward diode characteristics**

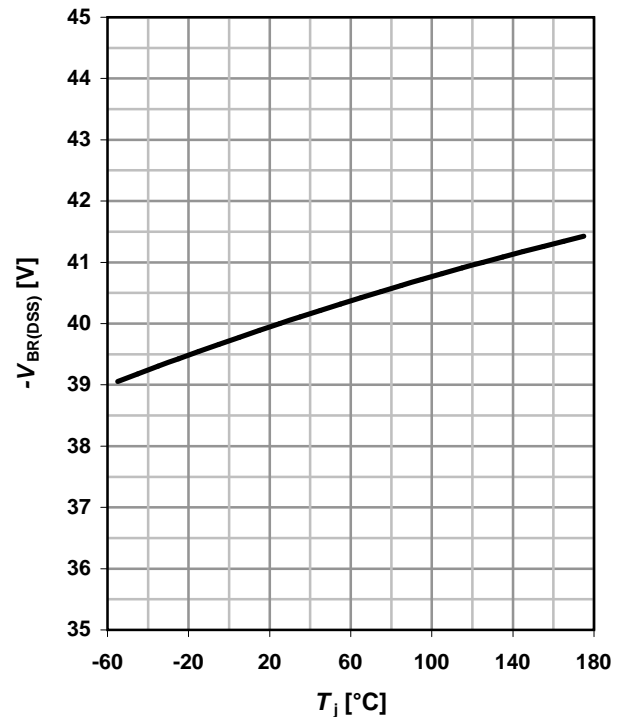
$I_F = f(V_{SD})$

parameter:  $T_j$



**12 Drain-source breakdown voltage**

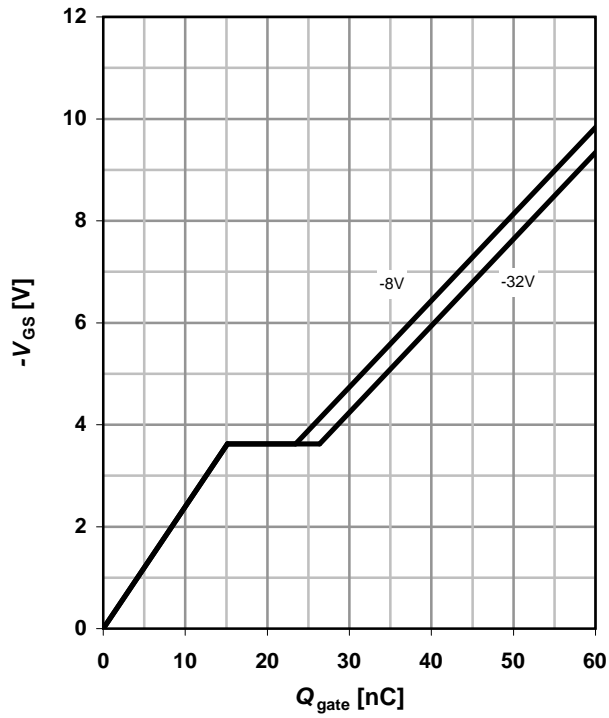
$V_{BR(DSS)} = f(T_j); I_D = -1 mA$



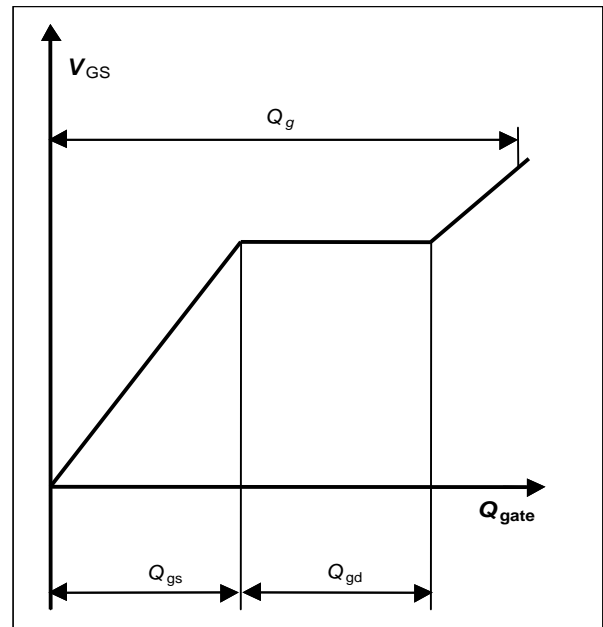
**13 Typ. gate charge**

$V_{GS} = f(Q_{gate}); I_D = -70 \text{ A pulsed}$

parameter:  $V_{DD}$



**14 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

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Version	Date	Changes
0.1	08.03.2010	Initial Target Data Sheet
0.2	20.12.2010	Preliminary Data Sheet
1.0	14.03.2011	Final Data Sheet

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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

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