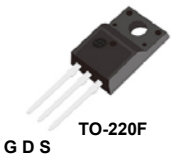
HMS10N50/HMS10N50F
500V N-Channel MOSFET

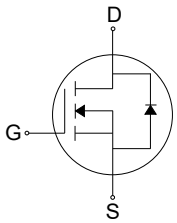
General Description

This Power MOSFET is produced using H&M Semi's Advanced Super-Junction technology.
This advanced technology has been especially tailored to minimize conduction loss, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.
These devices are well suited for AC/DC power conversion in switching mode operation for higher efficiency.

Features

- 10A, 500V, $R_{DS(on)\ typ.}$ = 0.4Ω@V_{GS} = 10 V
- Low gate charge (typical 25nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability





Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		HMS10N50/HMS10N50F	Units
V_{DSS}	Drain-Source Voltage		500	V
I_D	Drain Current - Continuous (T_C = 25℃)		10*	A
	Drain Current - Continuous (T_C = 100℃)		7*	A
I_{DM}	Drain Current - Pulsed	(Note 1)	30	A
V_{GSS}	Gate-Source Voltage		±30	V
EAS	Single Pulsed Avalanche Energy	(Note 2)	86	mJ
I_{AR}	Avalanche Current	(Note 1)	1.7	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	43	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	4.5	V/ns
P_D	Power Dissipation (T_C = 25℃)		57	W
	- Derate above 25℃		0.45	W/℃
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +150	℃
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		300	℃

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	HMS10N50/HMS10N50F	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2.2	℃/W
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	℃/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62	℃/W

Electrical Characteristics

T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 uA, T_J=25℃	500	--	--	V
		V_{GS} = 0 V, I_D = 250 uA, T_J=150℃	--	550	--	V
$\triangle BV_{DSS}$ / $\triangle T_J$	Breakdown Voltage Temperature Coefficient	I_D = 250 uA, Referenced to 25℃	--	0.6	--	V/℃
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 500 V, V_{GS} = 0 V	--	--	1	uA
		V_{DS} = 480 V, T_C = 125℃	--	--	10	uA
I_{GSSF}	Gate-Body Leakage Current, Forward	V_{GS} = 30 V, V_{DS} = 0 V	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	V_{GS} = -30 V, V_{DS} = 0 V	--	--	-100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250 uA	2.5		4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 3.5 A	--		0.4	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 3.5 A (Note 4)	--	16	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	360	--	pF
C_{oss}	Output Capacitance		--	25	--	pF
C_{rss}	Reverse Transfer Capacitance		--	1.2	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 400 V, I_D = 3.5 A, R_G = 20 Ω (Note 4, 5)	--	25	--	ns
t_r	Turn-On Rise Time		--	55	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	70	--	ns
t_f	Turn-Off Fall Time		--	40	--	ns
Q_g	Total Gate Charge	V_{DS} = 480 V, I_D = 10 A, V_{GS} = 10 V (Note 4, 5)	--	8	--	nC
Q_{gs}	Gate-Source Charge		--	2.0	--	nC
Q_{gd}	Gate-Drain Charge		--	2.7	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	10	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	30	A
V_{SD}	Drain-Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 10 A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 10 A, dI_F / dt = 100 A/us (Note 4)	--	190	--	ns
Q_{rr}	Reverse Recovery Charge		--	2.3	--	uC

NOTES:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. L=60mH, I_{AS}=1.7A, VDD=150V, Starting TJ=25 °C
3. I_{SD}≤7A, di/dt ≤ 200A/us, V_{DD} ≤ BV_{DSS}, Starting TJ = 25 °C
4. Pulse Test: Pulse width ≤ 300us, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

Typical Characteristics

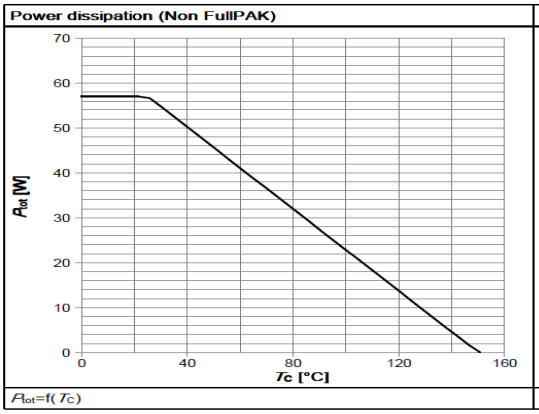


Figure 1: Power Dissipation

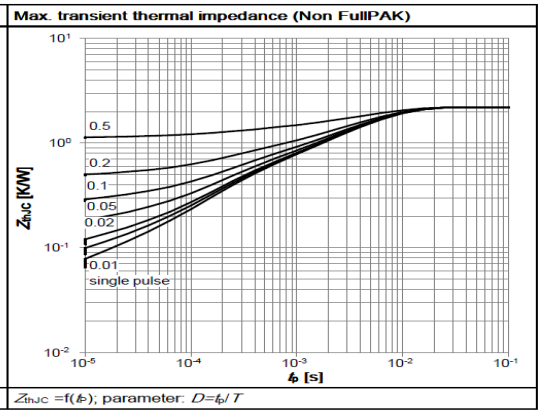


Figure 2: Transient Thermal Impedance

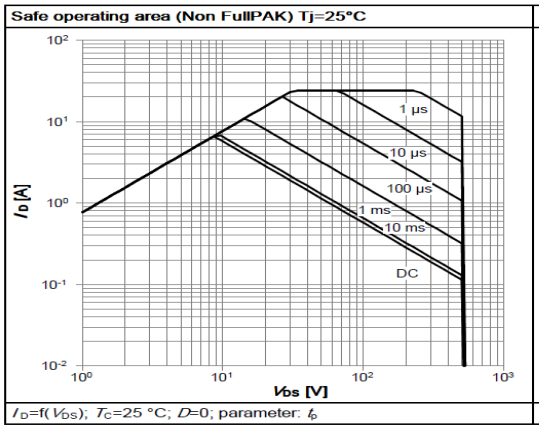


Figure 3: Safe Operating Area@25℃

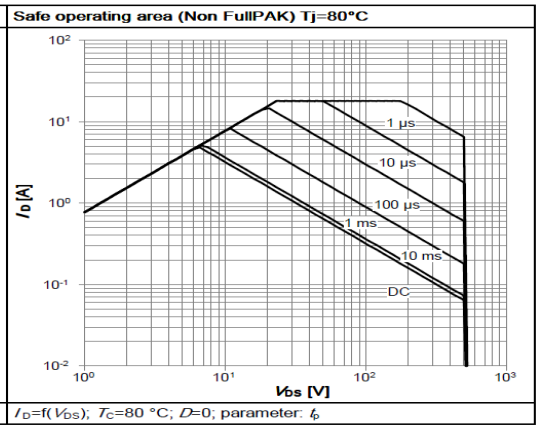


Figure 4: Safe Operating Area@80℃

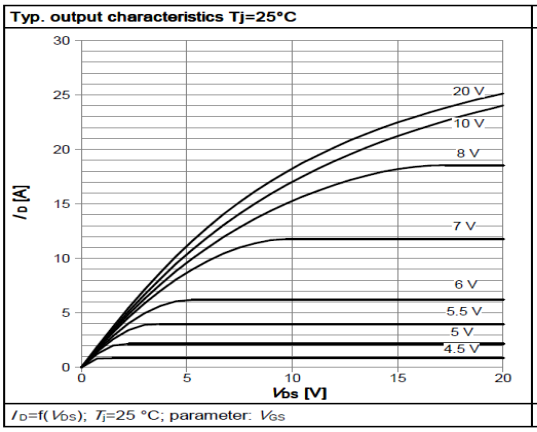


Figure 5: Output Characteristics@25℃

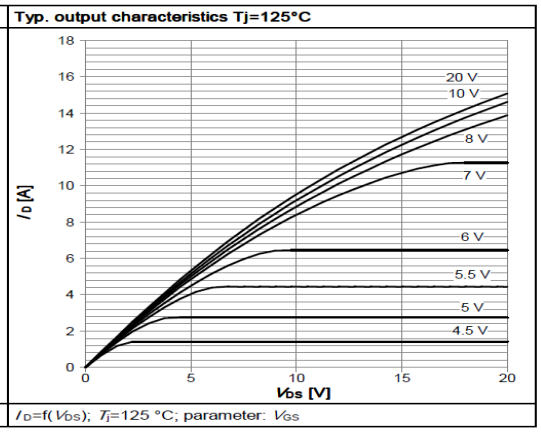


Figure 6: Output Characteristics@125℃

Typical Characteristics

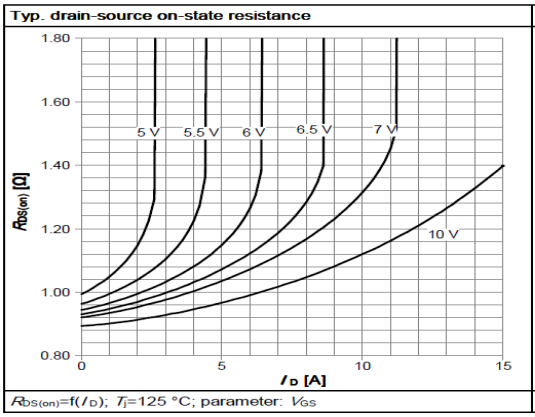


Figure 7: On-Resistance vs. Drain Current

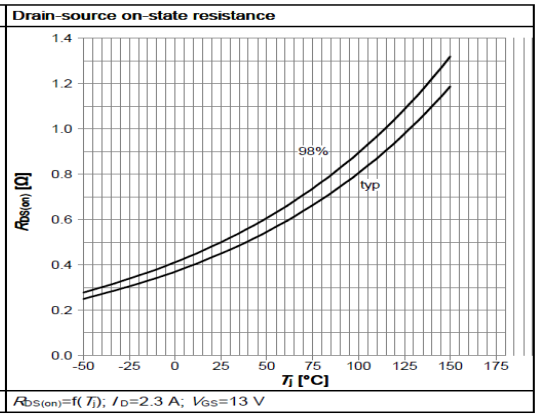


Figure 8: On-Resistance vs. Temperatures

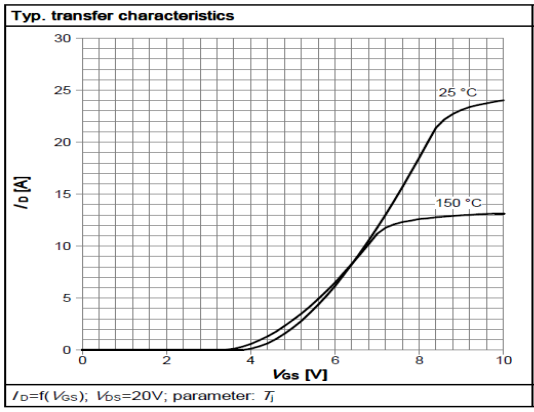


Figure 9: Transfer Characteristics

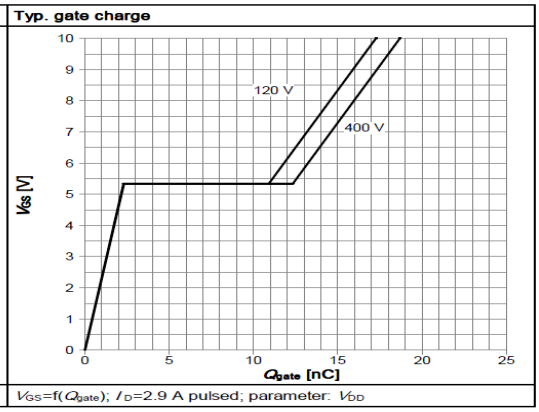


Figure 10: Gata Charge

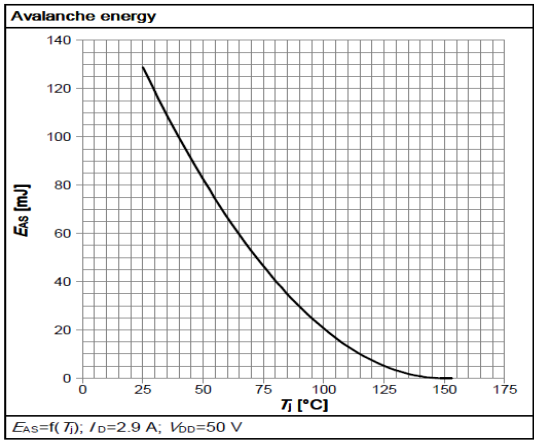


Figure 11: Avalanche Energy

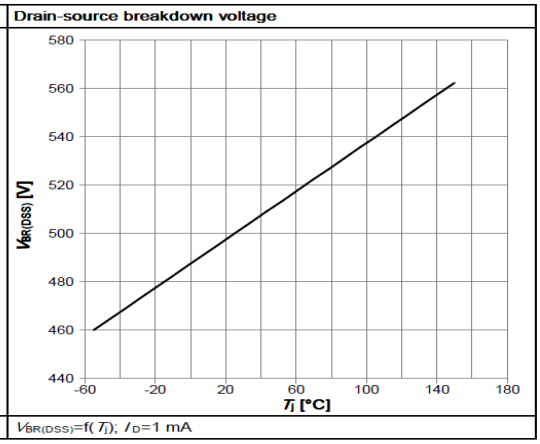


Figure 12: Drain-Source Breakdown Voltage

Typical Characteristics

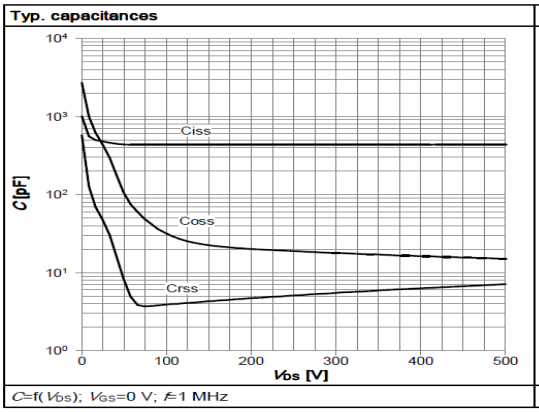


Figure 13: Capacitances

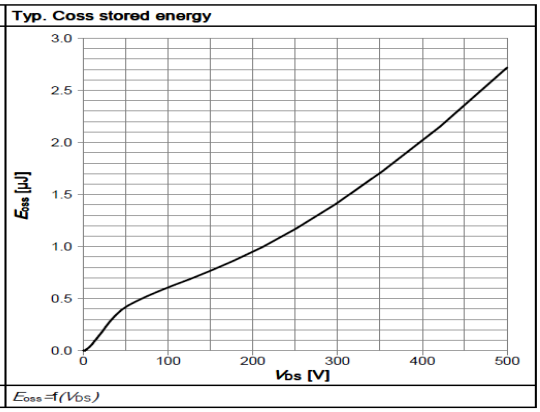


Figure 14: Coss Stored Energy

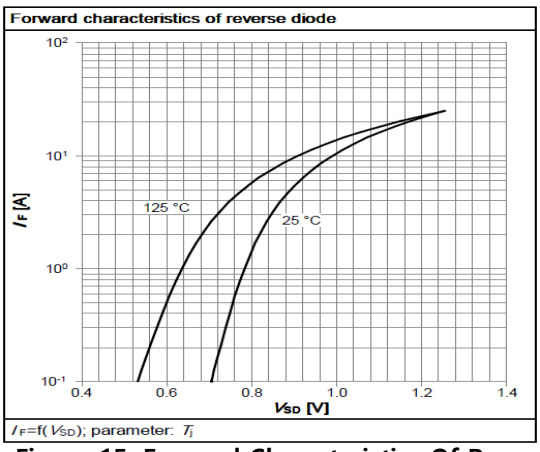
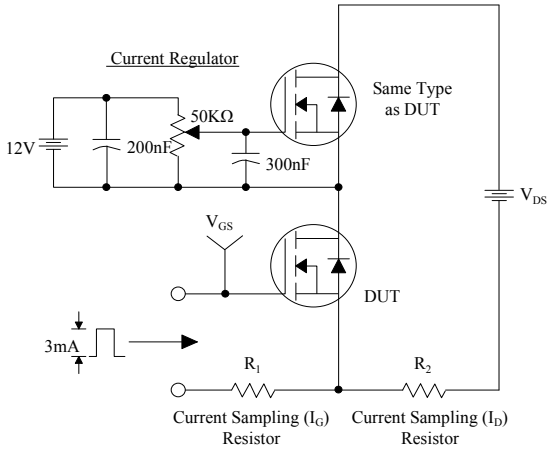
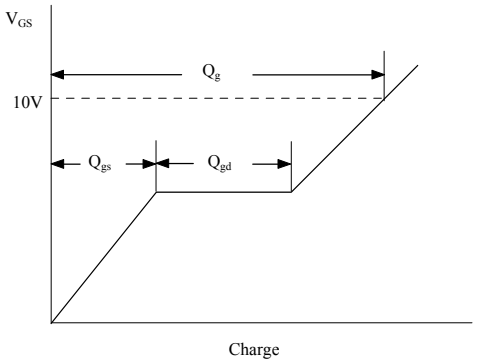


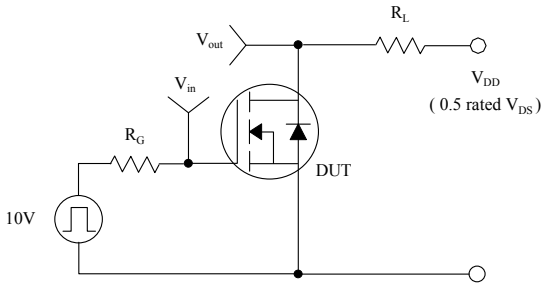
Figure 15: Forward Characteristics Of Reverse Diode

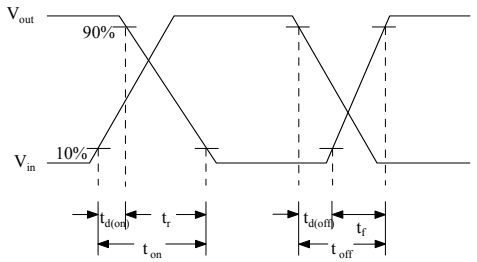
Gate Charge Test Circuit & Waveform



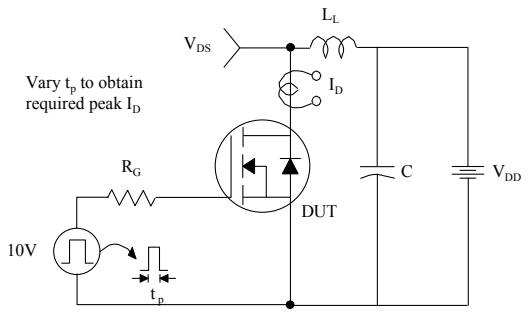


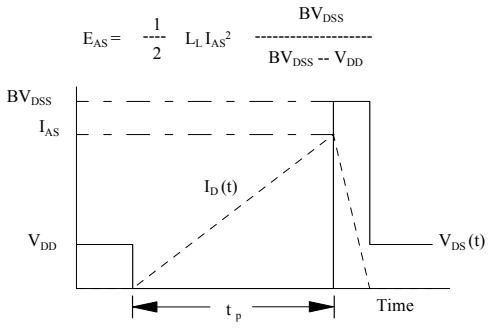
Resistive Switching Test Circuit & Waveforms





Unclamped Inductive Switching Test Circuit & Waveforms





Peak Diode Recovery dv/dt Test Circuit & Waveforms