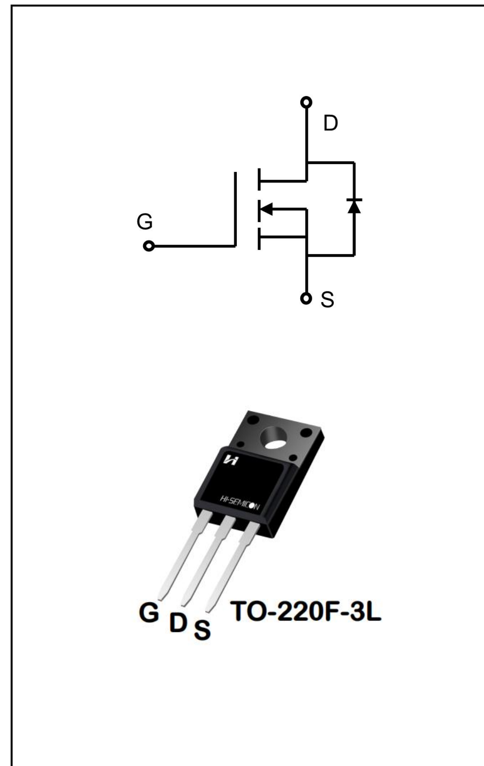
650V N-CHANNEL POWER MOSFET

GENERAL DESCRIPTION

The Power MOSFET is fabricated using advanced super junction technology. The resulting device has extremely low on resistance, making it especially suitable for applications which require superior power density and outstanding efficiency.



Features

- ◆VDS(V)=650V, ID=22A
- ◆$R_{DS(ON)}$
  TYP:148mΩ@V_{GS}=10V , I_D=12A
  MAX:180mΩ

Applications

- ◆Charger
- ◆Power Supply
- ◆LED/LCD/PDP TV and monitor
- ◆LightingSolar/Renewable/UPS-Micro Inverter System

HI-SEMICON

ORDERING INFORMATION

Part No.	Package	Marking	Material	Packing
SCF65R180C4	TO-220F-3L	SCF65R180C4	Pb free	Tube

ABSOLUTE MAXIMUM RATINGS (T_J=25°C unless otherwise noted)

Characteristics		Symbol	Ratings	Unit
Drain-Source Voltage		V_{DS}	650	V
Gate-Source Voltage		V_{GS}	±20	V
Drain Current	T_C = 25°C	I_D	22	A
	T_C = 100°C		13	
Drain Current Pulsed(Note 1)		I_{DM}	88	A
Power Dissipation(T_C=25°C)		P_D	45	W
-Derate above 25°C			0.36	W/°C
Single Pulsed Avalanche Energy (Note 2)		E_{AS}	320	mJ
Operation Junction Temperature Range		T_J	-55～+150	°C
Storage Temperature Range		T_{stg}	-55～+150	°C
Maximum lead temperature for soldering purposes,1/8" from case for 5 seconds		TL	300	°C

THERMAL CHARACTERISTICS

Characteristics	Symbol	MAX	Unit
Thermal Resistance, Junction-to-Case	$R_{θJC}$	2.78	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{θJA}$	62	°C/W

ELECTRICAL CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Off Characteristics						
Drain -Source Breakdown Voltage	B_{VDSS}	V_{GS}=0V, I_D=250μA	650	--	--	V
Drain-Source Leakage Current	I_{DSS}	V_{DS}=650V, V_{GS}=0V	--	--	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=20V, V_{DS}=0V	--	--	100	nA
Gate-Source Leakage Current	I_{GSS}	V_{GS}=-20V, V_{DS}=0V	--	--	-100	nA
On Characteristics						
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}= V_{DS}, I_D=250μA	2.0	3.2	4.0	V
Static Drain- Source On State Resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=12A	--	148	180	mΩ
Forward Transconductance	gFS	VDS=20V, ID=12A (Note 3)	--	7.0	--	S
Dynamic Characteristics						
Gate Rresistance	Rg	V_{GS}=0V; f=1.0MHZ	--	1.0	--	Ω
Input Capacitance	C_{iss}	V_{DS}=100V V_{GS}=0V f=1.0MHZ	--	1460	--	pF
Output Capacitance	C_{oss}		--	70.6	--	
Reverse Transfer Capacitance	C_{rss}		--	1.86	--	pF

Switching Characteristics						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=150V; V_{GS}=10V R_G=33Ω; I_D=20A (Note 3.4)	--	31	--	ns
Turn-on Rise Time	t_r		--	48	--	
Turn-off Delay Time	$t_{d(off)}$		--	132	--	
Turn-off Fall Time	t_f		--	51	--	
Total Gate Charge	Q_g	V_{DS}=520V, I_D=20A V_{GS}=10V (Note 3.4)	--	40.5	--	nC
Gate-Source Charge	Q_{gs}		--	10.2	--	
Gate-Drain Charge	Q_{gd}		--	19.8	--	

SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Continuous Source Current	I_S	Integral Reverse P-N Junction Diode in the MOSFET	--	--	22	A
Pulsed Source Current	I_{SM}		--	--	88	
Diode Forward Voltage	V_{SD}	I_S=20A,V_{GS}=0V	--	0.92	1.4	V
Reverse Recovery Time	T_{rr}	I=20A,V_{GS}=0V, dIF/dt=100A/μS(Note 3)	--	323	--	ns
Reverse Recovery Charge	Q_{rr}		--	5.5	--	μC

NOTE:

1.Pluse width limited by maximum junction temperature

2.L=10mH，V_{DD}=100V，V_G=10V，R_G=25Ω，starting T_J=25°C

3.Pulse Test: Pulse width ≤300μs, Duty cycle≤2%

4.Essentially independent of operating temperature

Typical Performance Characteristics

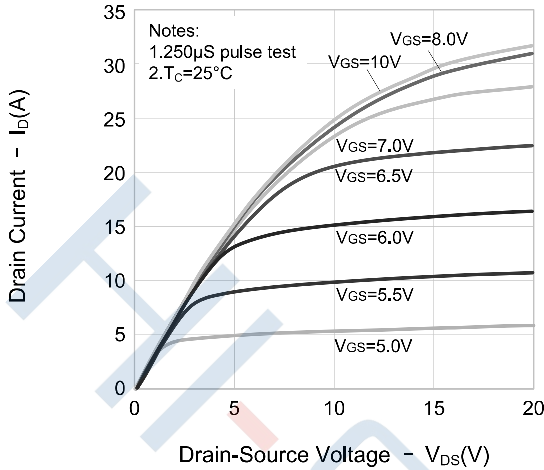


Figure 1. On-Region Characteristics

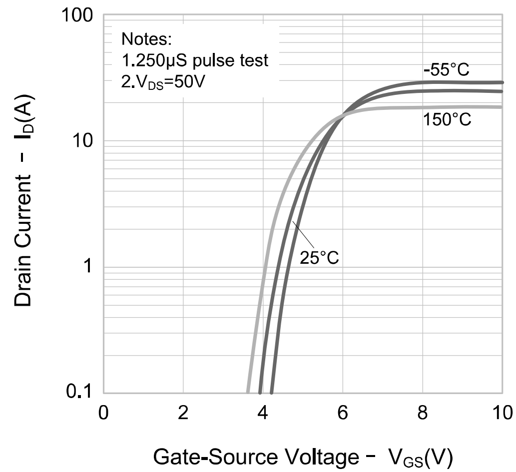


Figure 2. Transfer Characteristics

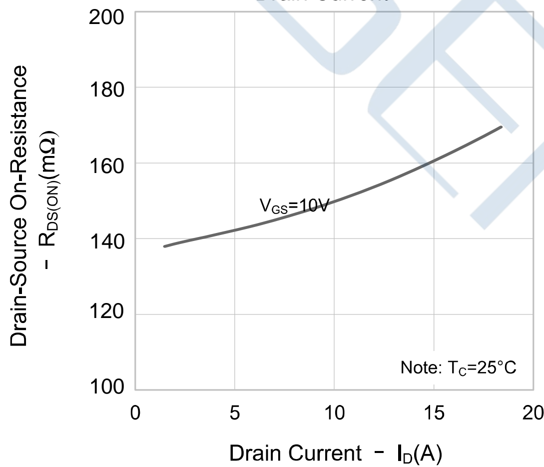


Figure 3. On-Resistance Variation vs. Drain Current

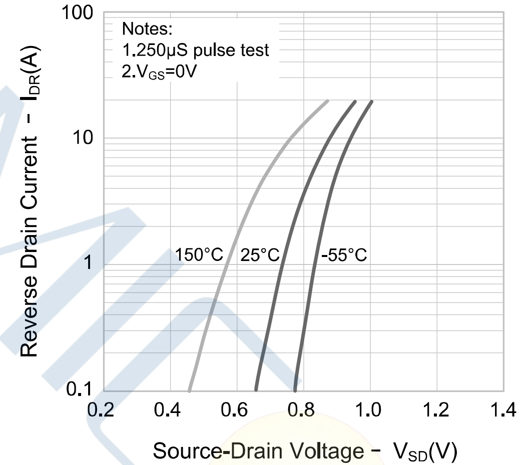


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

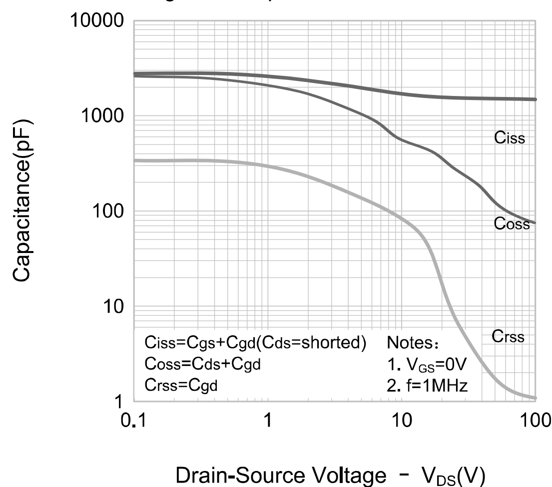


Figure 5. Capacitance Characteristics

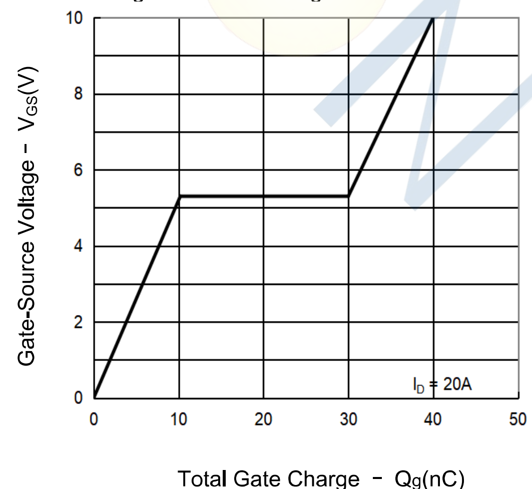
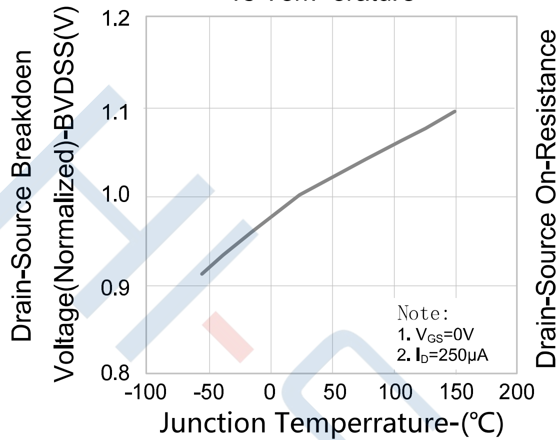
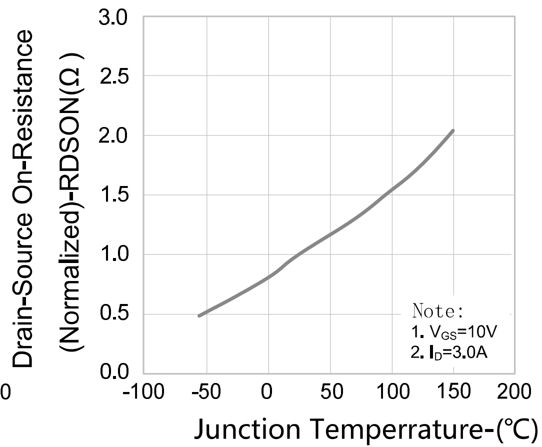
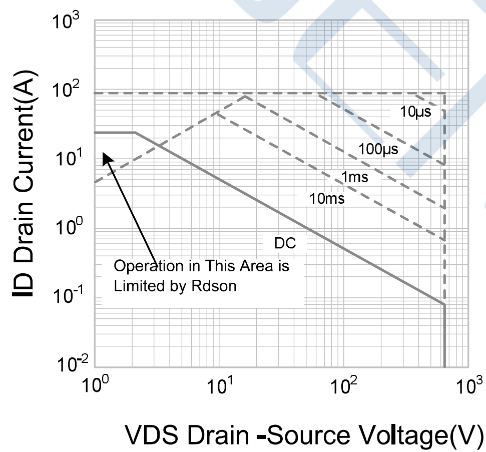


Figure 6. Gate Charge Characteristics

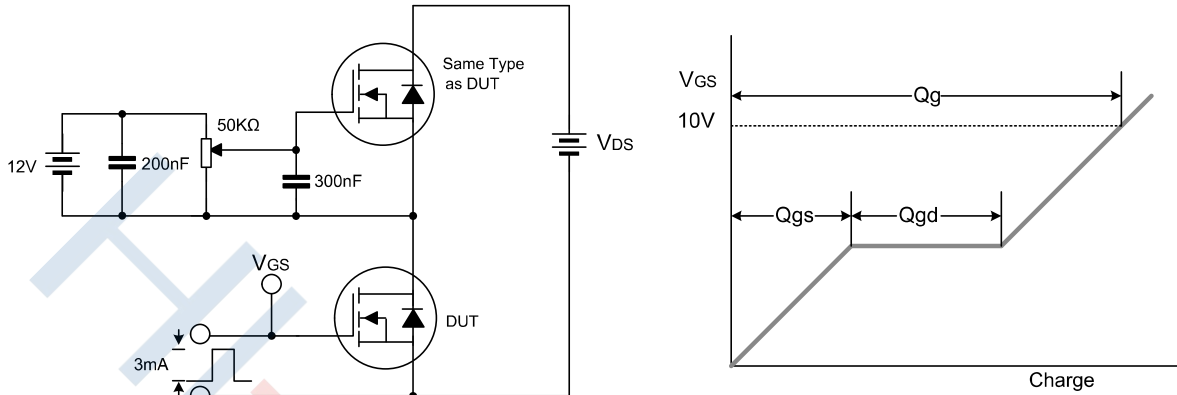
Typical Performance Characteristics



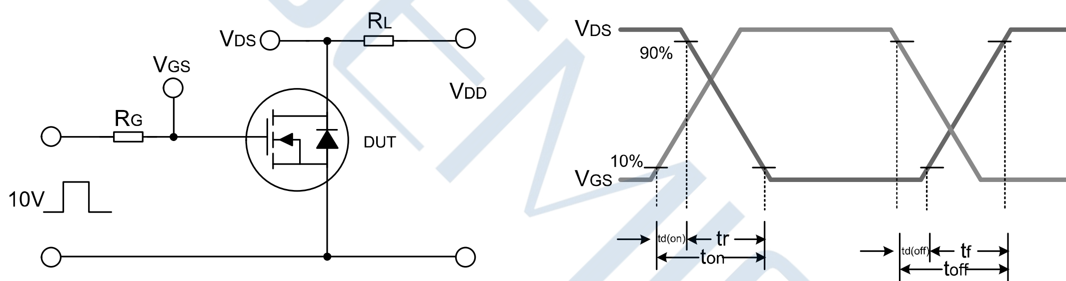




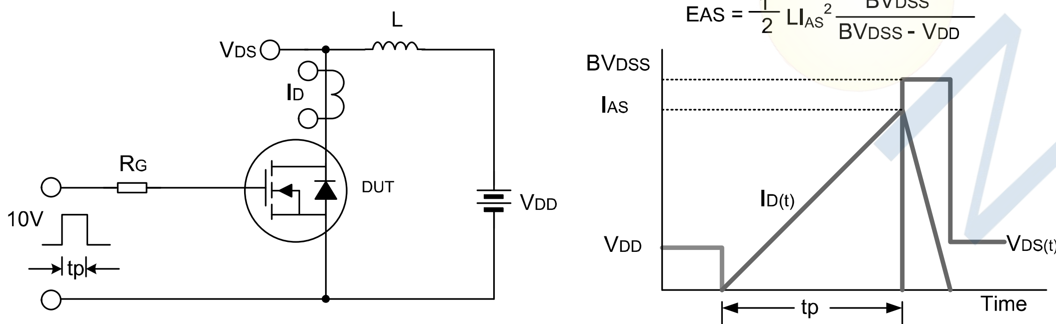
Test Circuit



Gate Charge Test Circuit & Waveform

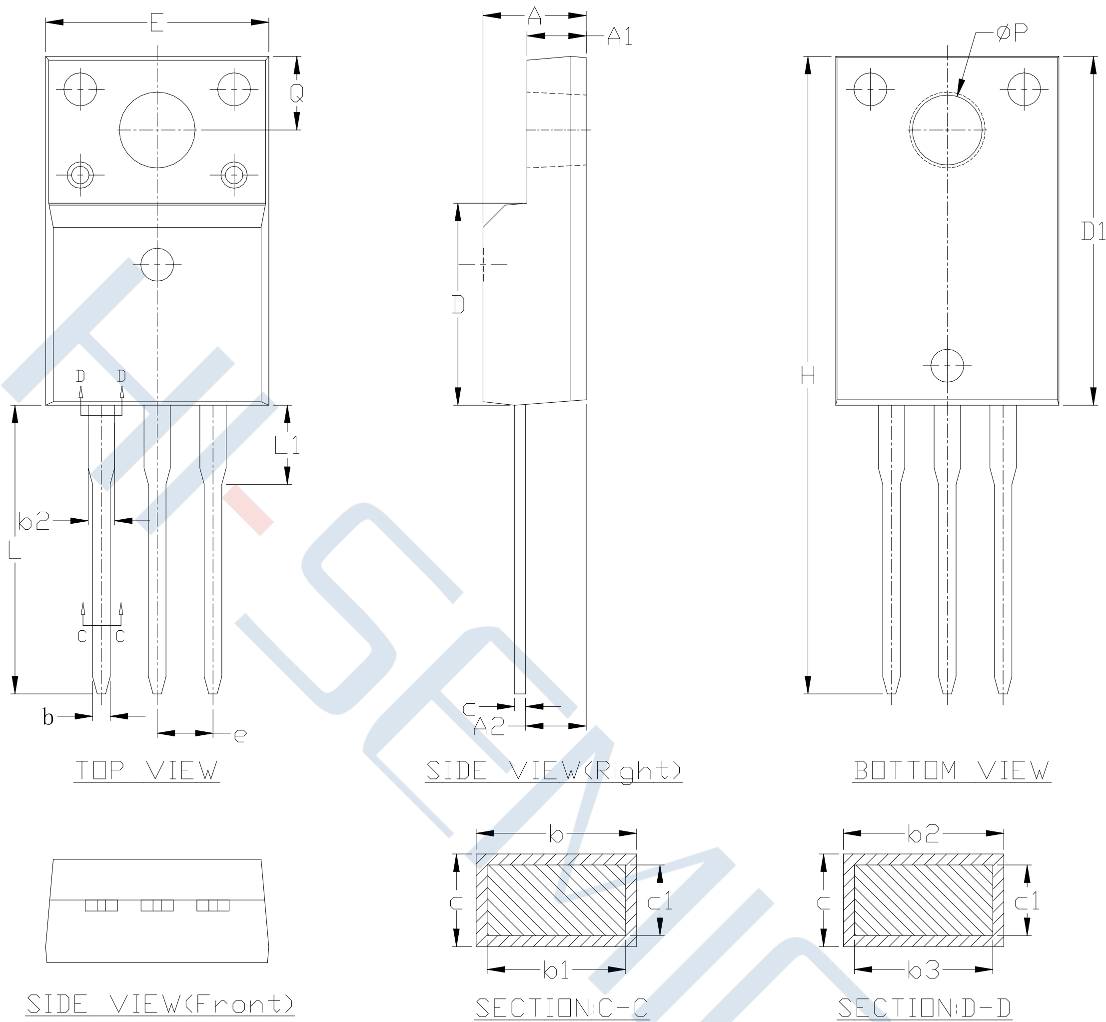


Resistive Switching Test Circuit & Waveform



EAS Test Circuit & Waveform

Package Dimensions of TO-220F-3L



DIM SYMBOL	MIN.	NOM.	MAX.
A	4.600	4.700	4.800
A1	2.600	2.700	2.800
A2	2.660	2.760	2.860
b	0.740	0.840	0.940
b1	0.700	0.800	0.900
b2	1.140	1.240	1.340
b3	1.100	1.200	1.300
c	0.440	0.540	0.640
c1	0.400	0.500	0.600
D	9.090	9.190	9.290
D1	15.770	15.870	15.970
E	10.060	10.160	10.260
e	2.540 BSC.		
H	28.800	29.000	29.200
L	12.930	13.130	13.330
L1	3.400	3.600	3.800
ØP	3.080	3.180	3.280
Q	3.150	3.350	3.550

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