

OptiMOS[®] -T Power-Transistor



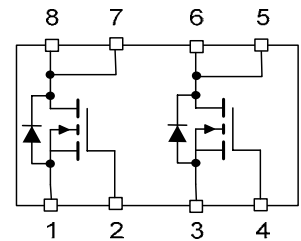
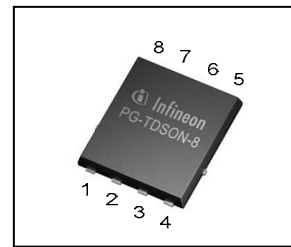
Features

- Dual N-channel Logic Level - Enhancement mode
- AEC Q101 qualified
- MSL1 up to 260°C peak reflow
- 175°C operating temperature
- Green Product (RoHS compliant)
- 100% Avalanche tested

Product Summary

V_{DS}	55	V
$R_{DS(on),max}^{5)}$	23	mΩ
I_D	20	A

PG-TDSON-8-4



Type	Package	Marking
IPG20N06S3L-23	PG-TDSON-8-4	3N06L23

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

Parameter	Symbol	Conditions	Value	Unit
Continuous drain current ¹⁾ one channel active	I_D	$T_C=25\text{ °C}$, $V_{GS}=10\text{ V}$	20	A
		$T_C=100\text{ °C}$, $V_{GS}=10\text{ V}^{2)}$	20	
Pulsed drain current ²⁾ one channel active	$I_{D,pulse}$	-	80	
Avalanche energy, single pulse ^{2, 5)}	E_{AS}	$I_D=10\text{ A}$	110	mJ
Avalanche current, single pulse ⁵⁾	I_{AS}	-	20	A
Gate source voltage ⁴⁾	V_{GS}	-	±16	V
Power dissipation one channel active	P_{tot}	$T_C=25\text{ °C}$	45	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}	-	-	-	3.3	K/W
SMD version, device on PCB	R_{thJA}	minimal footprint	-	100	-	
		6 cm ² cooling area ³⁾	-	60	-	

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

Static characteristics

Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0\text{ V}, I_D=1\text{ mA}$	55	-	-	V
Gate threshold voltage	$V_{GS(th)}$	$V_{DS}=V_{GS}, I_D=20\text{ }\mu\text{A}$	1.2	1.7	2.2	
Zero gate voltage drain current ⁵⁾	I_{DSS}	$V_{DS}=55\text{ V}, V_{GS}=0\text{ V}, T_j=25\text{ °C}$	-	0.01	1	μA
		$V_{DS}=55\text{ V}, V_{GS}=0\text{ V}, T_j=125\text{ °C}^{2)}$	-	1	100	
Gate-source leakage current ⁵⁾	I_{GSS}	$V_{GS}=16\text{ V}, V_{DS}=0\text{ V}$	-	1	100	nA
Drain-source on-state resistance ⁵⁾	$R_{DS(on)}$	$V_{GS}=5\text{ V}, I_D=10\text{ A}$	-	35	41	m Ω
		$V_{GS}=10\text{ V}, I_D=16\text{ A}$	-	20	23	

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	

Dynamic characteristics²⁾

Input capacitance ⁵⁾	C_{iss}	$V_{GS}=0\text{ V}, V_{DS}=25\text{ V},$ $f=1\text{ MHz}$	-	2270	2950	pF
Output capacitance ⁵⁾	C_{oss}		-	285	370	
Reverse transfer capacitance ⁵⁾	C_{rss}		-	270	410	
Turn-on delay time	$t_{d(on)}$	$V_{DD}=27.5\text{ V},$ $V_{GS}=10\text{ V}, I_D=20\text{ A},$ $R_G=25\ \Omega$	-	10	-	ns
Rise time	t_r		-	35	-	
Turn-off delay time	$t_{d(off)}$		-	40	-	
Fall time	t_f		-	75	-	

Gate Charge Characteristics^{2, 5)}

Gate to source charge	Q_{gs}	$V_{DD}=11\text{ V}, I_D=20\text{ A},$ $V_{GS}=0\text{ to }10\text{ V}$	-	11	14	nC
Gate to drain charge	Q_{gd}		-	6	9	
Gate charge total	Q_g		-	32	42	
Gate plateau voltage	$V_{plateau}$		-	4.5	-	V

Reverse Diode

Diode continuous forward current ²⁾ one channel active	I_S	$T_C=25\text{ °C}$	-	-	20	A
Diode pulse current ²⁾ one channel active	$I_{S,pulse}$		-	-	80	
Diode forward voltage	V_{SD}	$V_{GS}=0\text{ V}, I_F=20\text{ A},$ $T_J=25\text{ °C}$	-	1.0	1.3	V
Reverse recovery time ²⁾	t_{rr}	$V_R=27.5\text{ V}, I_F=I_S,$ $di_F/dt=100\text{ A}/\mu\text{s}$	-	15	-	ns
Reverse recovery charge ^{2, 5)}	Q_{rr}		-	15	-	nC

¹⁾ Current is limited by bondwire; with an $R_{thJC}=3.3\text{ K/W}$ the chip is able to carry 33A at 25°C.

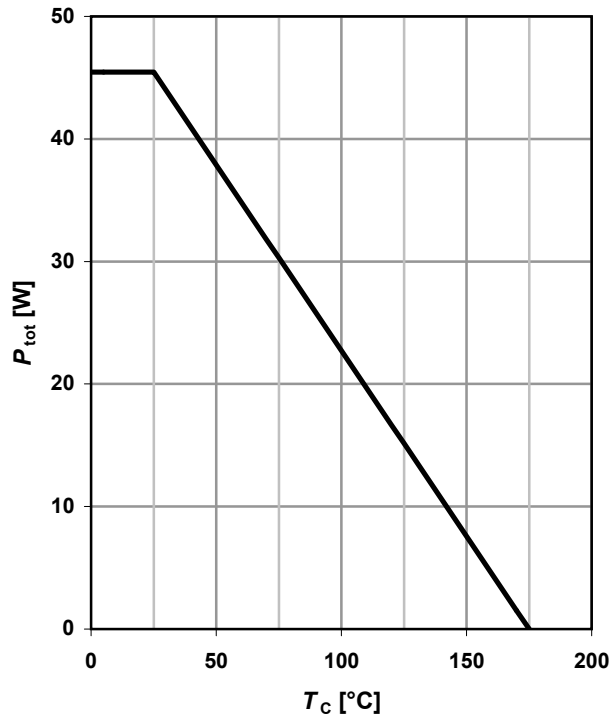
²⁾ Specified by design. Not subject to production test.

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.

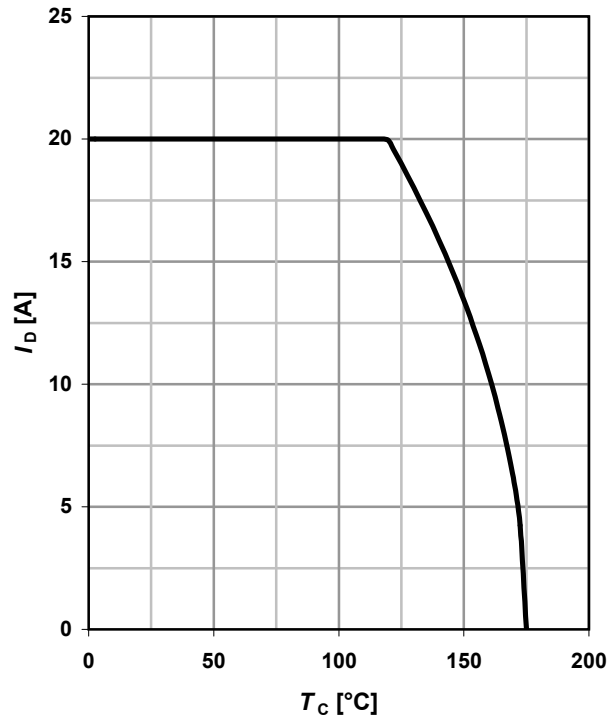
⁴⁾ Qualified at -5V and +16V.

⁵⁾ Per channel

1 Power dissipation

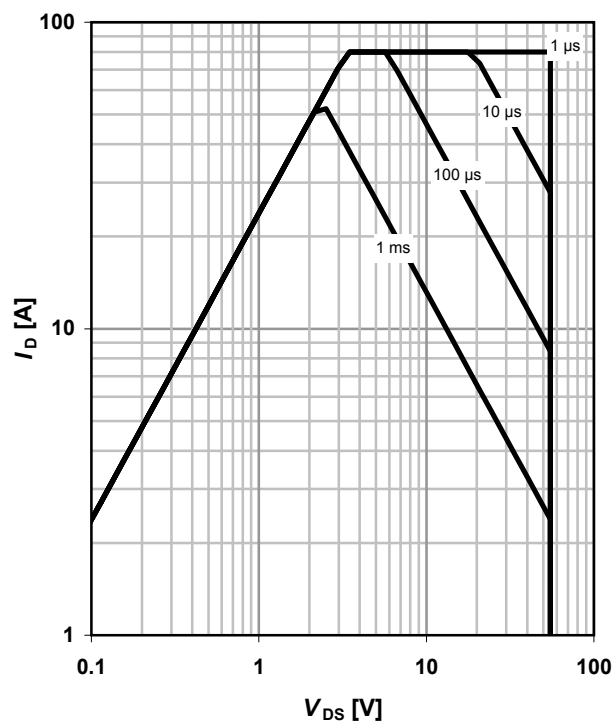
 $P_{\text{tot}} = f(T_C); V_{\text{GS}} \geq 6 \text{ V}; \text{ one channel active}$


2 Drain current

 $I_D = f(T_C); V_{\text{GS}} \geq 6 \text{ V}; \text{ one channel active}$


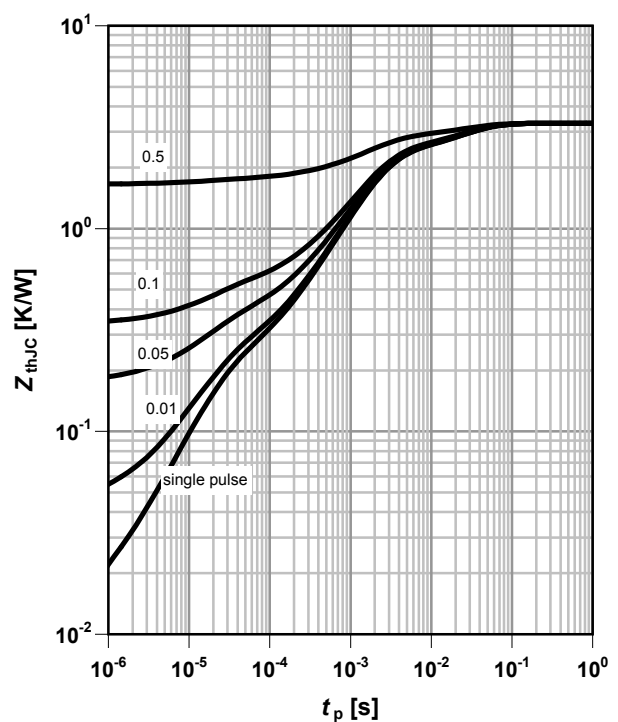
3 Safe operating area

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

parameter: t_p


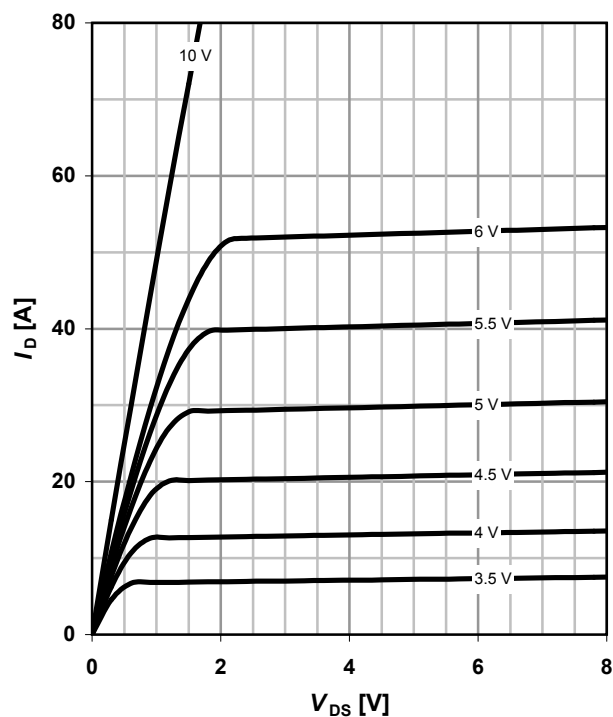
4 Max. transient thermal impedance

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

parameter: $D = t_p/T$


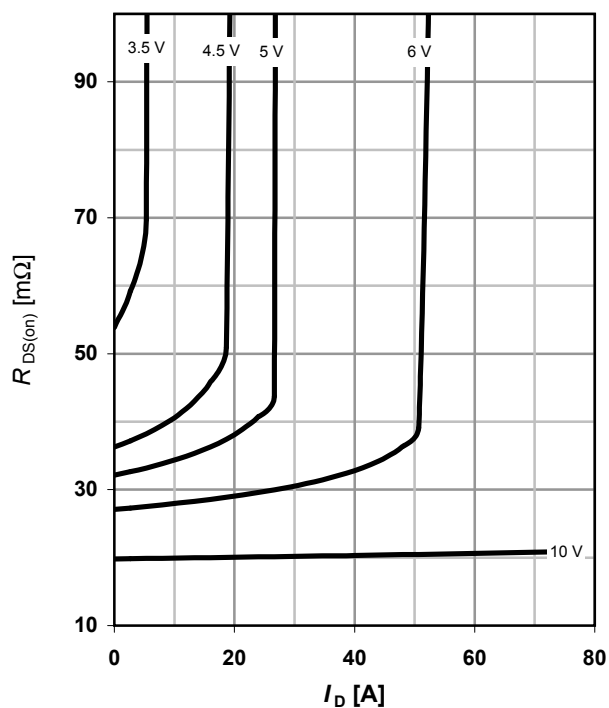
5 Typ. output characteristics⁵⁾

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

parameter: V_{GS}


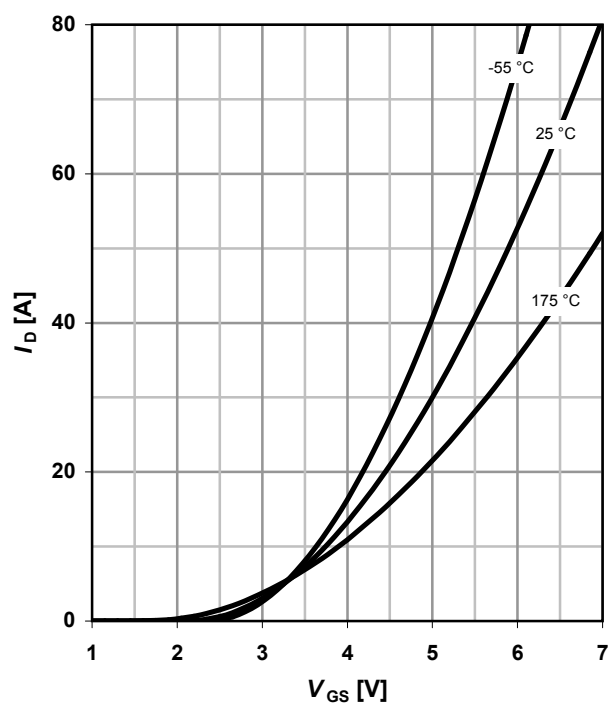
6 Typ. drain-source on-state resistance⁵⁾

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

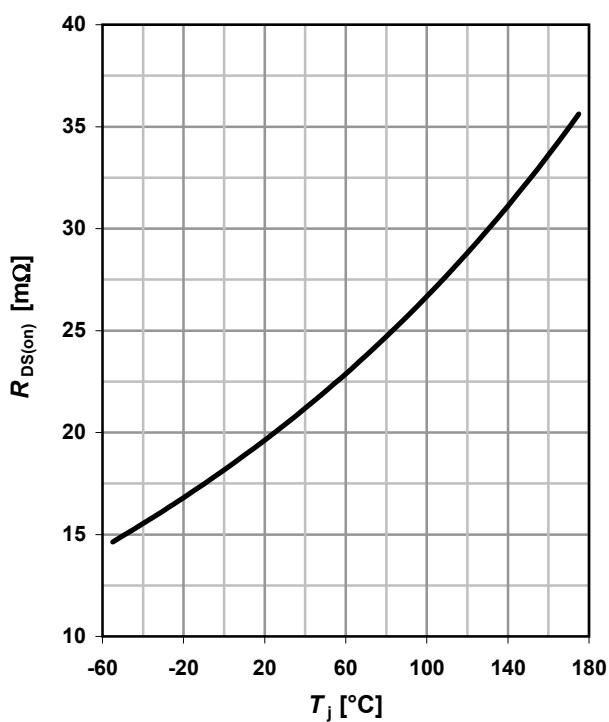
parameter: V_{GS}


7 Typ. transfer characteristics⁵⁾

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

parameter: T_j


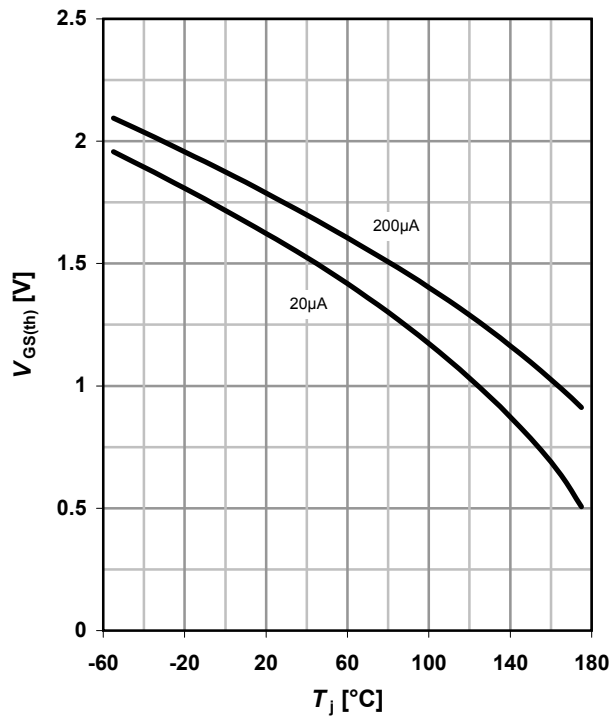
8 Typ. drain-source on-state resistance⁵⁾

 $R_{DS(on)} = f(T_j); I_D = 16\text{ A}; V_{GS} = 10\text{ V}$


9 Typ. gate threshold voltage

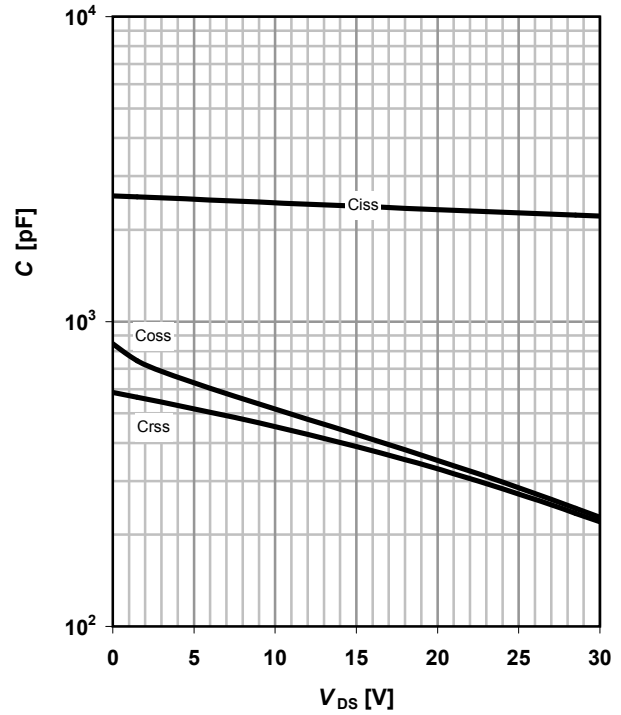
$$V_{GS(th)} = f(T_j); V_{GS} = V_{DS}$$

parameter: I_D



10 Typ. Capacitances⁵⁾

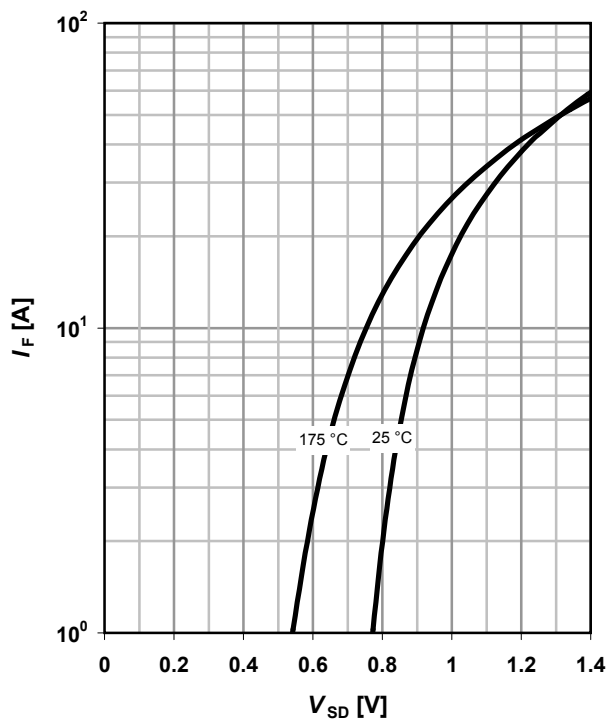
$$C = f(V_{DS}); V_{GS} = 0 \text{ V}; f = 1 \text{ MHz}$$



11 Typical forward diode characteristics⁵⁾

$$I_F = f(V_{SD})$$

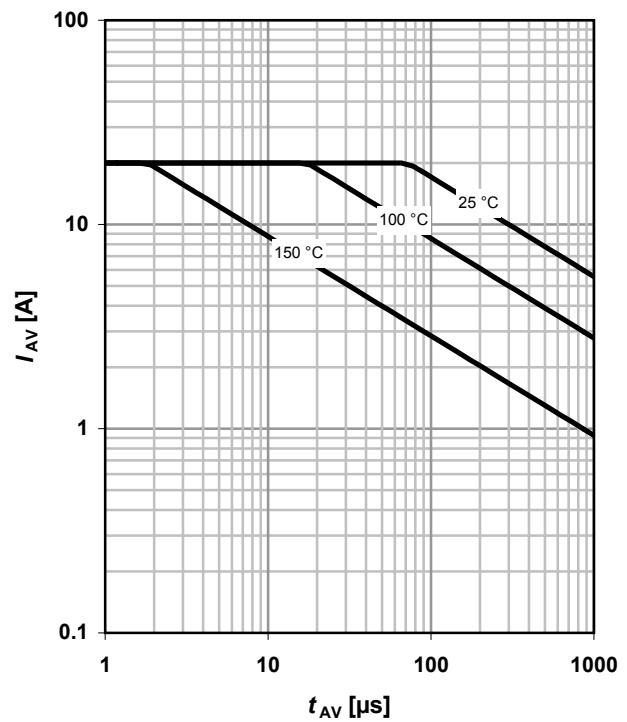
parameter: T_j



12 Avalanche characteristics⁵⁾

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

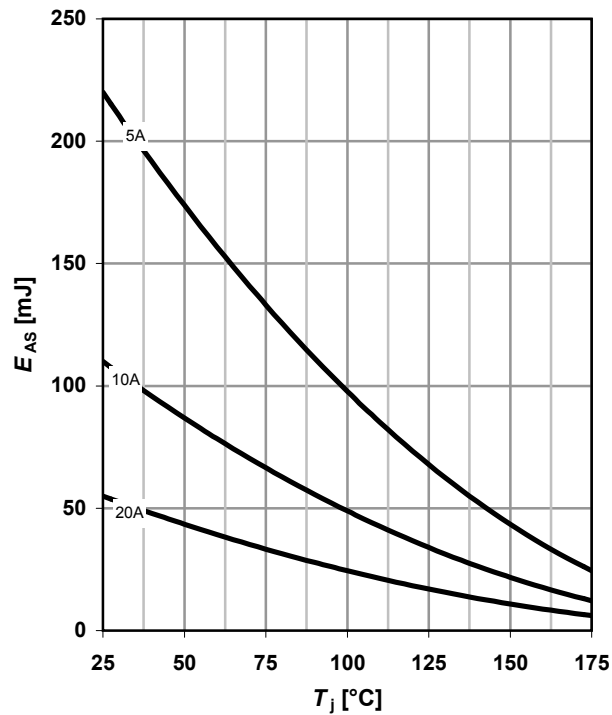
parameter: $T_{j(start)}$



13 Avalanche energy⁵⁾

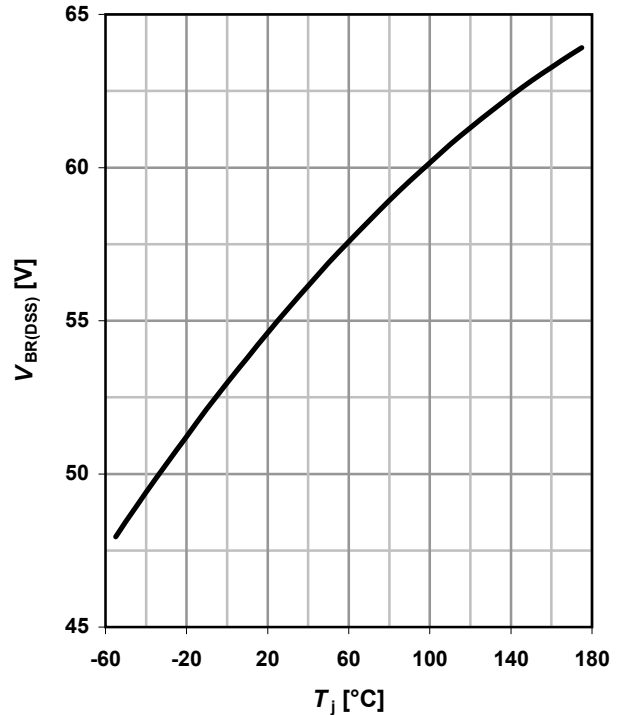
$$E_{AS} = f(T_j)$$

parameter: I_D



14 Drain-source breakdown voltage

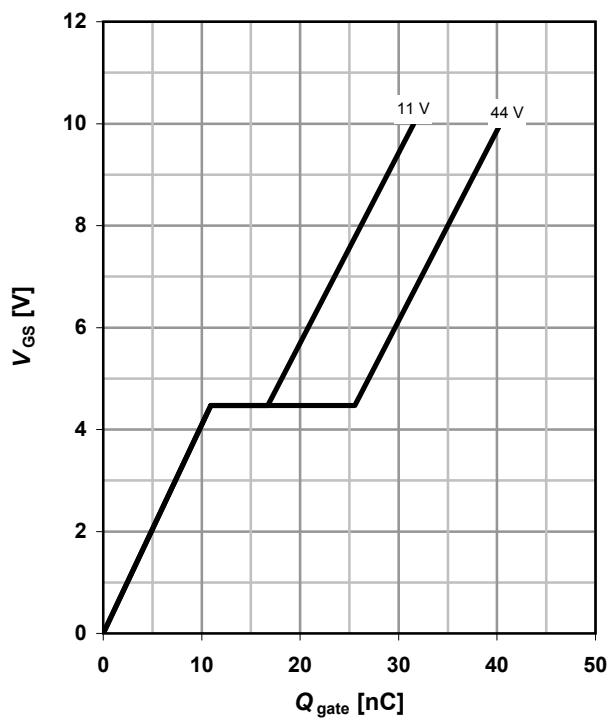
$$V_{BR(DSS)} = f(T_j); I_D = 1 \text{ mA}$$



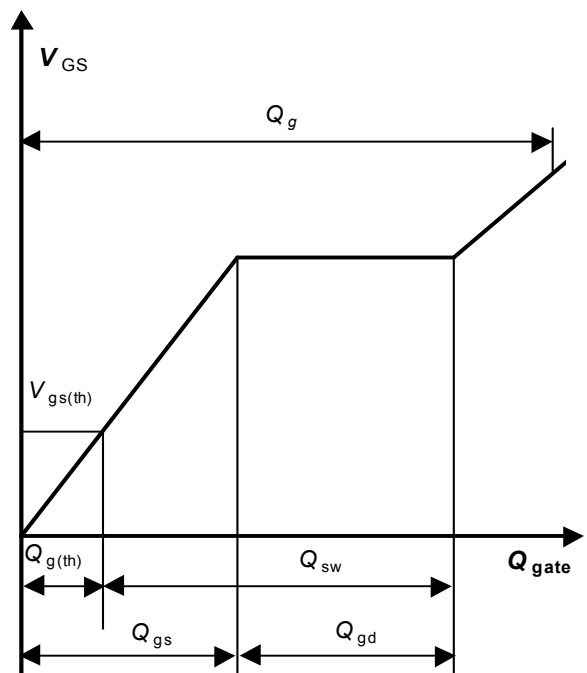
15 Typ. gate charge⁵⁾

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

parameter: V_{DD}



16 Gate charge waveforms



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Revision History

Version	Date	Changes
Revision 1.0	22.09.2008	Initial Final Data Sheet