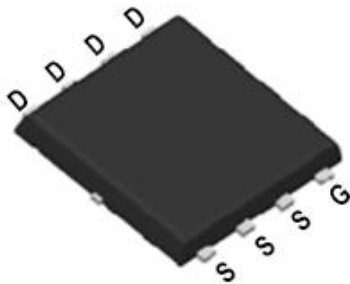


N-channel 150V, 16.5mΩ max.,
SGT MOSFET S2 in DFN5*6

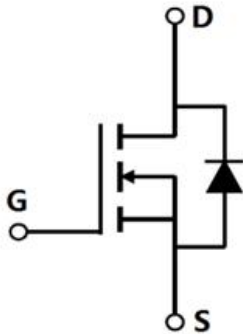
Datasheet - production data

1. Descriptions

DFN5*6



Schematic Diagram



Key Performance Parameters

Parameters	Value	Unit
BV_{DSS}	150	V
$R_{DS(on),max}$	16.5	mΩ
P_D	96	W
I_D (Package Limited)	60	A

Features

- Extremely low losses due to very low FOM $R_{dson} \cdot Q_g$.
- High-speed switching.
- Qualified for industrial grade applications according to JEDEC.
- 100% UIS Tested.

Applications

High-Efficiency DC-DC Converters, High-Frequency Switching and Synchronous Rectification, Motor Drivers.

Type/Ordering Code	Package	Marking	Related Links
CSLS165N15S2A	DFN5*6	165N15S2A	see Appendix A

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2. Maximum Ratings

at $T_J = 25^\circ\text{C}$, unless otherwise specified

Absolute Maximum Ratings

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
V_{DS}	Drain-source voltage	-	-	150	V	$V_{GS}=0V$, $I_D=250\mu A$
V_{GS}	Gate source voltage	-20	-	20	V	static; AC ($f > 1\text{ Hz}$)
I_D	Continuous drain current (Silicon Limited)	-	-	55	A	$T_C=25^\circ\text{C}$
	Continuous drain current (Package Limited)	-	-	60	A	$T_C=25^\circ\text{C}$
$I_{D,pulse}$	Pulsed drain current	-	-	200	A	$T_C=25^\circ\text{C}$
P_D	Power dissipation	-	-	96	W	$T_C=25^\circ\text{C}$
E_{AS}	Avalanche energy, single pulse ¹⁾	-	-	320	mJ	$I_D=36A$; $V_{DD}=50V$
T_J, T_{stg}	Operating and storage temperature	-55	-	175	$^\circ\text{C}$	-

3. Thermal Characteristics

Thermal Characteristics (DFN5*6)

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
R_{thJC}	Thermal resistance, junction - case	-	-	1.3	$^\circ\text{C/W}$	$T_C = 25^\circ\text{C}$
R_{thJA}	Thermal resistance, junction - ambient	-	-	55	$^\circ\text{C/W}$	$T_C = 25^\circ\text{C}$

4. Electrical Characteristics

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

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		

Off Characteristics

$V_{(BR)DSS}$	Drain-source breakdown voltage	150	-	-	V	$V_{GS}=0V, I_D=250\mu A$
I_{DSS}	Zero gate voltage drain current	-	-	1	μA	$V_{DS}=150V, V_{GS}=0V, T_j=25^\circ C$
I_{GSS}	Gate-source leakage current	-	-	± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$

On Characteristics³⁾

$V_{(GS)th}$	Gate threshold voltage	2	3	4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
$R_{DS(on)}$	Drain-source on-state resistance	-	12.5	16.5	m Ω	$V_{GS}=10V, I_D=20A, T_j=25^\circ C$
R_G	Gate resistance	-	2	-	Ω	$V_{DD}=0V, V_{GS}=0V, F=1MHz$
g_{fs}	Transconductance		56		S	$V_{DS}=5V, I_D=20A$

Dynamic Characteristics

C_{iss}	Input capacitance	-	2550	-	pF	$V_{GS}=0V, V_{DS}=75V, F=250KHz$
C_{oss}	Output capacitance	-	194	-	pF	
C_{rss}	Reverse transfer capacitance	-	8.39	-	pF	

Switching Characteristics⁴⁾

$t_{d(on)}$	Turn-on delay time	-	21	-	ns	$V_{DD}=75V, V_{GS}=10V, I_D=20A, R_G=3\Omega$
t_r	Turn-on rise time	-	13	-	ns	
$t_{d(off)}$	Turn-off delay time	-	9	-	ns	
t_f	Turn-off fall time	-	34	-	ns	
Q_g	Gate charge total	-	33.6	-	nC	$V_{DD}=75V, I_D=20A, V_{GS}=0 \text{ to } 10V$
Q_{gs}	Gate to source charge	-	9.3	-	nC	
Q_{gd}	Gate to drain charge	-	5.4	-	nC	

Reverse Diode Characteristics

V_{SD}	Diode forward voltage ³⁾	-	-	1.2	V	$V_{GS}=0V, I_F=20A$
t_{rr}	Reverse recovery time	-	63	-	ns	$V_R=75V, I_F=20A, di_F/dt=100A/\mu s$
Q_{rr}	Reverse recovery charge	-	180	-	nC	

1) $V_{DD}=50V, L=0.5mH, R_G=25\Omega$, Starting $T_j=25^\circ C$.

2) Surface Mounted on FR4 Board, $t \leq 10 \text{ sec}$.

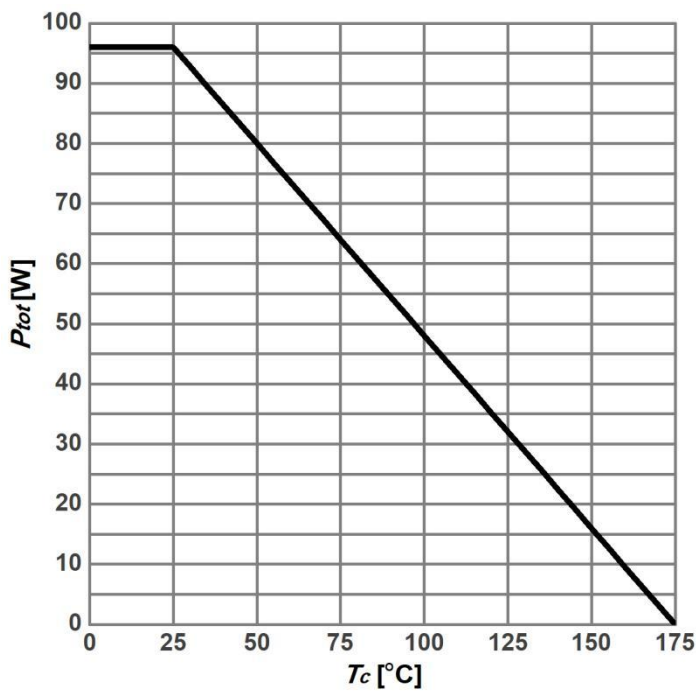
3) Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.

4) Guaranteed by design, not subject to production

5) Repetitive Rating: Pulse width limited by maximum junction temperature.

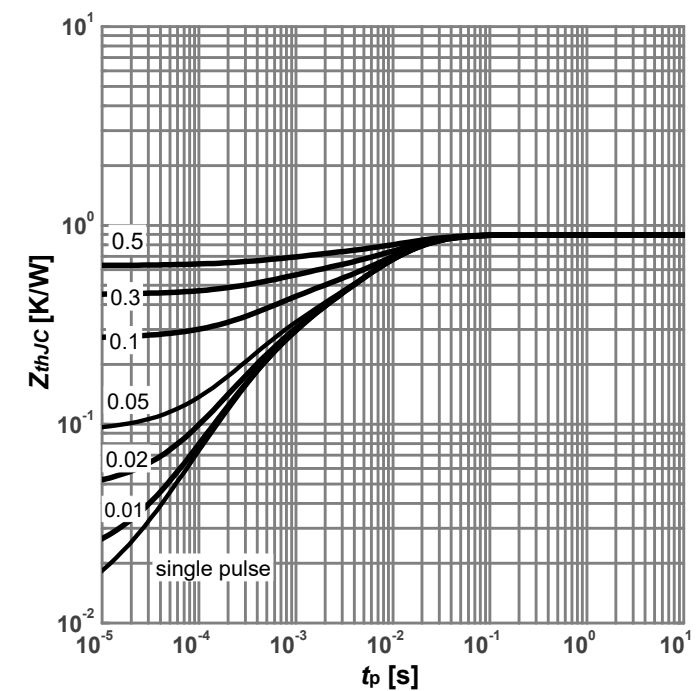
5. Electrical Characteristics Diagrams

Diagram 1: Power dissipation (DFN5*6)



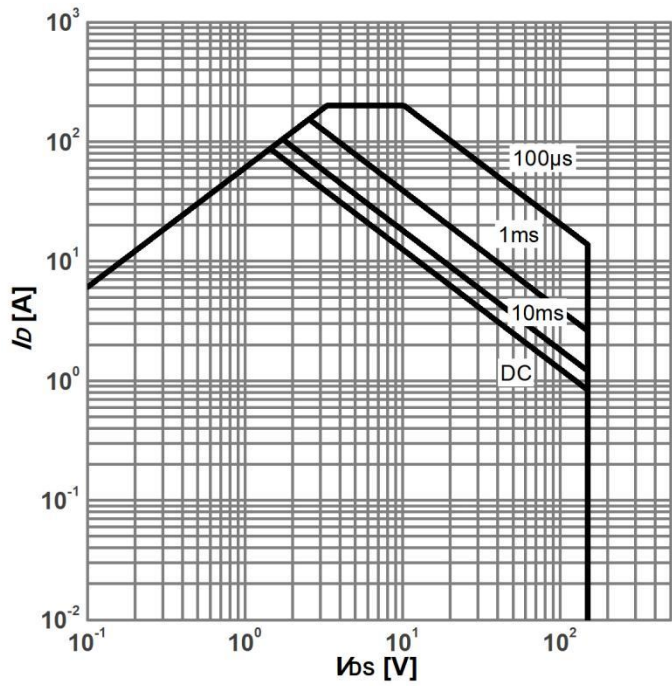
$P_{tot}=f(T_C)$

Diagram 2: Max. transient thermal impedance (DFN5*6)



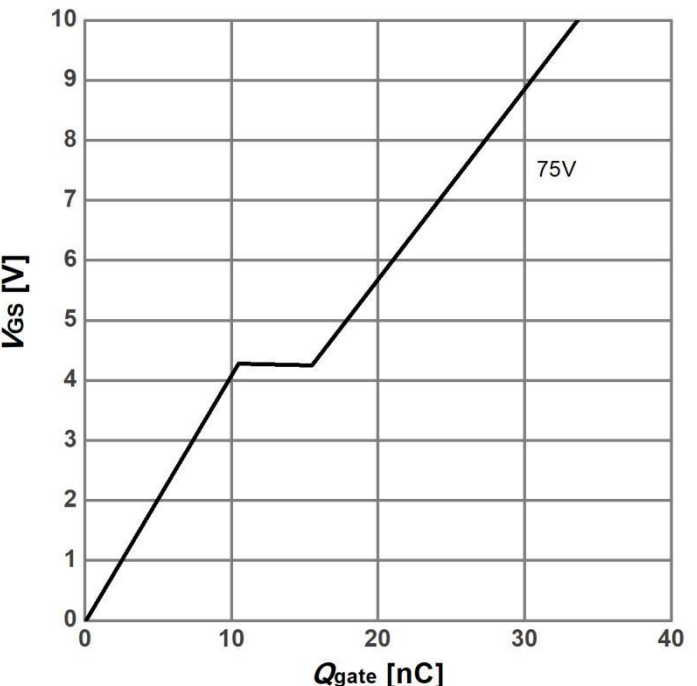
$Z_{thJC}=f(t_p)$; parameter: $D= t_p/T$

Diagram 3: Safe operating area (DFN5*6)



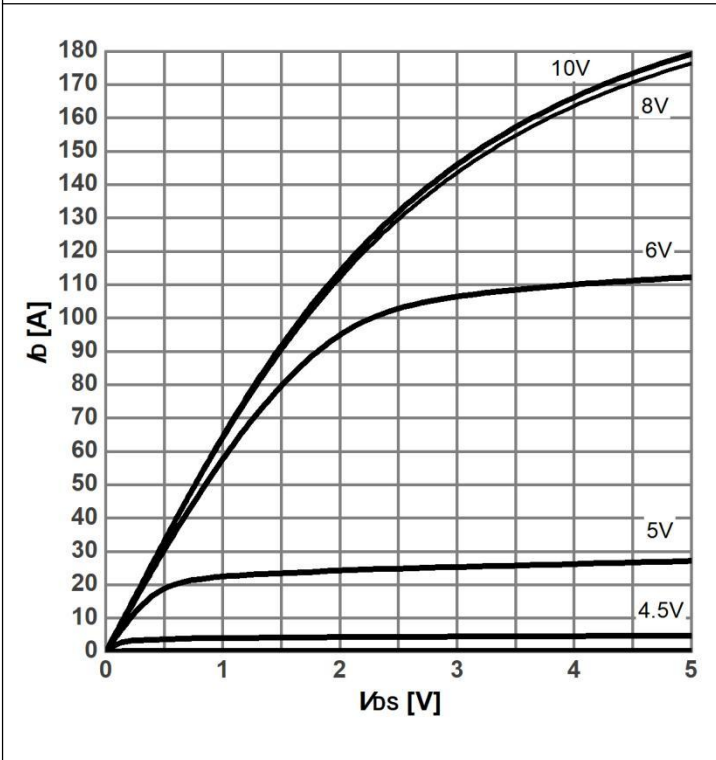
$I_D=f(V_{DS})$; $T_J=25^{\circ}C$; $D=0$; parameter: t_p

Diagram 4: Typ. gate charge



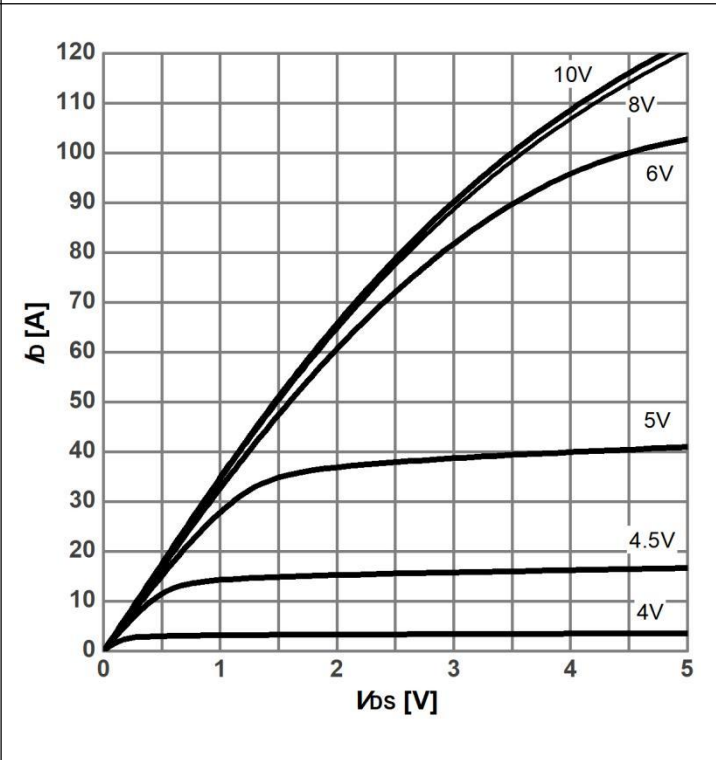
$V_{GS}=f(Q_{gate})$; $I_D=20A$ pulsed; $V_{DS}=75V$

Diagram 5: Typ. output characteristics



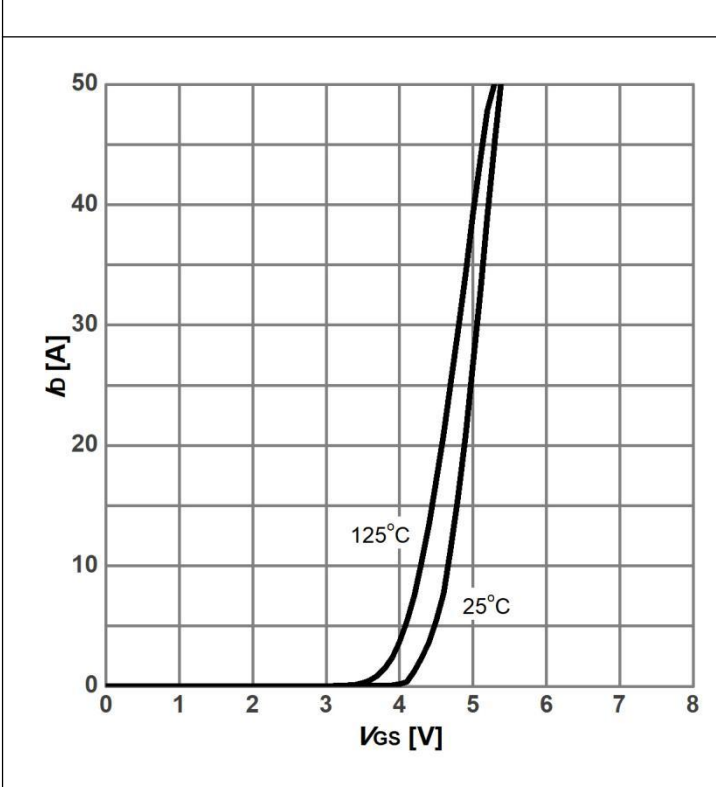
$I_D=f(V_{DS})$; $T_J=25^{\circ}\text{C}$; parameter: V_{GS}

Diagram 6: Typ. output characteristics



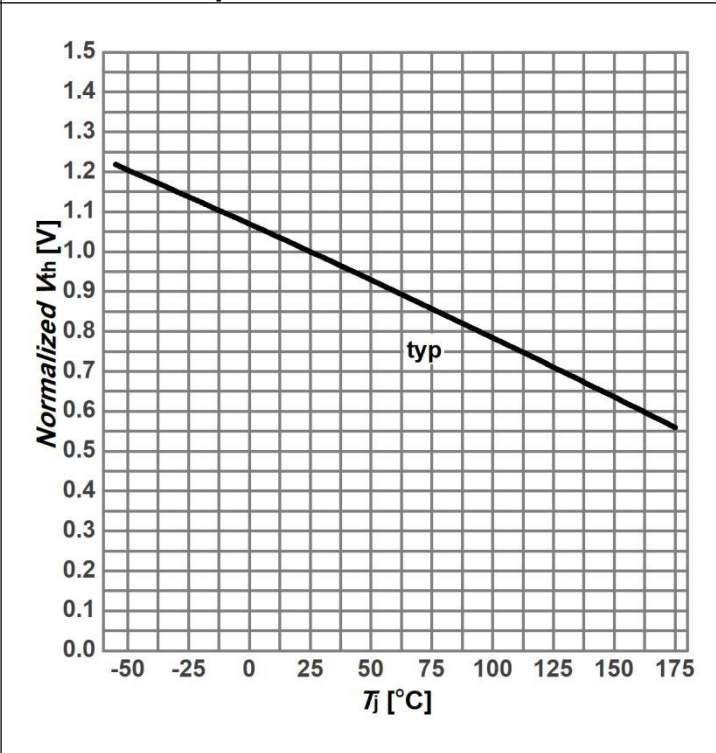
$I_D=f(V_{DS})$; $T_J=125^{\circ}\text{C}$; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



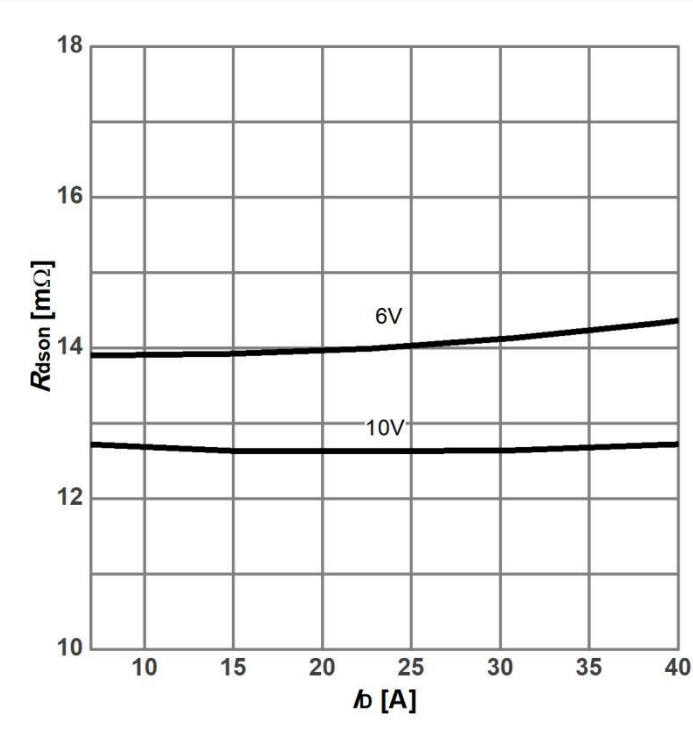
$I_D=f(V_{GS})$; $V_{DS}=5\text{V}$; parameter: T_J

Diagram 8: Gate threshold voltage vs. Junction temperature



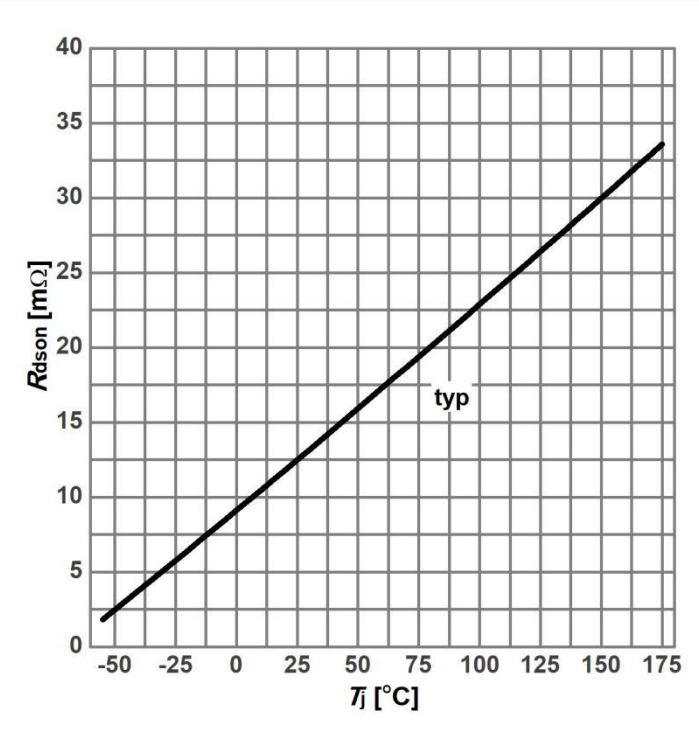
$V_{th}=f(T_J)$; $I_D=250\mu\text{A}$

Diagram 9: On-state resistance vs. Drain current



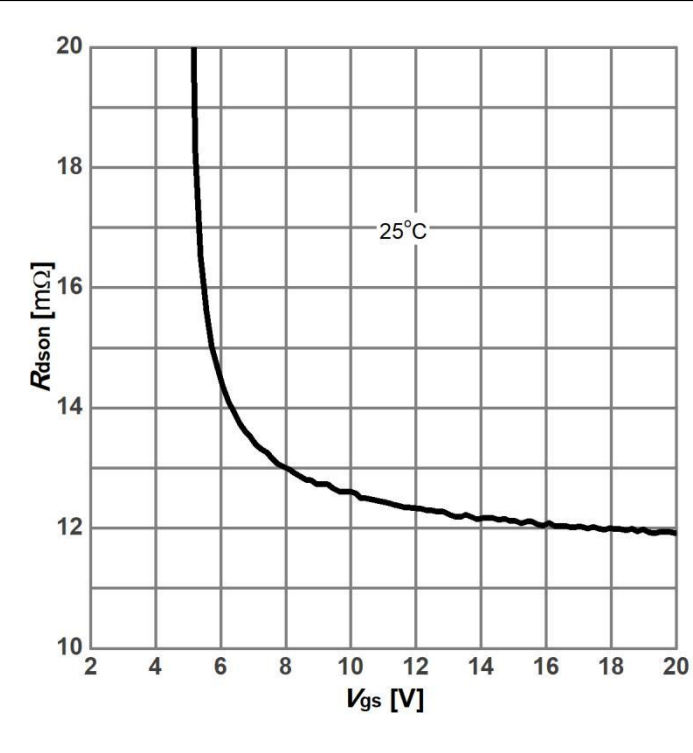
$R_{DS(on)}=f(I_D)$; $T_J=25^{\circ}C$; parameter: V_{GS}

Diagram 10: On-state resistance vs. Junction temperature



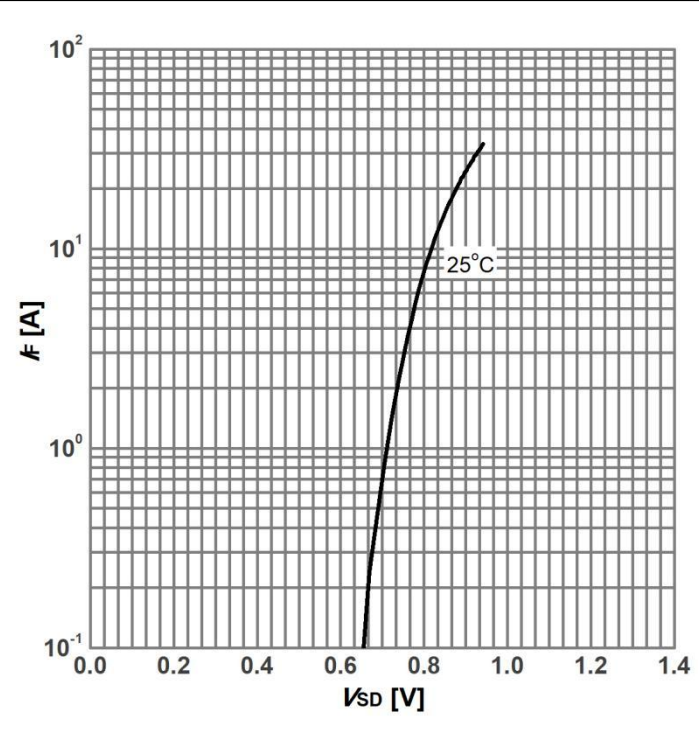
$R_{DS(on)}=f(T_J)$; $I_D=20A$; $V_{GS}=10V$

Diagram 11: On-state resistance vs. Vgs characteristics



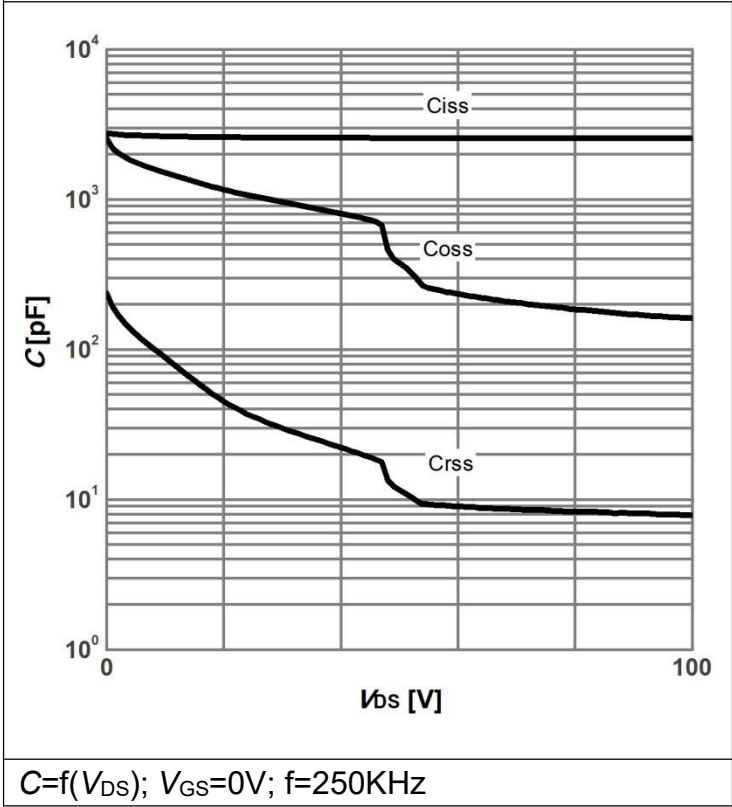
$R_{DS(on)}=f(V_{GS})$; $T_J=25^{\circ}C$; $I_D=20A$

Diagram 12: Forward characteristics of reverse diode



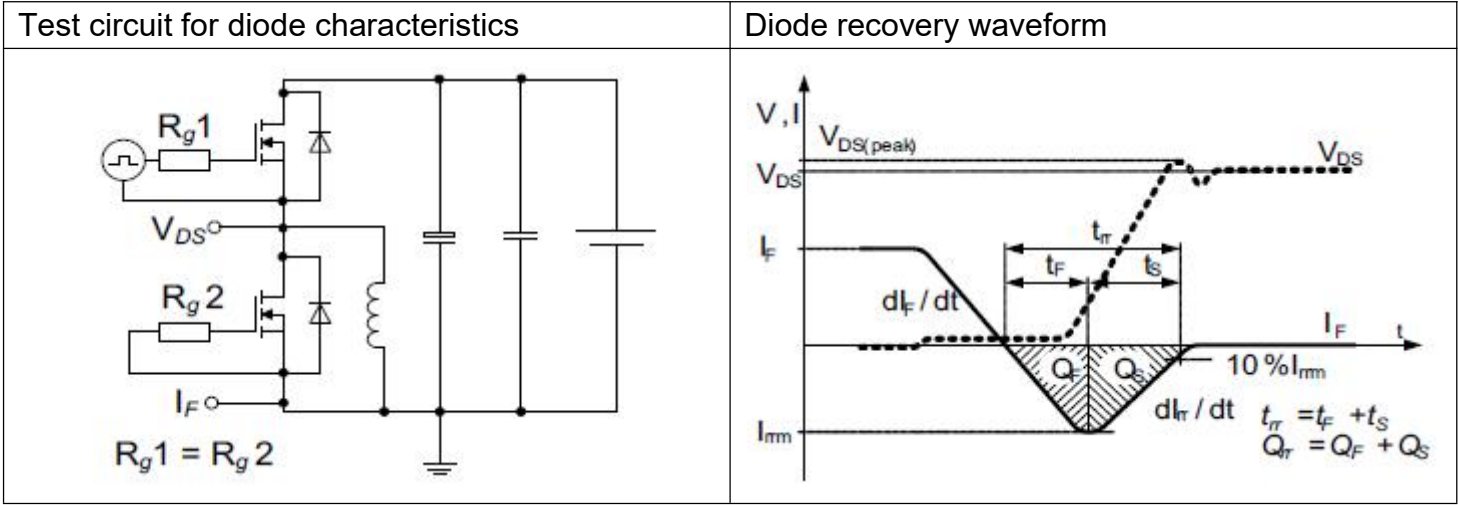
$I_F=f(V_{SD})$; $T_J=25^{\circ}C$

Diagram 13: Typ. capacitances

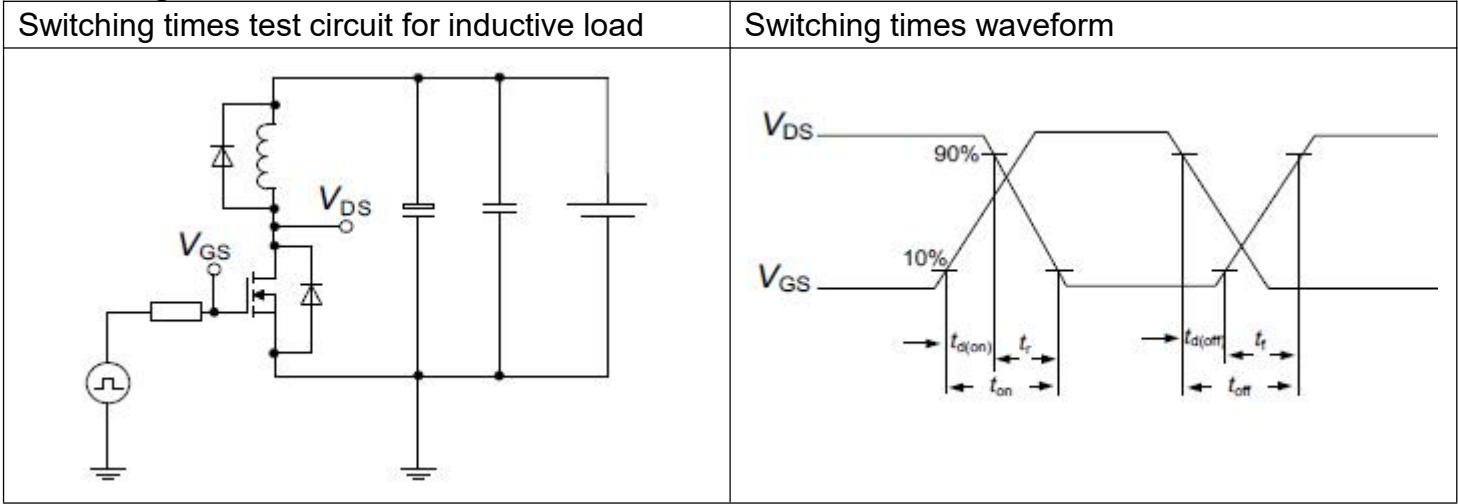


6. Test Circuits

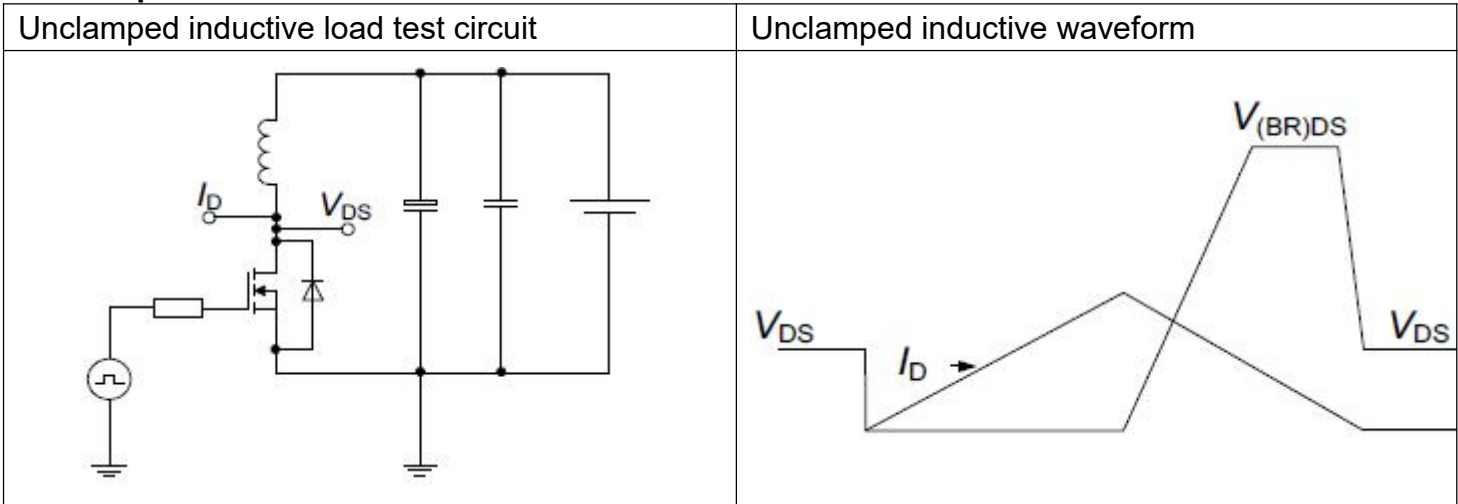
Diode Characteristics



Switching Times

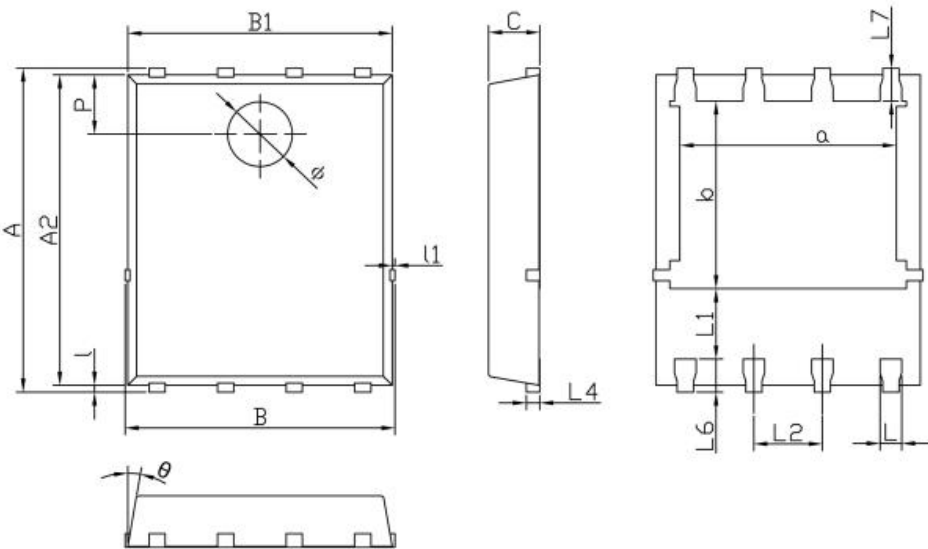


Unclamped Inductive Load



7. Package Outlines

Figure 1 Outline DFN5*6 Dimensions in mm



Dimensions In Millimeterer			
Symbol	MIN	TYP	MAX
A	5.90	6.00	6.10
a	3.91	4.01	4.11
A2	5.70	5.75	5.80
B	4.90	5.00	5.10
b	3.37	3.47	3.57
B1	4.80	4.90	5.00
C	0.90	0.95	1.00
L	0.35	0.40	0.45
l	0.06	0.13	0.20
L1	1.10	-	-
l1	-	-	0.10
L2	1.17	1.27	1.37
L4	0.21	0.26	0.34
L6	0.51	0.61	0.71
L7	0.51	0.61	0.71
P	1.00	1.10	1.20
θ	8°	10°	12°
ϕ	1.10	1.20	1.30

8. Appendix

CoolSemi Webpage: www.coolsemi.com.