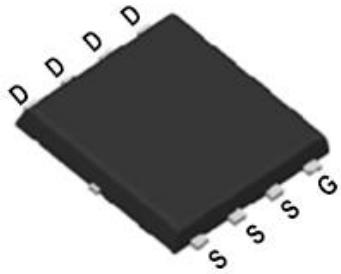
N-channel 30V, 1.1mΩ max.,250A
SGT MOSFET M1 in PDFN5*6

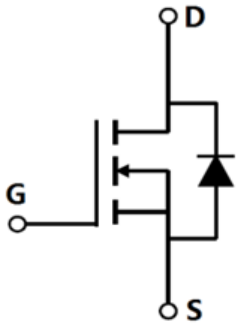
Datasheet - Preliminary data

1. Descriptions

PDFN5*6



Schematic Diagram



Key Performance Parameters

Parameters	Value	Unit
BV_{DSS}	30	V
$R_{DS(on),max}$	1.1	mΩ
$Q_{g,typ}$	64	nC
$I_{D,pulse}$	550	A
E_{AS}	205	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
CSLS011N03M1	PDFN5*6	011N03M1	see Appendix A

Contents

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)]	-	-	30	V	V_{GS}=0V, I_D=250μA
I_D	Continuous drain current (Silicon Limited)	-	-	245	A	T_C=25°C
$I_{D,pulse}$	Pulsed drain current[2)]	-	-	550	A	T_C=25°C
E_{AS}	Avalanche energy, single pulse[3)]	-	-	205	mJ	I_D=37A; V_{DD} =15V
I_{AS}	Avalanche current	-	-	37	A	-
V_{GS}	Gate source voltage	-20	-	20	V	static; AC (f>1 Hz)
P_{tot}	Power dissipation	-	-	96	W	T_C=25°C
T_j, T_{stg}	Operating and storage temperature	-55	-	150	°C	-
I_S	Continuous diode forward current	-	-	245	A	T_C=25°C
$I_{S,pulse}$	Diode pulse current[2)]	-	-	550	A	T_C=25°C

1) Limited by T_j max. Maximum duty cycle D=0.75.
2) This single-pulse measurement was taken under Tj_max=150°C.
3) V_{DD}=15V, L=0.3mH, 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	-	1.0	1.3	°C/W	T_C = 25°C
R_{thJA}	Thermal resistance, junction - ambient	-	50	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	30	-	-	V	V_{GS}=0V, I_D=250μA
$V_{(GS)th}$	2	1.2	1.8	2.5	V	V_{DS}=V_{GS}, I_D=250μA
I_{DSS}	Zero gate voltage drain current	-	-	1	μA	V_{DS}=30V, 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	-	0.88	1.1	mΩ	V_{GS}=10V, I_D=20A, T_j=25°C
		-	1.3	1.7	mΩ	V_{GS}=4.5V, I_D=20A, T_j=25°C
R_G	Gate resistance	-	1.8	-	Ω	V_{DD}=0V,V_{GS}=0V,F=1MHz
g_{fs}	Transconductance		110		S	V_{DS}=5V, I_D=20A

Table 4. Dynamic Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
C_{iss}	Input capacitance	-	4180	-	pF	V_{GS}=0V, V_{DS}=15V, f=1MHz
C_{oss}	Output capacitance	-	2850	-	pF	V_{GS}=0V, V_{DS}=15V, f=1MHz
C_{rss}	Reverse transfer capacitance	-	230	-	pF	V_{GS}=0V, V_{DS}=15V, f=1MHz
$t_{d(on)}$	Turn-on delay time	-	6	-	ns	V_{DD}=15V, V_{GS}=10V, I_D=20A, R_G =6Ω
t_r	Rise time	-	7.5	-	ns	V_{DD}=15V, V_{GS}=10V, I_D=20A, R_G =6Ω
$t_{d(off)}$	Turn-off delay time	-	35	-	ns	V_{DD}=15V, V_{GS}=10V, I_D=20A, R_G =6Ω
t_f	Fall time	-	20	-	ns	V_{DD}=15V, V_{GS}=10V, I_D=20A, R_G =6Ω

Table 5. Gate Charge Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Q_{gs}	Gate to source charge	-	10.4	-	nC	V_{DD}=15V, I_D=20A, V_{GS}=0 to 10V
Q_{gd}	Gate to drain charge	-	9.5	-	nC	V_{DD}=15V, I_D=20A, V_{GS}=0 to 10V
Q_g	Gate charge total	-	64	-	nC	V_{DD}=15V, I_D=20A, V_{GS}=0 to 10V
$V_{plateau}$	Gate plateau voltage	-	2.5	-	V	V_{DD}=15V, 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	-	0.7	1.2	V	V_{GS}=0V, I_F=15A, T_f=25°C
t_{rr}	Reverse recovery time	-	54	-	ns	V_R=15V, I_F=15A, di_F/dt=100A/μs
Q_{rr}	Reverse recovery charge	-	60	-	nC	V_R=15V, I_F=15A, di_F/dt=100A/μs

5. Electrical Characteristics Diagrams

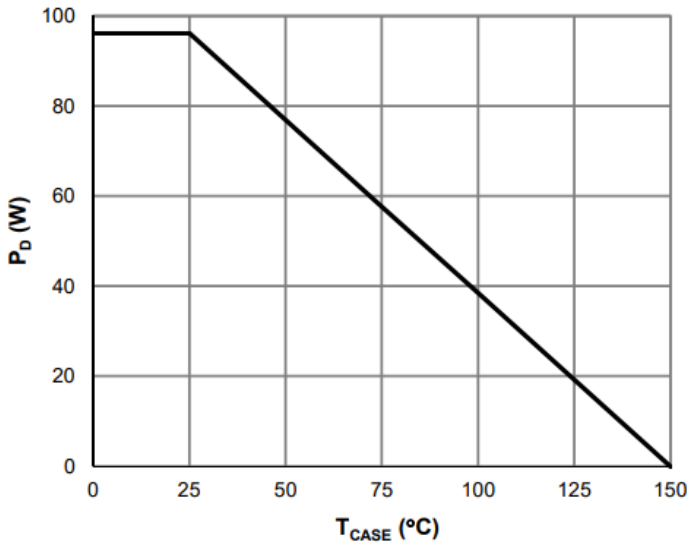
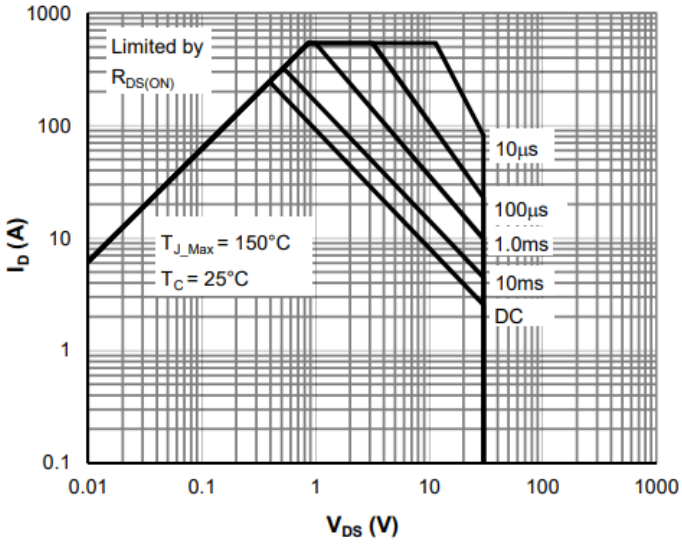
Diagram 1: Power dissipation	Diagram 2: Max. Safe Operating Area
	
P_{tot}=f(T_C)	I_D=f(V_{DS})

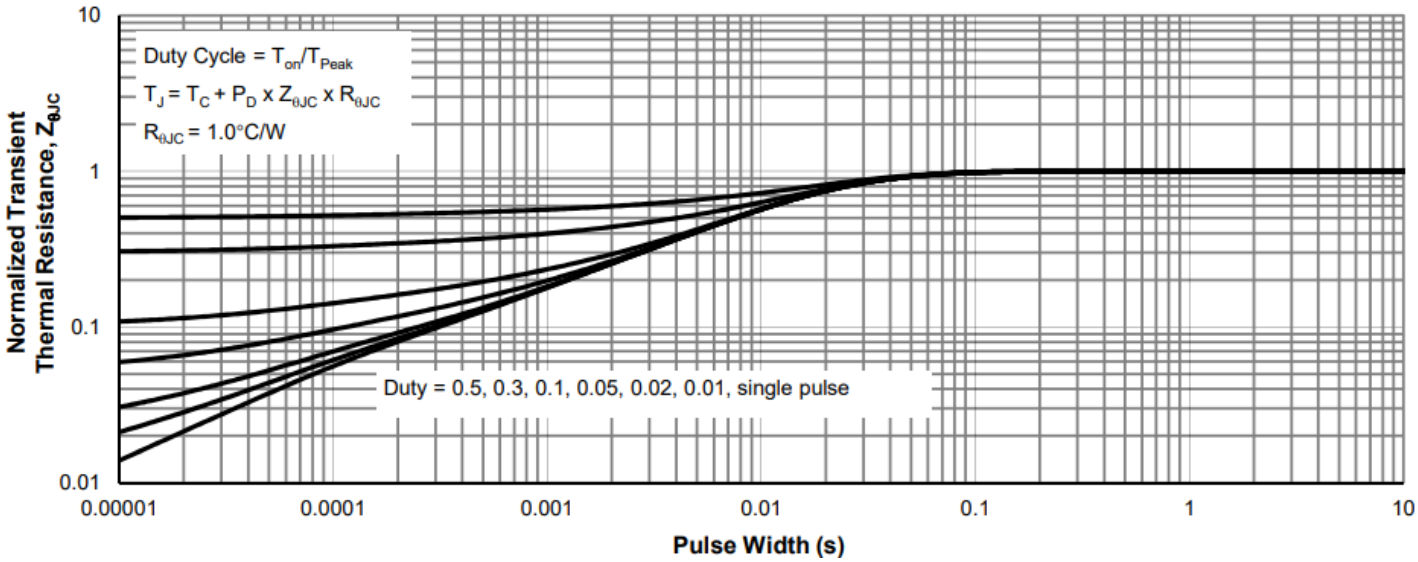
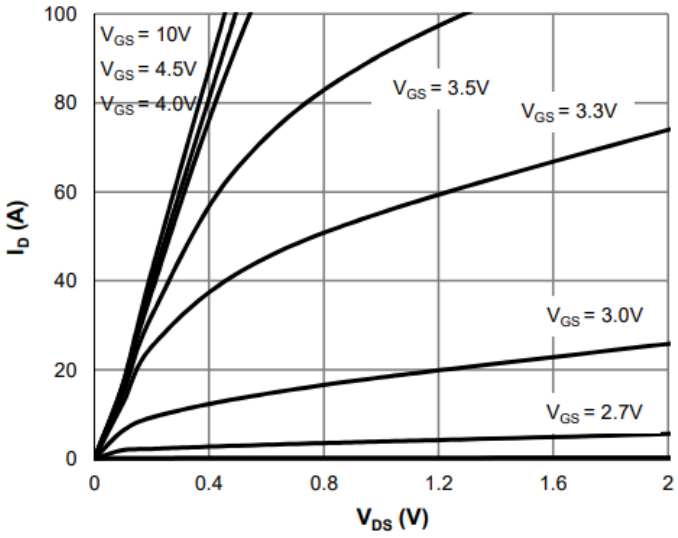
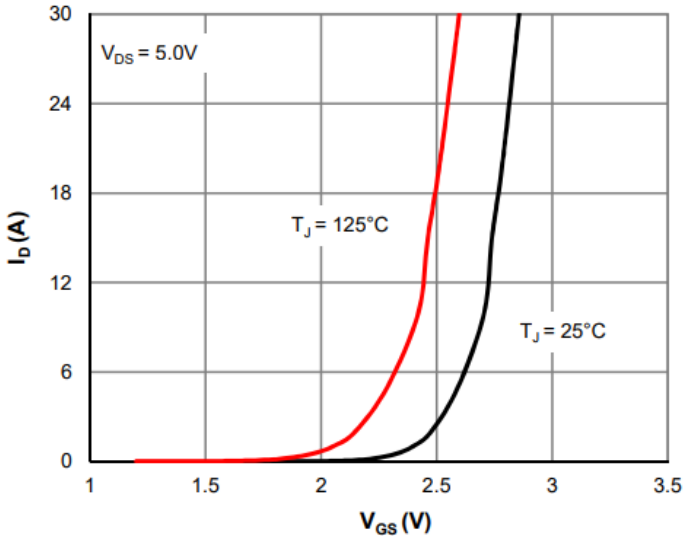
Diagram 3: Normalized Maximum Transient Thermal Impedance

Z_{thJC}=f(t_p)

Diagram 4: Typ. output characteristics



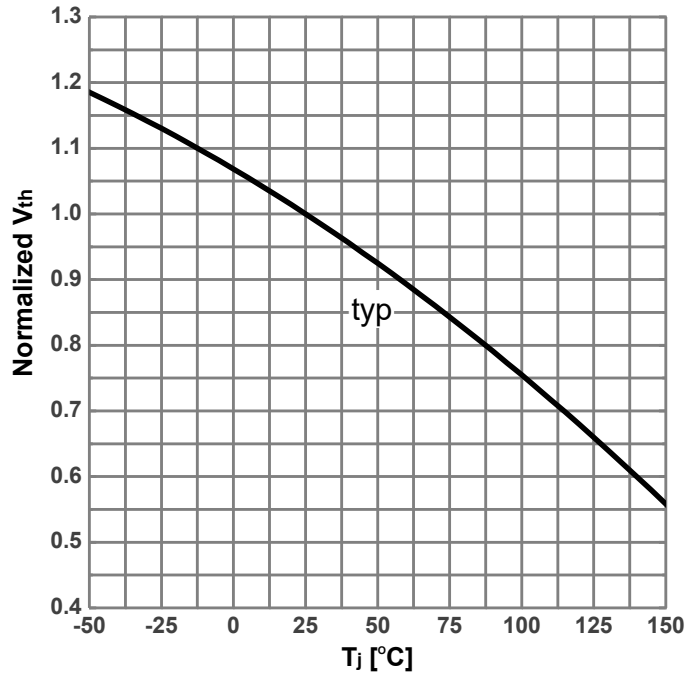
I_D=f(V_{DS}); Tj=25°C; parameter: V_{GS}

Diagram 5: Typ. transfer characteristics



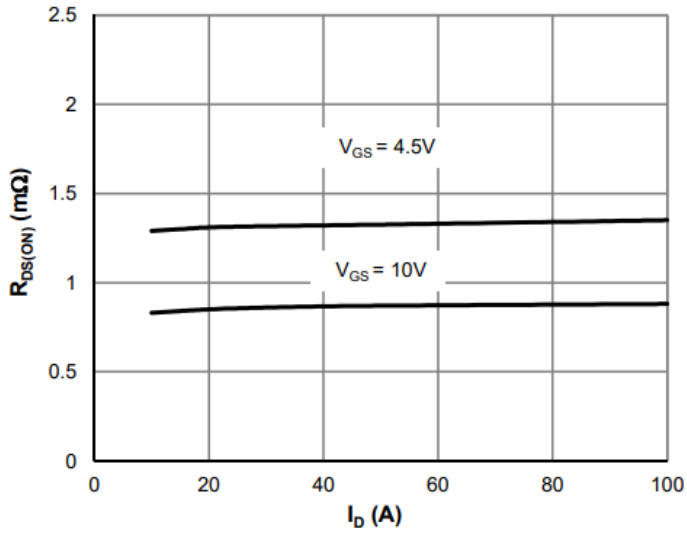
I_D=f(V_{GS}); V_{DS}=5V; parameter: T_j

Diagram 6: Gate threshold voltage vs. Junction temperature



V_{th}=f(T_j); I_D=250μA

Diagram 7: On-state resistance vs. Drain current



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

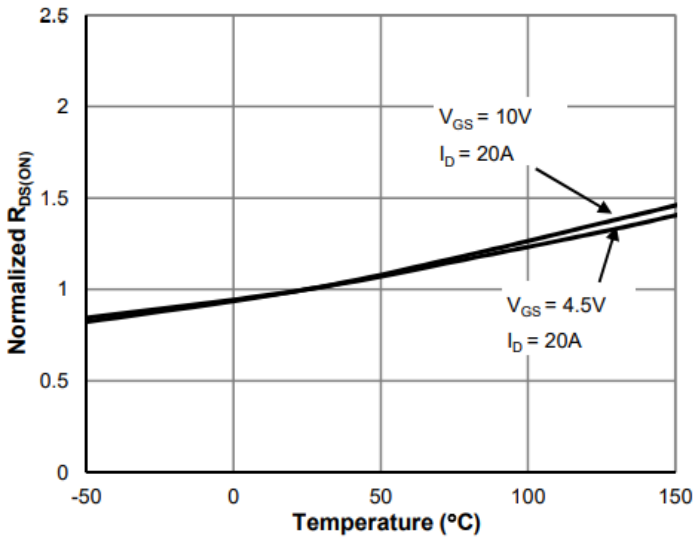
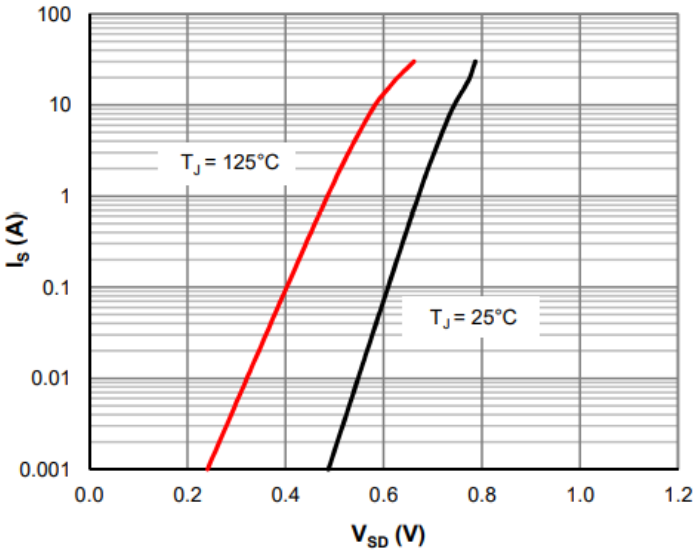
Diagram 8: On-state resistance vs. Junction temperature	Diagram 9: Forward characteristics of reverse diode
	
R_{DS}(on)=f(T_j)	I_S=f(V_{SD}); parameter: T_j

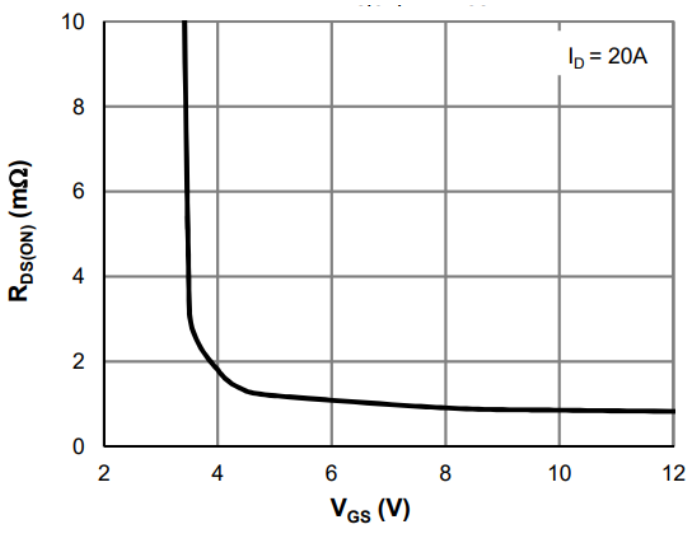
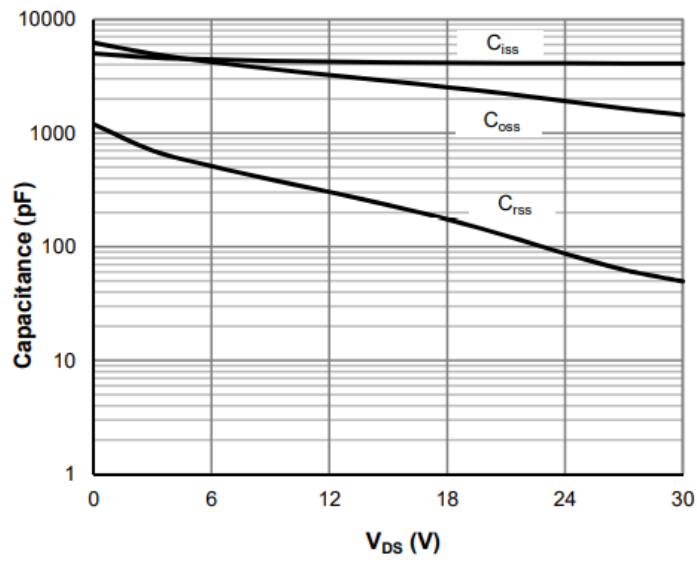
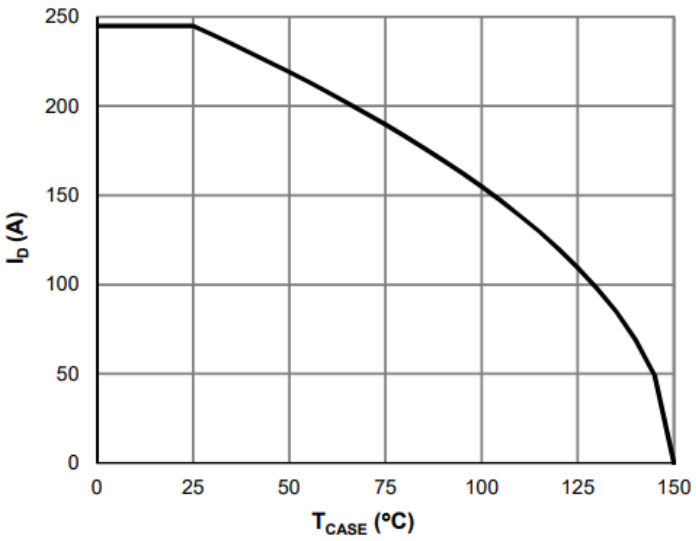
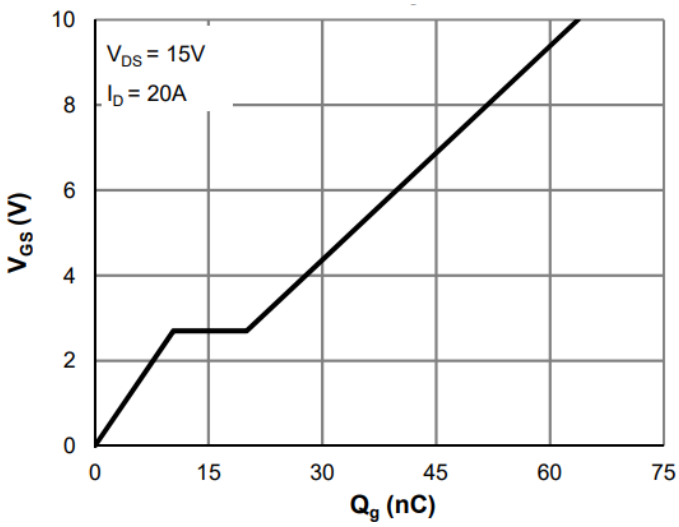
Diagram 10: On-state resistance vs. Vgs characteristics	Diagram 11: Typ. capacitances
	
R_{DS}(on)=f(V_{gs}); T_j=25°C; I_D=20A	C=f(V_{DS}); V_{GS}=0V; f=1MHz

Diagram 12: Maximum Drain Current	Diagram 13: Typ. gate charge
	
I_D= f(T_c); V_{GS}=10V	V_{GS}=f(Q_{gate}); I_D=20A pulsed; V_{DS}=15V

6. Test Circuits

Table 7. Diode Characteristics

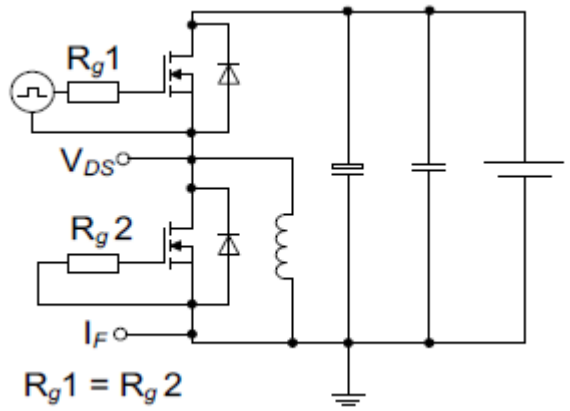
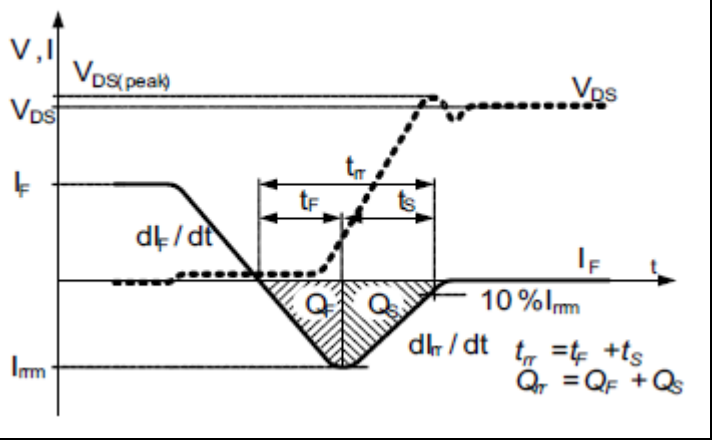
Test circuit for diode characteristics	Diode recovery waveform
	

Table 8. Switching Times

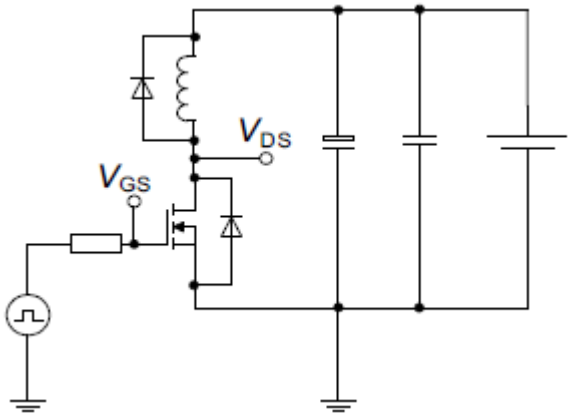
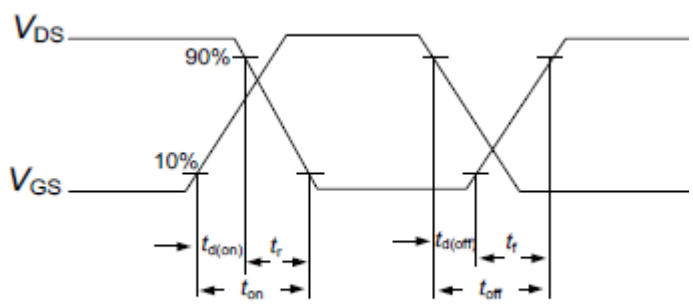
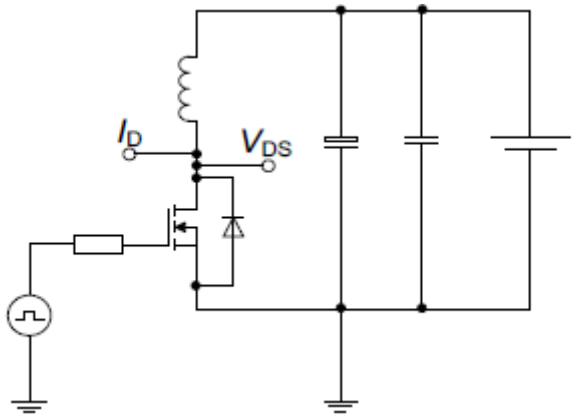
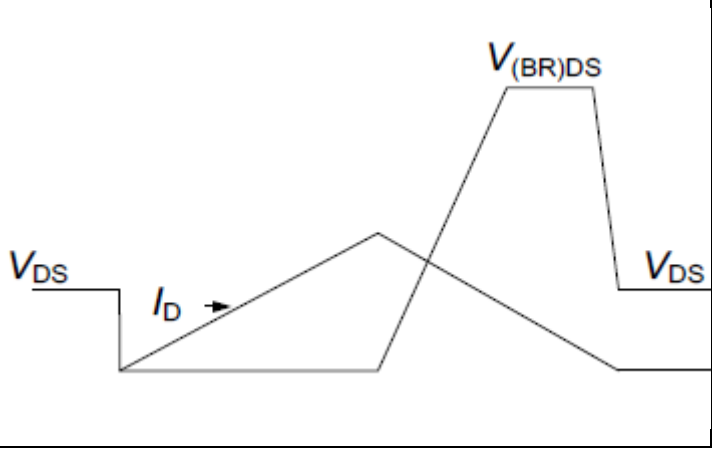
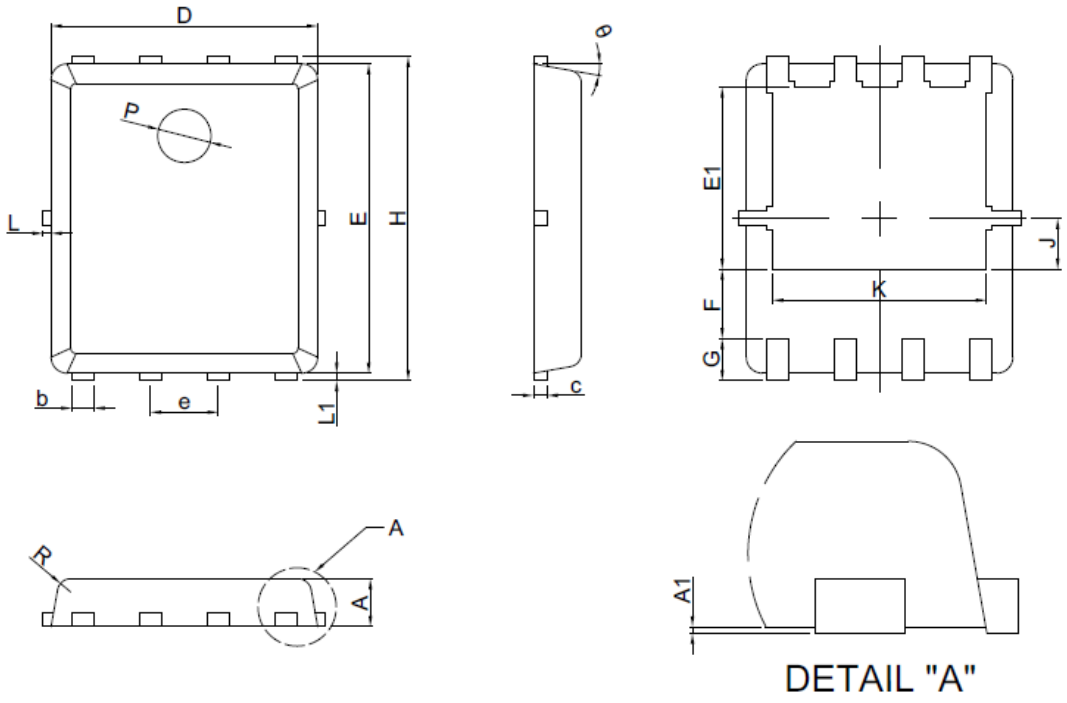
Switching times test circuit for inductive load	Switching times waveform
	

Table 9. Unclamped Inductive Load

Unclamped inductive load test circuit	Unclamped inductive waveform
	

7. Package Outlines

Figure 1 Outline PDFN5*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.