



**THE DATASHEET OF  
BSG0813NDIATMA1**

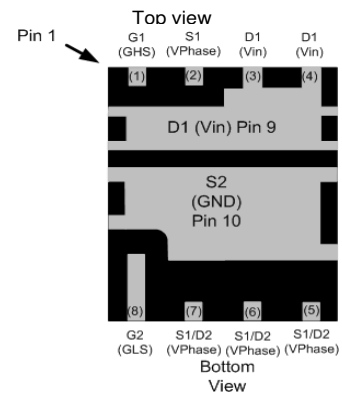
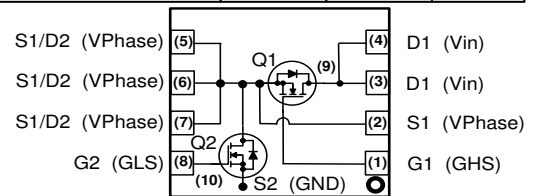


**Power Block**
**Features**

- Dual asymmetric N-channel OptiMOS™5 MOSFET
- Logic level (4.5V rated)
- Optimized for high performance buck converters
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC<sup>1)</sup> for target applications
- Halogen-free according to IEC61249-2-21
- Monolithic integrated Schottky like diode

**Product Summary**

		Q1	Q2	
$V_{DS}$		25	25	V
$R_{DS(on),max}$	$V_{GS}=10\text{ V}$	3	1.2	mΩ
	$V_{GS}=4.5\text{ V}$	4	1.7	
$I_D$		50	50	A



Type	Package	Marking
BSG0813NDI	PG-TISON8-4	0813NDI

**Maximum ratings, at  $T_j=25^\circ\text{C}$ , unless otherwise specified <sup>2)</sup>**

Parameter	Symbol	Conditions	Value		Unit
			Q1	Q2	
Continuous drain current	$I_D$	$T_C=70^\circ\text{C}, V_{GS}=10\text{ V}$	50	50	A
		$T_C=70^\circ\text{C}, V_{GS}=4.5\text{ V}$	50	50	
		$T_A=25^\circ\text{C}, V_{GS}=4.5\text{ V}^{3)}$	31	50	
		$T_A=25^\circ\text{C}, V_{GS}=4.5\text{ V}^{4)}$	19	33	
Pulsed drain current	$I_{D,pulse}$	$T_C=70^\circ\text{C}$	160	160	
Avalanche energy, single pulse	$E_{AS}$	Q1: $I_D=10\text{ A}$ , Q2: $I_D=20\text{ A}$ , $R_{GS}=25\ \Omega$	30	90	mJ
Gate source voltage	$V_{GS}$	$T_j=25^\circ\text{C}$	$\pm 16$		V
Power dissipation	$P_{tot}$	$T_A=25^\circ\text{C}^{3)}$	6.25	6.25	W
		$T_A=25^\circ\text{C}^{4)}$	2.5	2.5	
Operating and storage temperature	$T_j, T_{stg}$		-55 ... 150		$^\circ\text{C}$
IEC climatic category; DIN IEC 68-1			55/150/56		

<sup>1)</sup> J-STD20 and JESD22

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Thermal characteristics**

Thermal resistance, junction - case	Q1	$R_{thJC}$		-	-	4.3	K/W
	Q2			-	-	2.2	
Thermal resistance, junction - ambient <sup>2)</sup>	Q1	$R_{thJA}$	Application specific board <sup>3)</sup>	-	-	20	
	Q2						
	Q1	6 cm <sup>2</sup> cooling area <sup>4)</sup>	-	-	50		
	Q2						

**Electrical characteristics**, at  $T_j=25\text{ °C}$ , unless otherwise specified

**Static characteristics**

Drain-source breakdown voltage	Q1	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	25 <sup>6)</sup>	-	-	V
	Q2						
Breakdown voltage temperature coefficient	Q1	$dV_{(BR)DSS}/dT_j$	$I_D=10\text{ mA}$ , referenced to 25 °C	-	15	-	mV/K
	Q2						
Gate threshold voltage	Q1	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=250\text{ }\mu\text{A}$	1.2	1.6	2	V
	Q2						
Zero gate voltage drain current	Q1	$I_{DSS}$	$V_{DS}=25\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$	-	-	1	$\mu\text{A}$
	Q2					500	
	Q1		$V_{DS}=20\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}$	-	-	100	mA
	Q2					1	
Gate-source leakage current	Q1	$I_{GSS}$	$V_{GS}=16\text{ V}, V_{DS}=0\text{ V}$	-	-	100	nA
	Q2						
Drain-source on-state resistance	Q1	$R_{DS(on)}$	$V_{GS}=4.5\text{ V}, I_D=20\text{ A}$	-	3.2	4.0	m $\Omega$
	Q2					1.7	
	Q1		$V_{GS}=10\text{ V}, I_D=20\text{ A}$	-	2.4	3.0	
	Q2					1.2	
Gate resistance	Q1	$R_G$		-	0.7	1.2	$\Omega$
	Q2					1.7	
Transconductance	Q1	$g_{fs}$	$ V_{DS} >2 I_D R_{DS(on)max}, I_D=20\text{ A}$	46	93	-	S
	Q2					70	

<sup>2)</sup> Only one of both transistors active

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

**Dynamic characteristics**

Input capacitance	Q1	$C_{iss}$	$V_{GS}=0\text{ V},$ $V_{DS}=12\text{ V}, f=1\text{ MHz}$	-	780	1100	pF
	Q2			-	2200	2900	
Output capacitance	Q1	$C_{oss}$		-	390	520	
	Q2			-	1300	1700	
Reverse transfer capacitance	Q1	$C_{rss}$		-	38	-	
	Q2			-	71	-	
Turn-on delay time	Q1	$t_{d(on)}$	$V_{IN}=12\text{ V},$ $V_{DRV}=5\text{ V},$ $F_{SW}=500\text{ KHz},$ $I_{OUT}=20\text{ A}^{5)}$	-	4.3	-	ns
	Q2			-	3.6	-	
Rise time	Q1	$t_r$		-	4.7	-	
	Q2			-	2.8	-	
Turn-off delay time	Q1	$t_{d(off)}$		-	4.3	-	
	Q2			-	5.7	-	
Fall time	Q1	$t_f$		-	1.4	-	
	Q2			-	1.7	-	

**Gate Charge Characteristics**

Gate to source charge	Q1	$Q_{gs}$	$V_{DD}=12\text{ V},$ $I_D=20\text{ A},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	2.0		nC	
Gate to drain charge		$Q_{gd}$		-	1.4	-		
Gate charge total		$Q_g$		-	5.6	8.4		
Gate plateau voltage		$V_{plateau}$		-	2.6	-		V
Gate to source charge	Q2	$Q_{gs}$		$V_{DD}=12\text{ V},$ $I_D=20\text{ A},$ $V_{GS}=0\text{ to }4.5\text{ V}$	-	5.2	-	nC
Gate to drain charge		$Q_{gd}$			-	3.1	-	
Gate charge total		$Q_g$			-	15	22	
Gate plateau voltage		$V_{plateau}$			-	2.3	-	
Output charge	Q1	$Q_{oss}$	$V_{DD}=12\text{ V}, V_{GS}=0\text{ V}$		-	8	-	nC
	Q2				-	27	-	

<sup>3)</sup> 8 Layers copper 70µm thickness. PCB in still air

<sup>4)</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.

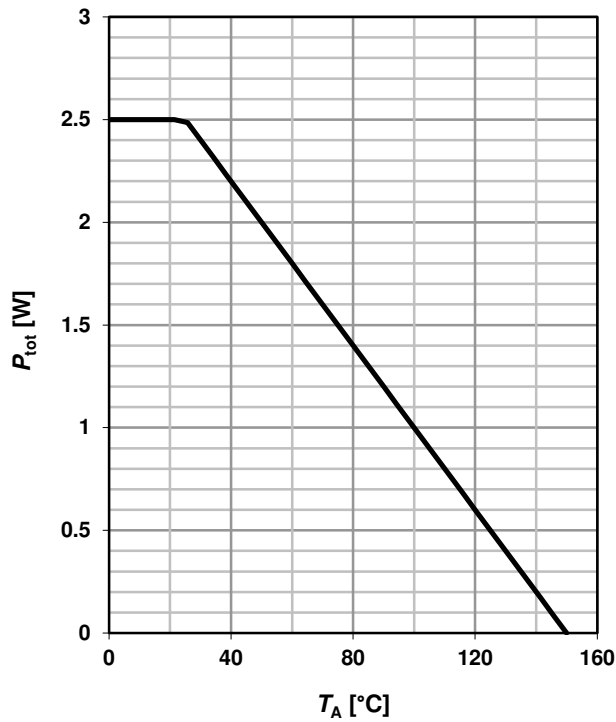
Parameter	Symbol	Conditions	Values			Unit		
			min.	typ.	max.			
<b>Reverse Diode</b>								
Diode continuous forward current	Q1	$I_S$	$T_C=25\text{ °C}$	-	-	29	A	
	Q2			-	-	50		
Diode pulse current	Q1	$I_{S,pulse}$		-	-	160		
	Q2			-	-	160		
Diode forward voltage	Q1	$V_{SD}$		$V_{GS}=0\text{ V}, I_F=20\text{ A},$ $T_j=25\text{ °C}$	-	0.82	1	V
	Q2			$V_{GS}=0\text{ V}, I_F=11\text{ A},$ $T_j=25\text{ °C}$	-	0.52	0.7	
Reverse recovery charge	Q1	$Q_{rr}$	$V_R=12\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	10	-	nC	
	Q2			-	-	-		

<sup>5)</sup> For more information see application note n° TBD

<sup>6)</sup> The device can withstand a pulse of not more than 30 V for a duration of up to 2 ns at a frequency of 600 kHz with maximum buck converter input voltage  $V_{IN}=16\text{ V}$

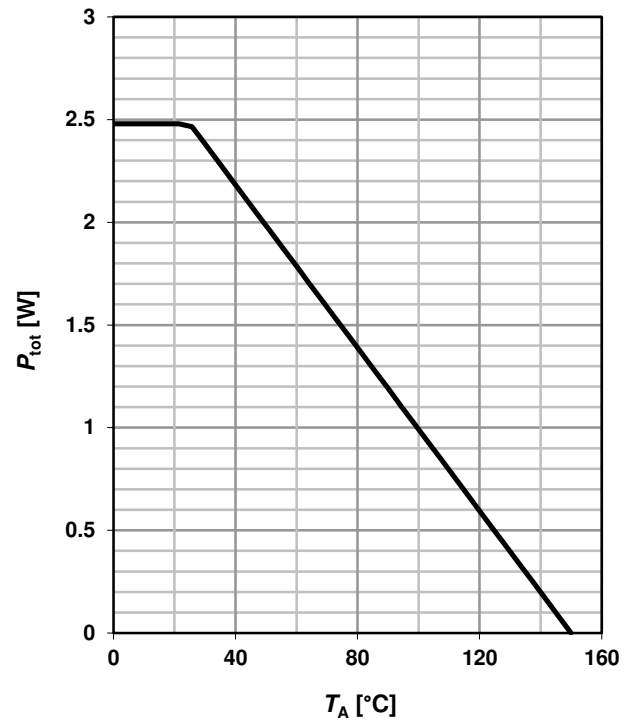
**1 Power dissipation (Q1)**

$$P_{tot}=f(T_A)^4$$



**2 Power dissipation (Q2)**

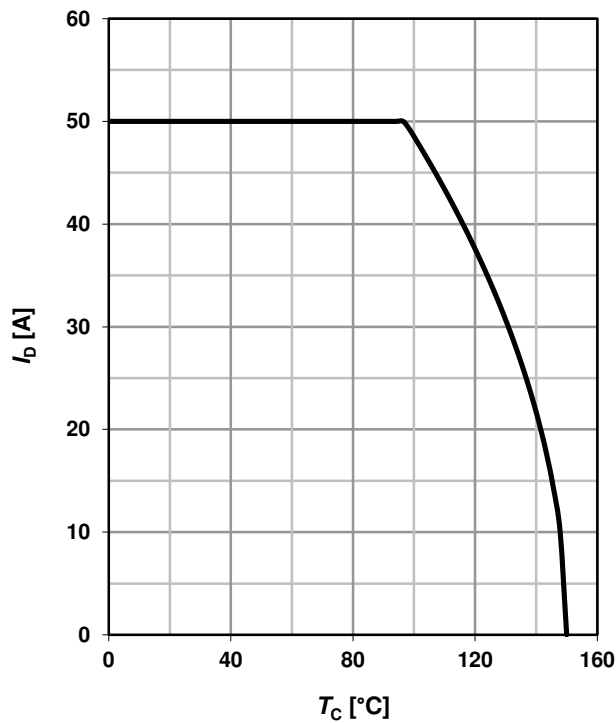
$$P_{tot}=f(T_A)^4$$



**3 Drain current (Q1)**

$$I_D=f(T_C)$$

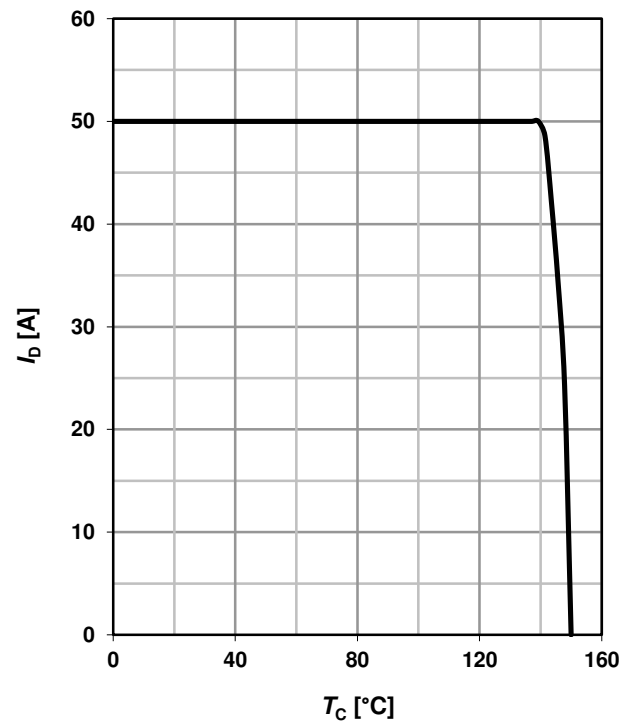
parameter: V<sub>GS</sub> ≥ 10 V



**4 Drain current (Q2)**

$$I_D=f(T_C)$$

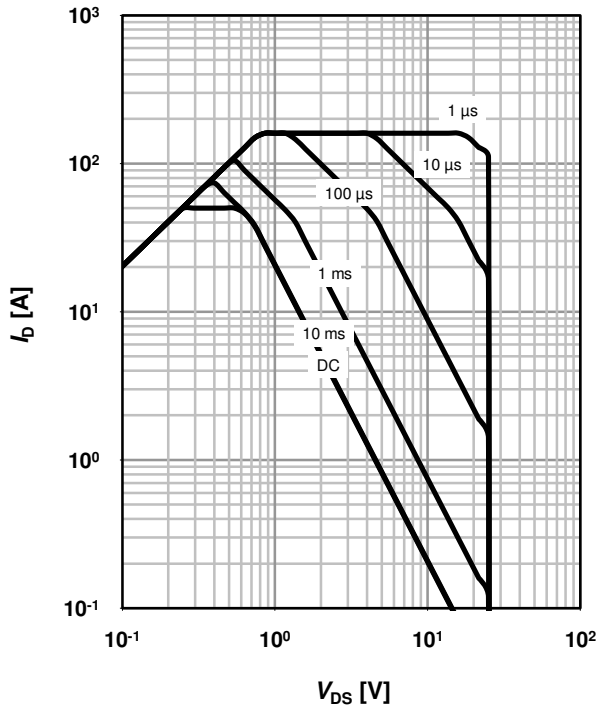
parameter: V<sub>GS</sub> ≥ 10 V



**5 Safe operating area (Q1)**

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

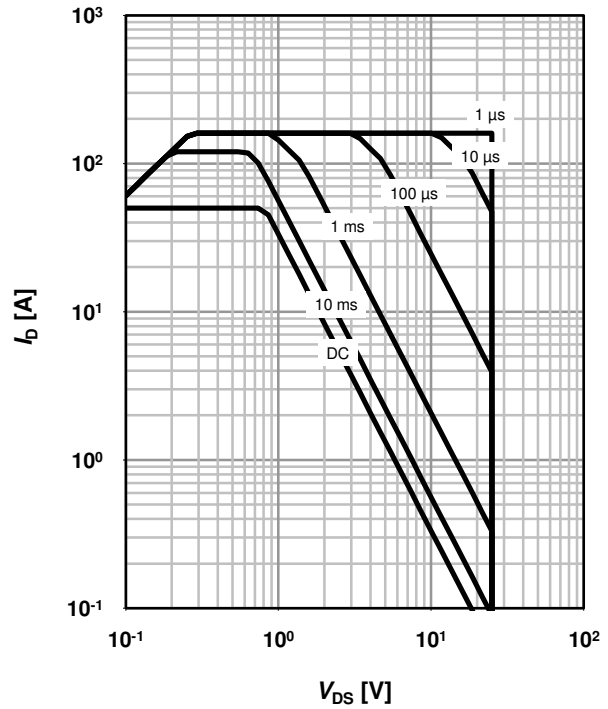
parameter:  $t_p$



**6 Safe operating area (Q2)**

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

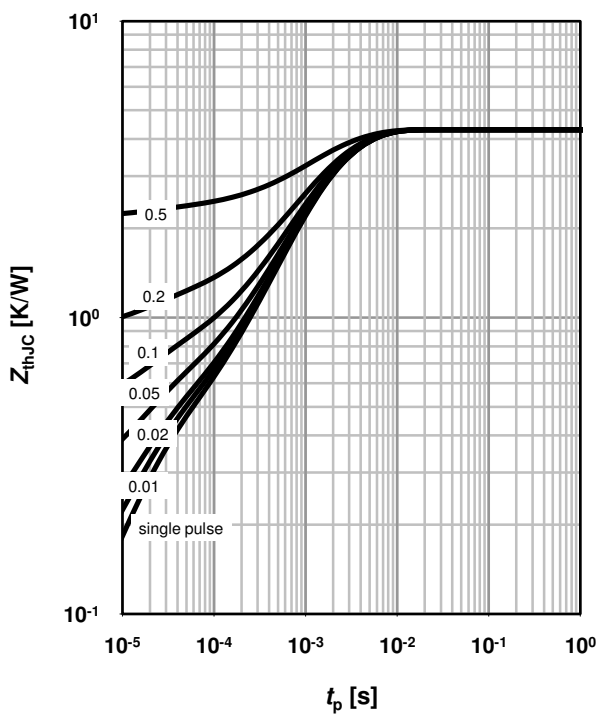
parameter:  $t_p$



**7 Max. transient thermal impedance (Q1)**

$Z_{thJC}=f(t_p)$

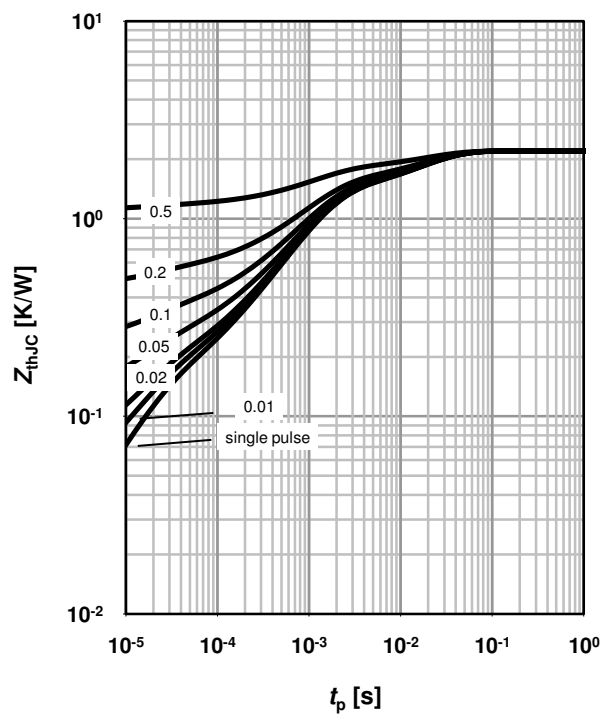
parameter:  $D=t_p/T$



**8 Max. transient thermal impedance (Q2)**

$Z_{thJC}=f(t_p)$

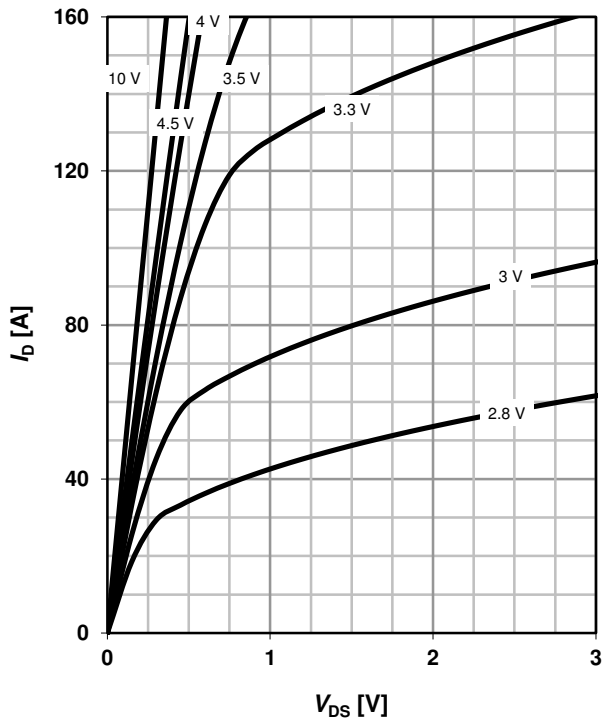
parameter:  $D=t_p/T$



**9 Typ. output characteristics (Q1)**

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

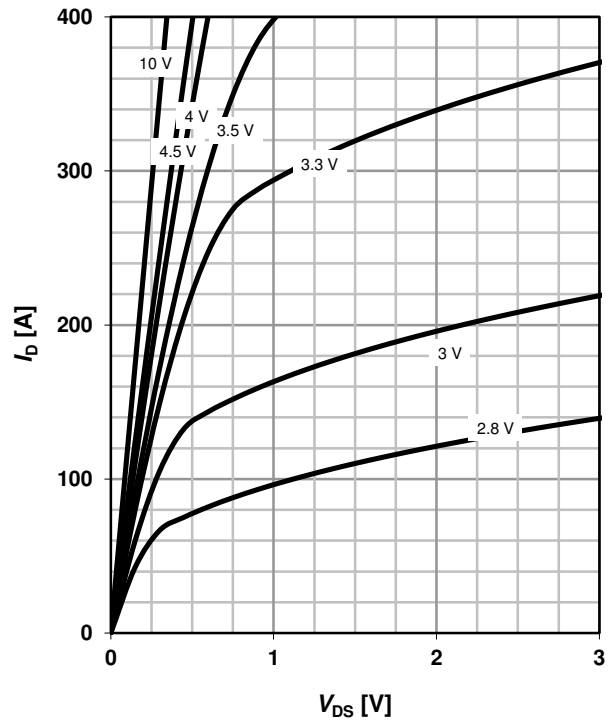
parameter:  $V_{GS}$



**10 Typ. output characteristics (Q2)**

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

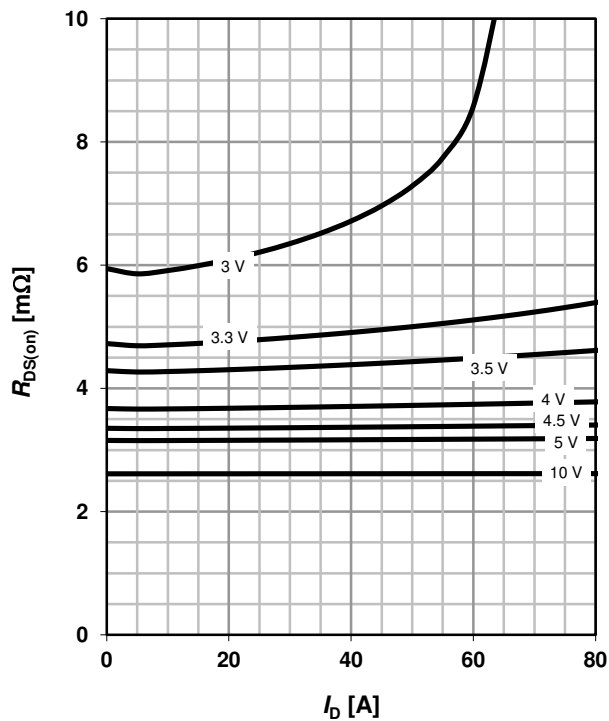
parameter:  $V_{GS}$



**11 Typ. drain-source on resistance (Q1)**

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

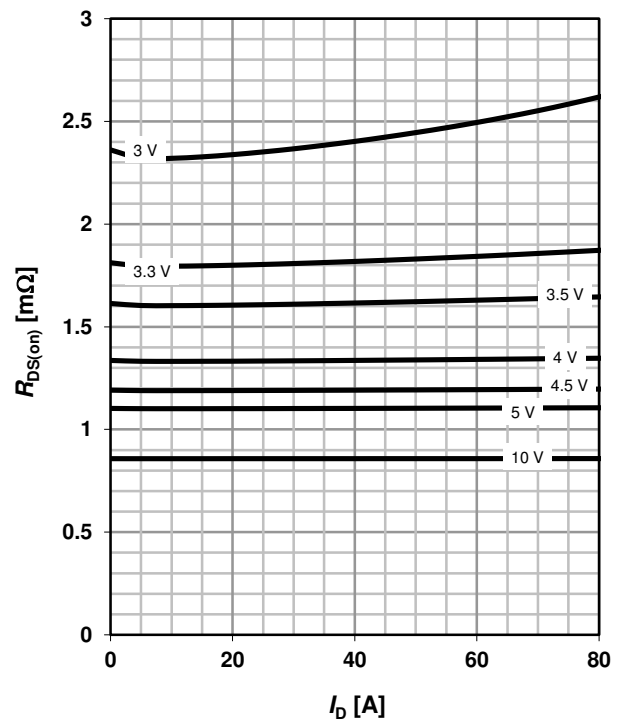
parameter:  $V_{GS}$



**12 Typ. drain-source on resistance (Q2)**

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

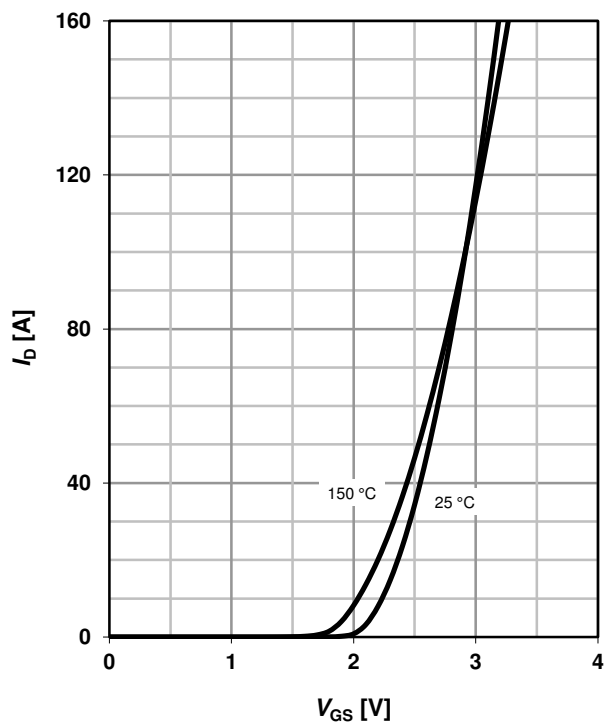
parameter:  $V_{GS}$



**13 Typ. transfer characteristics (Q1)**

$$I_D = f(V_{GS}); |V_{DS}| > 2 |I_D| R_{DS(on)max}$$

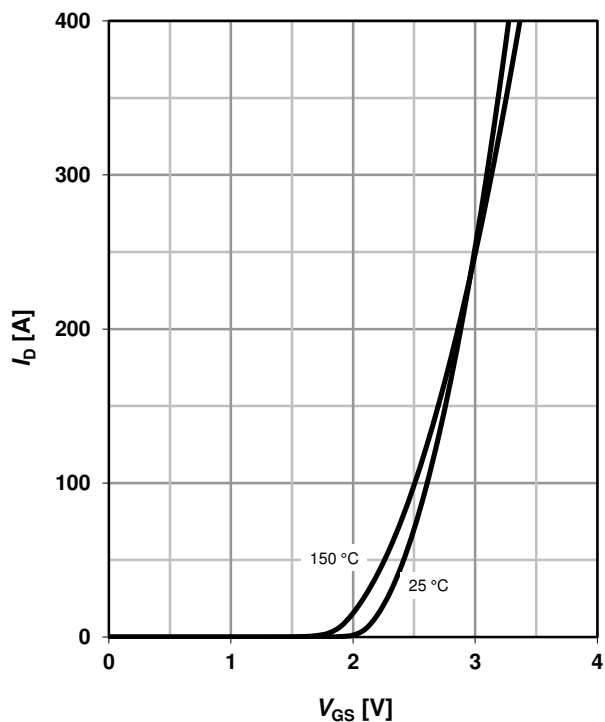
parameter:  $T_j$



**14 Typ. transfer characteristics (Q2)**

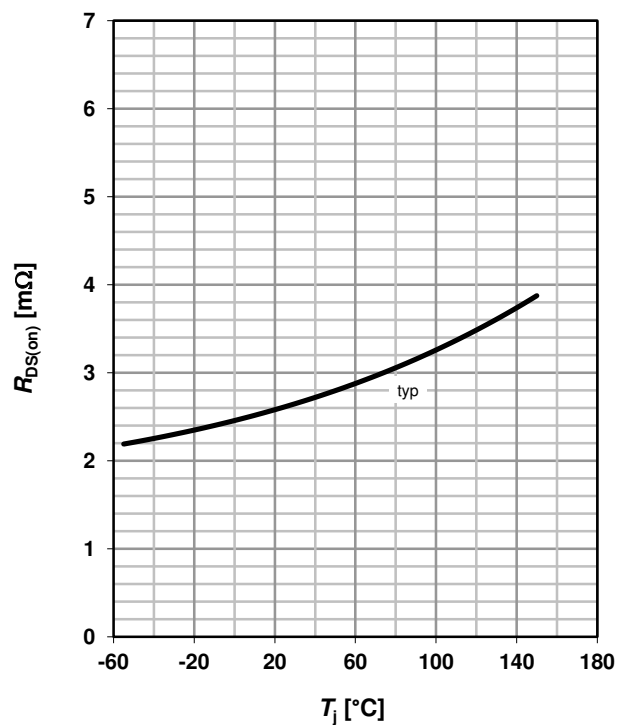
$$I_D = f(V_{GS}); |V_{DS}| > 2 |I_D| R_{DS(on)max}$$

parameter:  $T_j$



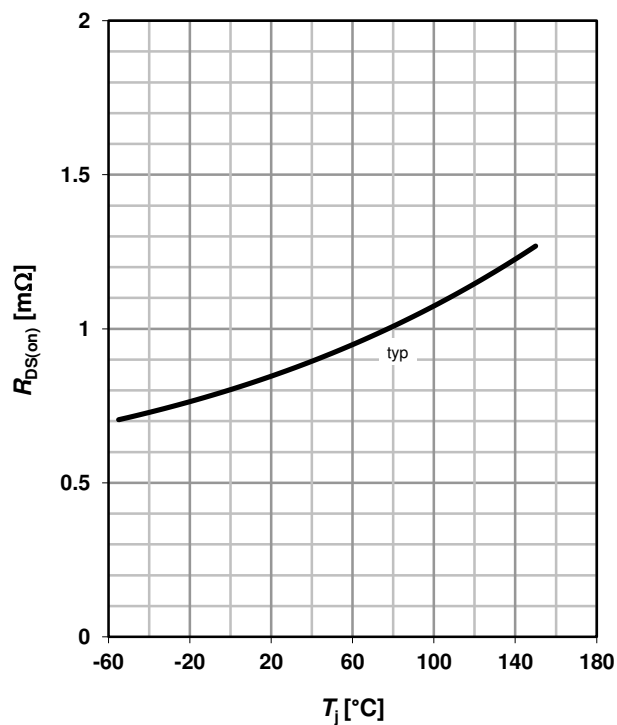
**15 Drain-source on-state resistance (Q1)**

$$R_{DS(on)} = f(T_j); I_D = 20 \text{ A}; V_{GS} = 10 \text{ V}$$



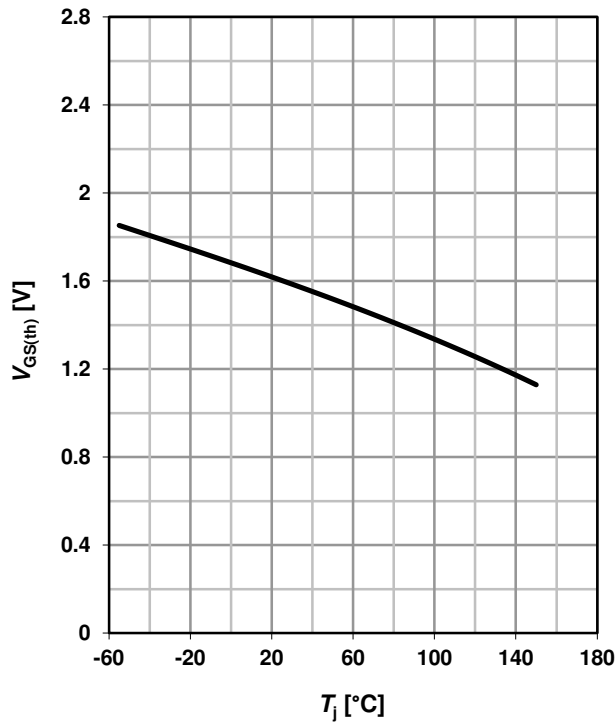
**16 Drain-source on-state resistance (Q2)**

$$R_{DS(on)} = f(T_j); I_D = 20 \text{ A}; V_{GS} = 10 \text{ V}$$



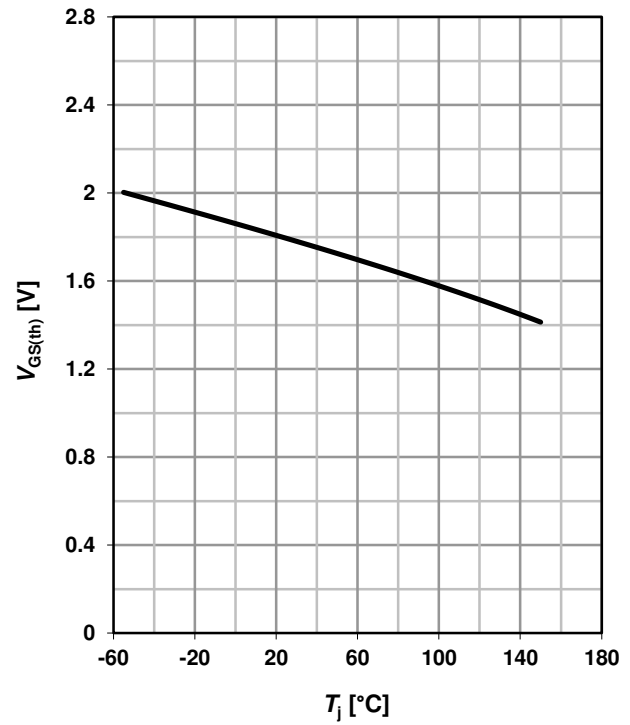
**17 Typ. gate threshold voltage (Q1)**

$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}; I_D=250 \mu A$



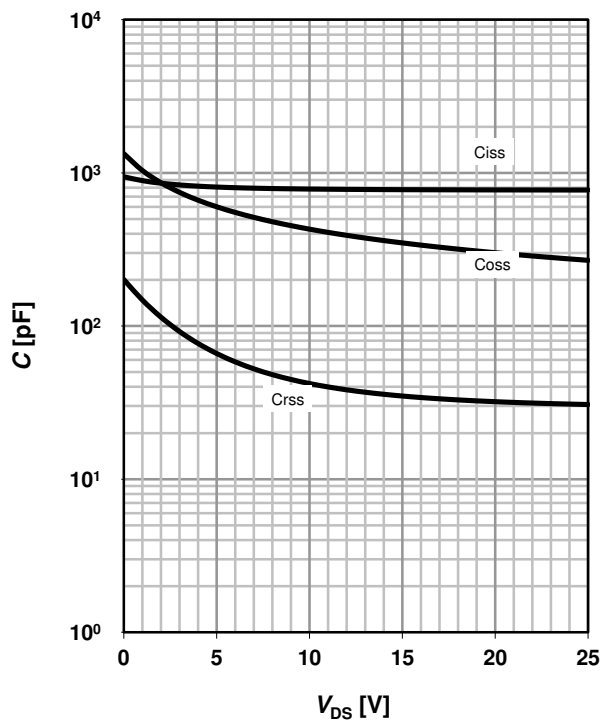
**18 Typ. gate threshold voltage (Q2)**

$V_{GS(th)}=f(T_j); V_{GS}=V_{DS}; I_D=10 \text{ mA}$



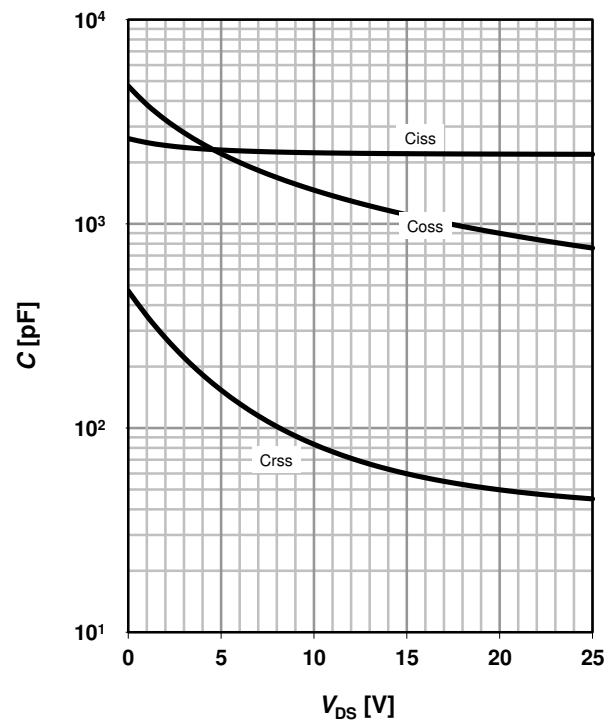
**19 Typ. capacitances (Q1)**

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



**20 Typ. capacitances (Q2)**

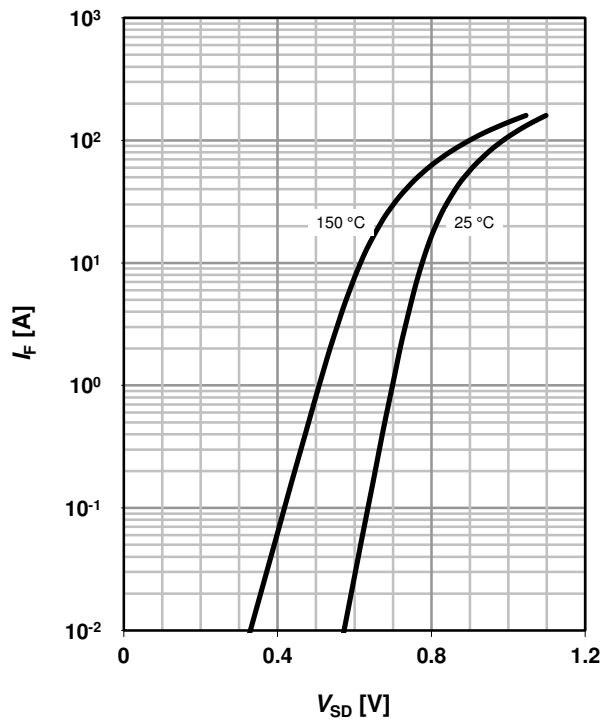
$C=f(V_{DS}); V_{GS}=0 \text{ V}; f=1 \text{ MHz}$



**21 Forward characteristics of reverse diode (Q1)**

$I_F=f(V_{SD})$

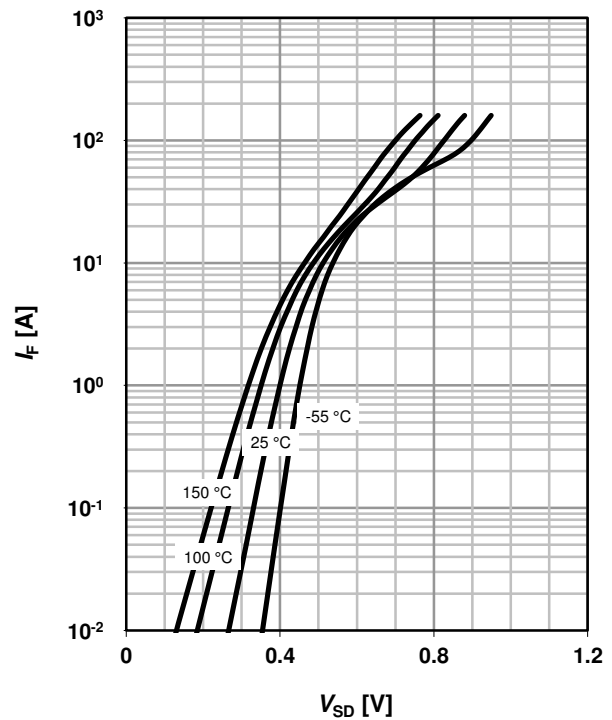
parameter:  $T_j$



**22 Forward characteristics of reverse diode (Q2)**

$I_F=f(V_{SD})$

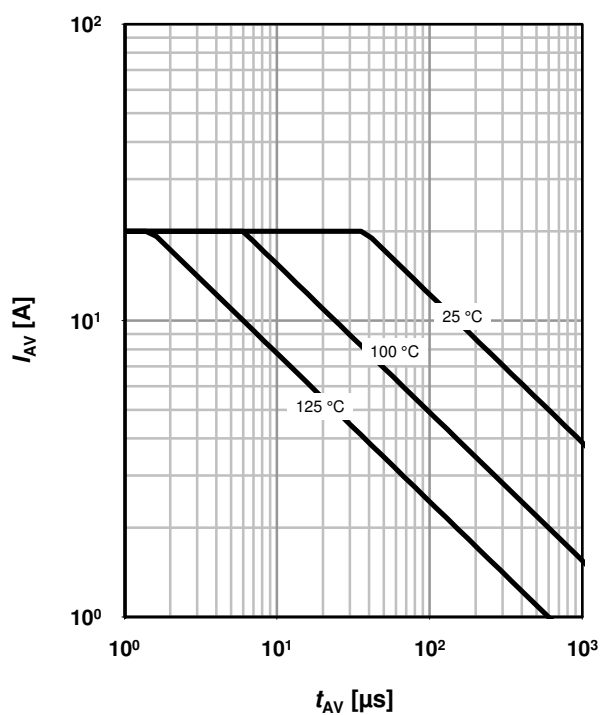
parameter:  $T_j$



**23 Avalanche characteristics (Q1)**

$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$

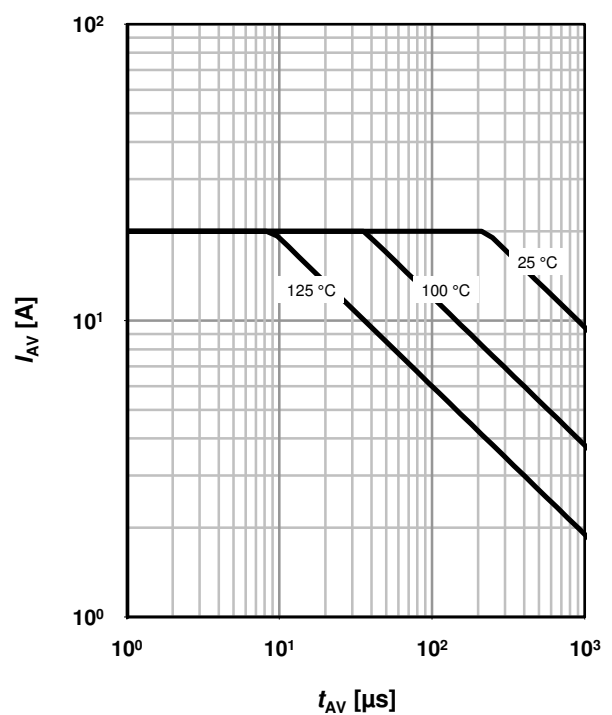
parameter:  $T_{j(start)}$



**24 Avalanche characteristics (Q2)**

$I_{AS}=f(t_{AV}); R_{GS}=25 \Omega$

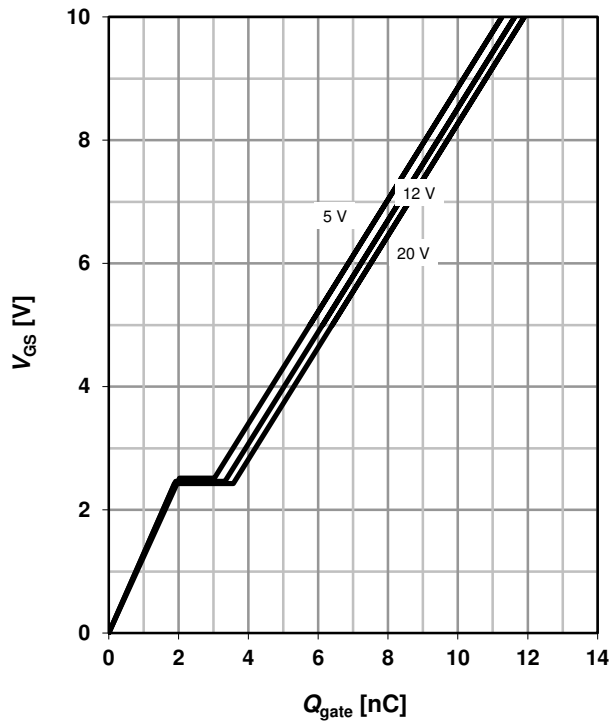
parameter:  $T_{j(start)}$



**25 Typ. gate charge (Q1)**

$V_{GS}=f(Q_{gate}); I_D=20\text{ A pulsed}$

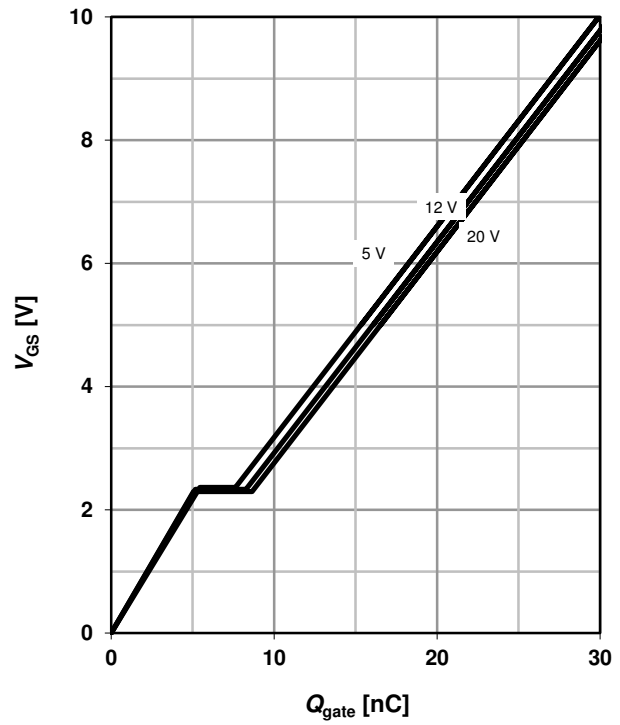
parameter:  $V_{DD}$



**26 Typ. gate charge (Q2)**

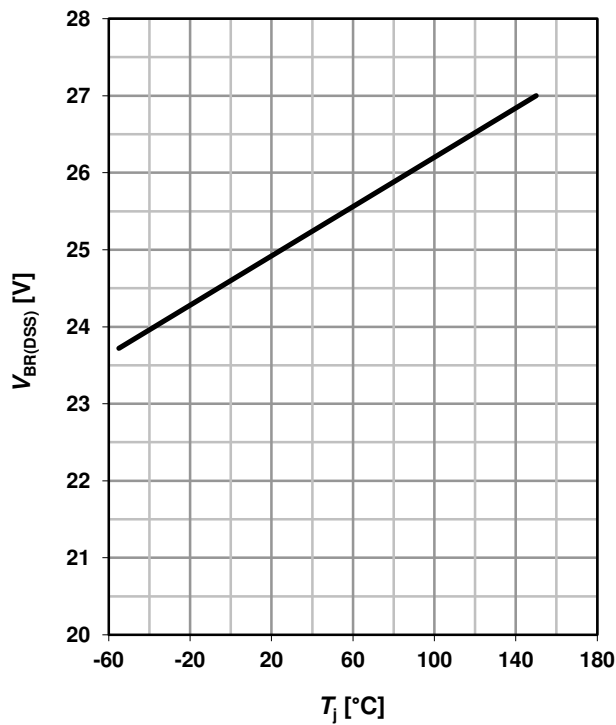
$V_{GS}=f(Q_{gate}); I_D=20\text{ A pulsed}$

parameter:  $V_{DD}$



**27 Drain-source breakdown voltage (Q1)**

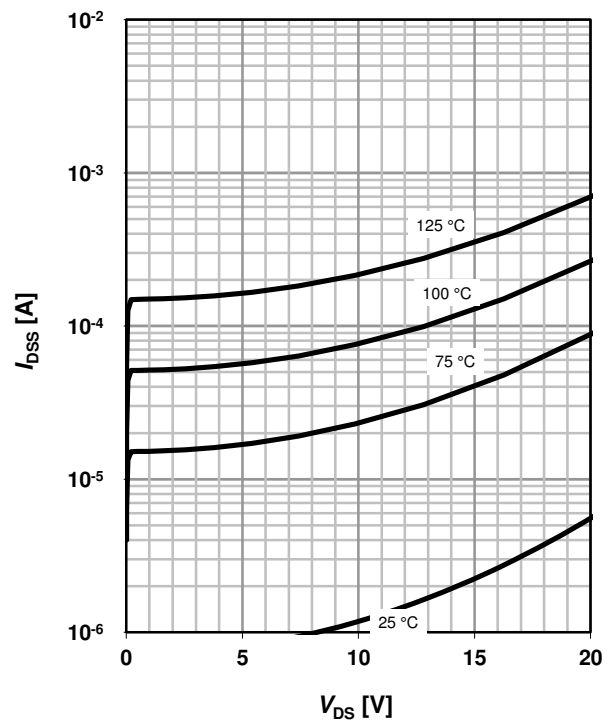
$V_{BR(DSS)}=f(T_j); I_D=1\text{ mA}$



**28 Typ. drain-source leakage current (Q2)**

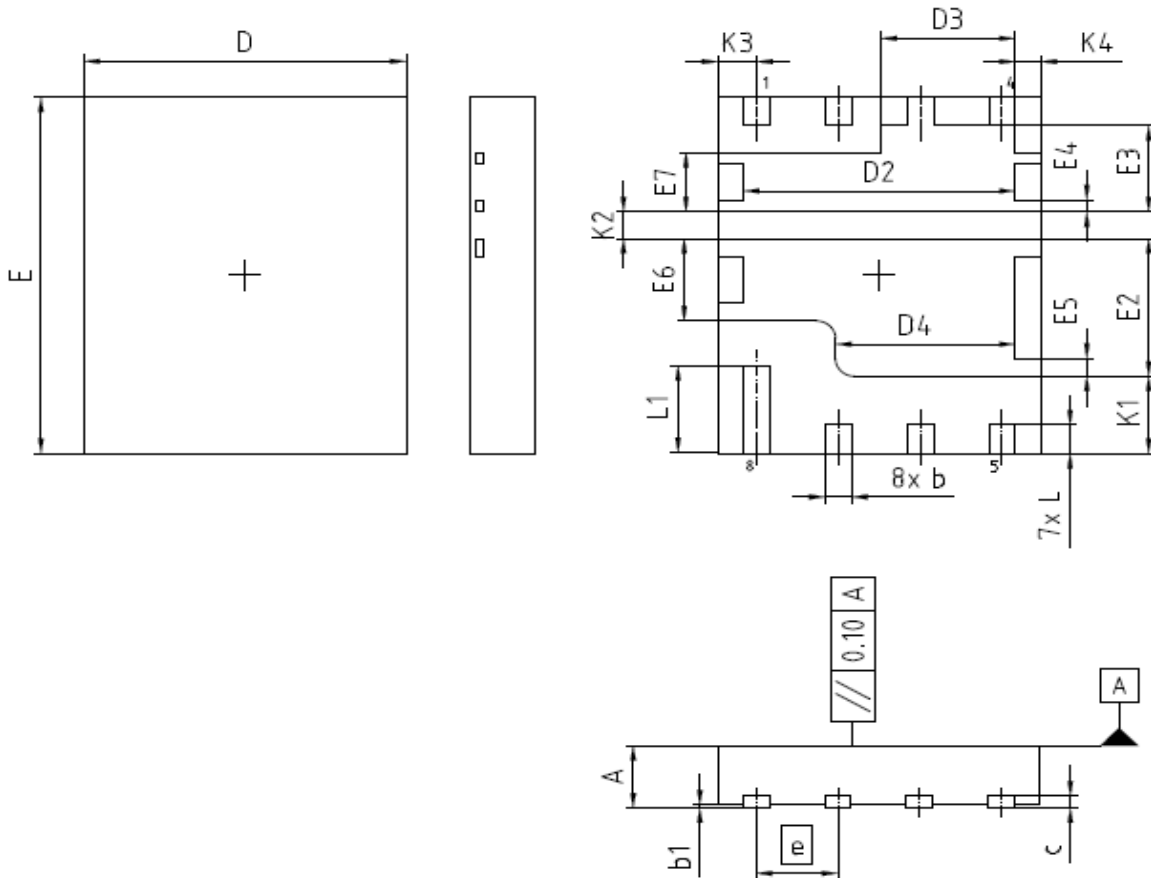
$I_{DSS}=f(V_{DS}); V_{GS}=0\text{ V}$

parameter:  $T_j$



Package Outline

PG-TISON8-4



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.15	0.035	0.045
b	0.31	0.51	0.012	0.020
b1	0.00	0.05	0.000	0.002
c	0.10	0.30	0.004	0.012
D	4.90	5.10	0.193	0.201
D2	4.12	4.32	0.162	0.170
D3	1.99	2.19	0.078	0.086
D4	2.69	2.89	0.106	0.114
E	5.90	6.10	0.232	0.240
E2	2.22	2.42	0.087	0.095
E3	1.35	1.55	0.053	0.061
E4	0.10	0.30	0.004	0.012
E5	0.20	0.40	0.008	0.016
E6	1.29	1.49	0.051	0.059
E7	0.90	1.10	0.035	0.043
e	1.27 (BSC)		0.05 (BSC)	
N	8		8	
L	0.38	0.58	0.015	0.023
L1	1.38	1.58	0.054	0.062
K1	1.20	1.40	0.047	0.055
K2	0.35	0.55	0.014	0.022
K3	0.50	0.70	0.020	0.028
K4	0.29	0.49	0.011	0.019

DOCUMENT NO.  
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SCALE

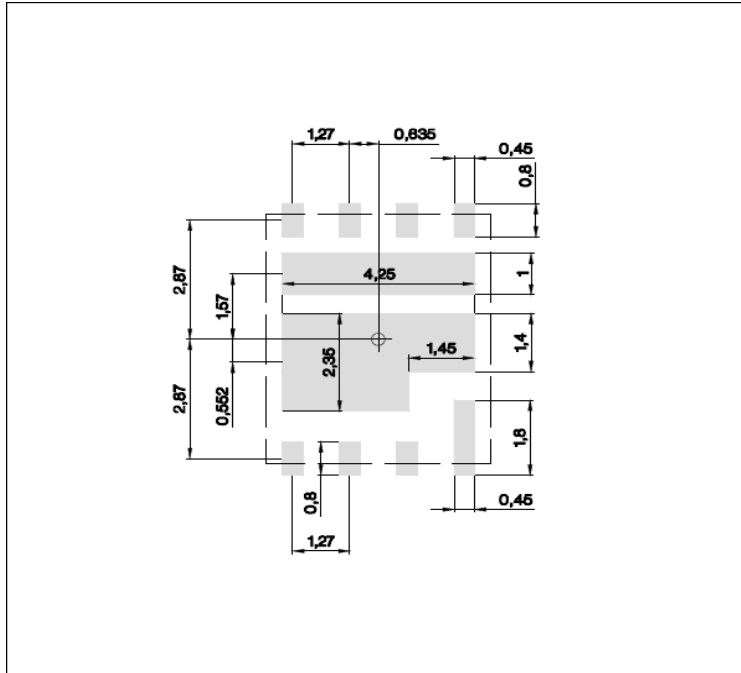
EUROPEAN PROJECTION

ISSUE DATE  
13-03-2015

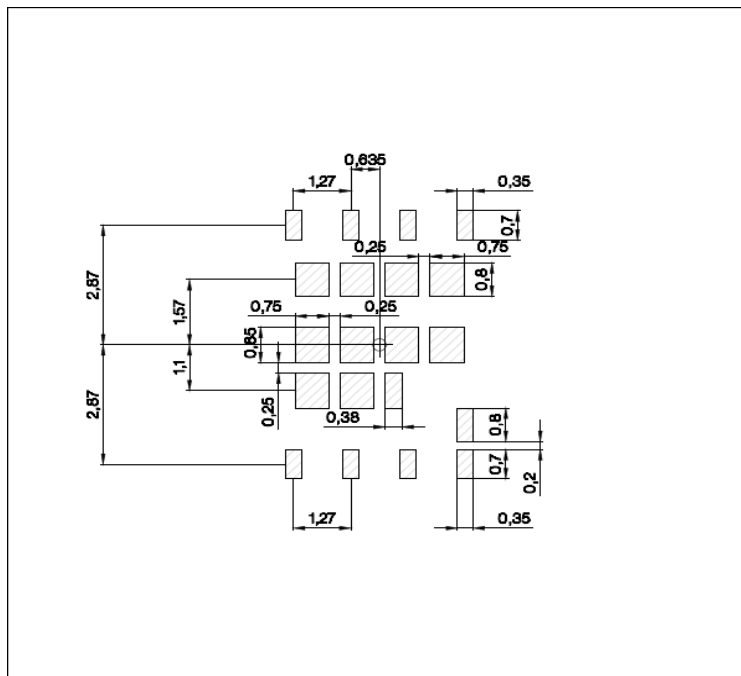
REVISION  
01

Boardpads & Apertures

PG-TISON8-4



■ copper



▨ stencil apertures

All the dimensions in mm

## Revision History

BSG0813NDI

**Revision: 2016-03-24, Rev. 2.1**

Previous Revision

Revision	Date	Subjects (major changes since last revision)
2.0	2015-03-17	Release of final version
2.1	2016-03-24	Update package drawing

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The Infineon Technologies component described in this Data Sheet may be used in life-support devices or systems and/or automotive, aviation and aerospace applications or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support, automotive, aviation and aerospace device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

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