General Description

The 8680A is N-channel MOS Field Effect Transistor designed for high current switching applications. Rugged E_{AS} capability and ultra low $R_{DS(ON)}$ is suitable for PWM, load switching especially for E-Bike controller applications.

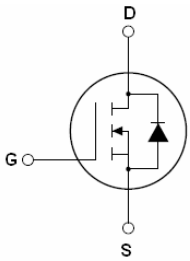
Features

VDSS	RDS(ON) @10V (typ)	ID
80V	6.6 mΩ	92A

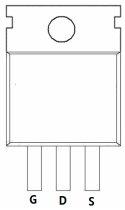
- Special Designed for E-Bike Controller Application
- Ultra Low On-Resistance
- High UIS and UIS 100% Test

Application

- 64V E-Bike Controller Applications
- Hard Switched and High Frequency Circuits
- Uninterruptible Power Supply



Schematic Diagram



Marking and pin assignment

To-220 Top View

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
8680A	8680A	TO-220	-	-	-

Table 1. Absolute Maximum Ratings (TA=25℃)

Symbol	Parameter	Value	Unit
V_{DS}	Drain-Source Voltage (V_{GS}=0V)	80	V
V_{GS}	Gate-Source Voltage (V_{DS}=0V)	±25	V
$I_{D\ (DC)}$	Drain Current (DC) at Tc=25℃	92	A
$I_{D\ (DC)}$	Drain Current (DC) at Tc=100℃	64.4	A
$I_{DM\ (pluse)}$	Drain Current-Continuous@ Current-Pulsed **(Note 1)**	368	A
dv/dt	Peak Diode Recovery Voltage	30	V/ns
P_D	Maximum Power Dissipation(Tc=25℃)	139	W
	Derating Factor	0.93	W/℃
E_{AS}	Single Pulse Avalanche Energy **(Note 2)**	625	mJ
T_J,T_{STG}	Operating Junction and Storage Temperature Range	-55 To 175	℃

Notes 1.Repetitive Rating: Pulse width limited by maximum junction temperature

2.E_{AS} condition:T_J=25℃,V_{DD}=40V,V_G=10V,R_G=25Ω

Table 2. Thermal Characteristic

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance,Junction-to-Case	1.08	℃/W

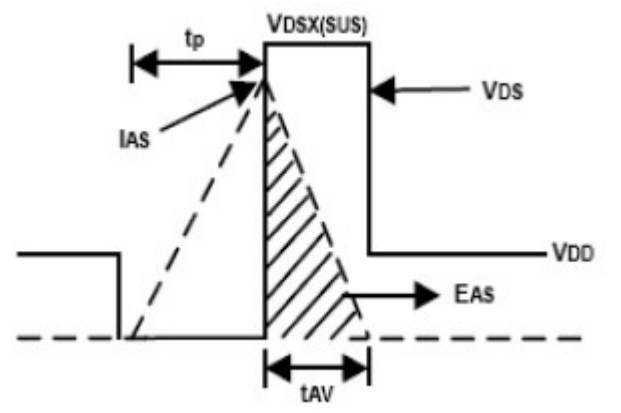
Table 3. Electrical Characteristics (TA=25℃unless otherwise noted)

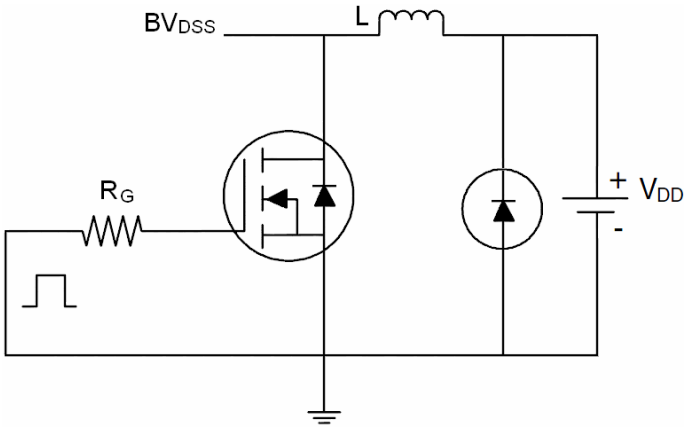
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
On/Off States						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V I_D=250μA	82			V
I_{DSS}	Zero Gate Voltage Drain Current(Tc=25℃)	V_{DS}=82V,V_{GS}=0V			1	μA
I_{DSS}	Zero Gate Voltage Drain Current(Tc=125℃)	V_{DS}=82V,V_{GS}=0V			10	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±20V,V_{DS}=0V			±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	2	2.8	4	V
$R_{DS(ON)}$	Drain-Source On-State Resistance	V_{GS}=10V, I_D=40A		6.6	7.8	mΩ
Dynamic Characteristics						
g_{FS}	Forward Transconductance	V_{DS}=10V,I_D=15A	20			S
C_{iss}	Input Capacitance	V_{DS}=25V,V_{GS}=0V, f=1.0MHz		5053		PF
C_{oss}	Output Capacitance			442		PF
C_{rss}	Reverse Transfer Capacitance			145		PF
Q_g	Total Gate Charge	V_{DS}=50V,I_D=40A, V_{GS}=10V		106		nC
Q_{gs}	Gate-Source Charge			19		nC
Q_{gd}	Gate-Drain Charge			47.9		nC
Switching Times						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=30V,I_D=40A,R_L=15Ω V_{GS}=10V,R_G=2.5Ω		15		nS
t_r	Turn-on Rise Time			18		nS
$t_{d(off)}$	Turn-Off Delay Time			31		nS
t_f	Turn-Off Fall Time			38		nS
Source-Drain Diode Characteristics						
I_{SD}	Source-drain Current(Body Diode)			92		A
I_{SDM}	Pulsed Source-Drain Current(Body Diode)			368		A
V_{SD}	Forward On Voltage **(Note 1)**	T_J=25℃,I_{SD}=40A,V_{GS}=0V		0.78	0.95	V
t_{rr}	Reverse Recovery Time **(Note 1)**	T_J=25℃,I_F=75A di/dt=100A/μs		56		nS
Q_{rr}	Reverse Recovery Charge **(Note 1)**			113		nC
t_{on}	Forward Turn-on Time	Intrinsic turn-on time is negligible(turn-on is dominated by L_S+L_D)				

Notes 1.Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 1.5%, R_G=25Ω, Starting T_J=25℃

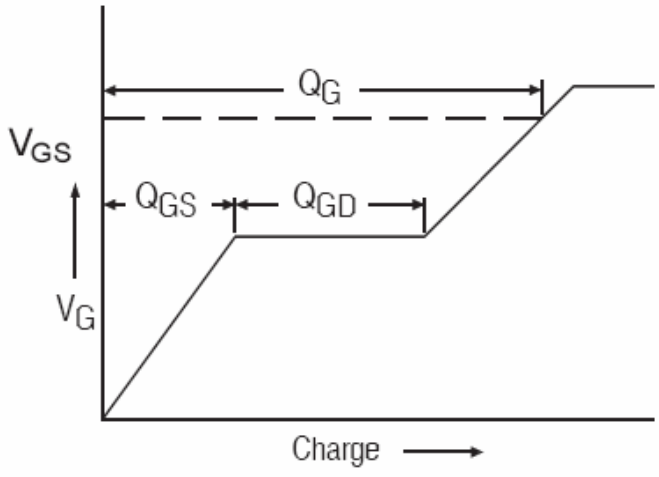
Test Circuit

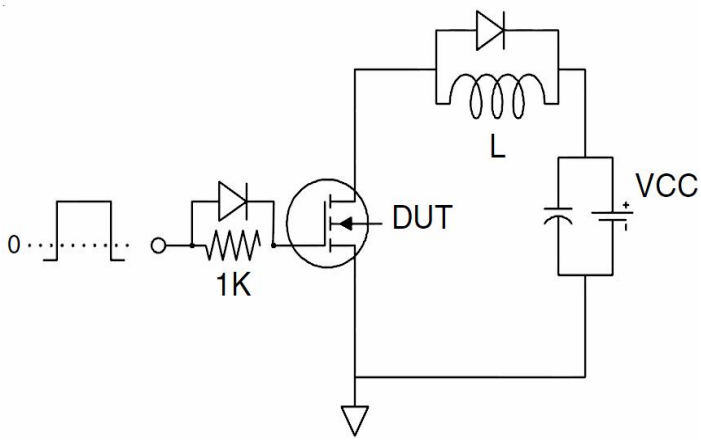
1) E_{AS} Test Circuits



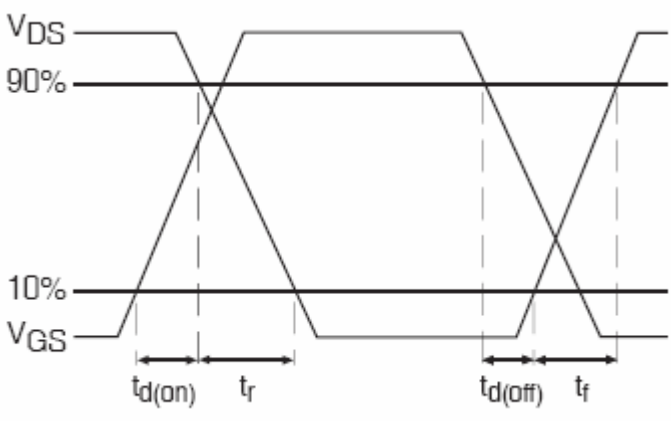


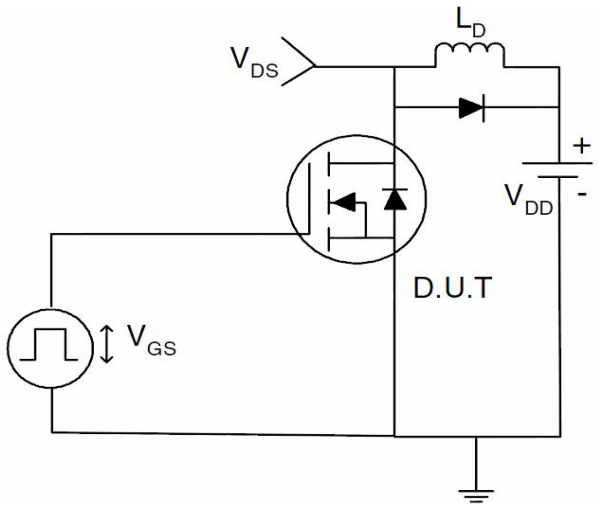
2) Gate Charge Test Circuit:





3) Switch Time Test Circuit:





TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (Curves)

Figure1. Output Characteristics

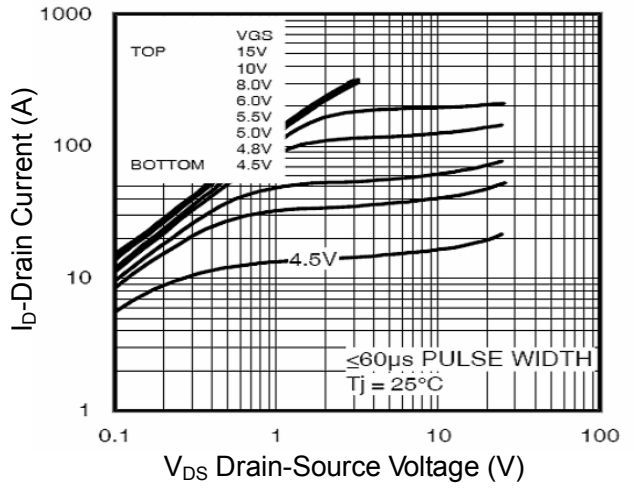


Figure2. Transfer Characteristics

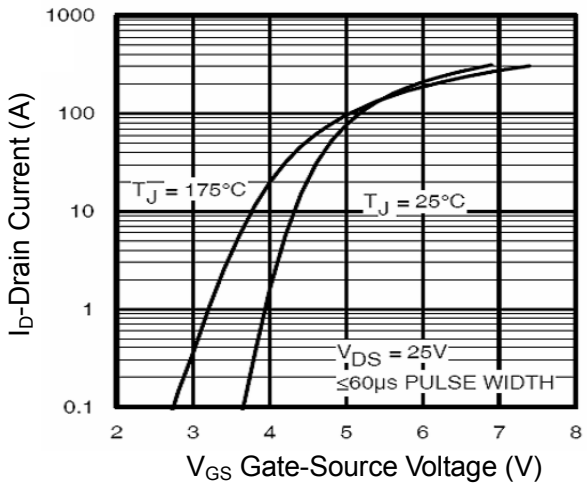


Figure3. Rdson Vs Drain Current

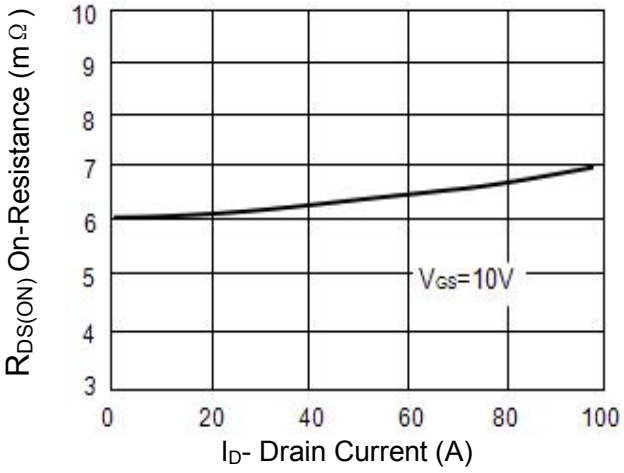


Figure4. Rdson Vs Junction Temperature

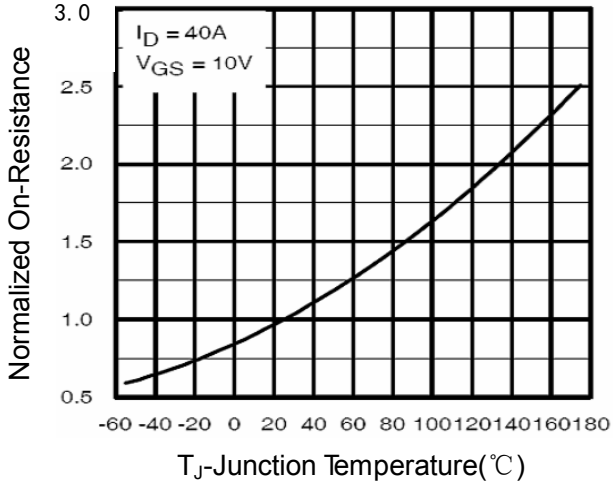


Figure5. Gate Charge

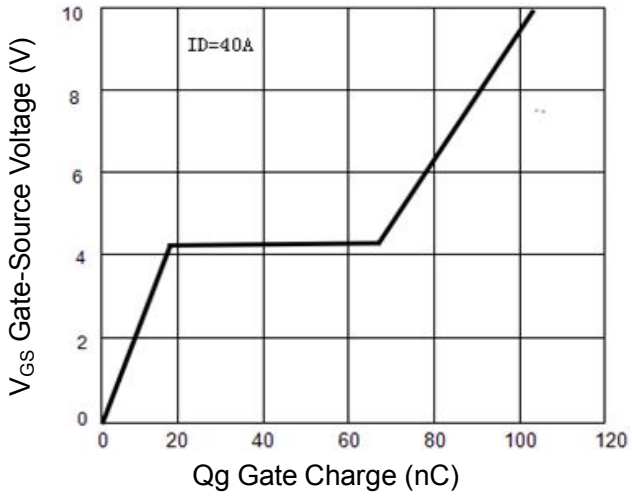


Figure6. Source- Drain Diode Forward

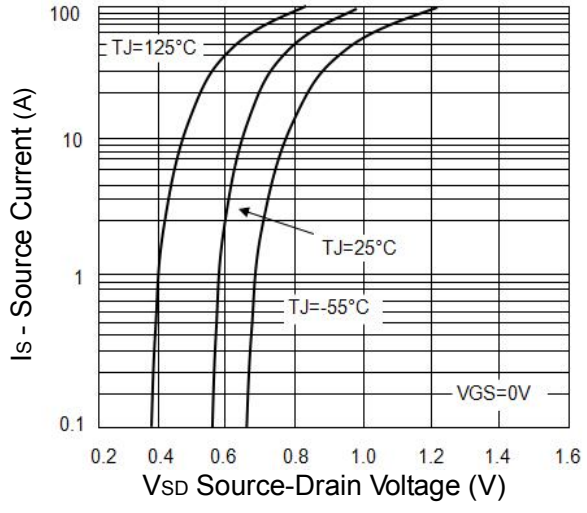


Figure7. Capacitance vs Vds

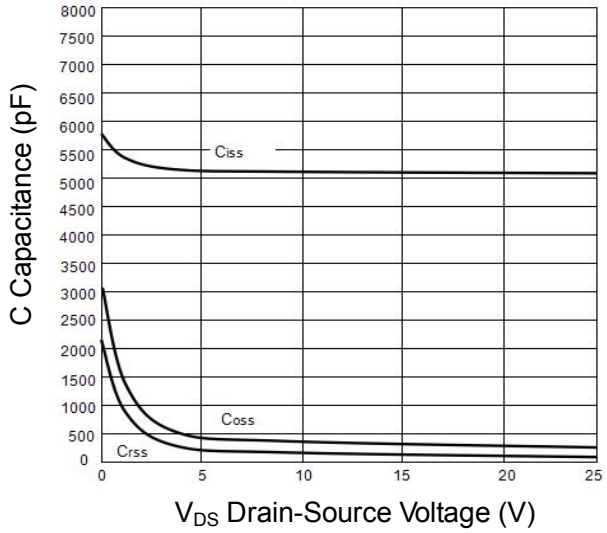


Figure8. Safe Operation Area

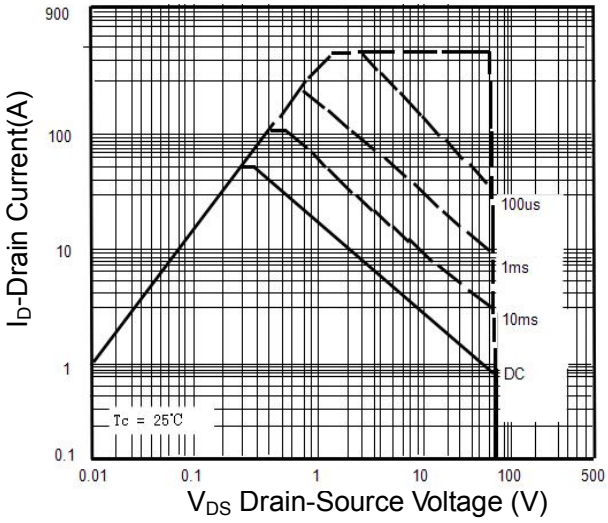


Figure9. BVDSS vs Junction Temperature

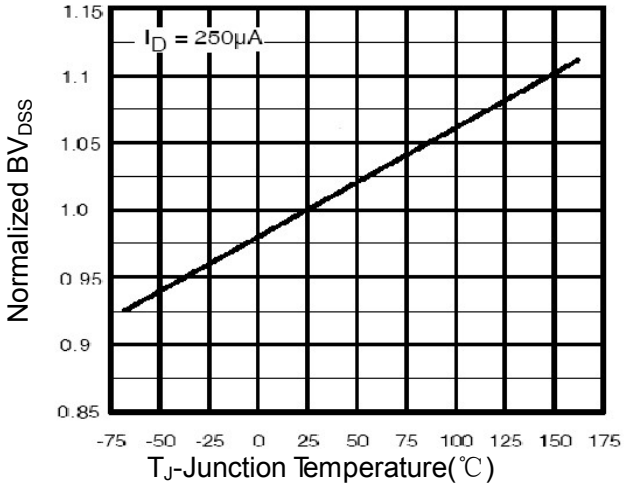


Figure10. VGS(th) vs Junction Temperature

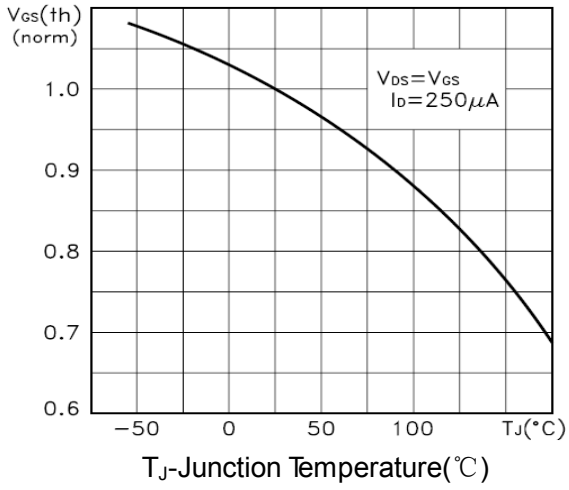


Figure11. Normalized Maximum Transient Thermal Impedance