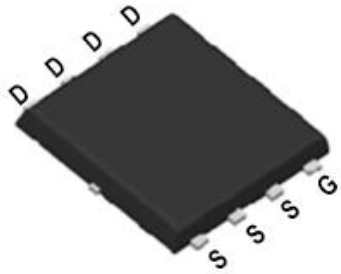
N-channel 40V, 2.3mΩ typ.,
SGT MOSFET S2 in DFN5*6

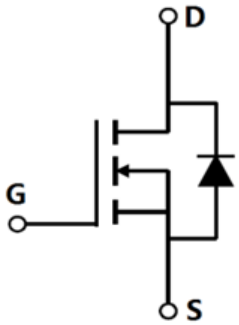
Datasheet - production data

1. Descriptions

DFN5*6



Schematic Diagram



Key Performance Parameters

Parameters	Value	Unit
BV_{DSS}	40	V
$R_{DS(on),max}$	2.6	mΩ
$Q_{g,typ}$	42	nC
$I_{D,pulse}$	380	A
E_{AS}	342	mJ

Features

• Extremely Low Losses Due to Very Low FOM Rdson*Qg.
• 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
CSLS024N04S2	DFN5*6	024N04S2	see Appendix A

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2. Maximum Ratings

at T_j = 25°C, unless otherwise specified

Table 1. Absolute Maximum Ratings

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
V_{DS}	Drain-Source Voltage[1)]	-	-	40	V	V_{GS}=0V, I_D=250μA
I_D	Continuous Drain Current (Silicon Limited)	-	-	110	A	T_C=25°C
$I_{D,pulse}$	Pulsed Drain Current	-	-	380	A	T_C=25°C
E_{AS}	Avalanche Energy, Single Pulse[2)]	-	-	342	mJ	I_D=37A; V_{DD}=50V
I_{AS}	Avalanche Current	-	-	37	A	-
V_{GS}	Gate Source Voltage	-20	-	20	V	Static; AC (f >1 Hz)
P_{tot}	Power Dissipation	-	-	83	W	T_C=25°C
T_J, T_{stg}	Operating and Storage Temperature	-55	-	150	°C	-
I_S	Continuous Diode Forward Current	-	-	110	A	T_C=25°C
$I_{S,pulse}$	Diode Pulse Current[2)]	-	-	380	A	T_C=25°C

1) Limited by T_j max. Maximum Duty Cycle D=0.75.
2) V_{DD}=50V, L=0.5mH, R_G=25Ω, Starting T_J=25°C.

3. Thermal Characteristics

Table 2. Thermal Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
R_{thJC}	Thermal Resistance, Junction - Case	-	-	1.5	°C/W	T_C=25°C
R_{thJA}	Thermal Resistance, Junction - Ambient	-	-	65	°C/W	T_C=25°C
T_{sold}	Soldering Temperature, Wavesoldering Only Allowed at Leads	-	-	260	°C	Lead Temperature (Soldering, 10 sec)

4. Electrical Characteristics

at Tj = 25°C, unless otherwise specified

Table 3. Static Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	40	-	-	V	V_{GS}=0V, I_D=250μA
$V_{(GS)th}$	Gate Threshold Voltage	1.0	1.8	2.5	V	V_{DS}=V_{GS}, I_D=250μA
I_{DSS}	Zero Gate Voltage Drain Current	-	-	1	μA	V_{DS}=40V, V_{GS}=0V, T_J=25°C
I_{GSS}	Gate-Source Leakage Current	-	-	±100	nA	V_{GS}=±20V, V_{DS}=0V
$R_{DS(on)}$	Drain-Source On-State Resistance	-	2.3	2.6	mΩ	V_{GS}=10V, I_D=20A, T_J=25°C
R_G	Gate resistance	-	3	-	Ω	V_{DD}=0V,V_{GS}=0V,F=1MHz
g_{fs}	Transconductance		120		S	V_{DS}=5V, I_D=20A

Table 4. Dynamic Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
C_{iss}	Input Capacitance	-	2920	-	pF	V_{GS}=0V, V_{DS}=20V, f=250kHz
C_{oss}	Output Capacitance	-	727	-	pF	V_{GS}=0V, V_{DS}=20V, f=250kHz
C_{rss}	Reverse Transfer Capacitance	-	55	-	pF	V_{GS}=0V, V_{DS}=20V, f=250kHz
$t_{d(on)}$	Turn-On Delay Time	-	19	-	ns	V_{DD}=20V, V_{GS}=10V, I_D=20A, R_G=7.5Ω
t_r	Rise Time	-	45	-	ns	V_{DD}=20V, V_{GS}=10V, I_D=20A, R_G=7.5Ω
$t_{d(off)}$	Turn-Off Delay Time	-	63	-	ns	V_{DD}=20V, V_{GS}=10V, I_D=20A, R_G=7.5Ω
t_f	Fall Time	-	18	-	ns	V_{DD}=20V, V_{GS}=10V, I_D=20A, R_G=7.5Ω

Table 5. Gate Charge Characteristics

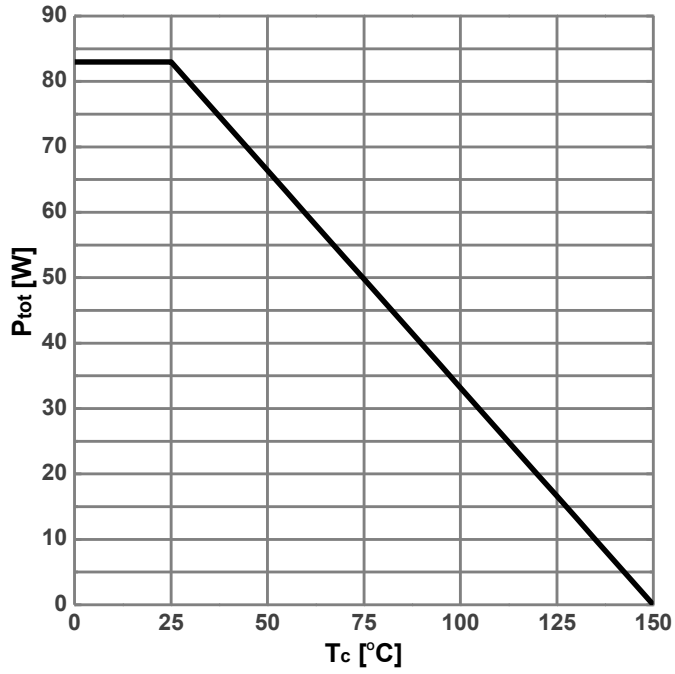
Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Q_{gs}	Gate to Source Charge	-	5.4	-	nC	V_{DD}=20V, I_D=20A, V_{GS}=0 to 10V
Q_{gd}	Gate to Drain Charge	-	4.3	-	nC	V_{DD}=20V, I_D=20A, V_{GS}=0 to 10V
Q_g	Gate Charge Total	-	42	-	nC	V_{DD}=20V, I_D=20A, V_{GS}=0 to 10V
$V_{plateau}$	Gate Plateau Voltage	-	2	-	V	V_{DD}=20V, I_D=20A, V_{GS}=0 to 10V

Table 6. Reverse Diode Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
V_{SD}	Diode Forward Voltage	-	0.8	-	V	V_{GS}=0V, I_F=20A, T_f=25°C
t_{rr}	Reverse Recovery Time	-	42	-	ns	V_R=20V, I_F=20A, d_{iF}/d_t=100A/μs
Q_{rr}	Reverse Recovery Charge	-	45	-	nC	V_R=20V, I_F=20A, d_{iF}/d_t=100A/μs

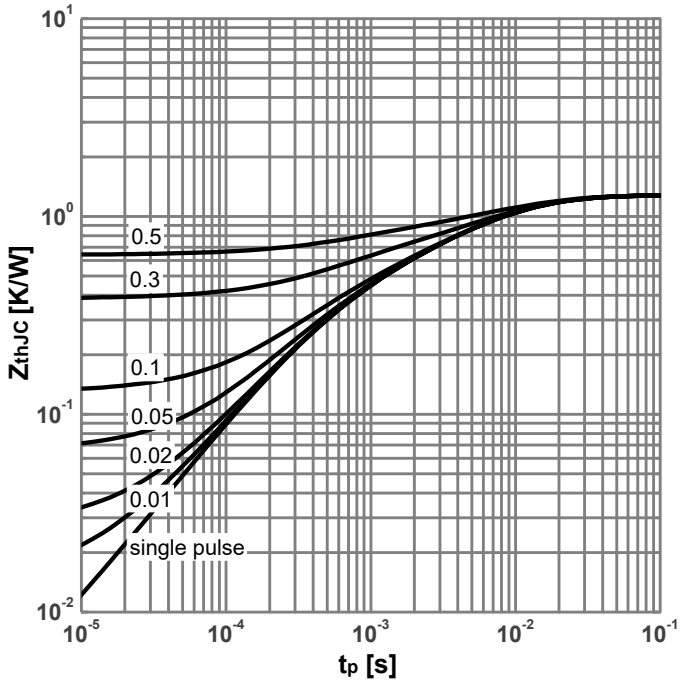
5. Electrical Characteristics Diagrams

Diagram 1: Power Dissipation



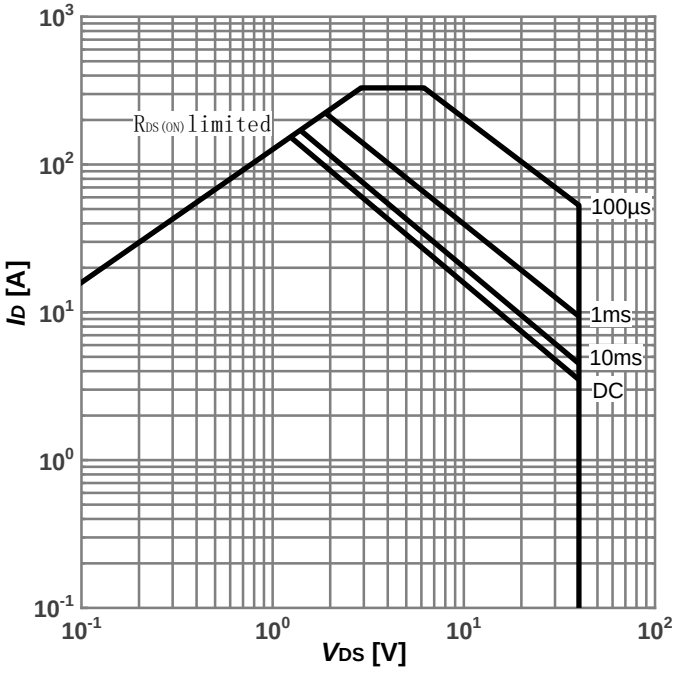
P_{tot}=f(T_C)

Diagram 2: Max. Transient Thermal Impedance



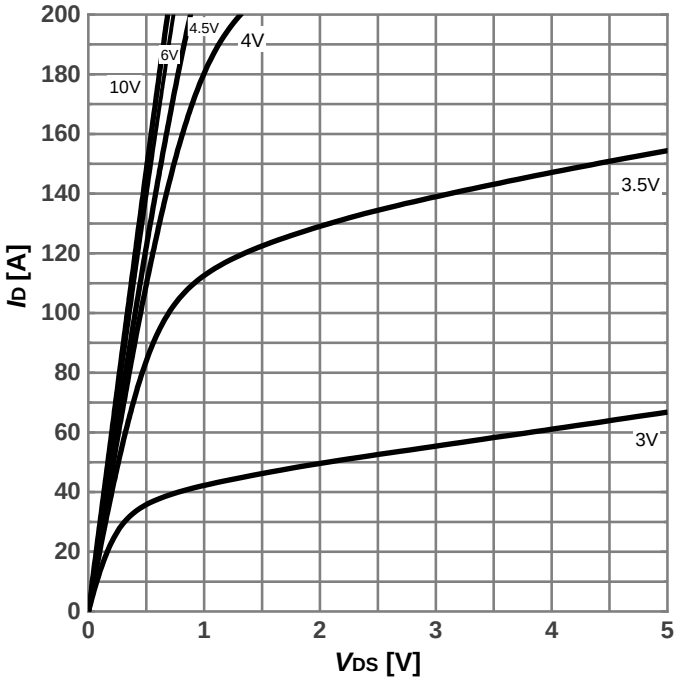
Z_{thJC}=f(t_p); parameter: D=t_p/T

Diagram 3: Safe Operating Area



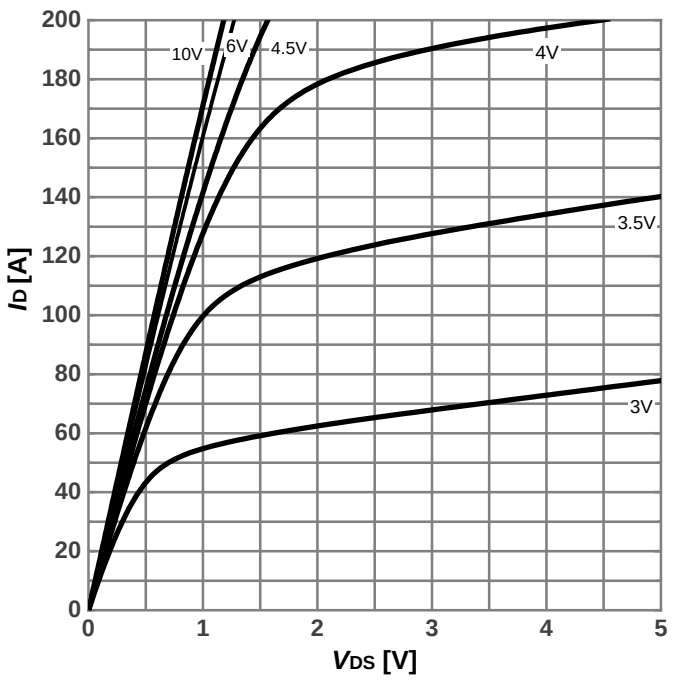
I_D=f(V_{DS}); T_J=25°C; D=0; parameter: t_p

Diagram 4: Typ. Output Characteristics



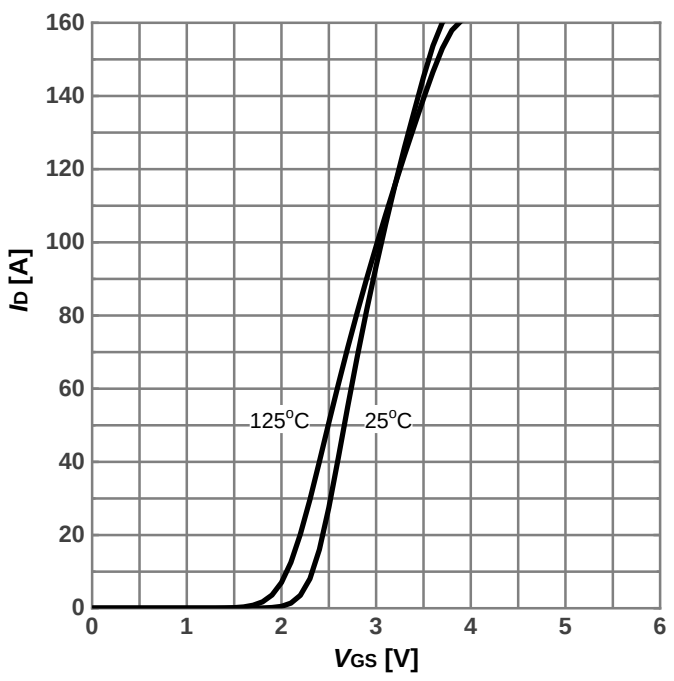
I_D=f(V_{DS}); T_J=25°C; parameter: V_{GS}

Diagram 5: Typ. Output Characteristics



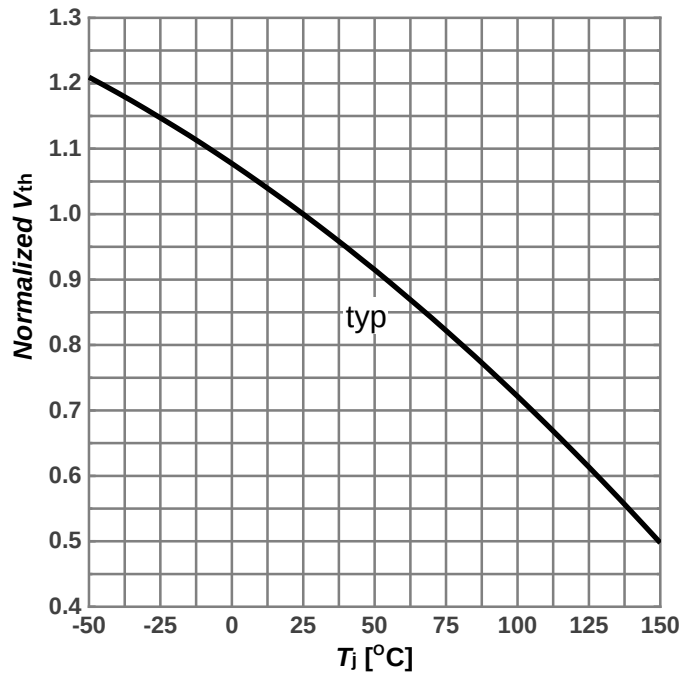
I_D=f(V_{DS}); T_J=125°C; parameter: V_{GS}

Diagram 6: Typ. Transfer Characteristics



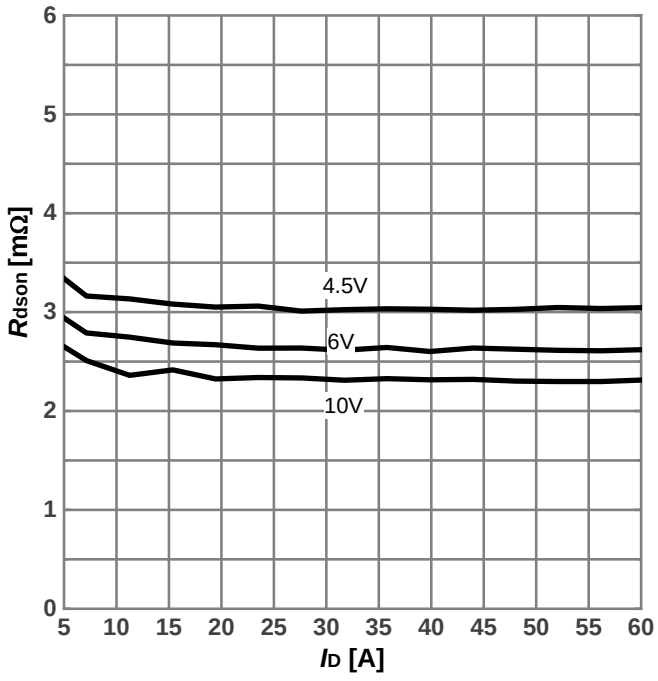
I_D=f(V_{GS}); V_{DS}=15V; parameter: T_J

Diagram 7: Gate Threshold Voltage vs. Junction Temperature



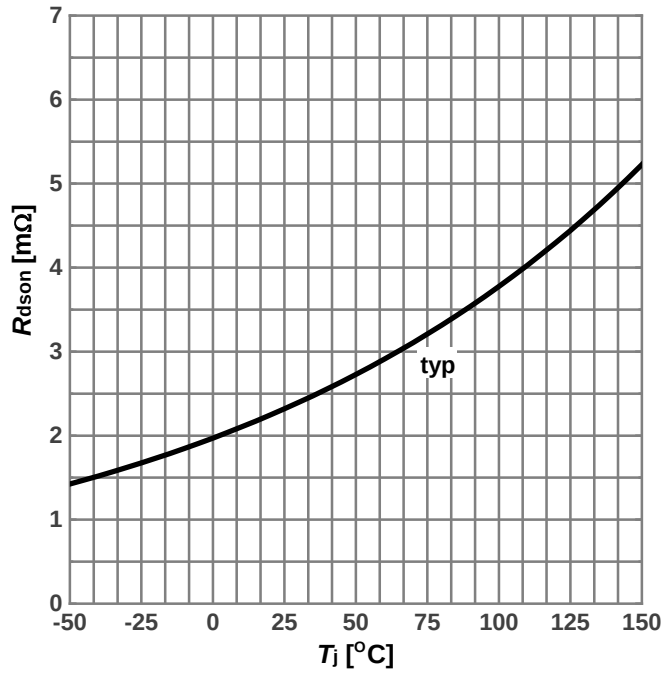
V_{th}=f(T_J); I_D=250µA

Diagram 8: On-State Resistance vs. Drain Current



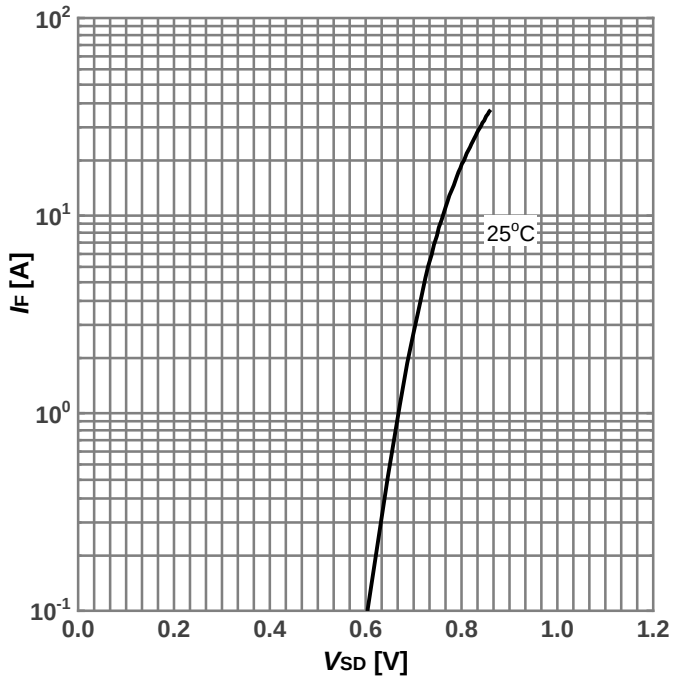
$R_{DS(on)}$=f(I_D); T_J=25°C; parameter: V_{GS}

Diagram 9: On-State Resistance vs. Junction Temperature



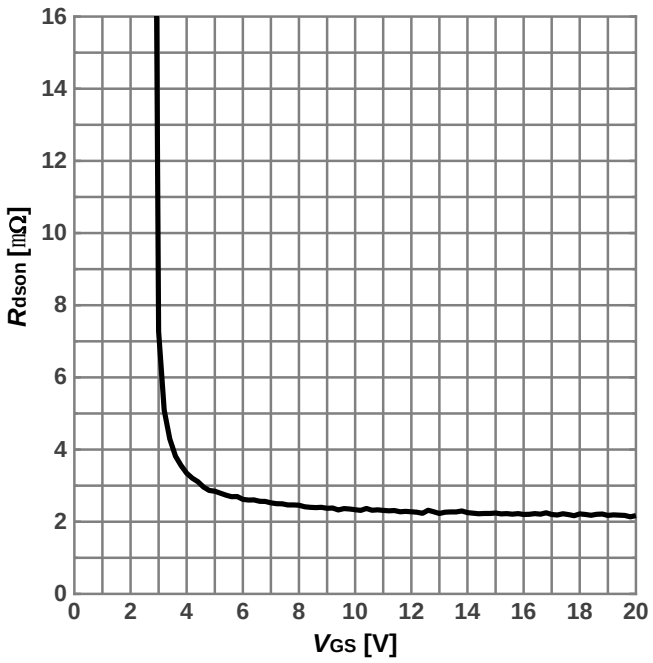
$R_{DS(on)}$=f(T_J); I_D=20A; V_{GS}=10V

Diagram 10: Forward Characteristics of Reverse Diode



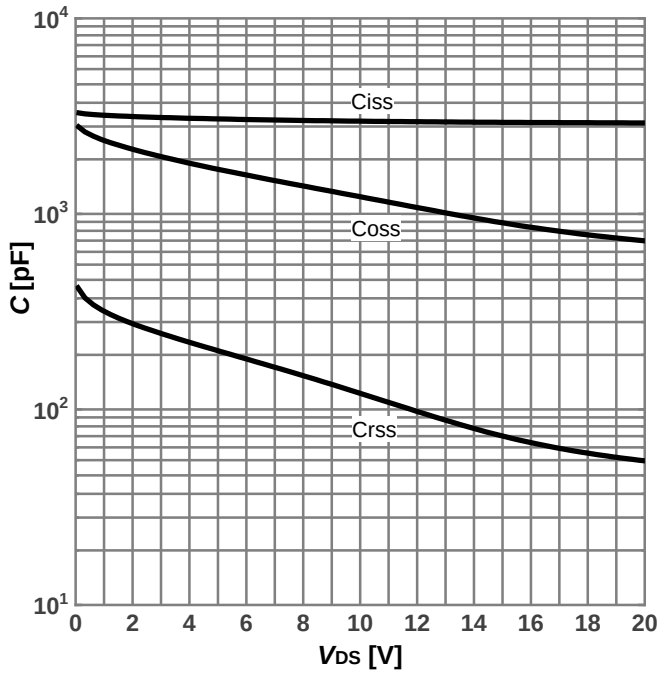
I_F=f(V_{SD}); parameter: T_J

Diagram 11: On-State Resistance vs. Vgs Characteristics



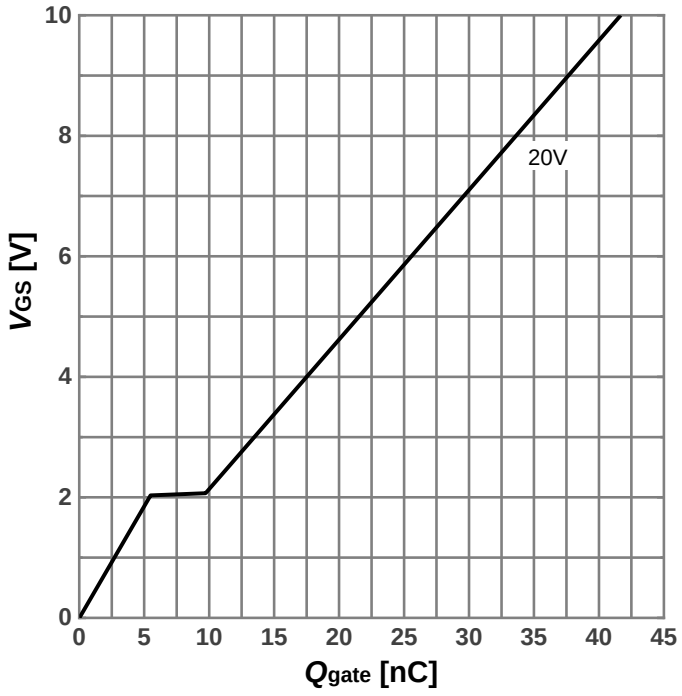
$R_{DS(on)}$=f(V_{GS}); T_J=25°C; I_D=20A

Diagram 12: Typ. Capacitances



C=f(V_{DS}); V_{GS}=0V; f=250kHz

Diagram 13: Typ. Gate Charge



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

6. Test Circuits

Table 7. Diode Characteristics

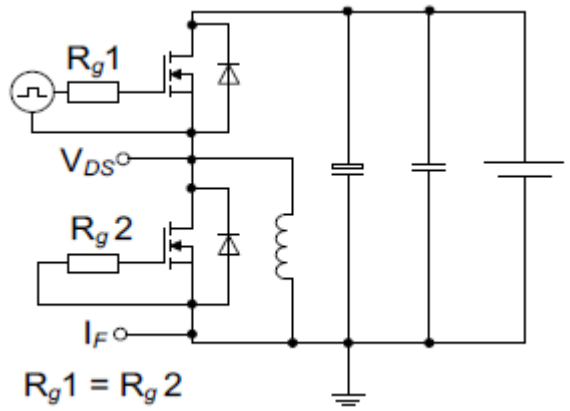
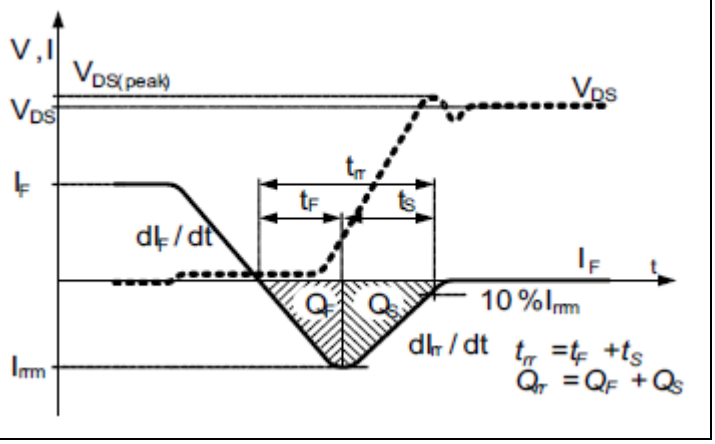
Test Circuit for Diode Characteristics	Diode Recovery Waveform
	

Table 8. Switching Times

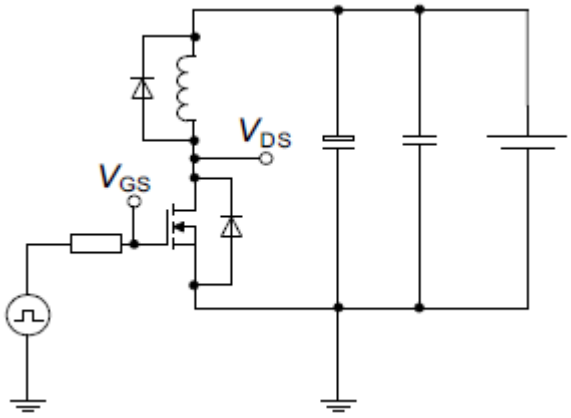
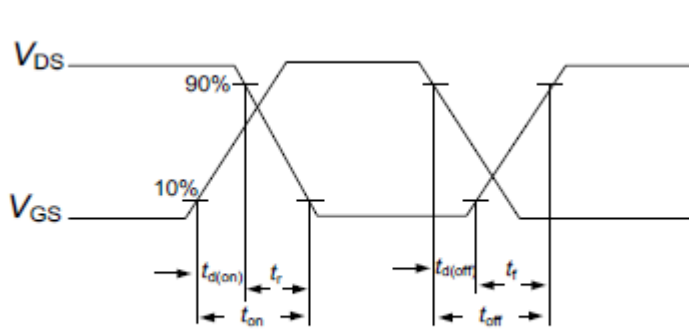
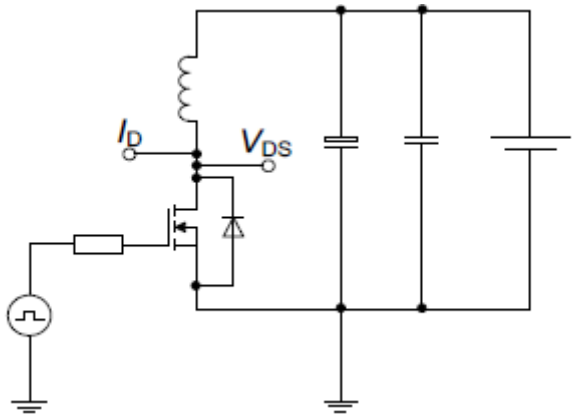
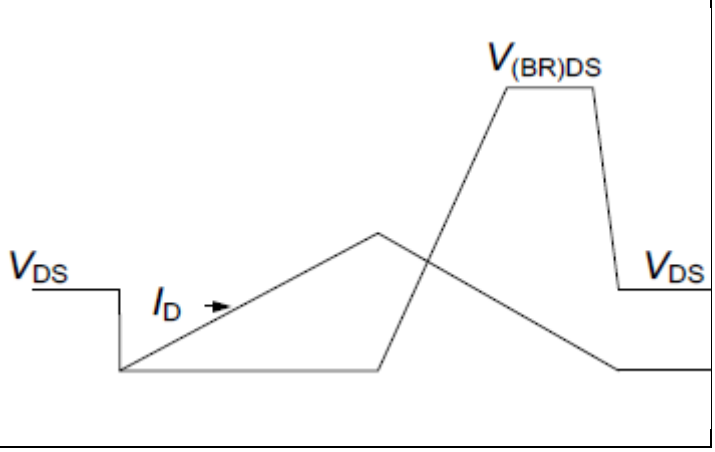
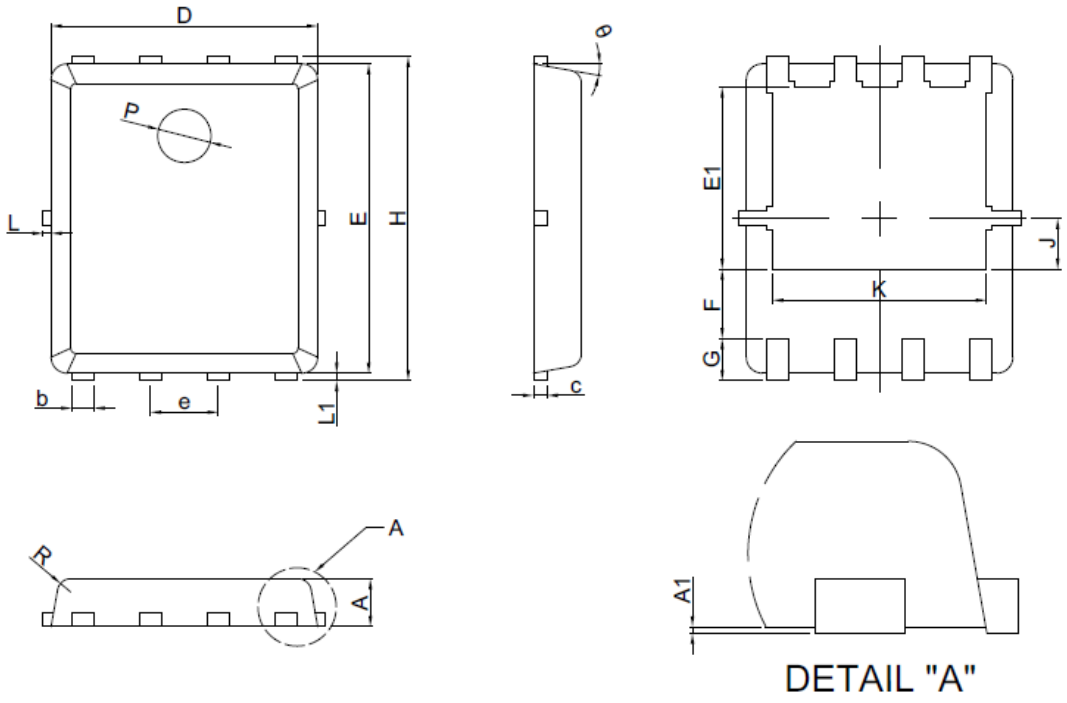
Switching Times Test Circuit for Inductive Load	Switching Times Waveform
	

Table 9. Unclamped Inductive Load

Unclamped Inductive Load Test Circuit	Unclamped Inductive Waveform
	

7. Package Outlines

Figure 1 Outline DFN5*6 Dimensions in mm



SYMBOL	MIN	NOM	MAX
A	0.80	0.90	1.00
A_1	0.00	0.03	0.05
b	0.35	0.42	0.49
c		0.254REF	
D	4.90	5.00	5.10
F		1.40REF	
E	5.70	5.80	5.90
e		1.27BSC	
H	5.95	6.08	6.20
L1	0.10	0.14	0.18
G		0.60REF	
K		4.00REF	
L	——	——	0.15
J		0.95BSC	
P		1.00REF	
E1	3.35	3.40	3.65
θ	6°	10°	14°
R		0.25REF	

8. Appendix

CoolSemi Webpage: www.coolsemi.com.