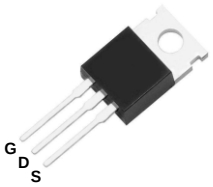
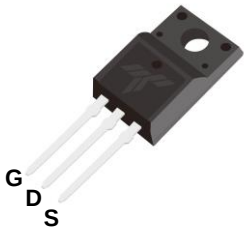
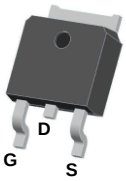
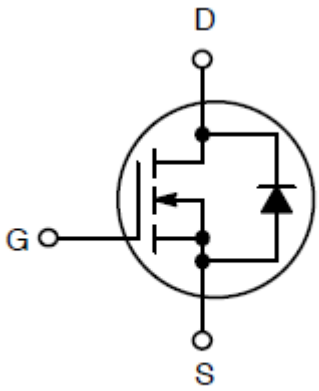
CPP65R340G2, CPA65R340G2
CPB65R340G2, CPD65R340G2

N-channel 650V, 0.28Ω typ.,
Super Junction MOSFET G2 in TO-220, TO-220F, TO-263 and TO-252

Datasheet - production data

1. Descriptions

TO-220	TO-220F
	
TO-263	**TO-252**
	
N-Channel MOSFET	
	
POWER MOSFET	

Key Performance Parameters

Parameters	Value	Unit
BV_{DSS}	650	V
$R_{DS(on),max}$	0.34	Ω
$Q_{g,typ}$	20.4	nC
$I_{D,pulse}$	29.3	A
E_{AS}	250	mJ

Features

• Extremely low losses due to very low FOM Rdson*Qg and Eoss.
• Very high commutation ruggedness.
• Qualified for industrial grade applications according to JEDEC.

Applications

PFC stages, hard switching PWM stages and resonant switching PWM stages for Adapter, LCD TV, Lighting, and UPS.

Type/Ordering Code	Package	Marking	Related Links
CPP65R340G2	TO-220	65R340G2	See Appendix A
CPA65R340G2	TO-220F		
CPB65R340G2	TO-263		
CPD65R340G2	TO-252		

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]	-	-	650	V	V_{GS}=0V, I_D=250μA
I_D	Continuous drain current[2]	- -	- -	14 7.5	A	T_C=25°C T_C=125°C
$I_{D,pulse}$	Pulsed drain current	-	-	29.3	A	T_C=25°C
E_{AS}	Avalanche energy, single pulse[3]	-	-	250	mJ	I_D=3.2A; V_{DD} =50V
I_{AR}	Avalanche current, repetitive	-	-	3.2	A	-
dv/dt	MOSFET dv/dt ruggedness	-	-	50	V/ns	V_{DS} =0...520V
V_{GS}	Gate source voltage	-30	-	30	V	static; AC (f>1 Hz)
P_{tot}	Power dissipation (Non FullPAK) TO-220, TO-263, TO-252	-	-	104.2	W	T_C=25°C
P_{tot}	Power dissipation (FullPAK) TO-220F	-	-	32	W	T_C=25°C
T_j, T_{stg}	Operating and storage temperature	-55	-	150	°C	-
I_S	Continuous diode forward current	-	-	14	A	T_C=25°C
$I_{S,pulse}$	Diode pulse current[2]	-	-	29.3	A	T_C=25°C
dv/dt	Reverse diode dv/dt[4]	-	-	15	V/ns	V_{DS}=0...400V, I_{SD}<=I_S, T_j=25°C
di_f/dt	Maximum diode commutation speed[4]	-	-	500	A/μs	V_{DS}=0...400V, I_{SD}<=I_S, T_j=25°C

1) Limited by T_j max. Maximum duty cycle D=0.75.
2) Pulse width t_p limited by T_j,max.
3) V_{DD}=50V, L=50mH, R_G=25Ω, Starting T_j=25°C.
4) V_{DClink}=400V; $V_{DS,peak}$<$V_{(BR)DSS}$; identical low side and high side switch with identical R_G.

3. Thermal Characteristics

Table 2. Thermal Characteristics (Non FullPAK) TO-220, TO-263, TO-252

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
R_{thJC}	Thermal resistance, junction - case	-	-	1.2	°C/W	T_C = 25°C
R_{thJA}	Thermal resistance, junction - ambient	-	-	62	°C/W	T_C = 25°C
T_{sold}	Soldering temperature, wavesoldering only allowed at leads	-	-	260	°C	Lead Temperature (Soldering, 10 sec)

Table 3. Thermal Characteristics (FullPAK) TO-220F

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
R_{thJC}	Thermal resistance, junction - case	-	-	3.9	°C/W	T_C = 25°C
R_{thJA}	Thermal resistance, junction - ambient	-	-	62.5	°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 T_j = 25°C, unless otherwise specified

Table 4. Static Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
$V_{(BR)DSS}$	Drain-source breakdown voltage	650	-	-	V	V_{GS}=0V, I_D=250μA
$V_{(GS)th}$	Gate threshold voltage	2.5	3.3	4.5	V	V_{DS}=V_{GS}, I_D=250μA
I_{DSS}	Zero gate voltage drain current	-	-	1 10	μA	V_{DS}=650V, V_{GS}=0V, T_j=25°C V_{DS}=650V, V_{GS}=0V, T_j=150°C
I_{GSS}	Gate-source leakage current	-	-	±100	nA	V_{GS}=±30V, V_{DS}=0V
$R_{DS(on)}$	Drain-source on-state resistance	-	0.28 0.73	0.34 0.85	Ω	V_{GS}=10V, I_D=4A, T_j=25°C V_{GS}=10V, I_D=4A, T_j=150°C
R_G	Gate resistance	-	3	-	Ω	V_{DD}=0V,V_{GS}=0V,F=1MHz

Table 5. Dynamic Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
C_{iss}	Input capacitance	-	781	-	pF	V_{GS}=0V, V_{DS}=100V, f=250KHz
C_{oss}	Output capacitance	-	30.3	-	pF	V_{GS}=0V, V_{DS}=100V, f=250KHz
C_{rss}	Reverse transfer capacitance	-	1.47	-	pF	V_{GS}=0V, V_{DS}=100V, f=250KHz
$t_{d(on)}$	Turn-on delay time	-	6.2	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=7A,
t_r	Rise time	-	21	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=7A,
$t_{d(off)}$	Turn-off delay time	-	28.8	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=7A,
t_f	Fall time	-	22.4	-	ns	V_{DD}=400V, V_{GS}=13V, I_D=7A,

Table 6. Gate Charge Characteristics

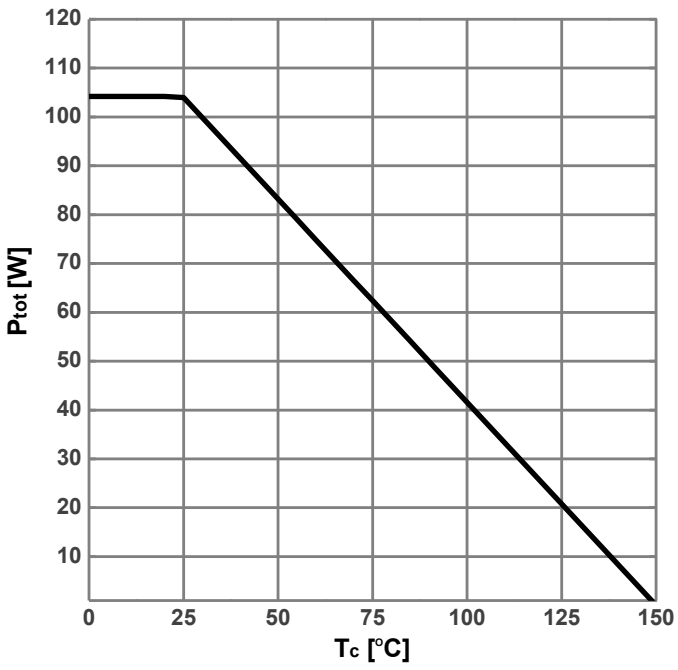
Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
Q_{gs}	Gate to source charge	-	2.77	-	nC	V_{DD}=400V, I_D=7A, V_{GS}=0 to 10V
Q_{gd}	Gate to drain charge	-	5.8	-	nC	V_{DD}=400V, I_D=7A, V_{GS}=0 to 10V
Q_g	Gate charge total	-	20.4	-	nC	V_{DD}=400V, I_D=7A, V_{GS}=0 to 10V
$V_{plateau}$	Gate plateau voltage	-	3.71	-	V	V_{DD}=400V, I_D=7A, V_{GS}=0 to 10V

Table 7. Reverse Diode Characteristics

Symbol	Parameter	Values			Unit	Test Condition
		Min.	Typ.	Max.		
V_{SD}	Diode forward voltage	-	0.846	-	V	V_{GS}=0V, I_F=7A, T_f=25°C
t_{rr}	Reverse recovery time	-	218	-	ns	V_R=400V, I_F=7A, di_F/dt=50A/μs
Q_{rr}	Reverse recovery charge	-	1.1	-	μC	V_R=400V, I_F=7A, di_F/dt=50A/μs
I_{rrm}	Peak reverse recovery current	-	10.7	-	A	V_R=400V, I_F=7A, di_F/dt=50A/μs

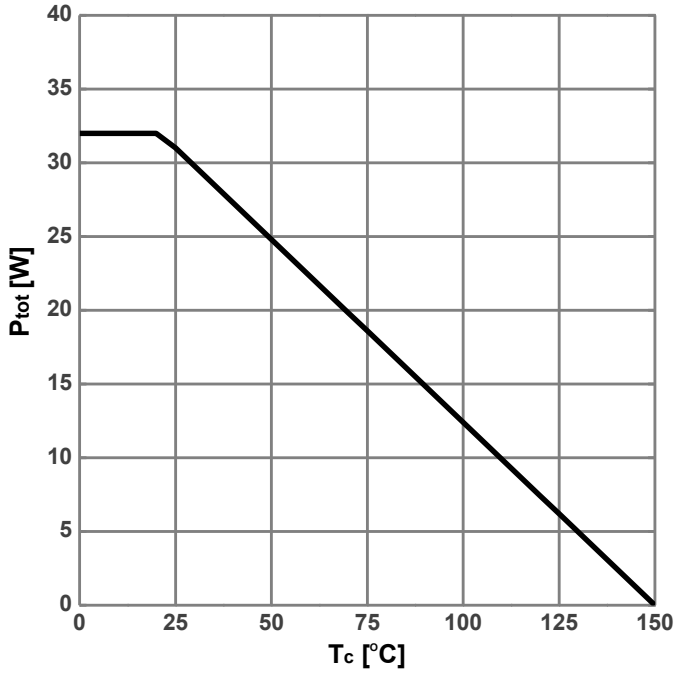
5. Electrical Characteristics Diagrams

Diagram 1: Power dissipation (Non FullPAK)



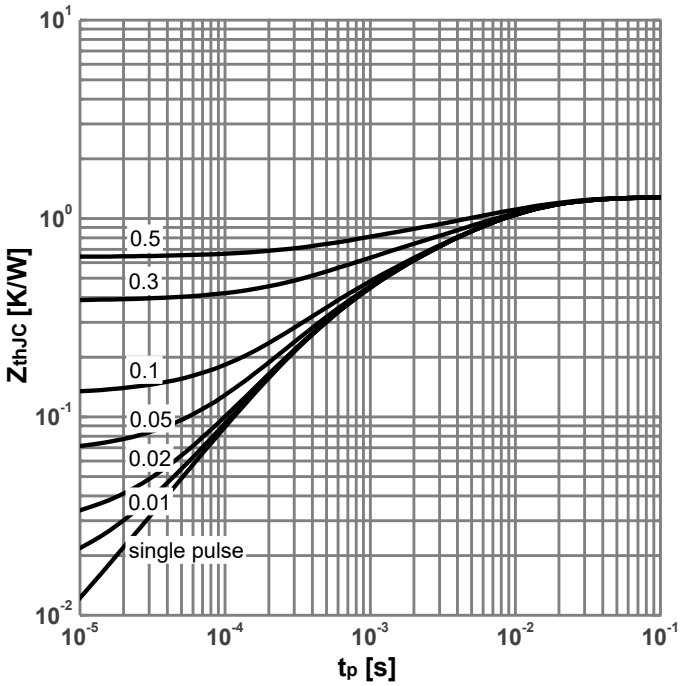
$P_{tot}=f(T_C)$

Diagram 2: Power dissipation (FullPAK)



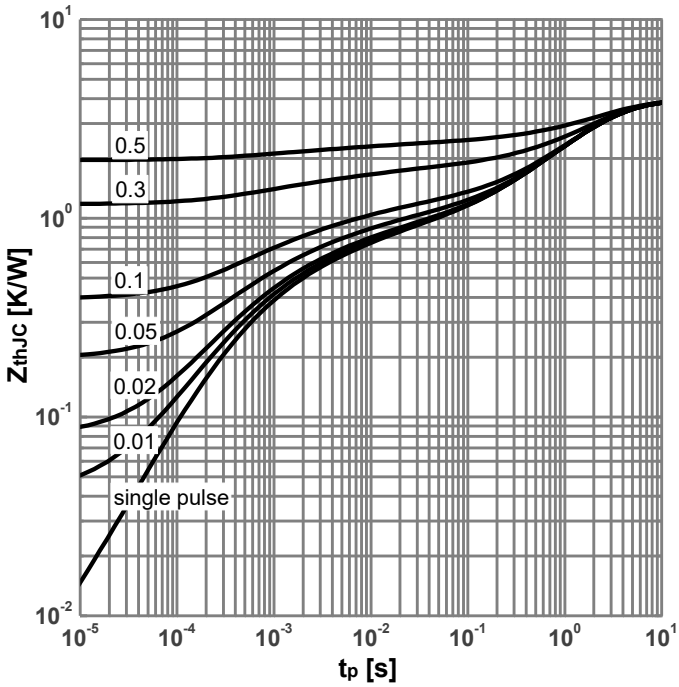
$P_{tot}=f(T_C)$

Diagram 3: Max. transient thermal impedance (Non FullPAK)



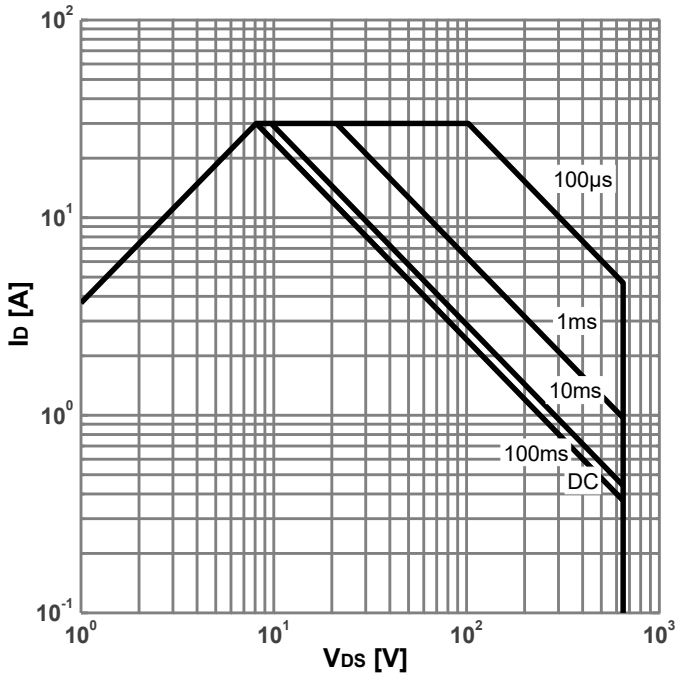
$Z_{thJC}=f(t_p)$; parameter: D= t_p/T

Diagram 4: Max. transient thermal impedance (FullPAK)



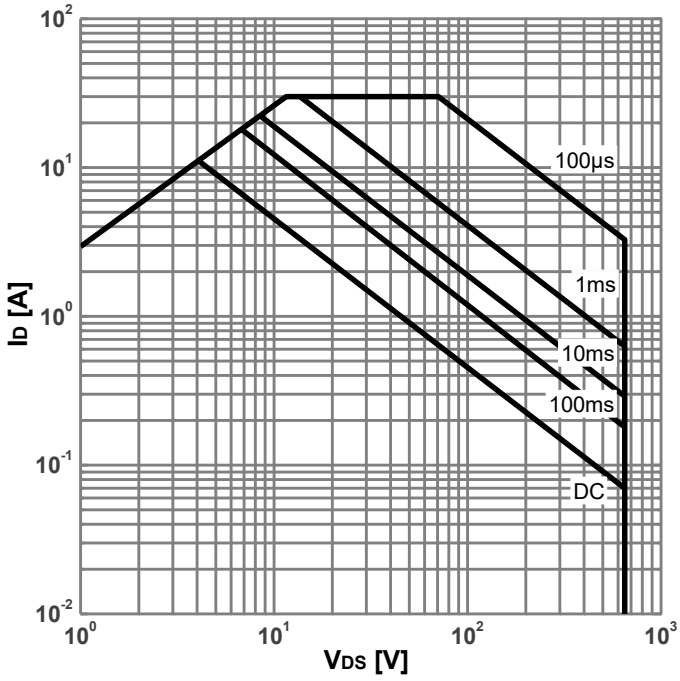
$Z_{thJC}=f(t_p)$; parameter: D= t_p/T

Diagram 5: Safe operating area (Non FullPAK)



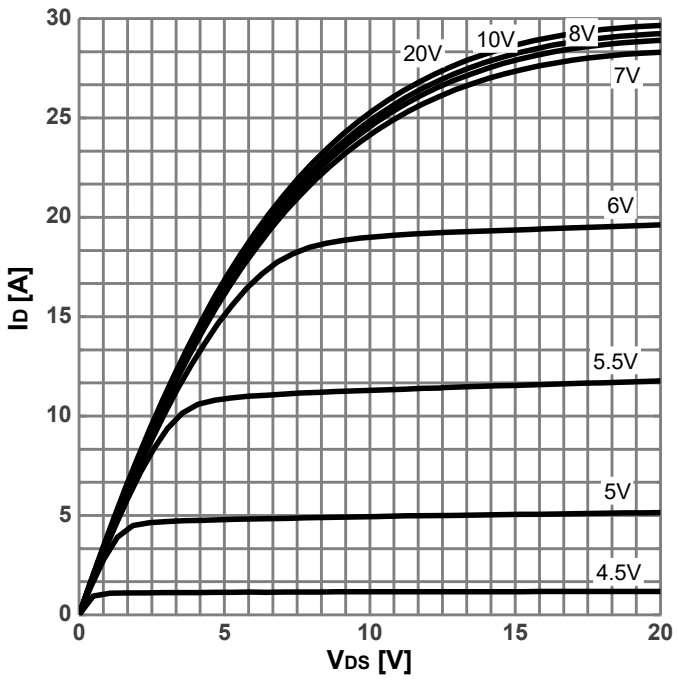
I_D=f(V_{DS}); Tj=25°C; D=0; parameter: t_p

Diagram 6: Safe operating area (FullPAK)



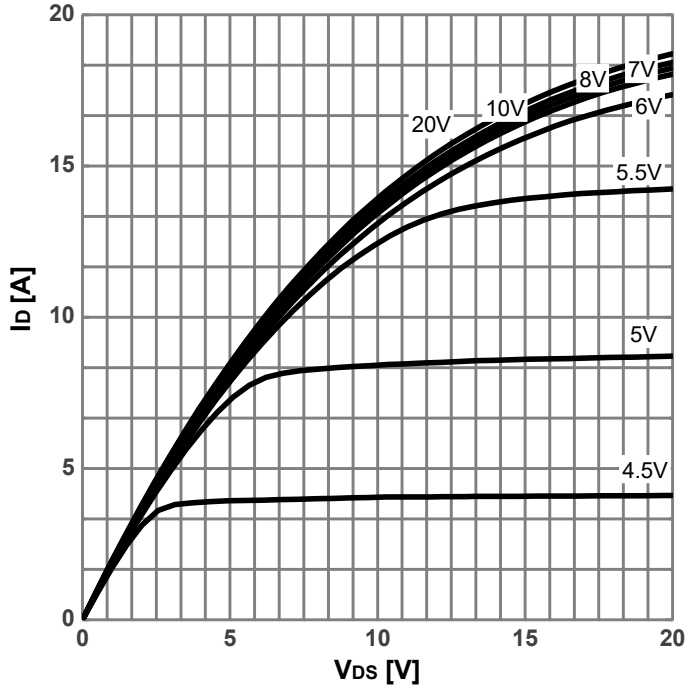
I_D=f(V_{DS}); Tj=25°C; D=0; parameter: t_p

Diagram 7: Typ. output characteristics



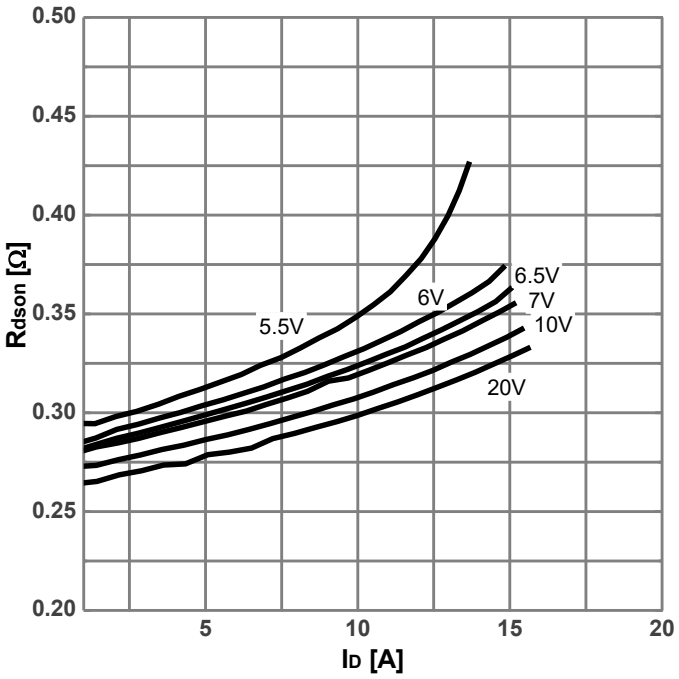
I_D=f(V_{DS}); Tj=25°C; parameter: V_{GS}

Diagram 8: Typ. output characteristics



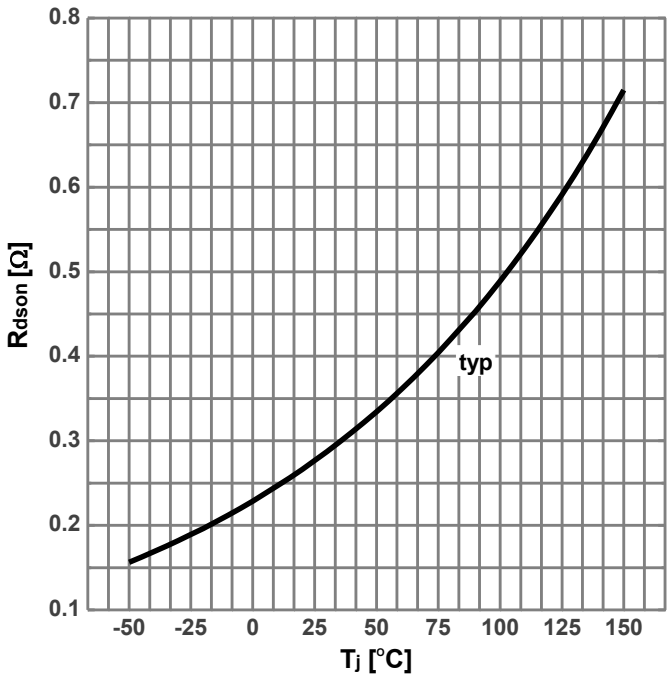
I_D=f(V_{DS}); Tj=125°C; parameter: V_{GS}

Diagram 9: Typ. drain-source on-state resistance



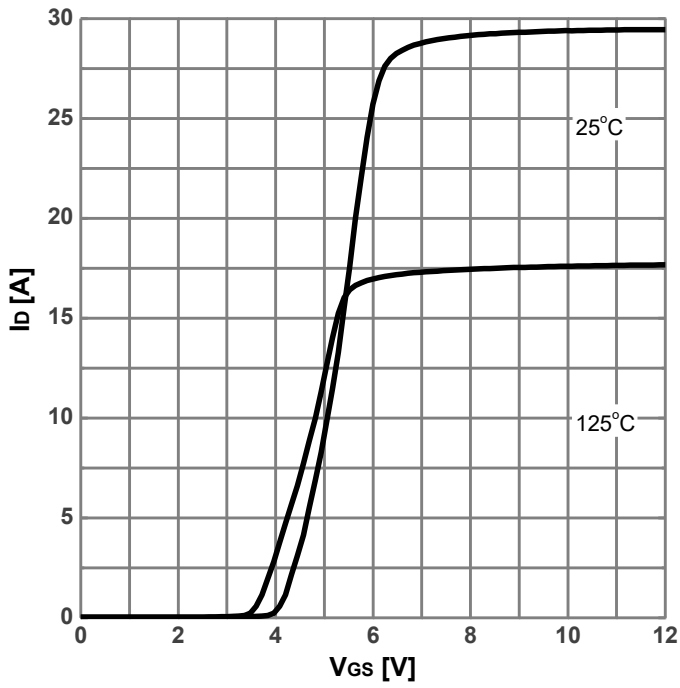
$R_{DS}(on)=f(I_D)$; $T_j=25°C$; parameter: V_{GS}

Diagram 10: drain-source on-state resistance



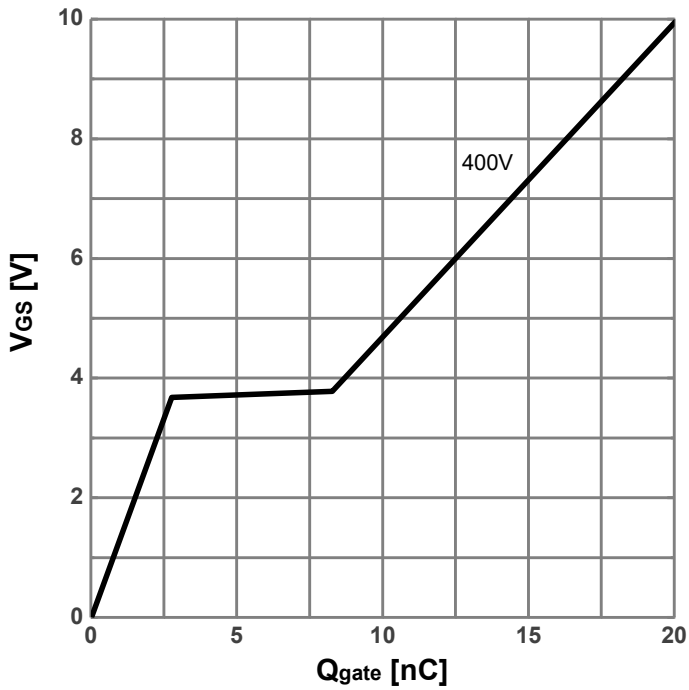
$R_{DS}(on)=f(T_j)$; $I_D=7A$; $V_{GS}=10V$

Diagram 11: Typ. transfer characteristics



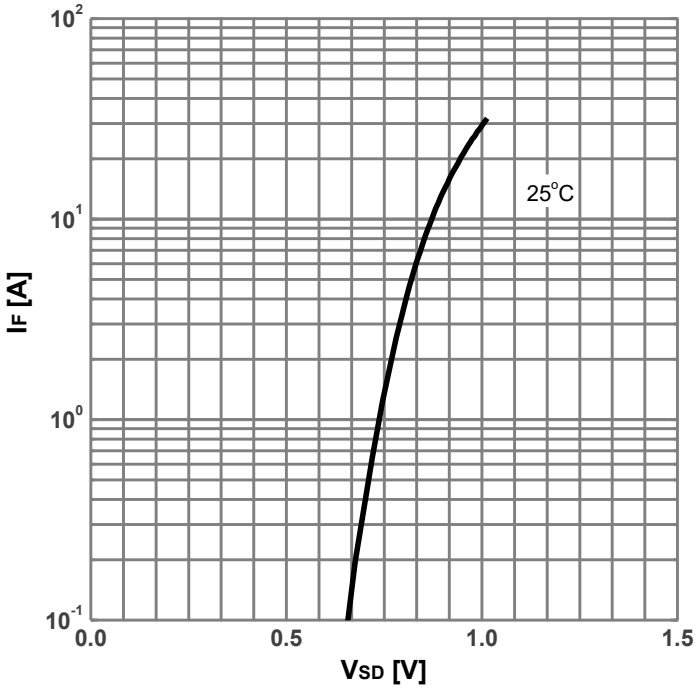
$I_D=f(V_{GS})$; $V_{DS}=20V$; parameter: T_j

Diagram 12: Typ. gate charge



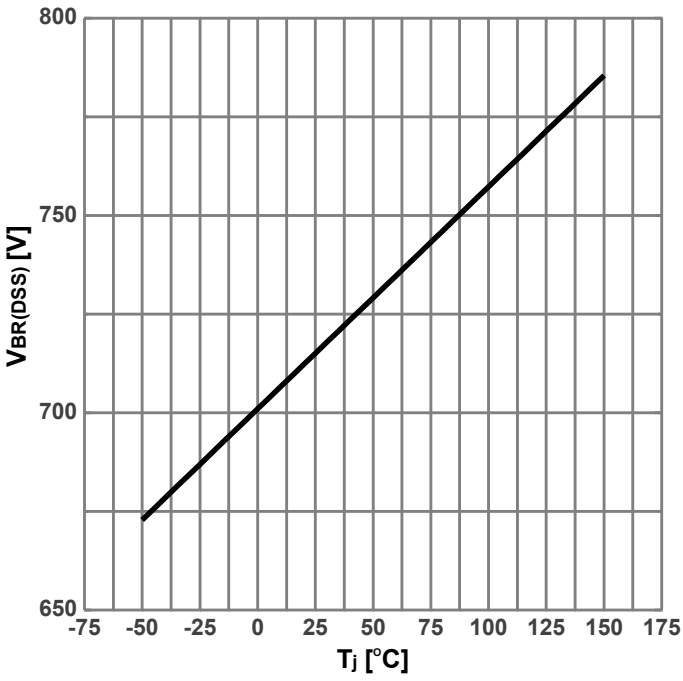
$V_{GS}=f(Q_{gate})$; $I_D=7A$ pulsed; $V_{DS}=400V$

Diagram 13: Forward characteristics of reverse diode



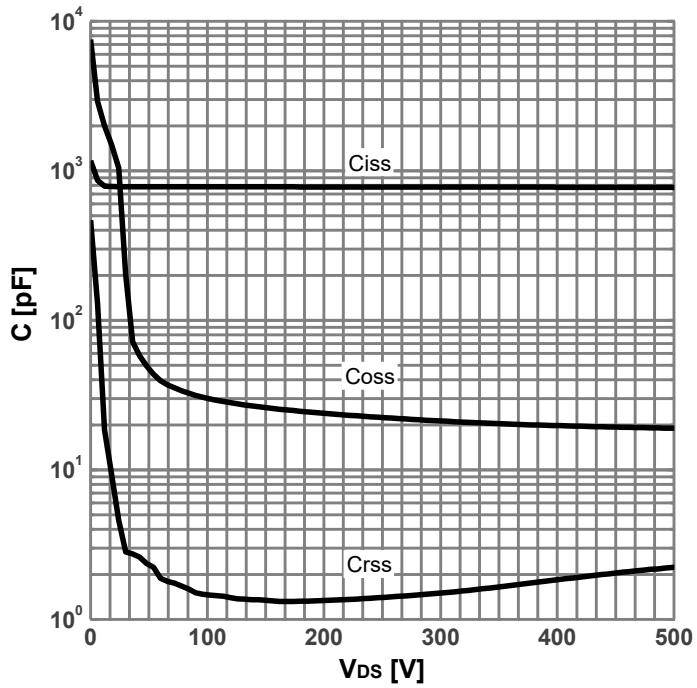
I_F=f(V_{SD}); parameter: T_j

Diagram 14: Drain-source breakdown voltage



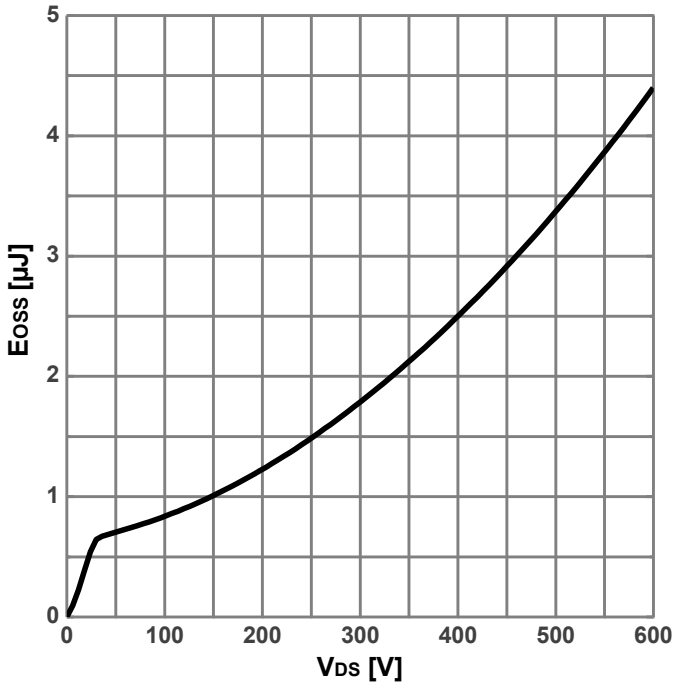
$V_{BR(DSS)}$=f(T_j); I_D=250μA

Diagram 15: Typ. capacitances



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

Diagram 16: Typ. Coss stored energy



E_{OSS} =f(V_{DS})

6. Test Circuits

Table 8. Diode Characteristics

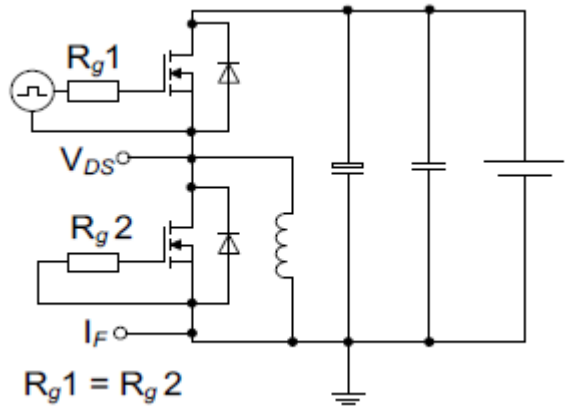
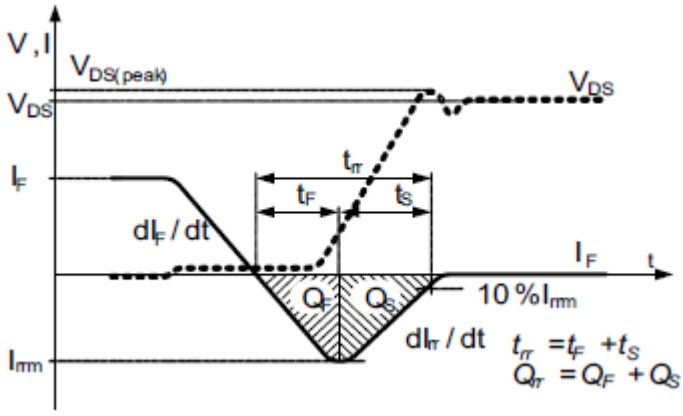
Test circuit for diode characteristics	Diode recovery waveform
	

Table 9. Switching Times

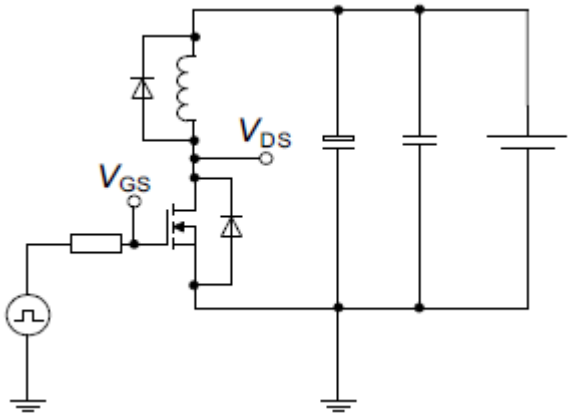
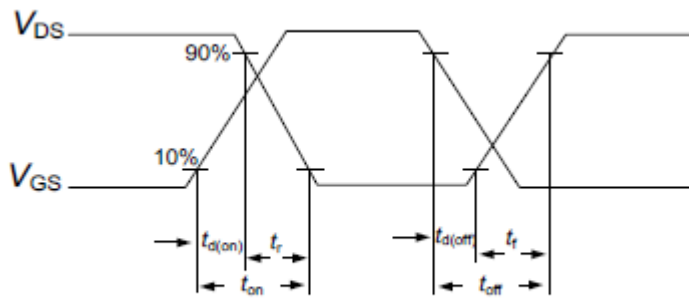
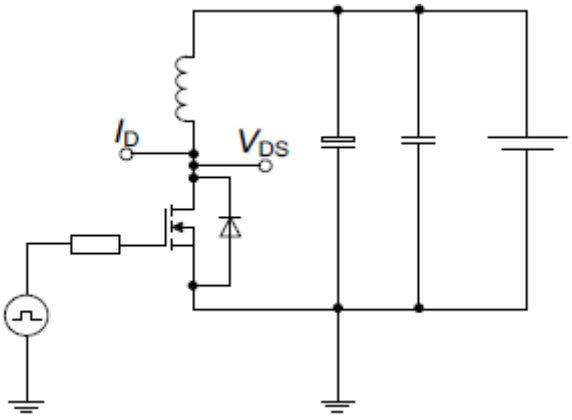
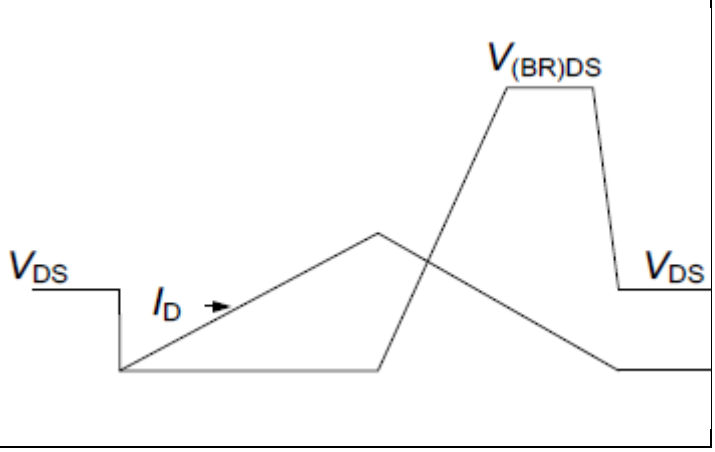
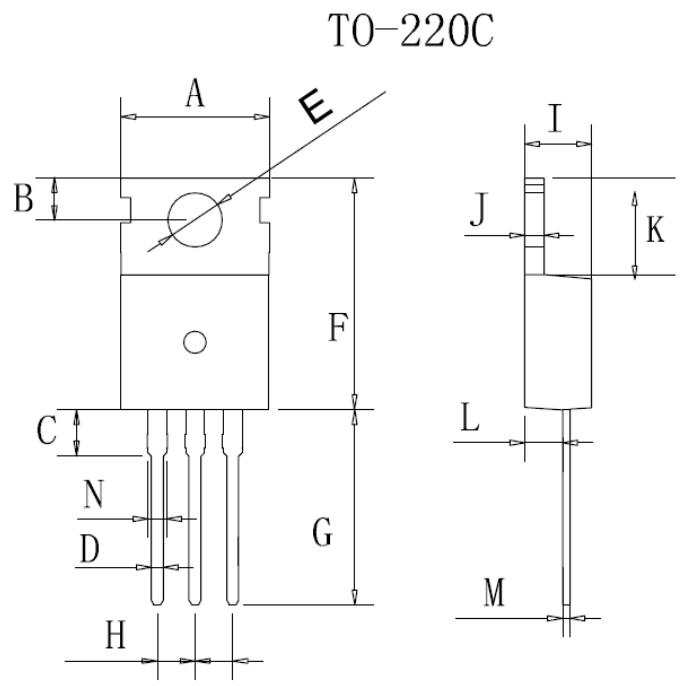
Switching times test circuit for inductive load	Switching times waveform
	

Table 10. Unclamped Inductive Load

Unclamped inductive load test circuit	Unclamped inductive waveform
	

7. Package Outlines

Figure 1 Outline TO-220 Dimensions in mm

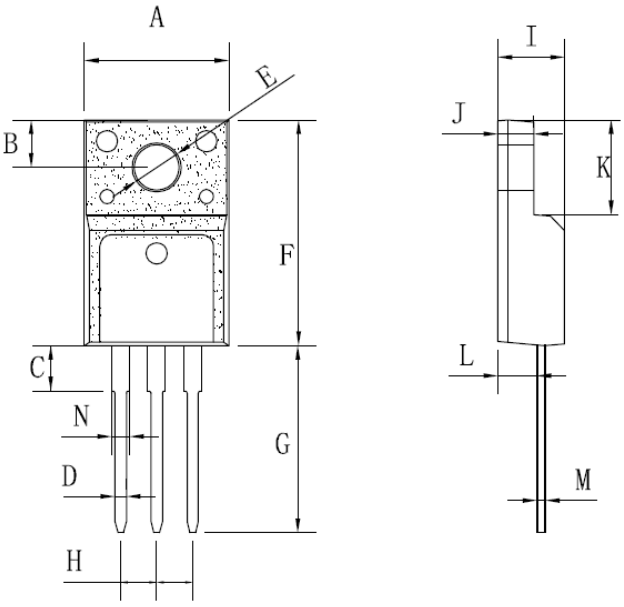


DIM.	Unit(mm)		Unit(inch)	
	Min	Max	Min	Max
A	9.7	10.4	0.381	0.409
B	2.65	3.1	0.104	0.122
C	2.8	3.42	0.110	0.134
D	0.7	0.92	0.027	0.036
E	3.55	3.78	0.139	0.148
F	15.35	15.82	0.604	0.622
G	12.95	13.46	0.509	0.529
H	2.4	2.7	0.094	0.106
I	4.38	4.71	0.172	0.185
J	1.22	1.42	0.048	0.055
K	6.13	6.82	0.241	0.268
L	2.35	2.75	0.092	0.108
M	0.38	0.65	0.014	0.025
N	1.18	1.42	0.046	0.055

Figure 2 Outline TO-220F FullPAK Dimensions in mm

PACKAGE OUTLINE DIMENSIONS

TO-220F

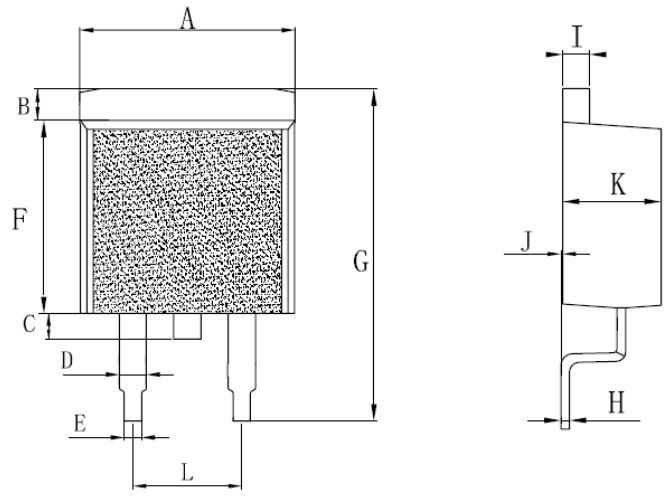


DIM.	Unit(mm)		Unit(inch)	
	Min	Max	Min	Max
A	9.6	10.5	0.377	0.413
B	3.15	3.65	0.124	0.143
C	2.95	3.5	0.116	0.137
D	0.7	0.92	0.027	0.036
E	3	3.4	0.118	0.133
F	15.3	16.5	0.602	0.649
G	12.85	13.45	0.505	0.529
H	2.4	2.7	0.094	0.106
I	4.15	5.12	0.163	0.201
J	2.28	2.65	0.089	0.104
K	6.12	6.95	0.240	0.273
L	2.45	2.9	0.096	0.114
M	0.5	0.6	0.019	0.023
N	1.18	1.42	0.046	0.055

Figure 3 Outline TO-263 Dimensions in mm

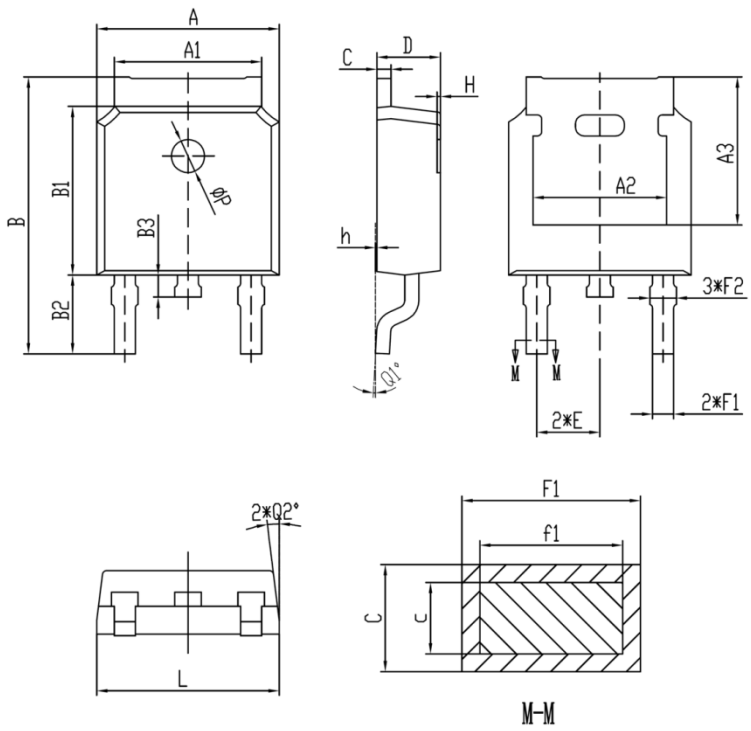
PACKAGE OUTLINE DIMENSIONS

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 4 Outline TO-252 Dimensions in mm



SYMBOL	MIN	NOM	MAX
A	6.50	6.60	6.70
A1	5.16	5.31	5.46
A2		4.83 REF	
A3		5.30 REF	
B	9.77	9.97	10.17
B1	6.00	6.10	6.20
B2	2.60	2.80	3.00
B3	0.70	0.80	0.90
C	0.41	—	0.61
c	0.40	0.50	0.60
D	2.20	2.30	2.40
E	2.186	2.286	2.386
F1	0.67	—	0.87
f1	0.66	0.76	0.86
F2	0.76	0.86	0.96
H	0.00	—	0.30
h	0.00	—	0.15
L	6.50	6.60	6.70
øP	1.10	1.20	1.30
Q1°	0°	—	8°
Q2°	6°	7°	8°

8. Appendix

CoolSemi Webpage: www.coolsemi.com.