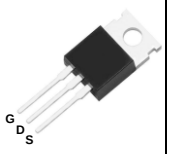
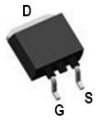
CSP100N20S2,CSB100N20S2, CSW100N20S2

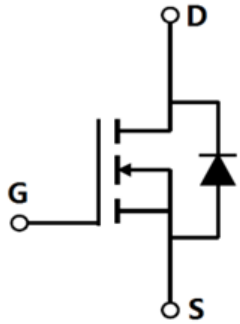
N-channel 200V, 10mΩ max.,140A
SGT MOSFET S2 in TO-220、TO-263 and TO247

Datasheet - production data

1. Descriptions

TO-220	TO-263	TO-247
		

Schematic Diagram



Key Performance Parameters

Parameters	Value	Unit
BV_{DSS}	200	V
$R_{DS(on),max}$	10	mΩ
$Q_{g,typ}$	137	nC
$I_{D,pulse}$	400	A
E_{AS}	1225	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, Switching Voltage Regulators and Motor Drivers.

Type/Ordering Code	Package	Marking	Related Links
CSP100N20S2	TO-220	100N20S2	See Appendix A
CSB100N20S2	TO-263		
CSW100N20S2	TO-247		

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)]	-	-	200	V	V_{GS}=0V, I_D=250uA
I_D	Continuous drain current	-	-	140 95	A	T_C=25°C T_C=100°C
$I_{D,pulse}$	Pulsed drain current	-	-	400	A	T_C=25°C
E_{AS}	Avalanche energy, single pulse[2)]	-	-	1225	mJ	I_D=70A; V_{DD} =50V
I_{AS}	Avalanche current	-	-	70	A	-
V_{GS}	Gate source voltage	-20	-	20	V	static; AC (f>1 Hz)
P_{tot}	Power dissipation	-	-	430	W	T_C=25°C
T_j, T_{stg}	Operating and storage temperature	-55	-	175	°C	-
I_S	Continuous diode forward current	-	-	140	A	T_C=25°C
$I_{S,pulse}$	Diode pulse current[2)]	-	-	400	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	-	-	0.35	°C/W	T_C = 25°C
R_{thJA}	Thermal resistance, junction - ambient	-	-	50	°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	200	-	-	V	V_{GS}=0V, I_D=250uA
$V_{(GS)th}$	Gate threshold voltage	2	3.1	4	V	V_{DS}=V_{GS}, I_D=250μA
I_{DSS}	Zero gate voltage drain current	-	-	1	μA	V_{DS}=200V, 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 (TO-263)	-	8.1	10	mΩ	V_{GS}=10V, I_D=20A, T_j=25°C
$R_{DS(on)}$	Drain-source on-state resistance (TO-220)	-	8.4	10	mΩ	V_{GS}=10V, I_D=20A, T_j=25°C
$R_{DS(on)}$	Drain-source on-state resistance (TO-247)	-	8.0	10	mΩ	V_{GS}=10V, I_D=20A, T_j=25°C
R_G	Gate resistance	-	2.5	-	Ω	V_{DD}=0V,V_{GS}=0V,F=1MHz
g_{fs}	Transconductance		90		S	V_{DS}=5V, I_D=20A

Table 4. Dynamic Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
C_{iss}	Input capacitance	-	10700	-	pF	V_{GS}=0V, V_{DS}=100V, f=250kHz
C_{oss}	Output capacitance	-	435	-	pF	V_{GS}=0V, V_{DS}=100V, f=250kHz
C_{rss}	Reverse transfer capacitance	-	7.2	-	pF	V_{GS}=0V, V_{DS}=100V, f=250kHz
$t_{d(on)}$	Turn-on delay time	-	80	-	ns	V_{DD}=100V, V_{GS}=10V, I_D=20A, R_G =10Ω
t_r	Rise time	-	14	-	ns	V_{DD}=100V, V_{GS}=10V, I_D=20A, R_G =10Ω
$t_{d(off)}$	Turn-off delay time	-	220	-	ns	V_{DD}=100V, V_{GS}=10V, I_D=20A, R_G =10Ω
t_f	Fall time	-	55	-	ns	V_{DD}=100V, V_{GS}=10V, I_D=20A, R_G =10Ω

Table 5. Gate Charge Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Q_{gs}	Gate to source charge	-	40	-	nC	V_{DD}=100V, I_D=20A, V_{GS}=0 to 10V
Q_{gd}	Gate to drain charge	-	17.7	-	nC	V_{DD}=100V, I_D=20A, V_{GS}=0 to 10V
Q_g	Gate charge total	-	137	-	nC	V_{DD}=100V, I_D=20A, V_{GS}=0 to 10V
$V_{plateau}$	Gate plateau voltage	-	4	-	V	V_{DD}=100V, 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	-	-	1.2	V	V_{GS}=0V, I_F=20A, T_f=25°C
t_{rr}	Reverse recovery time	-	116	-	ns	V_R=10V, I_F=20A, di_F/dt=100A/μs
Q_{rr}	Reverse recovery charge	-	644	-	nC	V_R=10V, I_F=20A, di_F/dt=100A/μs

5. Electrical Characteristics Diagrams

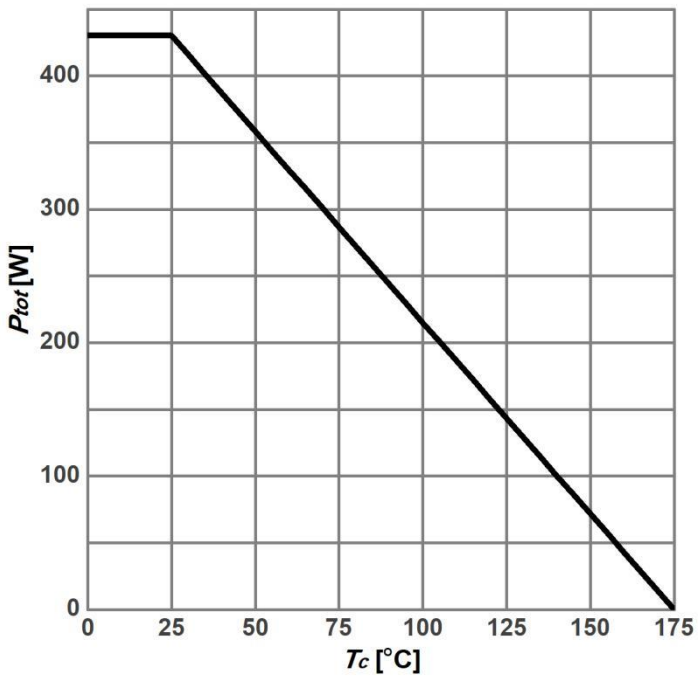
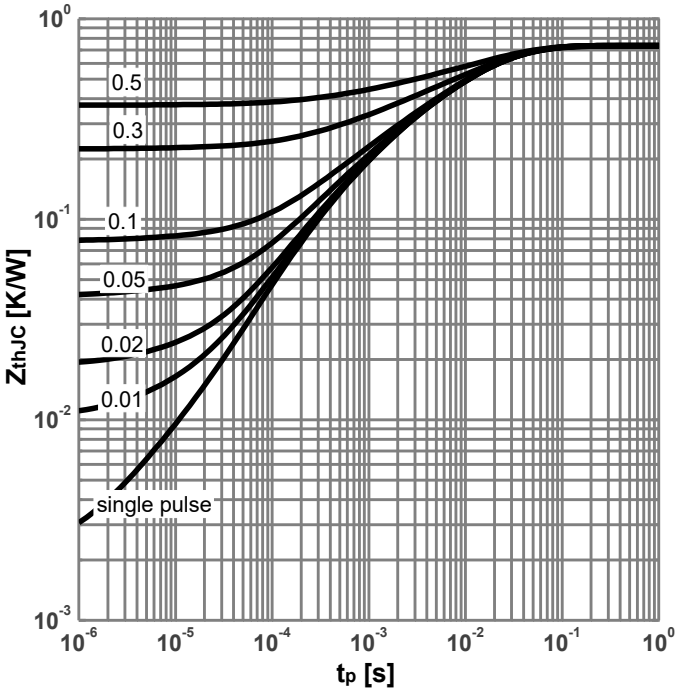
Diagram 1: Power dissipation	Diagram 2: Max. transient thermal impedance
	
P_{tot}=f(T_C)	Z_{thJC}=f(t_p); parameter: D= t_p/T

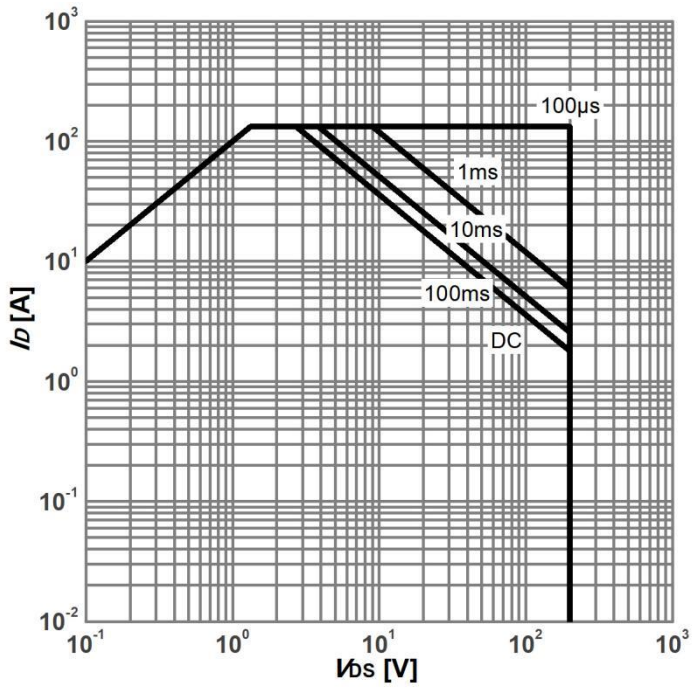
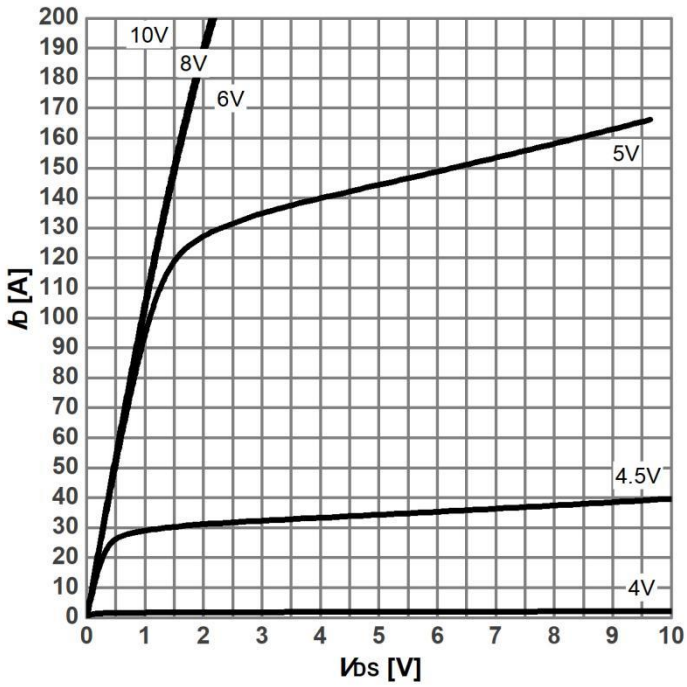
Diagram 3: Safe operating area	Diagram 4: Typ. output characteristics
	
I_D=f(V_{DS}); T_j=25°C; D=0; parameter: t_p	I_D=f(V_{DS}); T_j=25°C; parameter: V_{GS}

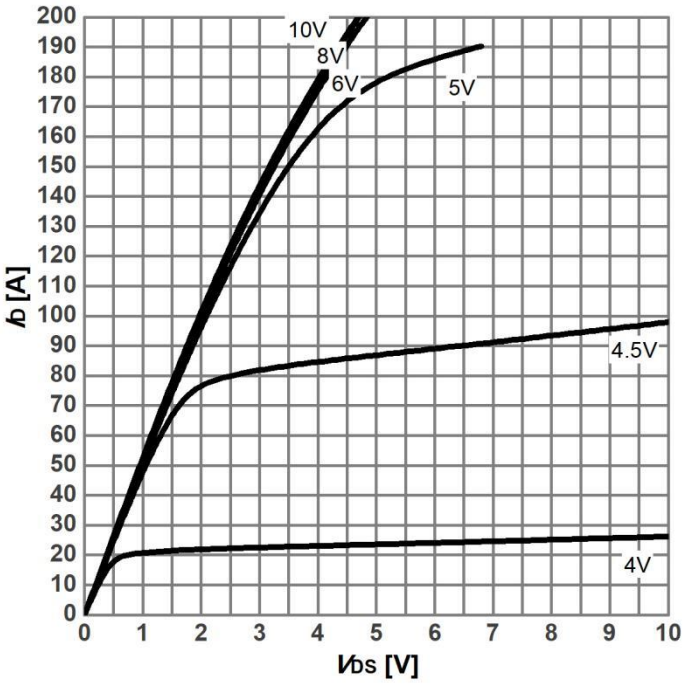
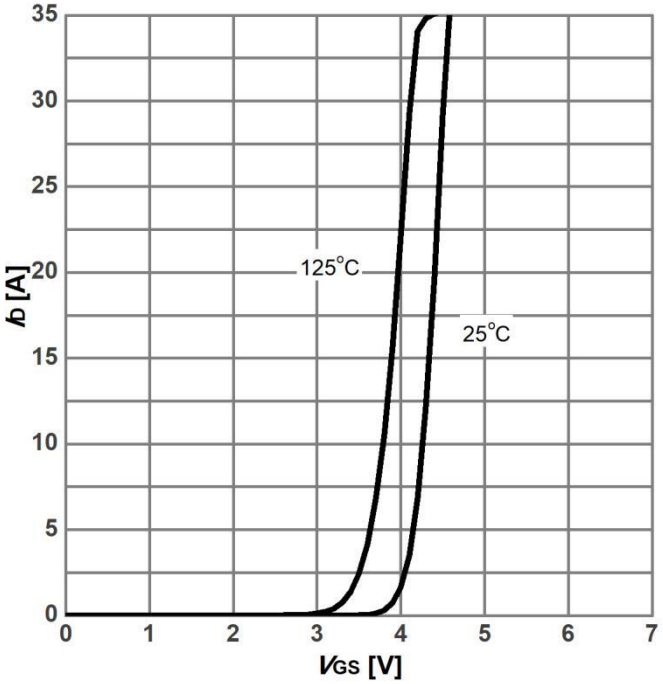
Diagram 5: Typ. output characteristics	Diagram 6: Typ. transfer characteristics
	
I_D=f(V_{DS}); Tj=125°C; parameter: V_{GS}	I_D=f(V_{GS}); V_{DS}=5V; parameter: T_j

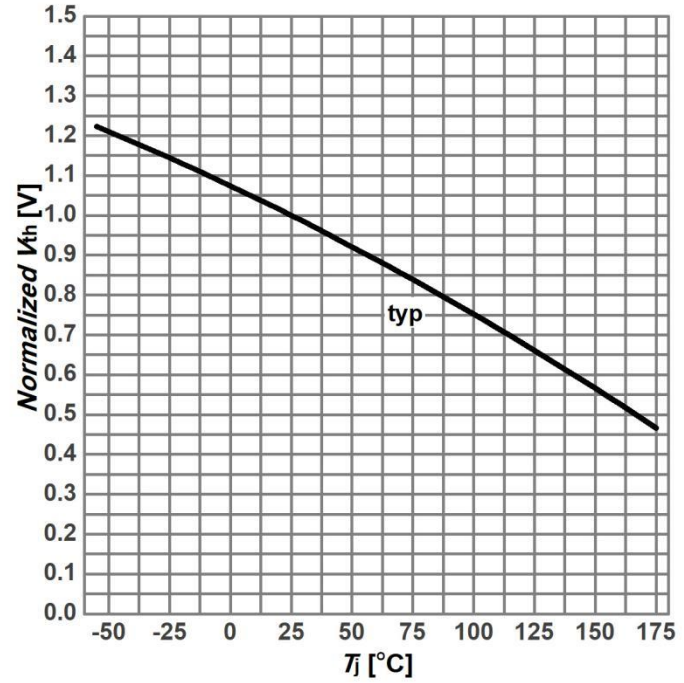
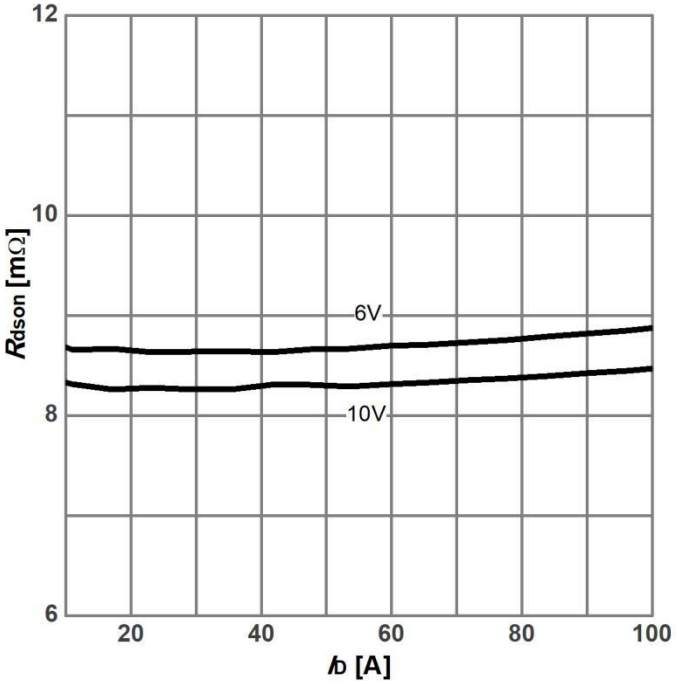
Diagram 7: Gate threshold voltage vs. Junction temperature	Diagram 8: On-state resistance vs. Drain current
	
V_{th}=f(T_j); I_D=250μA	R_{DS}(on)=f(I_D); Tj=25°C; parameter: V_{GS}

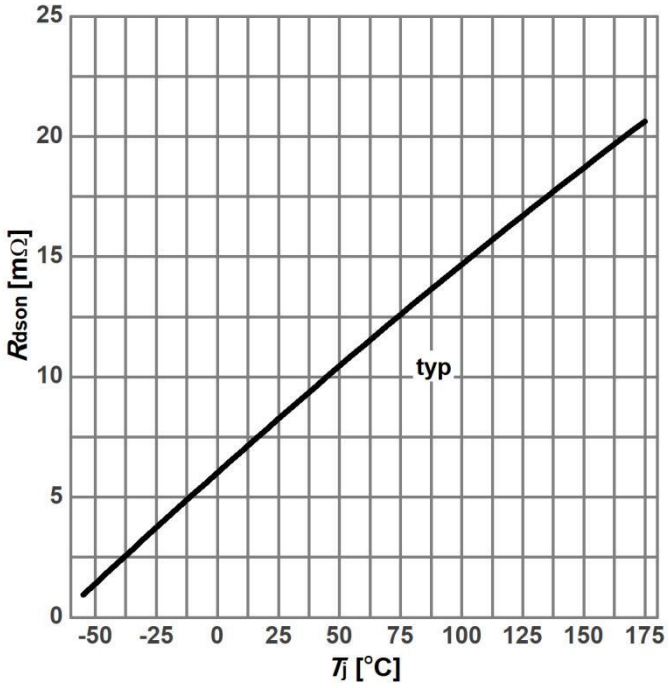
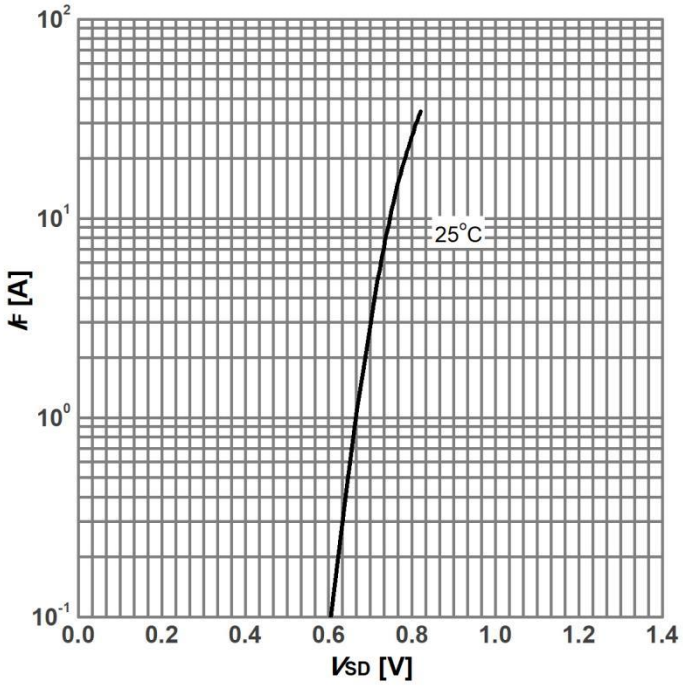
Diagram 9: On-state resistance vs. Junction temperature	Diagram 10: Forward characteristics of reverse diode
	
R_{DS}(on)=f(T_j); I_D=20A; V_{GS}=10V	I_F=f(V_{SD}); Tj=25°C

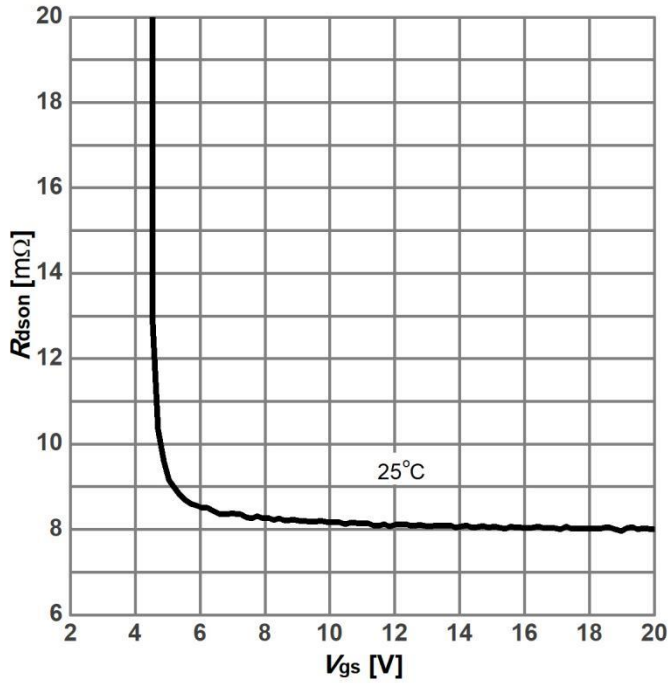
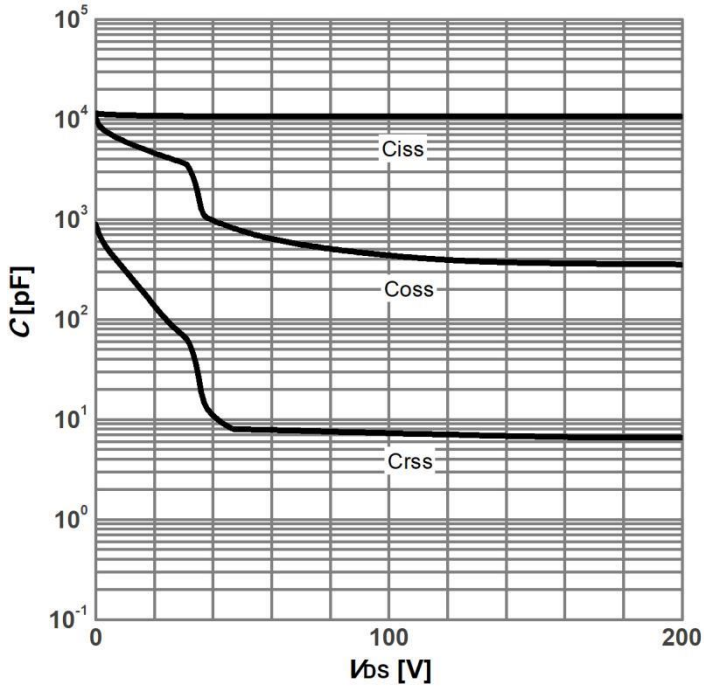
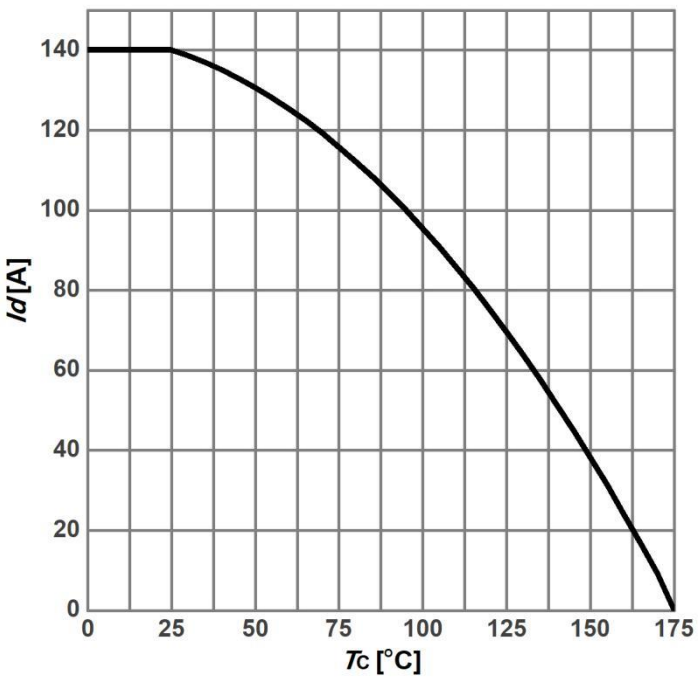
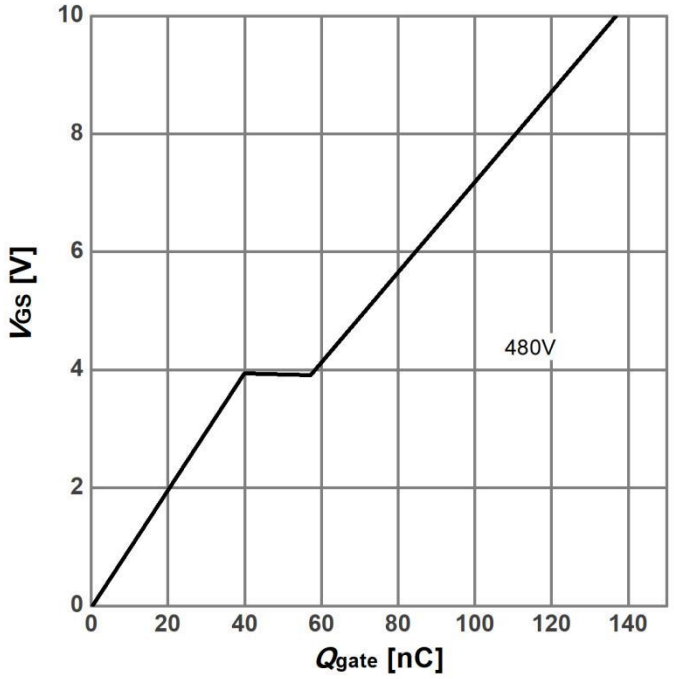
Diagram 11: On-state resistance vs. Vgs characteristics	Diagram 12: Typ. capacitances
	
R_{DS}(on)=f(V_{gs}); Tj=25°C; I_D=20A	C=f(V_{DS}); V_{GS}=0V; f=250KHz

Diagram 13: Maximum Drain Current	Diagram 14: Typ. gate charge
	
I_D= f(T_c); V_{GS}=10V	V_{GS}=f(Q_{gate}); I_D=20A pulsed; V_{DS}=30V

6. Test Circuits

Table 7. Diode Characteristics

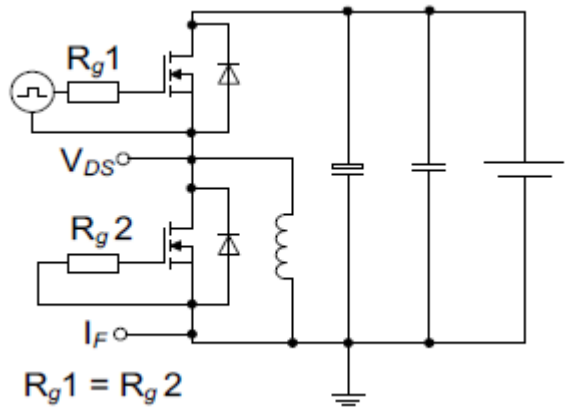
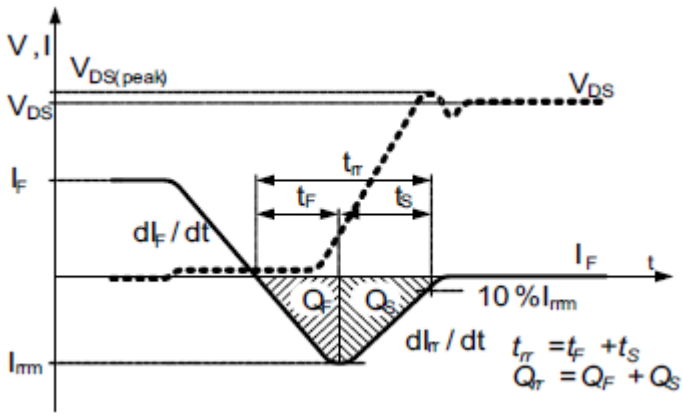
Test circuit for diode characteristics	Diode recovery waveform
	

Table 8. Switching Times

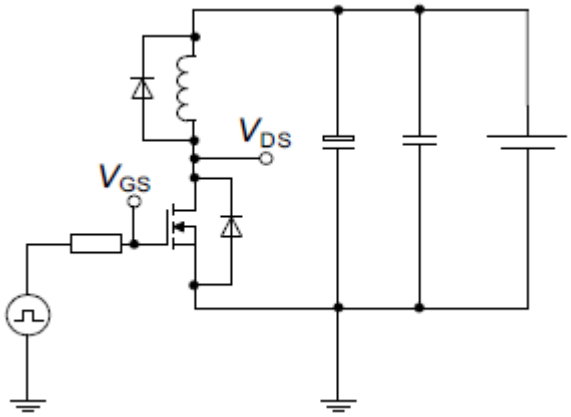
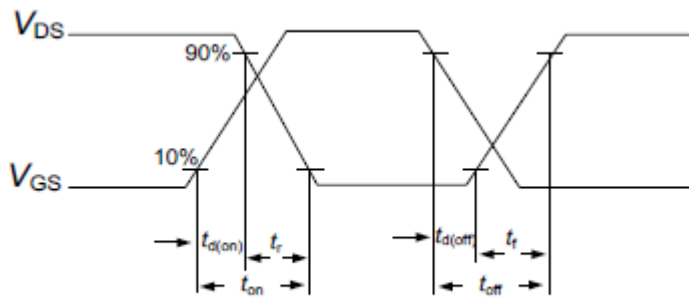
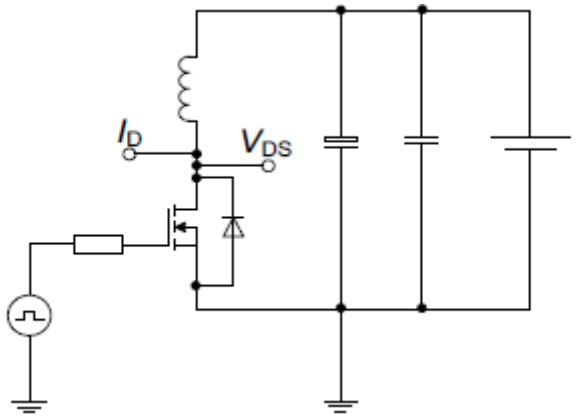
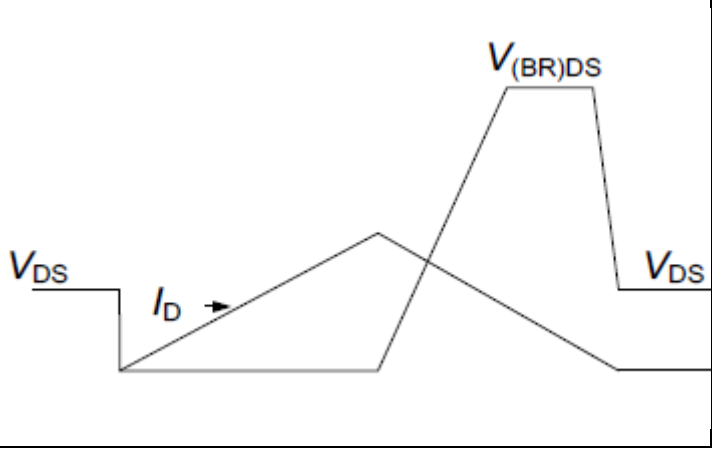
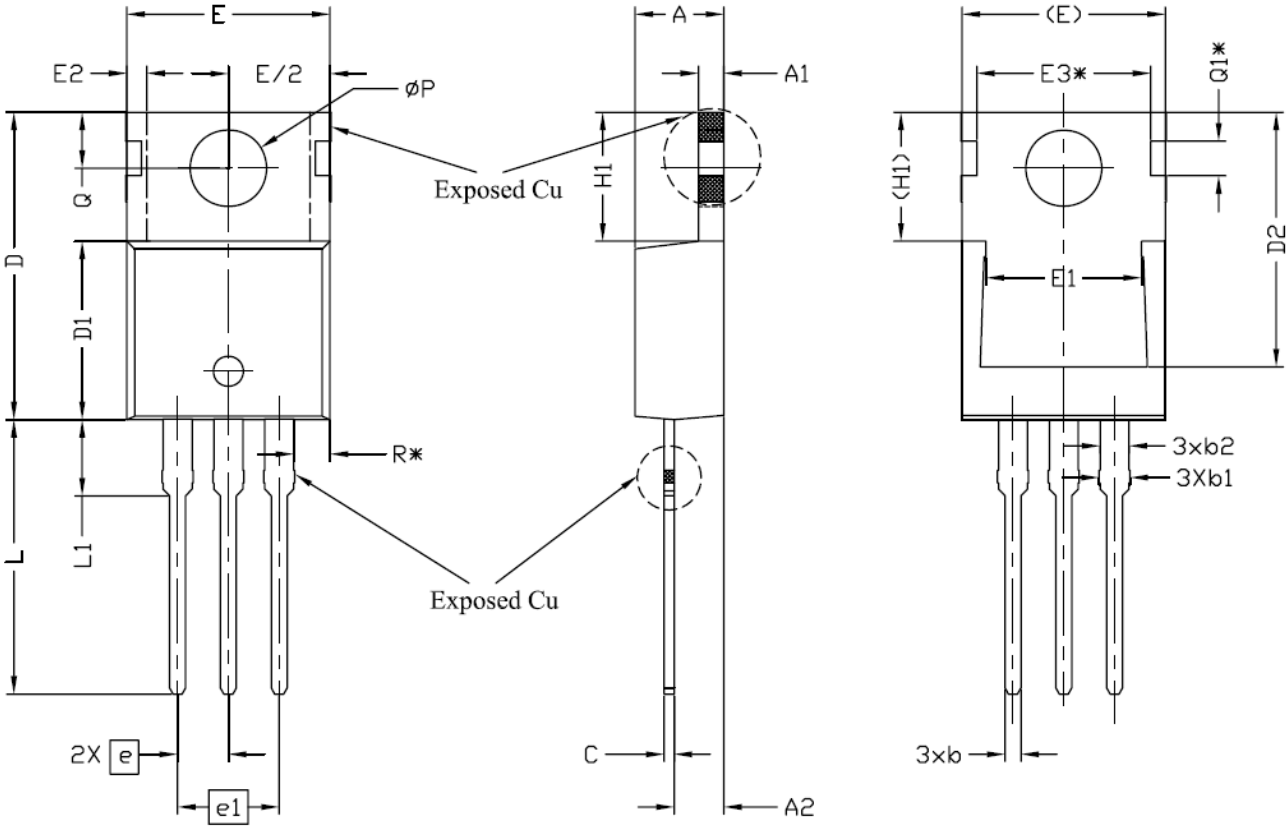
Switching times test circuit for inductive load	Switching times waveform
	

Table 9. Unclamped Inductive Load

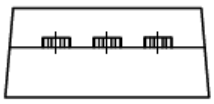
Unclamped inductive load test circuit	Unclamped inductive waveform
	

7. Package Outlines

Figure 1 Outline TO-220 Dimensions in mm



SYMBOL	DIMENSIONS			NOTES
	MIN.	NOM.	MAX.	
A	4.24	4.44	4.64	
A1	1.15	1.27	1.40	
A2	2.30	2.48	2.70	
b	0.70	0.80	0.90	
b1	1.20	1.55	1.75	
b2	1.20	1.45	1.70	
c	0.40	0.50	0.60	
D	14.70	15.37	16.00	4
D1	8.82	8.92	9.02	
D2	12.43	12.73	12.83	5
E	9.96	10.16	10.36	4,5
E1	6.86	7.77	8.89	5
E2	-	-	0.76	6
E3*	8.70REF.			
e	2.54BSC			
e1	5.08BSC			
H1	6.30	6.45	6.60	5,6
L	13.47	13.72	13.97	
L1	3.60	3.80	4.00	
øP	3.75	3.84	3.93	
Q	2.60	2.80	3.00	
Q1*	1.73REF.			
R*	1.82REF.			

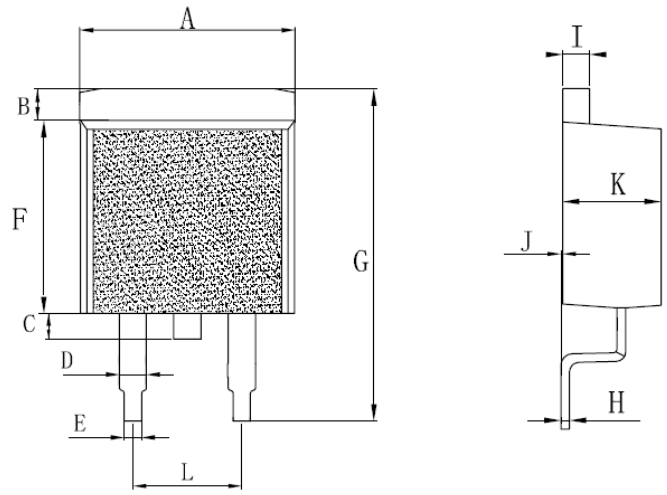


Note:
1. Package Reference: JEDEC TO220, Variation AB.
2. All Dimensions Are In mm.
3. Slot Required, Notch May Be Rounded
4. Dimension D & E Do Not Include Mold Flash. Mold Flash Shall Not Exceed 0.127mm Pre Side. These Dimensions Are Measured At The Outermost Extreme Of The Plastic Body.
5. Thermal Pad Contour Optional Within Dimensions E, H1, D2 & E1.
6. Dimension E2 & H1 Define A Zone Where Stamping And Singulation Irregularities Are Allowed.
7. "*" is reference .

Figure 2 Outline TO-263 Dimensions in mm

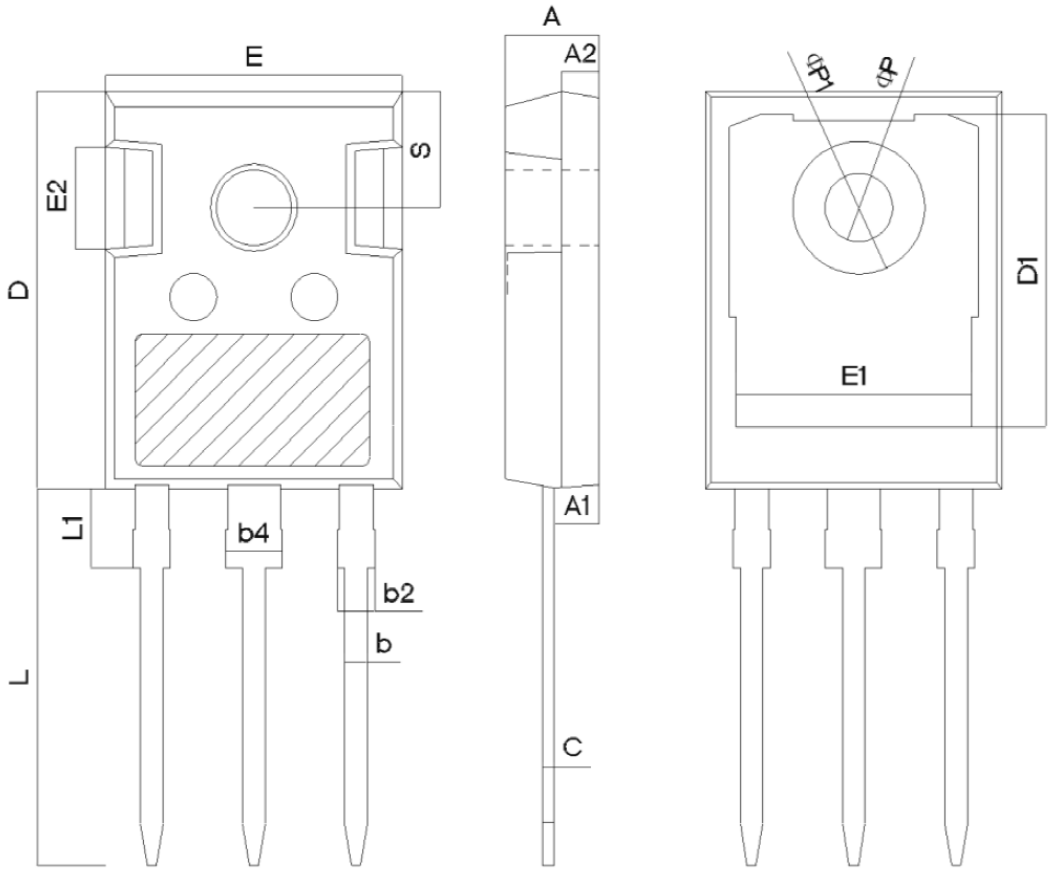
PACKAGE OUTLINE DIMENSIONS

TO-263



DIM.	Unit(mm)		Unit(inch)	
	Min	Max	Min	Max
A	9.7	10.4	0.381	0.409
B	1.31	1.62	0.051	0.063
C	0.65	1.22	0.025	0.048
D	1.15	1.36	0.045	0.053
E	0.62	0.95	0.024	0.037
F	8.75	9.32	0.344	0.366
G	14.75	15.8	0.580	0.622
H	0.32	0.48	0.012	0.018
I	1.18	1.36	0.046	0.053
J	0	0.15	0	0.005
K	4.38	4.86	0.172	0.191
L	4.85	5.23	0.190	0.205

Figure 3 Outline TO-247 Dimensions in mm



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	-	-	4.30
ΦP	3.40	3.60	3.80
ΦP1	-	-	7.30
S	6.15BSC		

8. Appendix

CoolSemi Webpage: www.coolsemi.com.