650V N-Channnel Super Junction Power MOSFET

DESCRIPTION

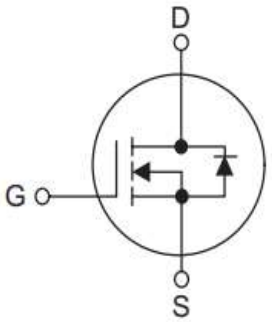
The **65R180F** use advanced super junction technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. This supper junction MOSFET has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.These devices are well suited for high efficiency switched mode power supplies.

FEATURES

*New technology for high voltage device
*Ultra Low Gate Charge
*Ultra Low Crss
*Fast Switching
*Improved dv/dt Capability

SYMBOL

1. Gate
2. Drain
3. Source



Package Description

Product Model	Package Type	Mark Name	Indentification Code	Package
CMS65R180F	TO-220F	CMS65R180	F	Tube

CMS65R180F

(2) Package type

(1) Chip name

(1) CMS65R180F: 650V 21A (2) F:TO-220F

ABSOLUTE MAXIMUM RATINGS (T_C = 25°C, unless otherwise specified)

PARAMETER			SYMBOL	RATINGS	UNIT
Drain-Source Voltage			V_{DSS}	650	V
Gate-Source Voltage			V_{GSS}	±30	V
Drain Current	Continuous(Tc=25℃)		I_D	21.0	A
	Continuous(Tc=100℃)			13.2	A
Drain Current	Pulsed (Note1)		I_{DM}	63	A
Avalanche Energy	Single Pulsed (Note2)		E_{AS}	690	mJ
Avalanche Current(Note1)			I_{AR}	7.0	A
Repetitive Avalanche Energy (Note1)			E_{AR}	1.0	mJ
Drain Source voltage slope, V_{DS}≤480V			dv/dt	50	V/ns
Power Dissipation	Tc=25°C	TO-220F	P_D	34.0	W
Junction Temperature			T_J	+150	°C
Storage Temperature			T_{STG}	-55~+150	°C

Notes:
1.Repetitive Rating:Pulse Width Limited by Maximum Junction Temperature.
2.T_J = 25°C , V_{DD} = 50V, V_G =10V, R_G = 25 Ω

THERMAL CHARACTERISTICS

Symbol	Parameter	PACKAGE	RATINGS	Units
$R_{\theta JC}$	Junction-to-Case	TO-220F	3.67	℃/W
$R_{\theta JA}$	Junction-to-Ambient	TO-220F	80	℃/W

ELECTRICAL CHARACTERISTICS (T_C =25°C, unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS} = 0 V, I_D = 250μA	650			V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS} = 650 V, V_{GS} = 0 V			1	μA
Gate-Source Leakage Current	Forward	I_{GSS}	V_{GS} = 30 V, V_{DS} = 0 V			100	nA
	Reverse		V_{GS} = -30 V, V_{DS} = 0 V			-100	nA
ON CHARACTERISTICS							
Gate Threshold Voltage		$V_{GS(TH)}$	V_{DS} = V_{GS}, I_D = 250μA	2.5		3.5	V
Static Drain-Source On- Resistance		$R_{DS(ON)}$	V_{GS} = 10 V, I_D =10.5A		150	180	mΩ
DYNAMIC CHARACTERISTICS							
Input Capacitance		C_{ISS}	V_{DS} =50 V, V_{GS} =0V , f = 1.0MHz		1950		pF
Output Capacitance		C_{OSS}			150		pF
Reverse Transfer Capacitance		C_{RSS}			5.0		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge		Q_G	V_{DS}= 480V, I_D= 21A, V_{GS}= 10V		45		nC
Gate-Source Charge		Q_{GS}			9.0		nC
Gate-Drain Charge		Q_{GD}			18		nC
Turn-On Delay Time		$t_{D(ON)}$	V_{DS} = 380V, I_D =11A, R_G =4Ω, V_{GS}= 10V		11		ns
Turn-On Rise Time		t_R			6.0		ns
Turn-Off Delay Time		$t_{D(OFF)}$			61		ns
Turn-Off Fall Time		t_F			4.5		ns
Drain-Source Diode Characteristics and Maximum Ratings							
Maximum Continuous Drain-Source Diode Forward Current		I_{SD}				21	A
Maximum Pulsed Drain-Source Diode Forward Current		I_{SM}				63	A
Drain-Source Diode Forward Voltage		V_{SD}	T_J=25℃ ,V_{GS} = 0 V			1.2	V
Reverse Recovery Time		t_{rr}	T_J=25℃, I_F = 21A, dI_F/dt = 100 A/μs		310		ns
Reverse Recovery Charge		Q_{rr}			5.0		μC

* Drain Current Limited by Maximum Junction Temperature.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS (curves)

Figure1. Safe operating area for TO-220F

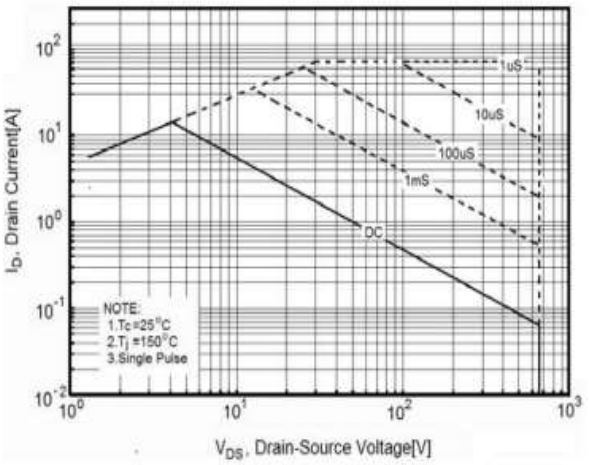


Figure2. Capacitance

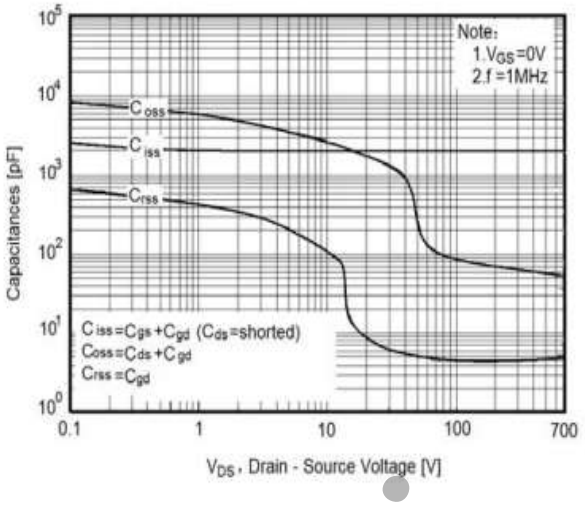


Figure3. Source-Drain Diode Forward Voltage

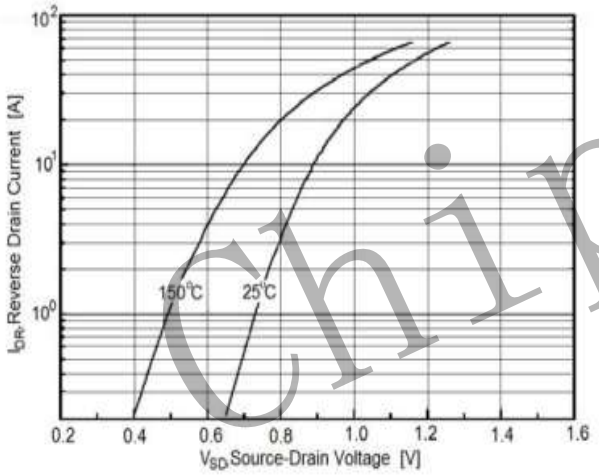


Figure4. Output characteristics

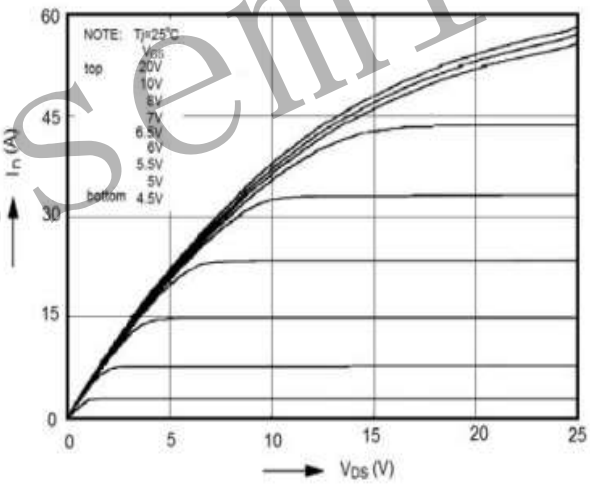


Figure5. Transfer characteristics

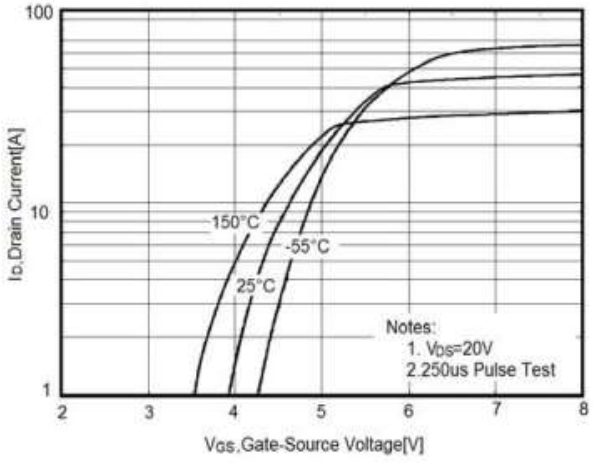
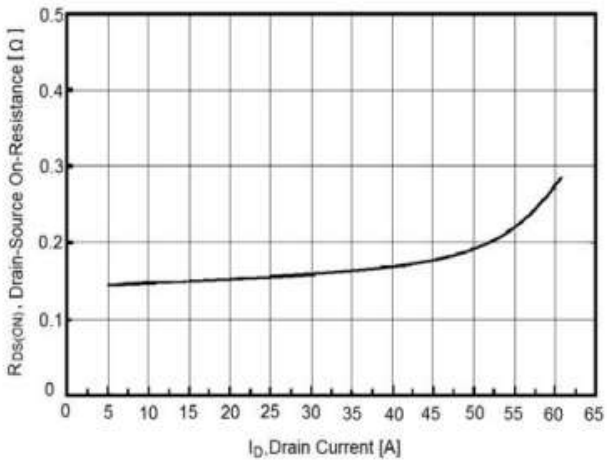


Figure6. Static drain-source on resistance



TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS(Cont.)

Figure7. $R_{DS(ON)}$ vs Junction Temperature

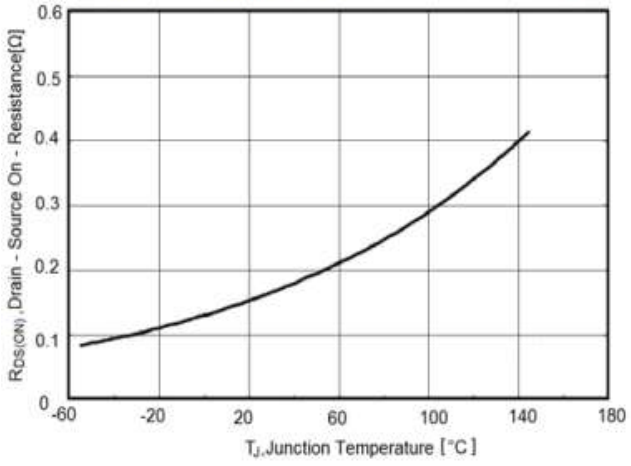


Figure8. BV_{DSS} vs Junction Temperature

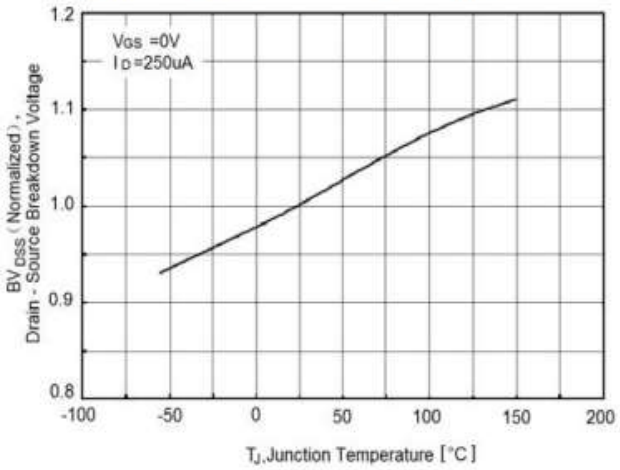


Figure9. Maximum I_D vs Junction Temperature

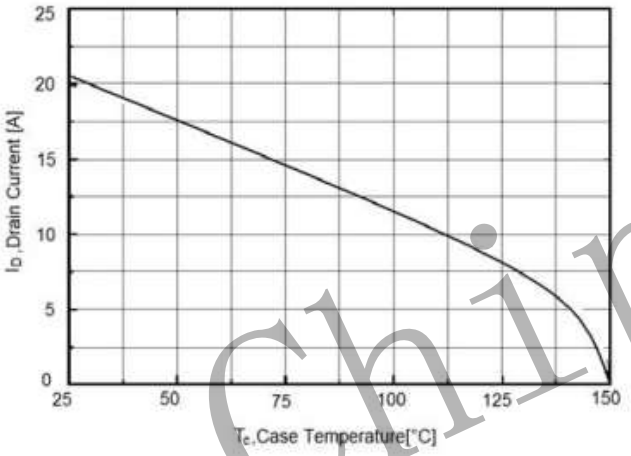


Figure10. Gate charge waveforms

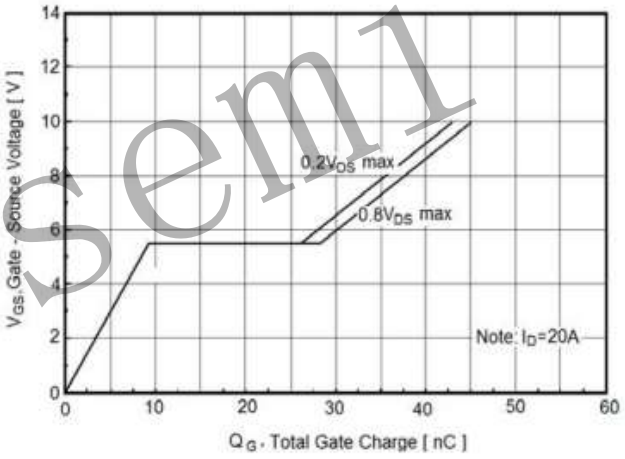
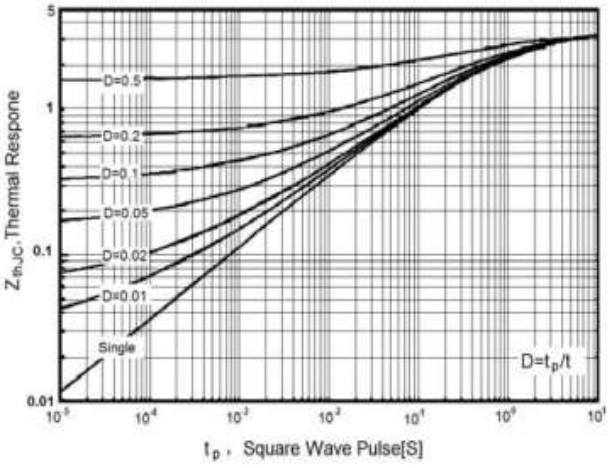
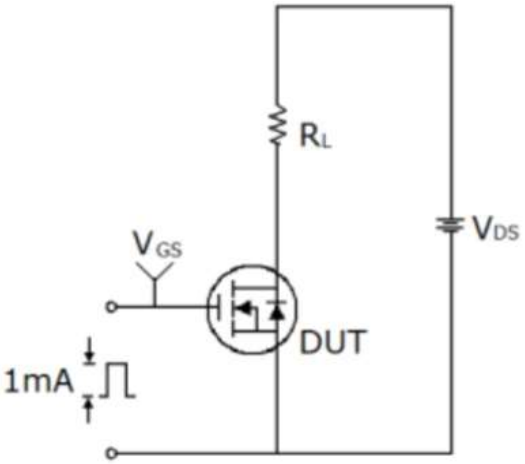


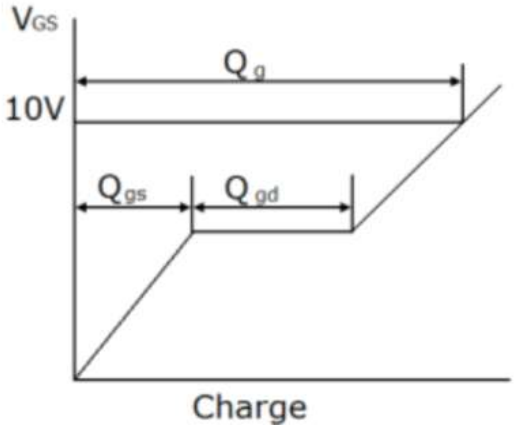
Figure11. Transient Thermal Impedance for TO-220F



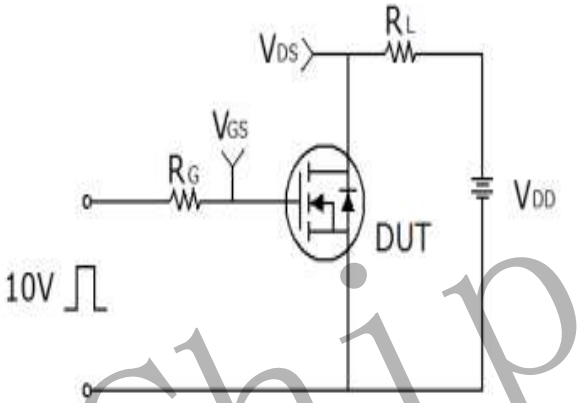
TEST CIRCUITS

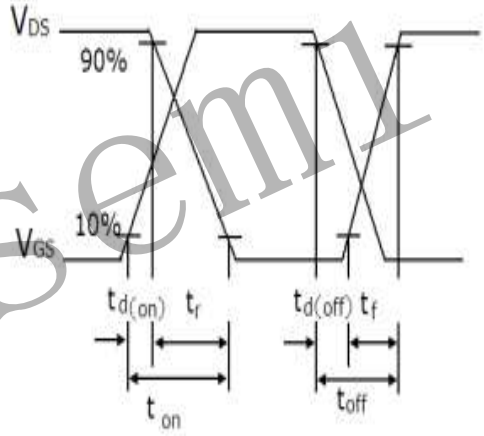
1）Gate charge test circuit & Waveform



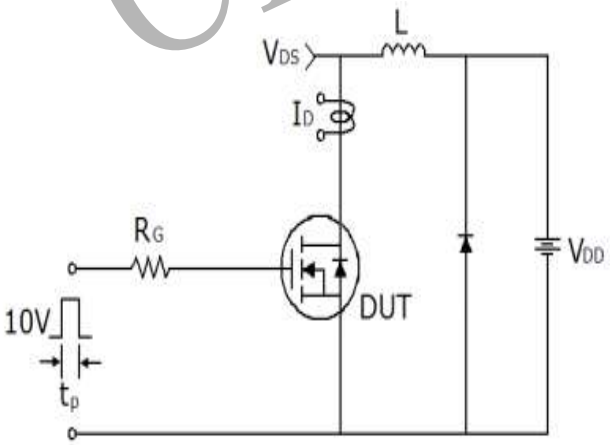


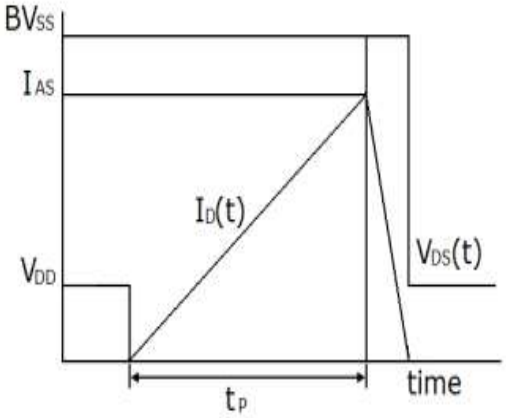
2）Switch Time Test Circuit：





3）Unclamped Inductive Switching Test Circuit & Waveforms





Attentions

- Exceeding the maximum ratings of the device in performance may cause damage to the device, even the permanent failure, which may affect the dependability of the machine. Please do not exceed the absolute maximum ratings of the device when circuit designing.
- When installing the heat sink, please pay attention to the torsional moment and the smoothness of the heat sink.
- MOSFET is the device which is sensitive to the static electricity, it is necessary to protect the device from being damaged by the static electricity when using it.
- Chipsemi reserves the right to make changes in this specification sheet and is subject to change without prior notice.

Appendix

Revision history:

Date	REV.	Description	Page
2023.3	1.0	Original	7