MOSFET

Metal Oxide Semiconductor Field Effect Transistor

OptiMOS™ Power-Transistor, 25V

25V OptiMOS™5 Power MOSFET
BSC0511NDI

Data Sheet

Rev. 2.0
Final

Industrial & Multimarket

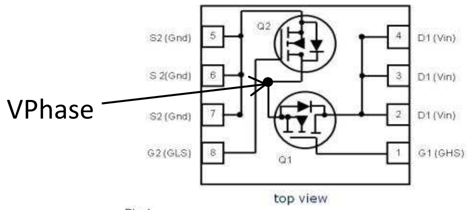
Dual N-Channel OptiMOS™5 MOSFET

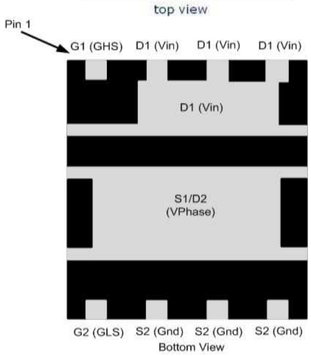
Product Summary

		Q1	Q2	
V_{DS}		25	25	V
$R_{DS(on),max}$	V_{GS}=10 V	2.8	1.0	mΩ
	V_{GS}=4.5 V	4.2	1.4	
I_D		40	40	A

Features

- Dual N-channel OptiMOS™ MOSFET
- Optimized for high performance buck converters
- Logic level (4.5V rated)
- 100% avalanche tested
- Qualified according to JEDEC[1]) for target applications
- Pb-free lead plating; RoHS compliant
- Halogen-free according to IEC61249-2-21
- Integrated monolithic Schottky-like diode





Type	Package	Marking
BSC0511NDI	PG-TISON-8	0511NDI

Maximum ratings[2]) at T_j=25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value		Unit
			Q1	Q2	
Continuous drain current	I_D	T_C=70 °C, V_{GS}=10 V	40	40	A
		T_A=25 °C, V_{GS}=4.5 V[3])	19	33	
		T_A=70 °C, V_{GS}=4.5 V[3])	15	26	
		T_A=25 °C, V_{GS}=10 V[4])	15	26	
Pulsed drain current[5])	$I_{D,pulse}$	T_C=70 °C	160	160	
Avalanche energy, single pulse	E_{AS}	Q1: I_D=20 A, Q2: I_D=20 A, R_{GS}=25 Ω	12	90	mJ
Gate source voltage	V_{GS}		±16		V
Power dissipation	P_{tot}	T_A=25 °C[2])	2.5	2.5	W
		T_A=25 °C, minimum footprint[4])	1.0	1.0	
Operating and storage temperature	T_j, T_{stg}		-55 ... 150		°C
IEC climatic category; DIN IEC 68-1			55/150/56		

Parameter		Symbol	Conditions	Values			Unit
				min.	typ.	max.	
Thermal characteristics							
Thermal resistance, junction - case	Q1	R_{thJC}		-	-	4.3	K/W
	Q2			-	-	1.7	
Thermal resistance, junction - ambient[1)]	Q1	R_{thJA}	6 cm^2 cooling area[3)]	-	-	50	
	Q2						
	Q1		minimal footprint, steady state[4)]	-	-	125	
	Q2						

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

Static characteristics

Parameter		Symbol	Conditions	min.	typ.	max.	Unit
Drain-source breakdown voltage	Q1	$V_{(BR)DSS}$	V_{GS}=0 V, I_D=10 mA	25	-	-	V
	Q2						
Breakdown voltage temperature coefficient	Q1	$dV_{(BR)DSS}/dT_j$	I_D=10 mA, referenced to 25 °C	-	15	-	mV/K
	Q2						
Gate threshold voltage	Q1	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250 µA	1.2	1.6	2	V
	Q2						
Zero gate voltage drain current	Q1	I_{DSS}	V_{DS}=20 V, V_{GS}=0 V, T_j=25 °C	-	-	1	µA
	Q2			-	-	500	
	Q1		V_{DS}=20 V, V_{GS}=0 V, T_j=125 °C	-	-	0.1	mA
	Q2			-	3	-	
Gate-source leakage current	Q1	I_{GSS}	V_{GS}=16 V, V_{DS}=0 V	-	-	100	nA
	Q2						
Drain-source on-state resistance	Q1	$R_{DS(on)}$	V_{GS}=4.5 V, I_D=25 A	-	3.0	4.2	mΩ
	Q2			-	1.0	1.4	
	Q1		V_{GS}=10 V, I_D=25 A	-	2.2	2.8	
	Q2			-	0.8	1.0	
Gate resistance	Q1	R_G		-	0.7	1.2	Ω
	Q2			-	1.1	1.8	
Transconductance	Q1	g_{fs}	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=30 A	55	110	-	S
	Q2			75	150	-	

Parameter		Symbol	Conditions	Values			Unit
				min.	typ.	max.	

Dynamic characteristics

Parameter		Symbol	Conditions	min.	typ.	max.	Unit
Input capacitance[6)]	Q1	C_{iss}	V_{GS}=0 V, V_{DS}= 12 V, f=1 MHz	-	780	1100	pF
	Q2			-	2400	3300	
Output capacitance[6)]	Q1	C_{oss}		-	390	530	
	Q2			-	1400	1900	
Reverse transfer capacitance	Q1	C_{rss}		-	38	-	
	Q2			-	130	-	
Turn-on delay time	Q1	$t_{d(on)}$	V_{DD}=12 V, V_{GS}=10 V, R_G=1.6 Ω, I_D=30 A	-	3	-	ns
	Q2			-	5	-	
Rise time	Q1	t_r		-	3	-	
	Q2			-	5	-	
Turn-off delay time	Q1	$t_{d(off)}$		-	13	-	
	Q2			-	26	-	
Fall time	Q1	t_f		-	2	-	
	Q2			-	4	-	

Gate Charge Characteristics

Parameter		Symbol	Conditions	min.	typ.	max.	Unit
Gate to source charge	Q1	Q_{gs}	V_{DD}=12 V, I_D=30 A, V_{GS}=0 to 4.5 V	-	2.0	-	nC
Gate to drain charge		Q_{gd}		-	1.4	-	
Gate charge total		Q_g		-	5.6	7.8	
Gate plateau voltage		$V_{plateau}$		-	2.6	-	V
Gate to source charge	Q2	Q_{gs}		-	5.6	-	nC
Gate to drain charge		Q_{gd}		-	4.3	-	
Gate charge total		Q_g			17	23	
Gate plateau voltage		$V_{plateau}$			2.3	-	V
Output charge	Q1	Q_{oss}	V_{DD}=12 V, V_{GS}=0 V	-	7.6	-	nC
	Q2			-	28	-	

Parameter		Symbol	Conditions	Values			Unit
				min.	typ.	max.	
Reverse Diode							
Diode continuous forward current	Q1	I_S	T_C=25 °C	-	-	29	A
	Q2			-	-	40	
Diode pulse current	Q1	$I_{S,pulse}$		-	-	160	
	Q2			-	-	160	
Diode forward voltage	Q1	V_{SD}	V_{GS}=0 V, I_F=25 A, T_j=25 °C	-	0.83	1	V
	Q2		V_{GS}=0 V, I_F=11 A, T_j=25 °C	-	0.48	0.7	
Reverse recovery charge	Q1	Q_{rr}	V_R=12 V, I_F=10 A, di_F/dt=400 A/µs	-	5	-	nC
	Q2			-	5	-	

[1] J-STD20 and JESD22

[2] One transistor active

[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.

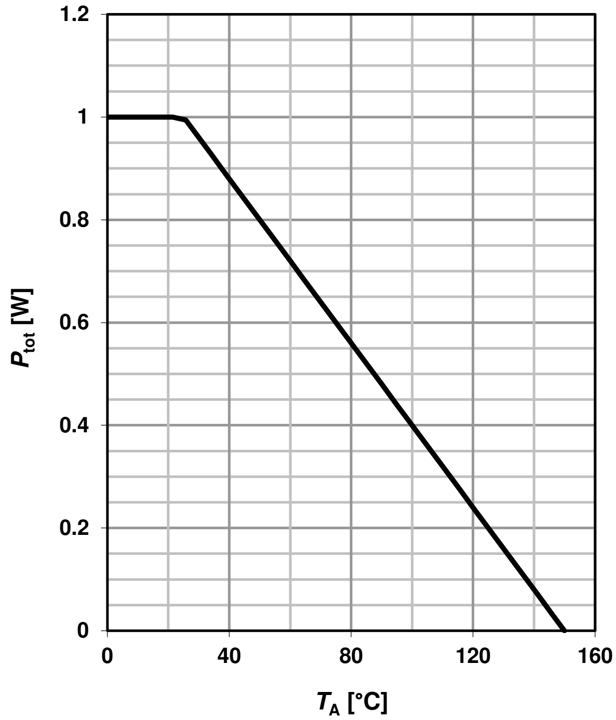
[4] Device mounted on a minimum pad (one layer, 70 µm thick). One transistor active.

[5] See figure 3 for more detailed information.

[6] Defined by design. Not subject to production test

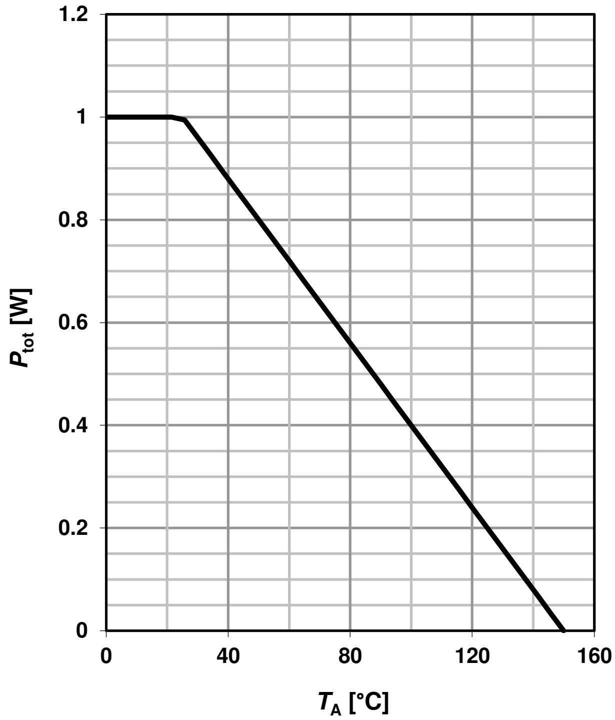
1 Power dissipation (Q1)

P_{tot}=f(T_A)[3)]



2 Power dissipation (Q2)

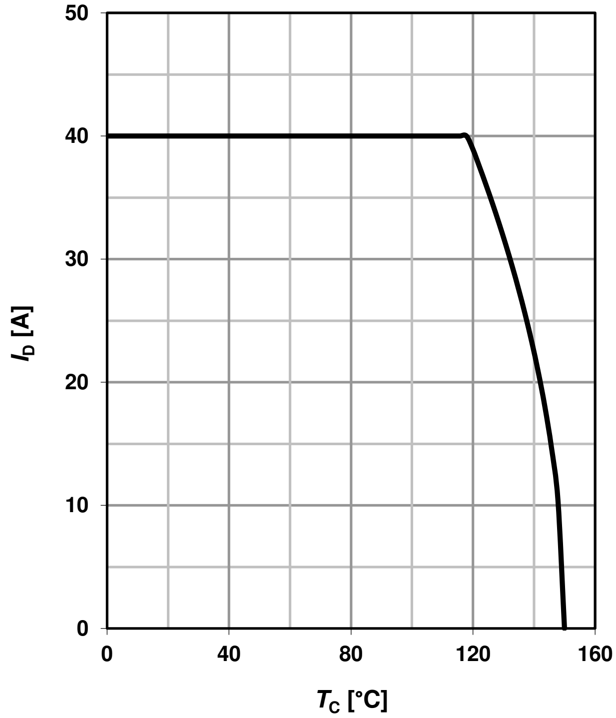
P_{tot}=f(T_A)[3)]



3 Drain current (Q1)

I_D=f(T_C)

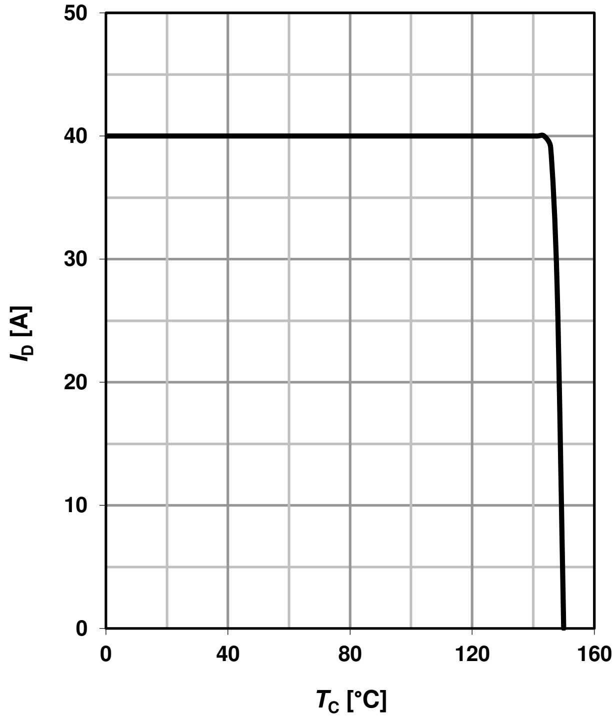
parameter: V_{GS}≥10 V



4 Drain current (Q2)

I_D=f(T_C)

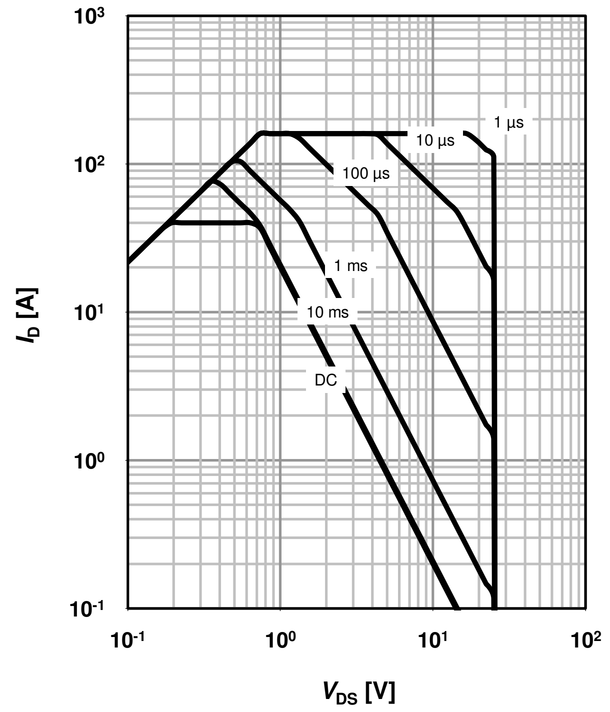
parameter: V_{GS}≥10 V



5 Safe operating area (Q1)

I_D=f(V_{DS}); T_C=25 °C; D=0

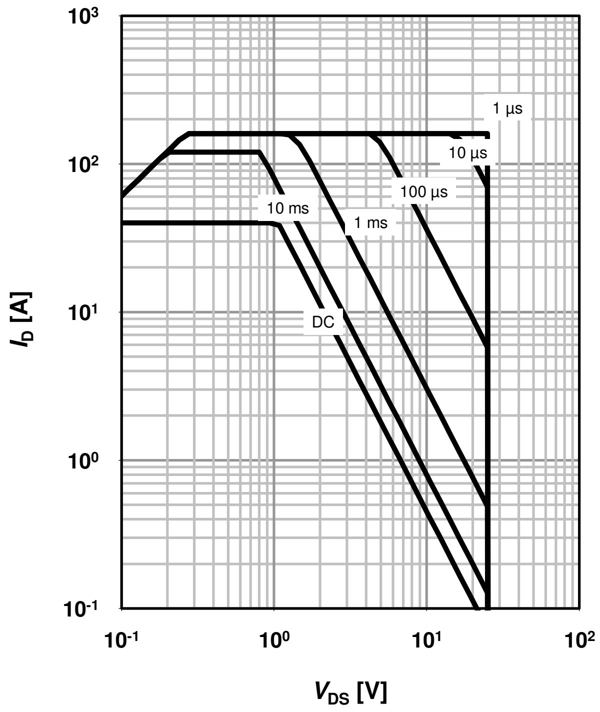
parameter: t_p



6 Safe operating area (Q2)

I_D=f(V_{DS}); T_C=25 °C; D=0

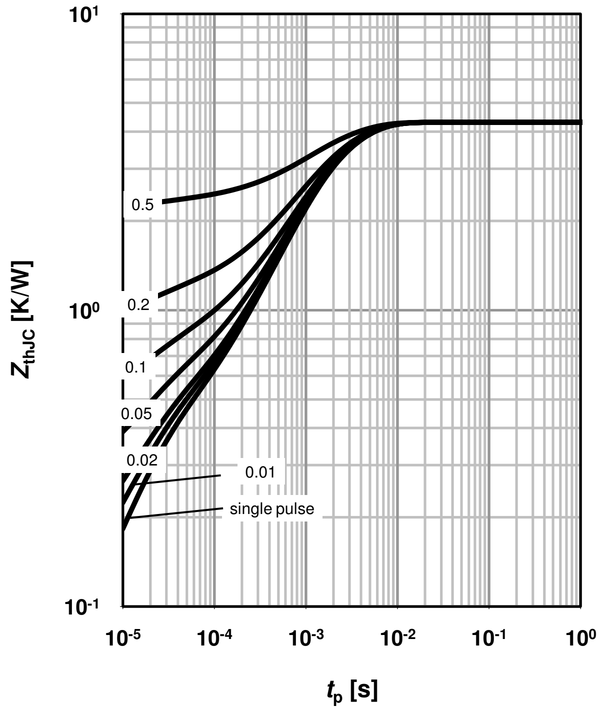
parameter: t_p



7 Max. transient thermal impedance (Q1)

Z_{thJC}=f(t_p)

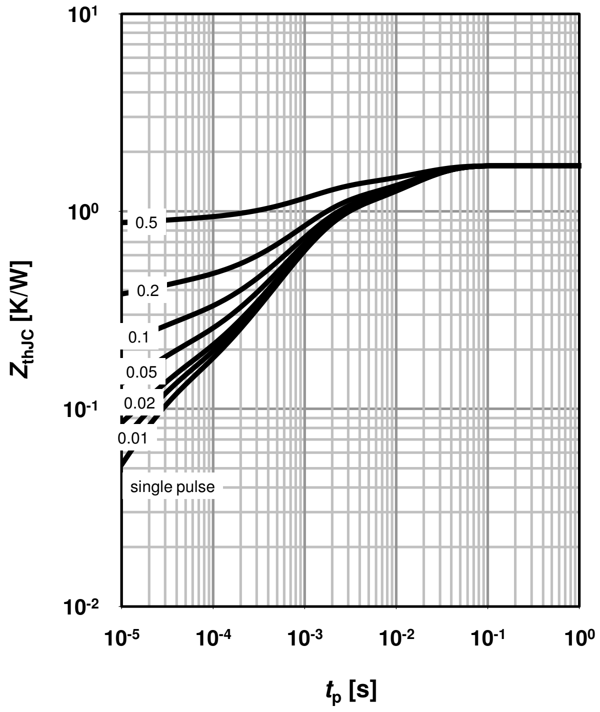
parameter: D=t_p/T



8 Max. transient thermal impedance (Q2)

Z_{thJC}=f(t_p)

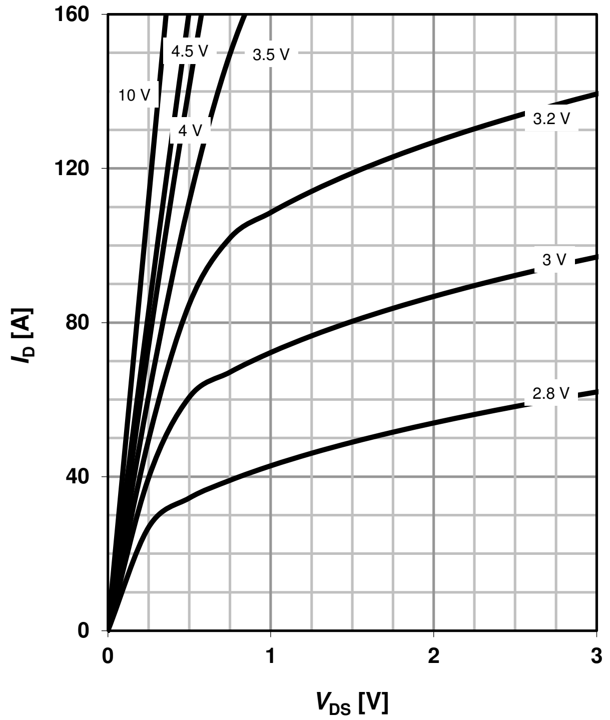
parameter: D=t_p/T



9 Typ. output characteristics (Q1)

I_D=f(V_{DS}); T_j=25 °C

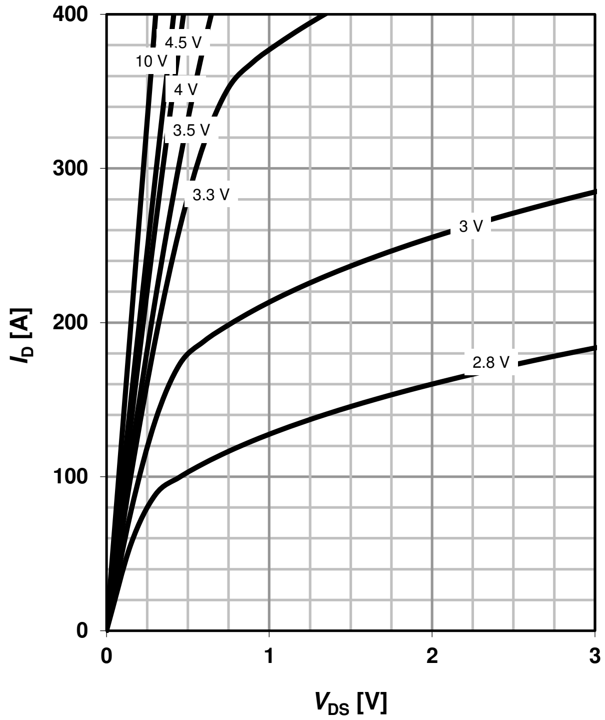
parameter: V_{GS}



10 Typ. output characteristics (Q2)

I_D=f(V_{DS}); T_j=25 °C

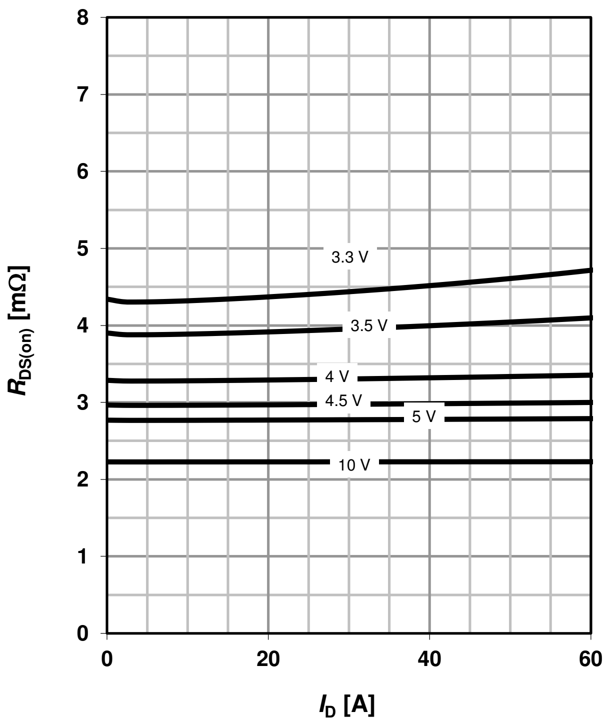
parameter: V_{GS}



11 Typ. drain-source on resistance (Q1)

$R_{DS(on)}$=f(I_D); T_j=25 °C

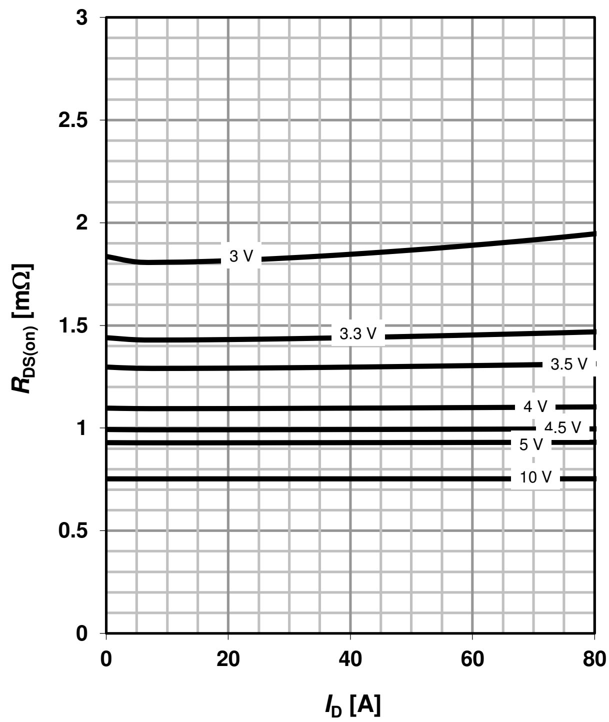
parameter: V_{GS}



12 Typ. drain-source on resistance (Q2)

$R_{DS(on)}$=f(I_D); T_j=25 °C

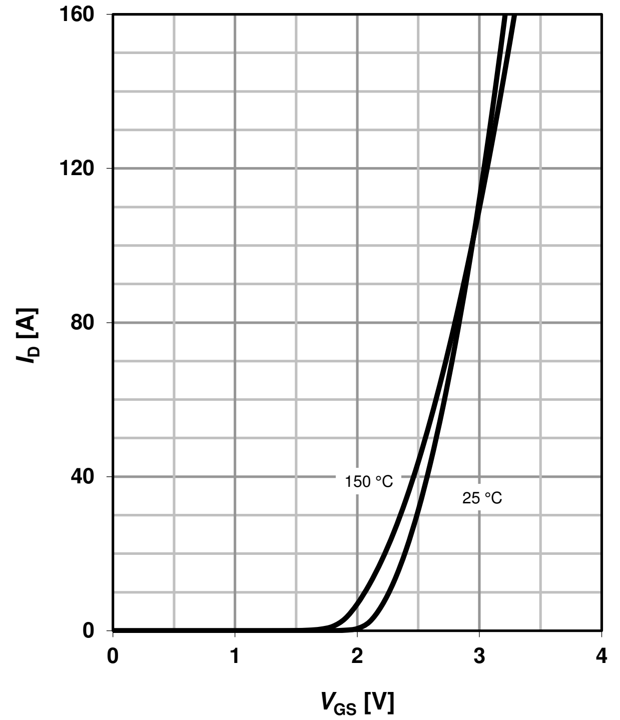
parameter: V_{GS}



13 Typ. transfer characteristics (Q1)

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

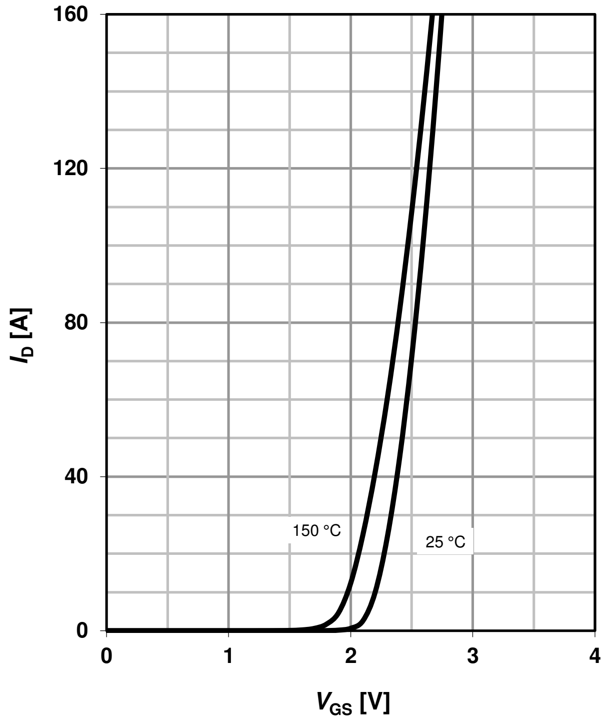
parameter: T_j



14 Typ. transfer characteristics (Q2)

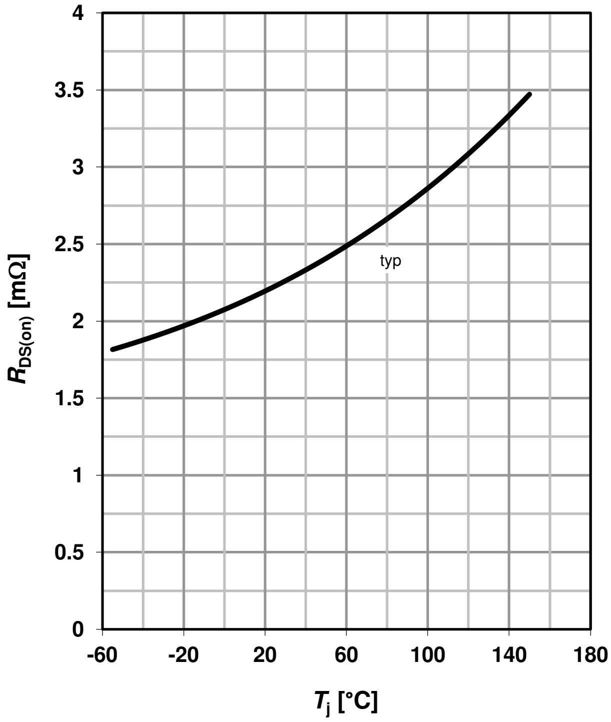
I_D=f(V_{GS}); $|V_{DS}|$>2 $|I_D| R_{DS(on)max}$

parameter: T_j



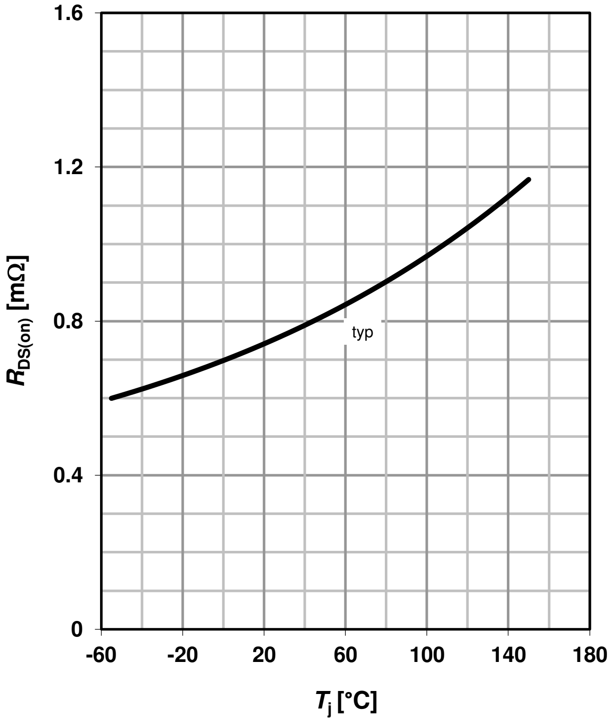
15 Drain-source on-state resistance (Q1)

$R_{DS(on)}$=f(T_j); I_D=25 A; V_{GS}=10 V



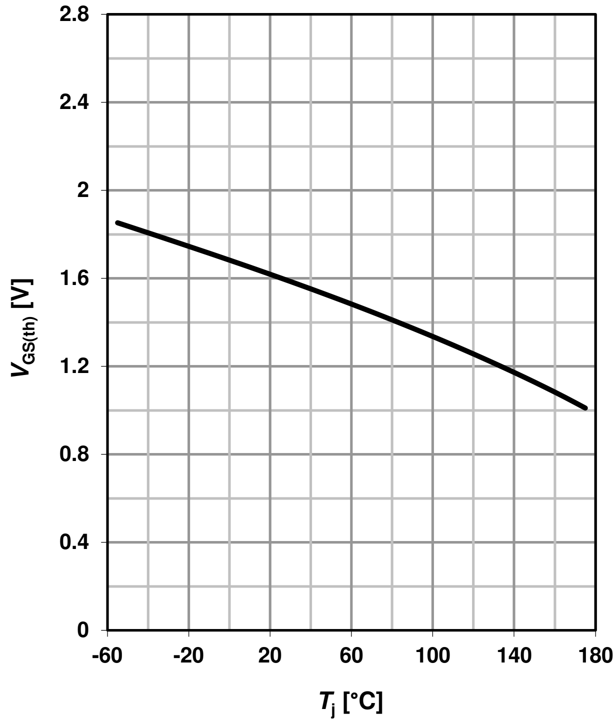
16 Drain-source on-state resistance (Q2)

$R_{DS(on)}$=f(T_j); I_D=25 A; V_{GS}=10 V



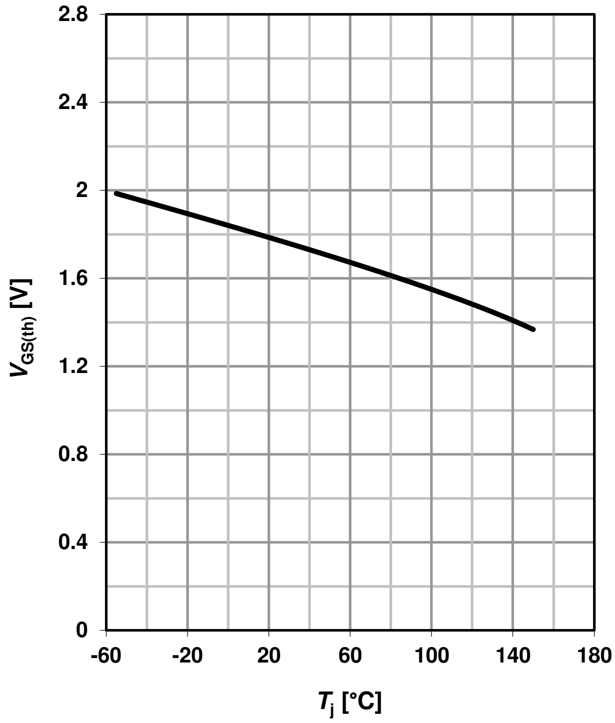
17 Typ. gate threshold voltage (Q1)

$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; I_D=250 µA



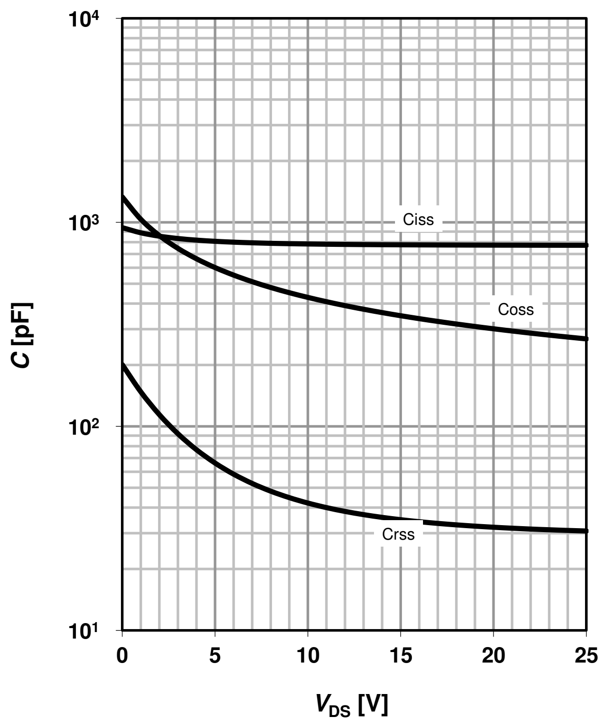
18 Typ. gate threshold voltage (Q2)

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



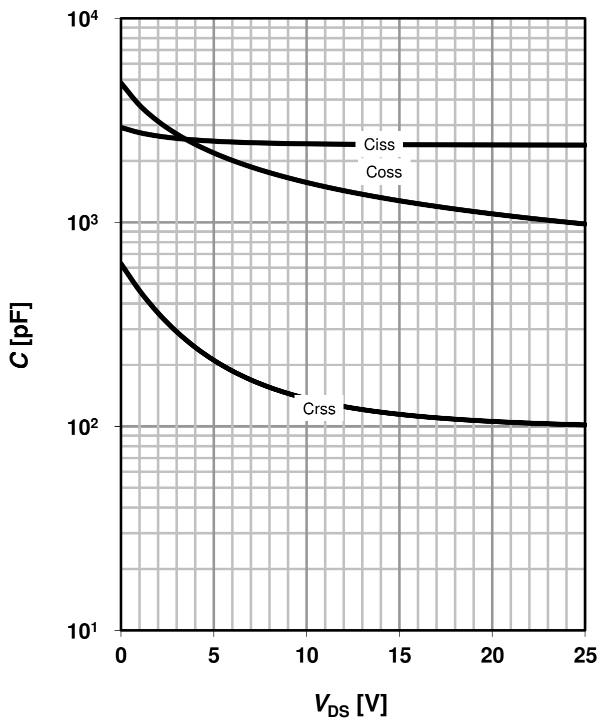
19 Typ. capacitances (Q1)

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



20 Typ. capacitances (Q2)

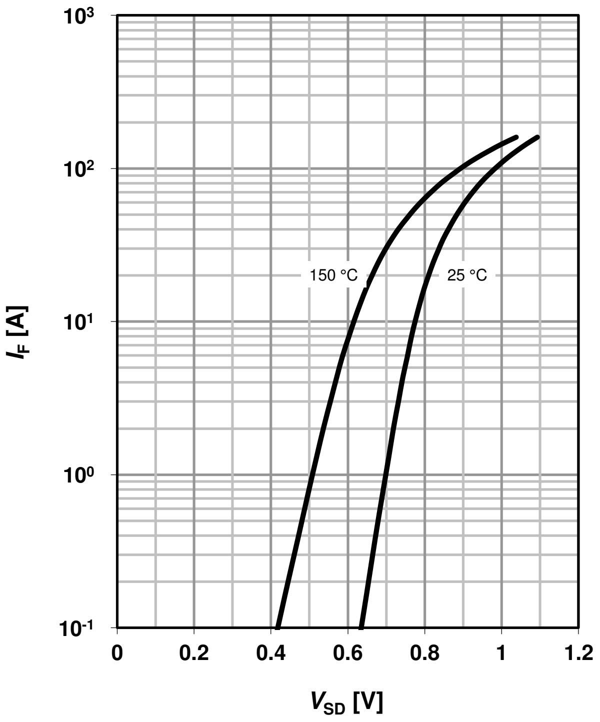
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz



21 Forward characteristics of reverse diode (Q1)

$I_F = f(V_{SD})$

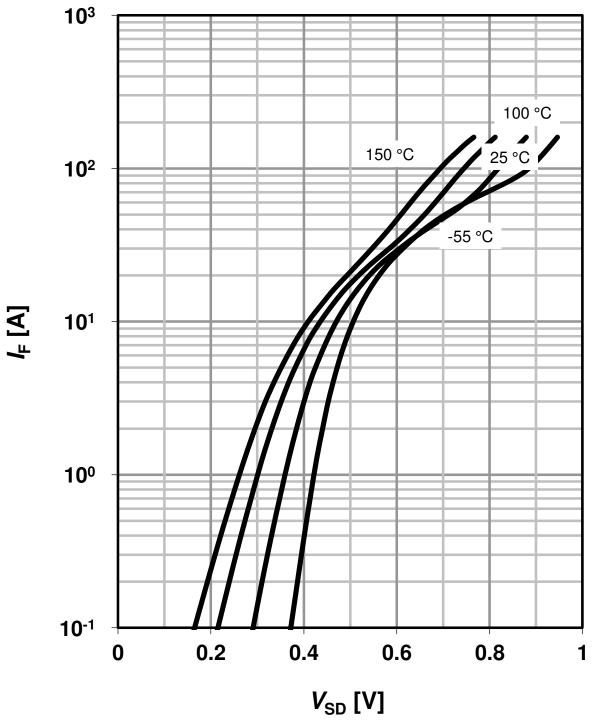
parameter: T_j



22 Forward characteristics of reverse diode (Q2)

$I_F = f(V_{SD})$

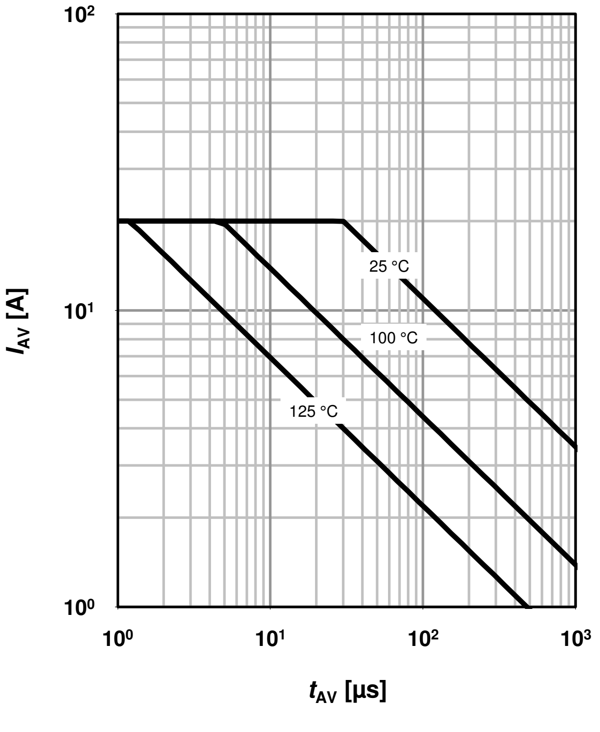
parameter: T_j



23 Avalanche characteristics (Q1)

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

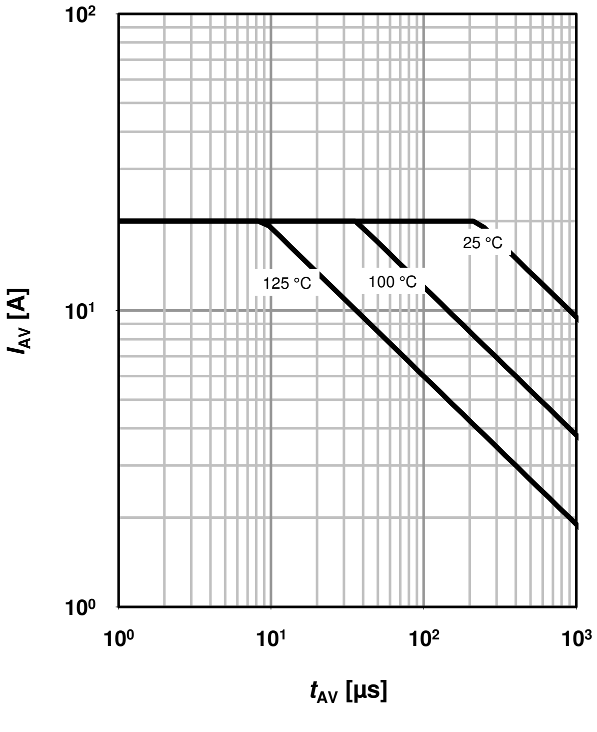
parameter: $T_{j(start)}$



24 Avalanche characteristics (Q2)

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

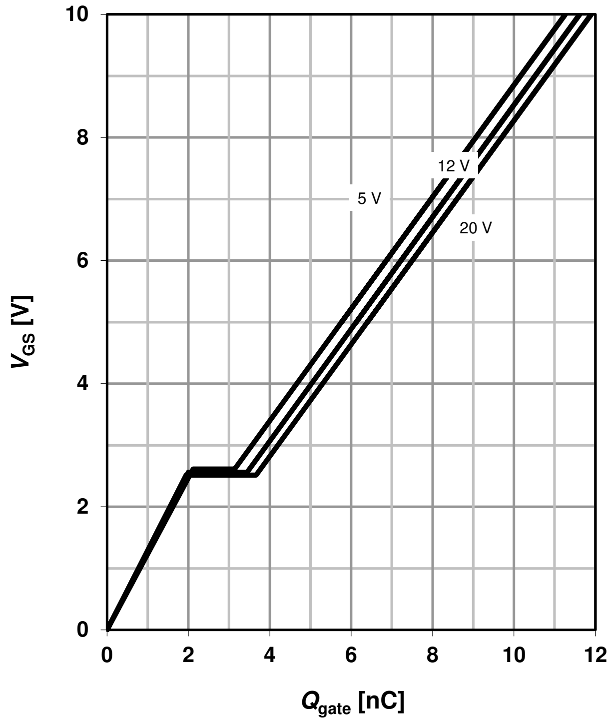
parameter: $T_{j(start)}$



25 Typ. gate charge (Q1)

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

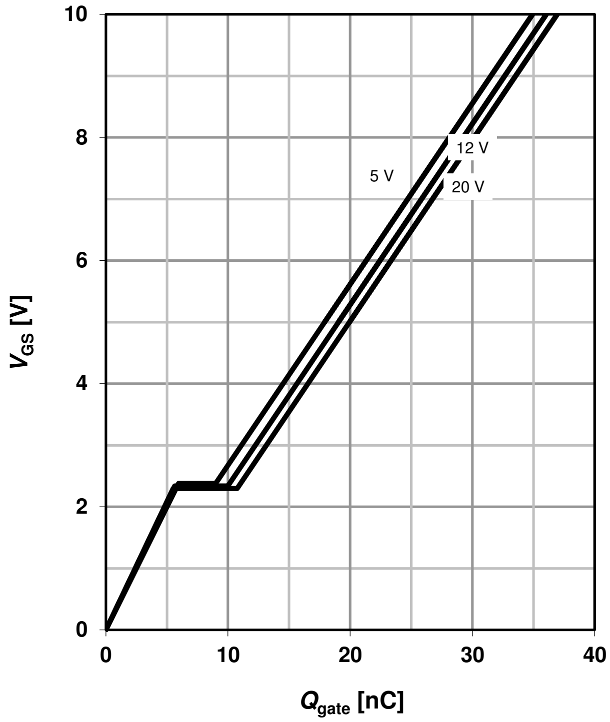
parameter: V_{DD}



26 Typ. gate charge (Q2)

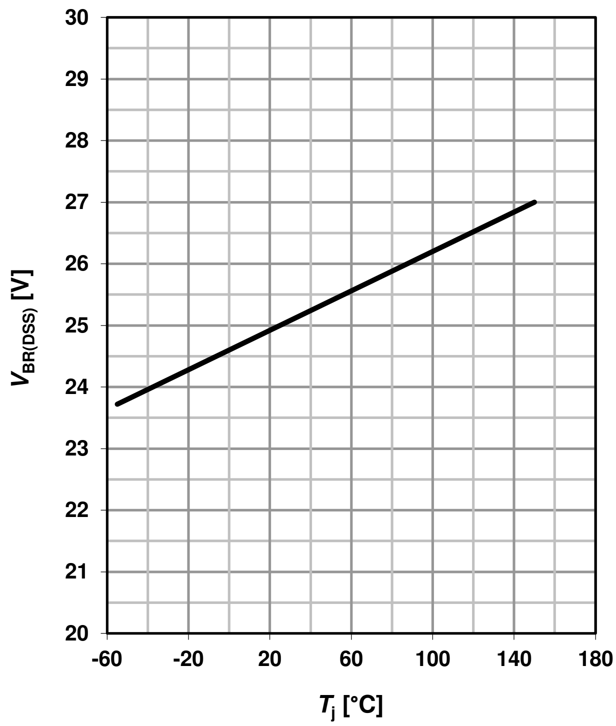
V_{GS}=f(Q_{gate}); I_D=20 A pulsed

parameter: V_{DD}



27 Drain-source breakdown voltage (Q1)

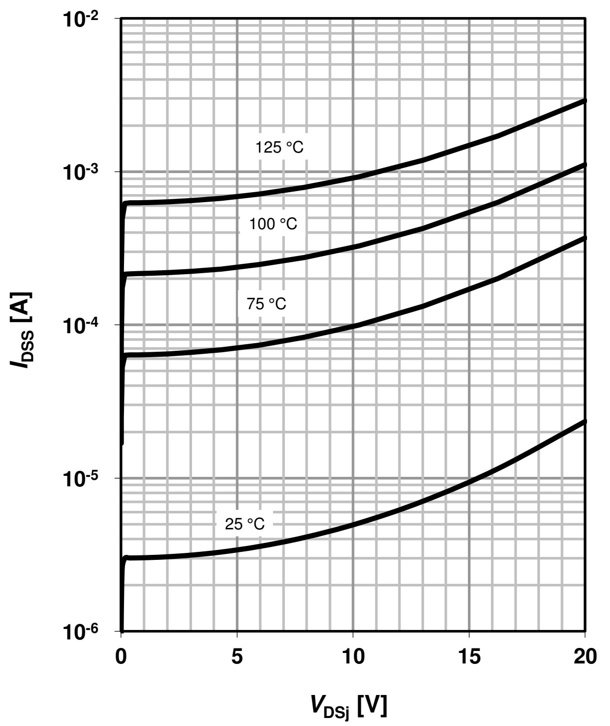
$V_{BR(DSS)}$=f(T_j); I_D=1 mA



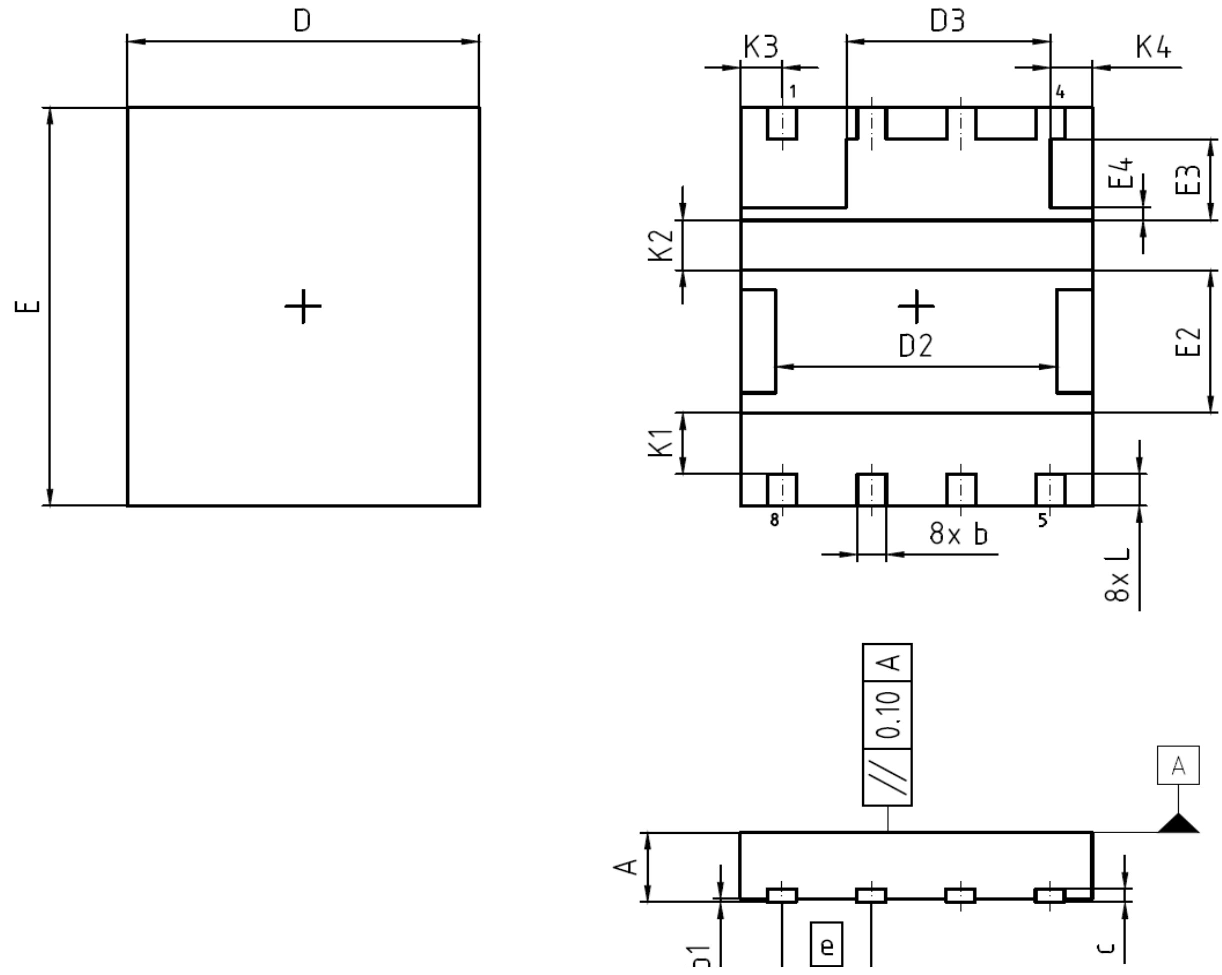
28 Typ. drain-source leakage current (Q2)

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

parameter: T_j



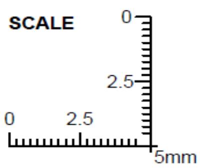
PG-TISON



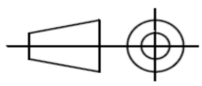
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.90	1.15	0.035	0.045
b	0.31	0.51	0.012	0.020
b1	0.00	0.05	0.000	0.002
c	0.10	0.30	0.004	0.012
D	4.90	5.10	0.193	0.201
D2	3.90	4.10	0.154	0.161
D3	2.80	3.00	0.110	0.118
E	5.90	6.10	0.232	0.240
E2	2.05	2.25	0.081	0.089
E3	1.12	1.32	0.044	0.052
E4	0.10	0.30	0.004	0.012
e	1.27 (BSC)		0.05 (BSC)	
N	8		8	
L	0.38	0.58	0.015	0.023
K1	0.82	1.02	0.032	0.040
K2	0.65	0.85	0.026	0.033
K3 = K4	0.50	0.70	0.019	0.027

DOCUMENT NO.
Z8B00162738

SCALE



EUROPEAN PROJECTION

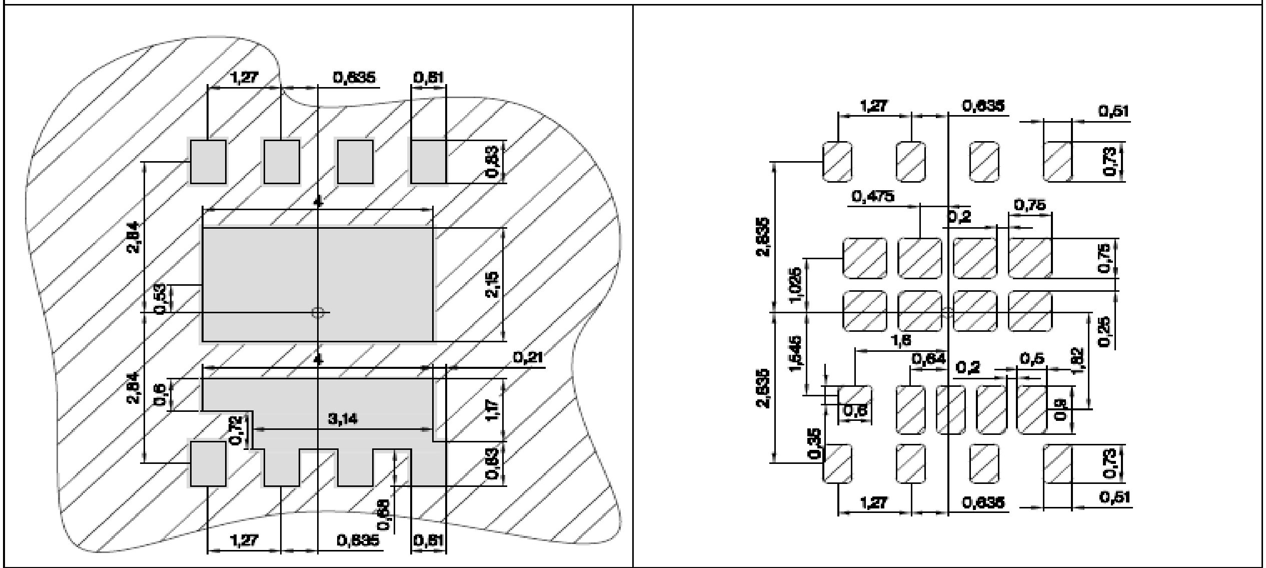


ISSUE DATE
21-09-2011

REVISION
01

PG-TISON-8

PG-TISON-8-2, -3: Boardpads & Apertures



copper   solder mask   stencil apertures

Revision History

BSC0511NDI

Revision: 2015-03-09, Rev. 2.0

Previous Revision		
Revision	Date	Subjects (major changes since last revision)
2.0	2015-03-09	Release of final version

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