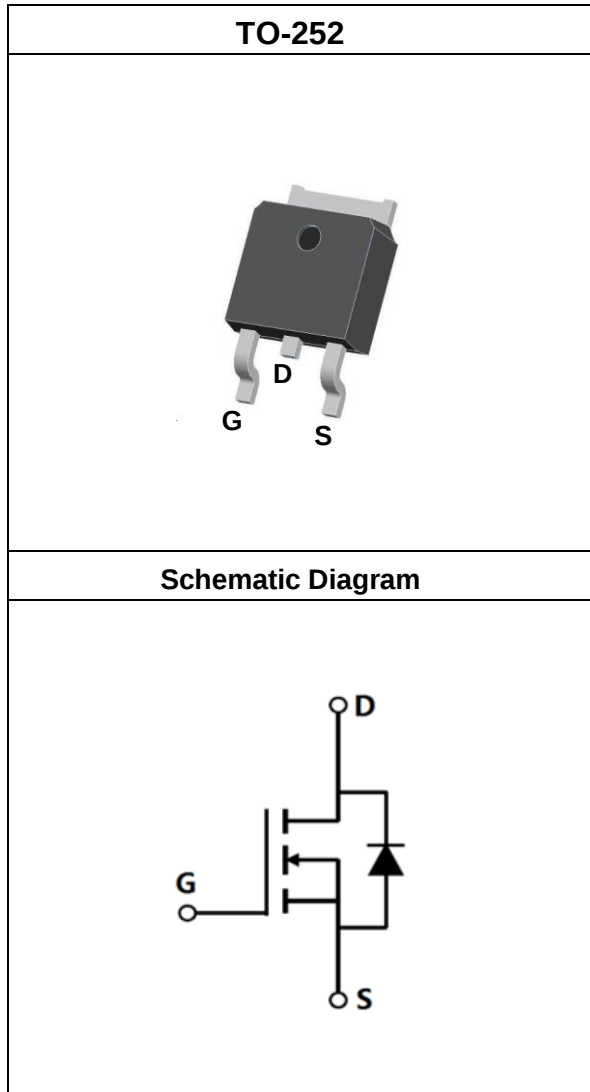


N-channel 100V, 9.8mΩ max, 67A
 SGT MOSFET H1 in TO-252

Datasheet — Production data

1. Descriptions



Key Performance Parameters

Parameters	Value	Unit
BV_{DSS}	100	V
$R_{DS(on),max}$	9.8	mΩ
$Q_{g,type}$	26	nC
$I_{D,pulse}$	160	A
E_{AS}	31	mJ

Features

- Extremely low losses due to very low FOM $R_{ds(on)} \cdot Q_g$.
- 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
CSD098N10SL	TO-252	098N10SL	see Appendix A

Contents

1.	Descriptions	1
2.	Maximum Ratings.....	3
3.	Thermal Characteristics	4
4.	Electrical Characteristics	5
5.	Electrical Characteristics Diagrams	6
6.	Test Circuits	10
7.	Package Outlines	11
8.	Appendix.....	12

2. Maximum Ratings

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

Table 1. Absolute Maximum Ratings

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
V_{DS}	Drain-source voltage ¹⁾	-	-	100	V	$V_{GS}=0V$, $I_D=250\mu A$
I_D	Continuous drain current	-	-	67	A	$T_C=25^\circ\text{C}$
$I_{D,pulse}$	Pulsed drain current	-	-	160	A	$T_C=25^\circ\text{C}$
E_{AS}	Avalanche energy, single pulse ²⁾	-	-	31	mJ	$I_D=25A$; $V_{DD}=50V$
I_{AS}	Avalanche current	-	-	25	A	-
V_{GS}	Gate source voltage	-20	-	20	V	static; AC ($f>1\text{ Hz}$)
P_{tot}	Power dissipation	-	-	94	W	$T_C=25^\circ\text{C}$
T_j, T_{stg}	Operating and storage temperature	-55	-	175	$^\circ\text{C}$	-
I_S	Continuous diode forward current	-	-	67	A	$T_C=25^\circ\text{C}$
$I_{S,pulse}$	Diode pulse current ²⁾	-	-	160	A	$T_C=25^\circ\text{C}$

1) Limited by T_j max. Maximum duty cycle $D=0.75$.

2) $V_{DD}=50V$, $L=0.1mH$, $R_G=25\Omega$, Starting $T_j=25^\circ\text{C}$.

3. Thermal Characteristics

Table 2. Thermal Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
R_{thJC}	Thermal resistance, junction - case	-	-	1.6	°C/W	$T_C = 25^{\circ}\text{C}$
R_{thJA}	Thermal resistance, junction - ambient	-	-	50	°C/W	$T_C = 25^{\circ}\text{C}$
T_{sold}	Soldering temperature, wavesoldering only allowed at leads	-	-	260	°C	Lead Temperature (Soldering, 10 sec)

4. Electrical Characteristics

at $T_j = 25^\circ\text{C}$, 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	$V_{GS}=0V, I_D=250\mu A$
$V_{(GS)th}$	Gate threshold voltage	1.4	2.0	2.4	V	$V_{DS}=V_{GS}, I_D=250\mu A$
I_{DSS}	Zero gate voltage drain current	-	-	1	μA	$V_{DS}=100V, V_{GS}=0V, T_j=25^\circ C$
I_{GSS}	Gate-source leakage current	-	-	± 100	nA	$V_{GS}=\pm 20V, V_{DS}=0V$
$R_{DS(on)}$	Drain-source on-state resistance	-	8.3	9.8	m Ω	$V_{GS}=10V, I_D=20A, T_j=25^\circ C$
R_G	Gate resistance	-	2.2	-	Ω	$V_{DD}=0V, V_{GS}=0V, F=1MHz$
g_{fs}	Transconductance		85		S	$V_{DS}=5V, I_D=20A$

Table 4. Dynamic Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
C_{iss}	Input capacitance	-	1620	-	pF	$V_{GS}=0V, V_{DS}=50V, f=1MHz$
C_{oss}	Output capacitance	-	1535	-	pF	$V_{GS}=0V, V_{DS}=50V, f=1MHz$
C_{rss}	Reverse transfer capacitance	-	8.8	-	pF	$V_{GS}=0V, V_{DS}=50V, f=1MHz$
$t_{d(on)}$	Turn-on delay time	-	14	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=20A, R_G=10\Omega$
t_r	Rise time	-	6	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=20A, R_G=10\Omega$
$t_{d(off)}$	Turn-off delay time	-	23	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=20A, R_G=10\Omega$
t_f	Fall time	-	6	-	ns	$V_{DD}=50V, V_{GS}=10V, I_D=20A, R_G=10\Omega$

Table 5. Gate Charge Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Q_{gs}	Gate to source charge	-	5	-	nC	$V_{DD}=50V, I_D=20A, V_{GS}=0 \text{ to } 10V$
Q_{gd}	Gate to drain charge	-	6	-	nC	$V_{DD}=50V, I_D=20A, V_{GS}=0 \text{ to } 10V$
Q_g	Gate charge total	-	26	-	nC	$V_{DD}=50V, I_D=20A, V_{GS}=0 \text{ to } 10V$
$V_{plateau}$	Gate plateau voltage	-	3.2	-	V	$V_{DD}=50V, I_D=20A, V_{GS}=0 \text{ to } 10V$

Table 6. Reverse Diode Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
V_{SD}	Diode forward voltage	-	0.9	1.2	V	$V_{GS}=0V, I_F=20A, T_j=25^\circ C$
t_{rr}	Reverse recovery time	-	30	-	ns	$V_R=50V, I_F=20A, di_F/dt=500A/\mu s$
Q_{rr}	Reverse recovery charge	-	102	-	nC	$V_R=50V, I_F=20A, di_F/dt=500A/\mu s$

5. Electrical Characteristics Diagrams

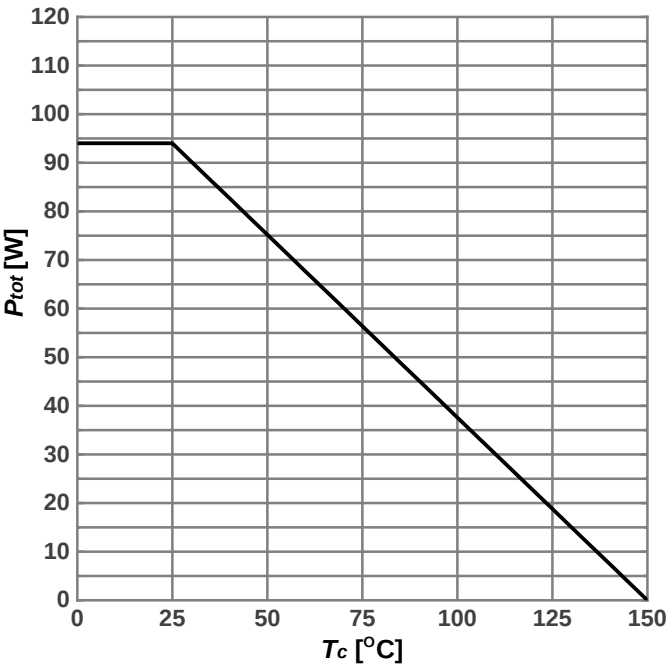
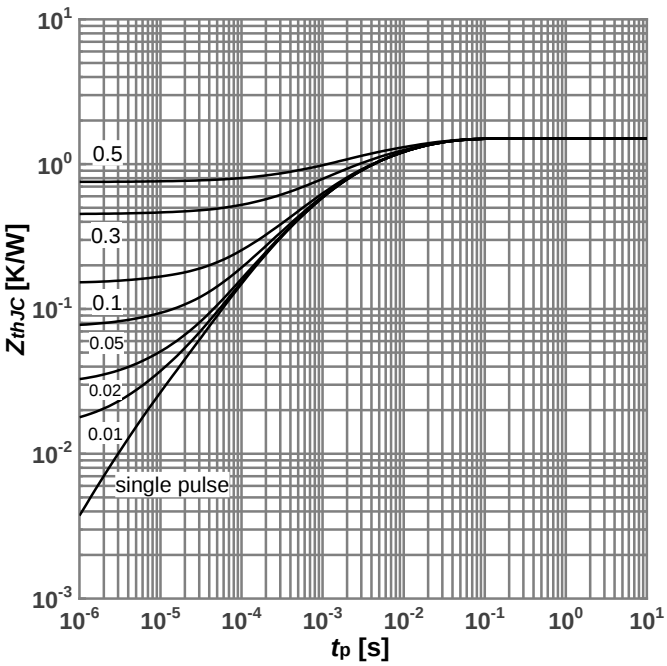
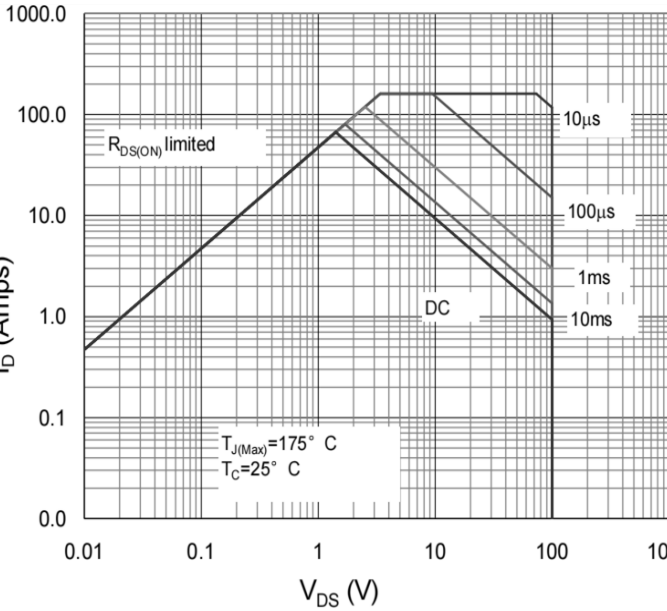
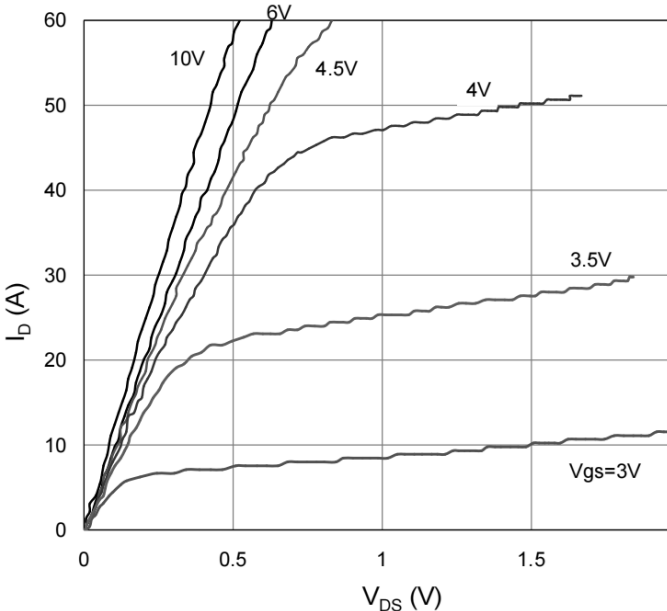
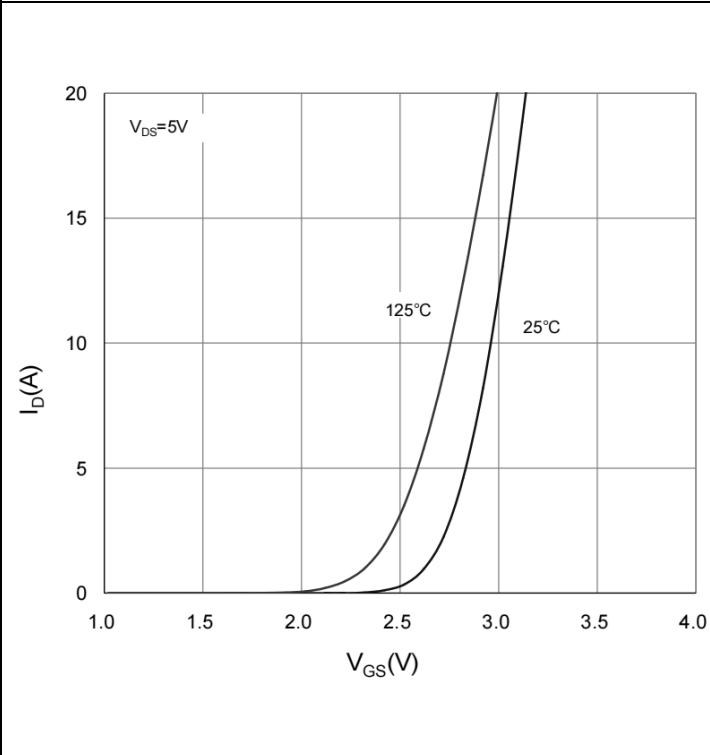
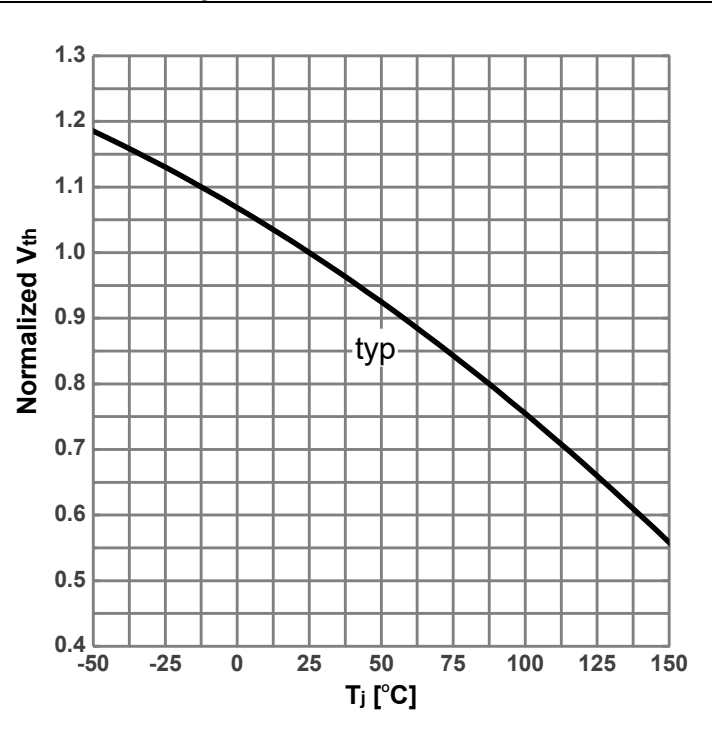
Diagram 1: Power dissipation  $P_{tot}=f(T_C)$	Diagram 2: Max. transient thermal impedance  $Z_{thJC}=f(t_p)$; parameter: $D= t_p/T$
Diagram 3: Safe operating area  $I_D=f(V_{DS})$; $T_J=25^{\circ}C$; $D=0$; parameter: t_p	Diagram 4: Typ. output characteristics  $I_D=f(V_{DS})$; $T_J=25^{\circ}C$; parameter: V_{GS}

Diagram 5: Typ. transfer characteristics



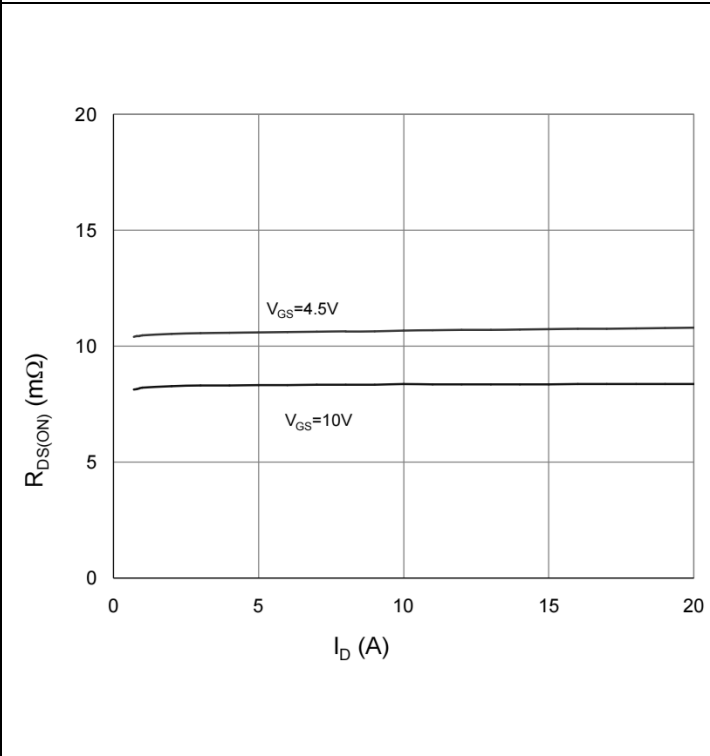
$I_D=f(V_{GS})$; $V_{DS}=5V$; parameter: T_j

Diagram 6: Gate threshold voltage vs. Junction temperature



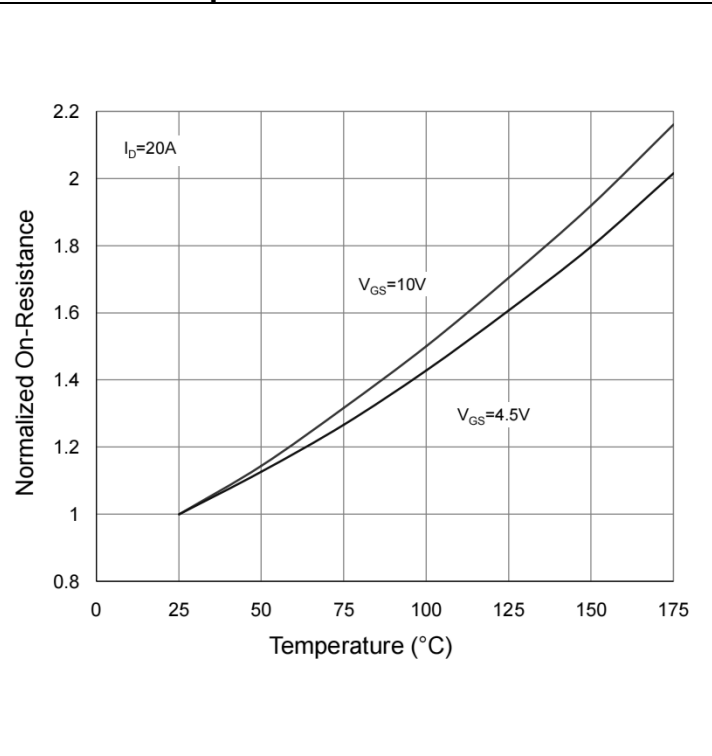
$V_{th}=f(T_j)$; $I_D=250\mu A$

Diagram 7: On-state resistance vs. Drain current



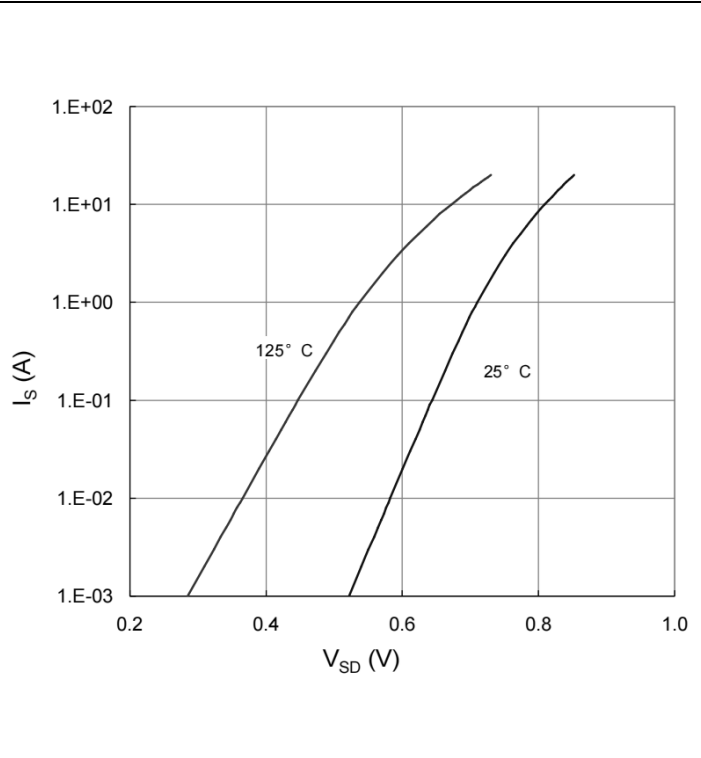
$R_{DS(on)}=f(I_D)$; $T_j=25^{\circ}C$; parameter: V_{GS}

Diagram 8: Normalized On-Resistance vs. Junction Temperature



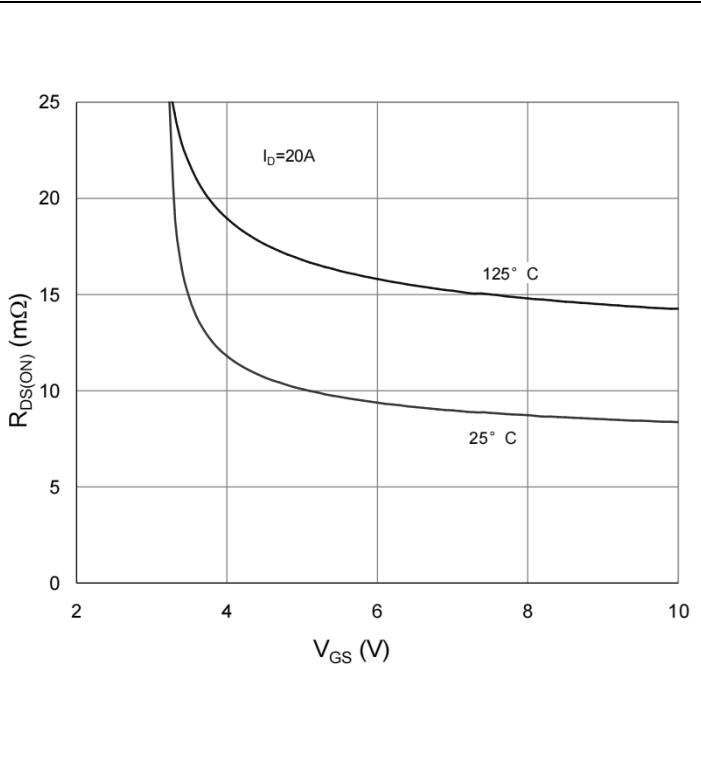
$R_{DS(on)}=f(T_j)$; $I_D=20A$; $V_{GS}=10V$

Diagram 9: Forward characteristics of reverse diode



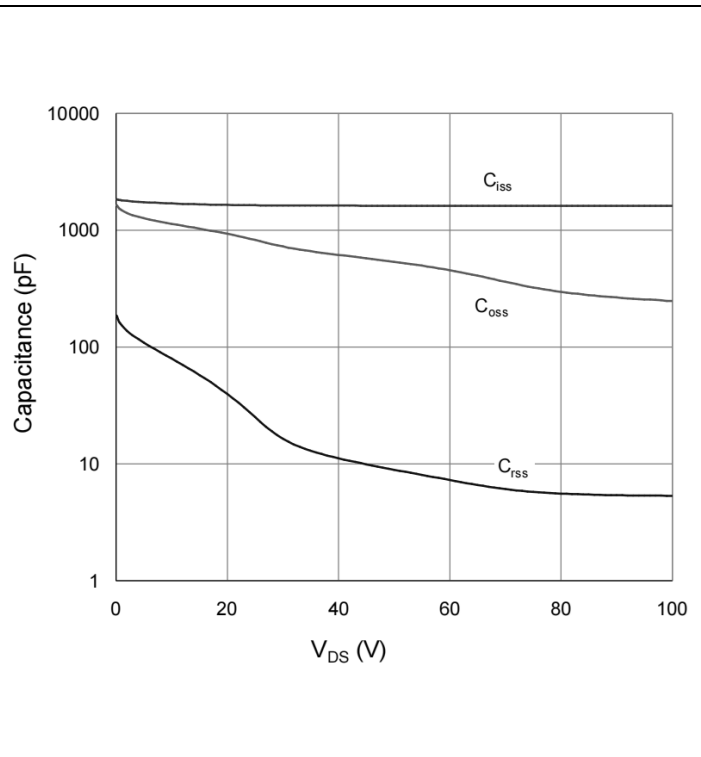
$I_F=f(V_{SD})$; parameter: T_j

Diagram 10: On-state resistance vs. Vgs characteristics



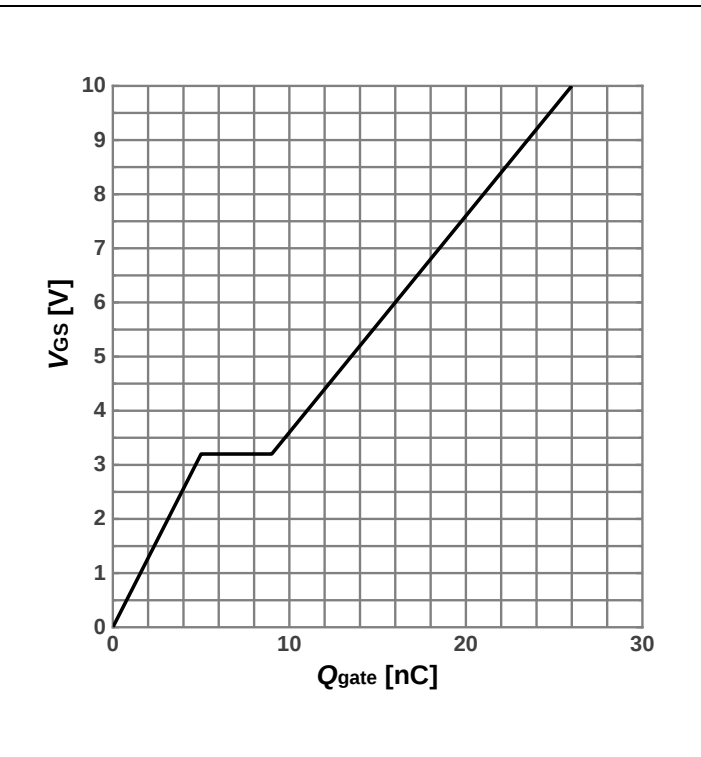
$R_{DS(on)}=f(V_{gs})$; $T_j=25^\circ\text{C}$; $I_D=20\text{A}$

Diagram 11: Typ. capacitances

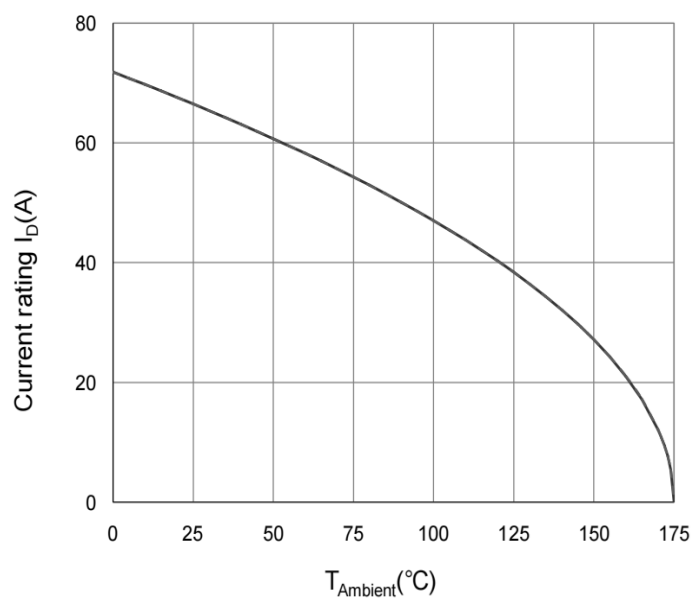


$C=f(V_{DS})$; $V_{GS}=0\text{V}$; $f=1\text{MHz}$

Diagram 12: Typ. gate charge



$V_{GS}=f(Q_{gate})$; $I_D=20\text{A}$ pulsed; $V_{DS}=50\text{V}$

Diagram 13: Maximum Drain Current vs. Case Temperature

$$I_D = f(T_C)$$

6. Test Circuits

Table 7. Diode Characteristics

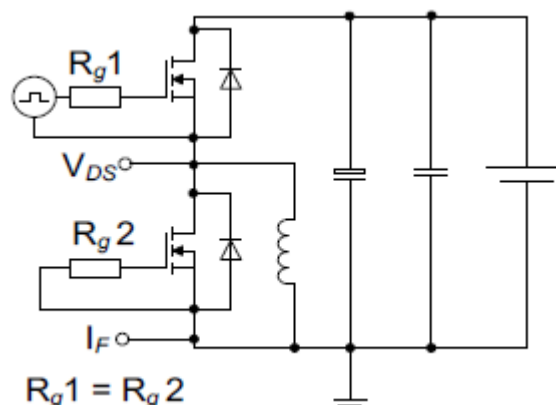
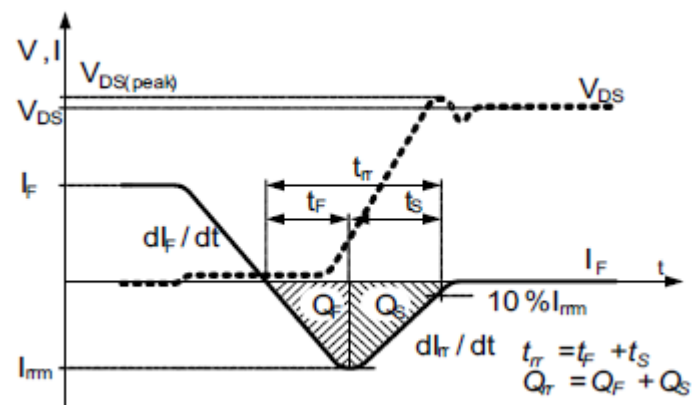
Test circuit for diode characteristics	Diode recovery waveform
 $R_{g1} = R_{g2}$	 $V_{DS(peak)}$ V_{DS} I_F dI_F/dt t_F t_{rr} t_s $10\% I_{Im}$ I_{Im} $t_{rr} = t_F + t_s$ $Q_{rr} = Q_F + Q_S$

Table 8. Switching Times

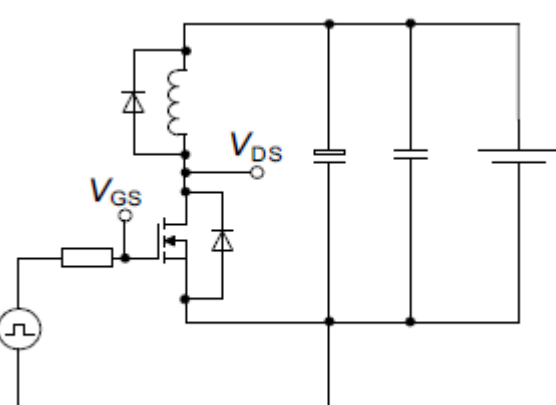
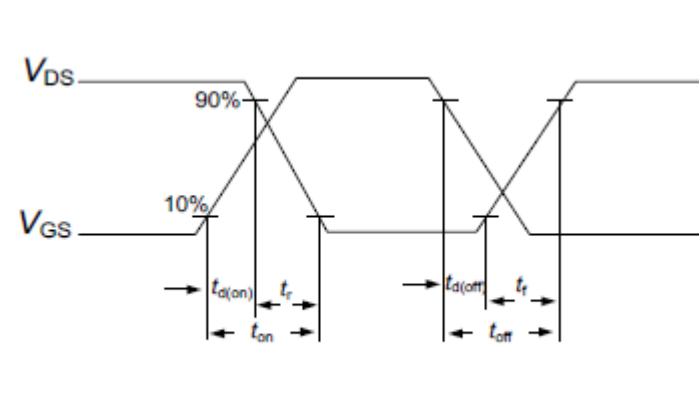
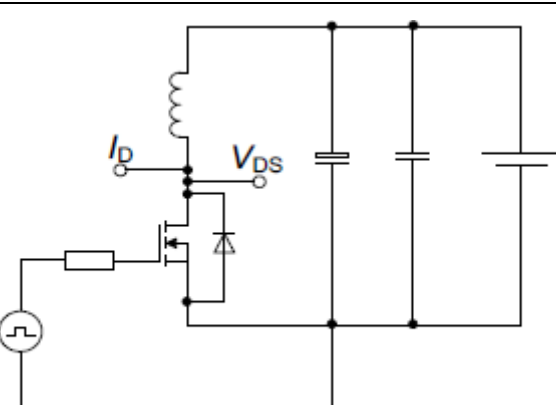
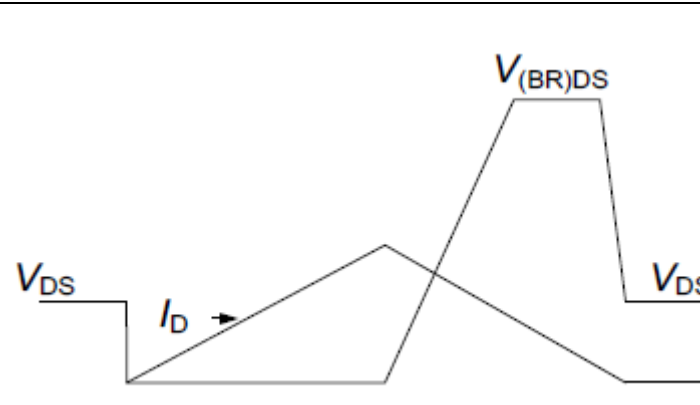
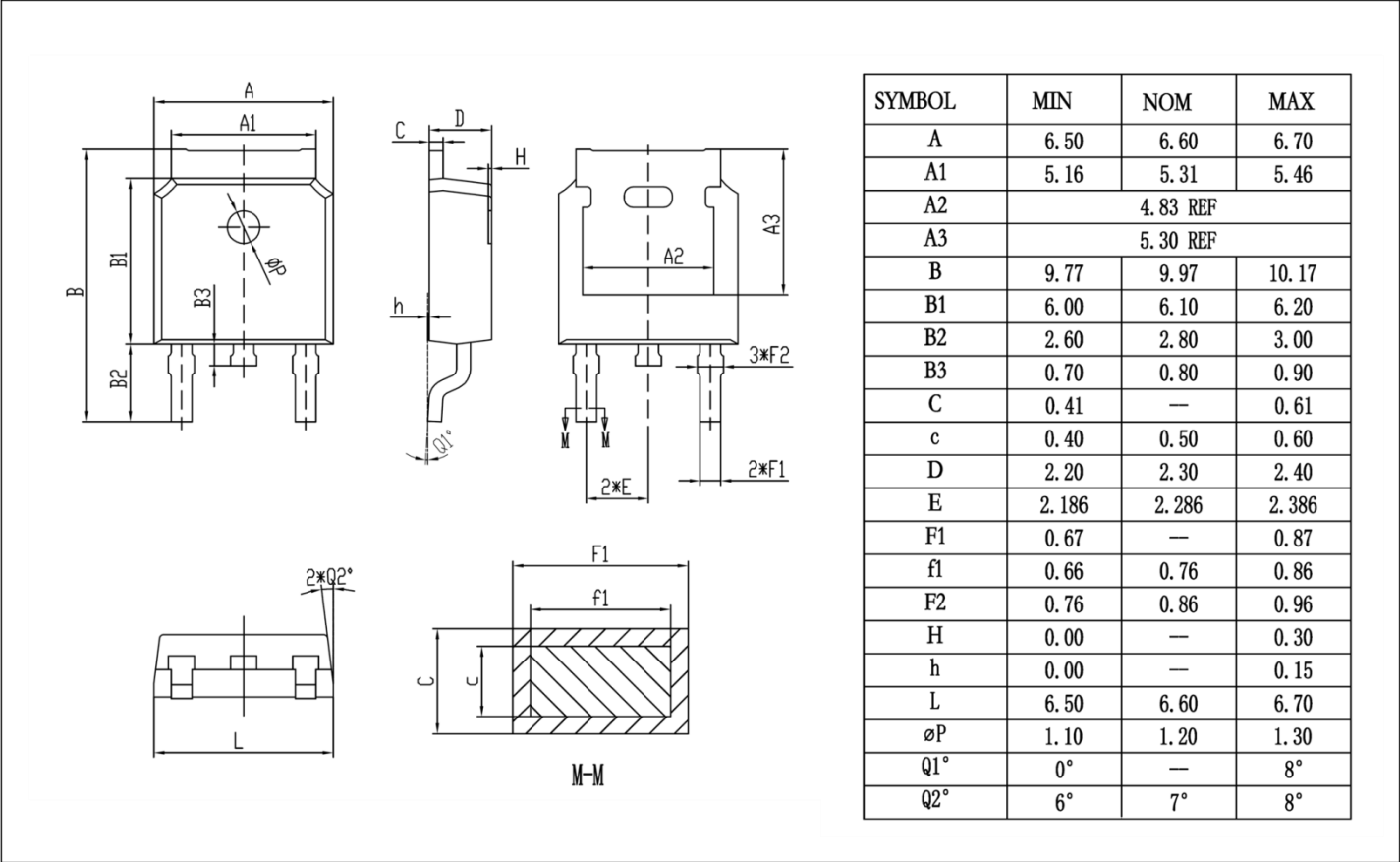
Switching times test circuit for inductive load	Switching times waveform
	 V_{DS} 90% 10% V_{GS} $t_{d(on)}$ t_r t_{on} $t_{d(off)}$ t_r t_{off}

Table 9. Unclamped Inductive Load

Unclamped inductive load test circuit	Unclamped inductive waveform
	 $V_{(BR)DS}$ V_{DS} I_D

7. Package Outlines

Figure 1 Outline TO-252 Dimensions in mm



8. Appendix

CoolSemi Webpage: www.coolsemi.com.