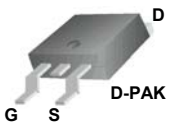
HMS11N65K/HMS11N65I
650V N-Channel MOSFET

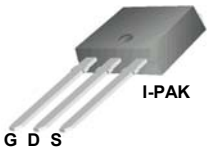
General Description

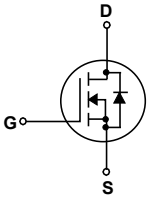
This Power MOSFET is produced using H&M Semi's Advanced Super-Junction technology.
This advanced technology has been especially tailored to minimize conduction loss, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode.
These devices are well suited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

Features

- 11A, 650V, $R_{DS(on)\ typ.}$ = 0.38Ω@V_{GS} = 10 V
- Low gate charge (typical 33nC)
- High ruggedness
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability







Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter		HMS11N65K/HMS11N65I	Units
V_{DSS}	Drain-Source Voltage		650	V
I_D	Drain Current - Continuous (T_C = 25℃)		11*	A
	- Continuous (T_C = 100℃)		6.7 *	A
I_{DM}	Drain Current - Pulsed	(Note 1)	30 *	A
V_{GSS}	Gate-Source Voltage		±30	V
EAS	Single Pulsed Avalanche Energy	(Note 2)	132	mJ
I_{AR}	Avalanche Current	(Note 1)	2.1	A
E_{AR}	Repetitive Avalanche Energy	(Note 1)	65	mJ
dv/dt	Peak Diode Recovery dv/dt	(Note 3)	5.0	V/ns
P_D	Power Dissipation (T_C = 25℃)		125	W
	- Derate above 25℃		1.0	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	HMS11N65K/HMS11N65I	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.6	℃/W
$R_{\theta JS}$	Thermal Resistance, Case-to-Sink Typ.	1.0	℃/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	650	--	--	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} = 650 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	--	4.5	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	V_{GS} = 10 V, I_D = 5.5A	--	0.38	0.42	Ω
g_{FS}	Forward Transconductance	V_{DS} = 40 V, I_D = 5.5A (Note 4)	--	16	--	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 25 V, V_{GS} = 0 V, f = 1.0 MHz	--	680	--	pF
C_{oss}	Output Capacitance		--	140	--	pF
C_{rss}	Reverse Transfer Capacitance		--	5	--	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 400 V, I_D = 5.5 A, R_G = 20 Ω (Note 4, 5)	--	26	--	ns
t_r	Turn-On Rise Time		--	60	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	75	--	ns
t_f	Turn-Off Fall Time		--	44	--	ns
Q_g	Total Gate Charge	V_{DS} = 480 V, I_D = 11 A, V_{GS} = 10 V (Note 4, 5)	--	33	--	nC
Q_{gs}	Gate-Source Charge		--	4	--	nC
Q_{gd}	Gate-Drain Charge		--	4.2	--	nC
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain-Source Diode Forward Current		--	--	11	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 = 11A	--	--	1.5	V
t_{rr}	Reverse Recovery Time	V_{GS} = 0 V, I_S = 11 A, dI_F / dt = 100 A/us (Note 4)	--	270	--	ns
Q_{rr}	Reverse Recovery Charge		--	3.3	--	uC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. I_{AS} = 2.1A, V_{DD} = 50V, R_G = 25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 10A, di/dt ≤ 200A/us, V_{DD} ≤ $BV_{DSS,}$ Starting T_J = 25°C
4. Pulse Test : Pulse width ≤ 300us, Duty cycle ≤ 2%
5. Essentially independent of operating temperature

Typical Characteristics

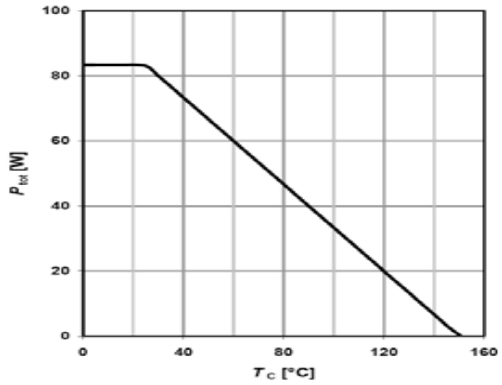


Figure 1. Power Dissipation for TO-251, TO-252

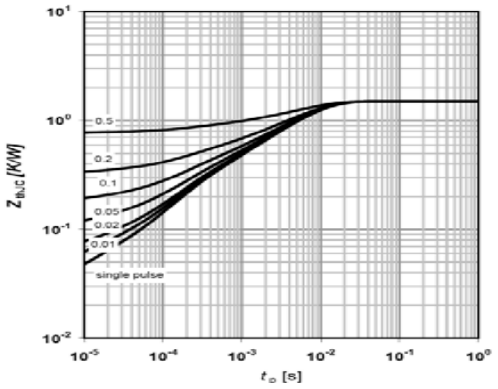


Figure 2. Transient Thermal Response Curve for TO-251,TO-252

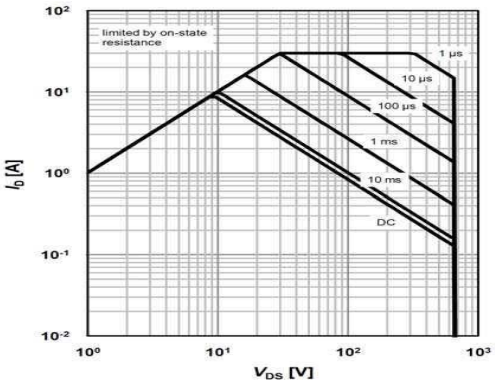


Figure 3. Maximum Safe Operating Area for TO-251,TO-252@25℃

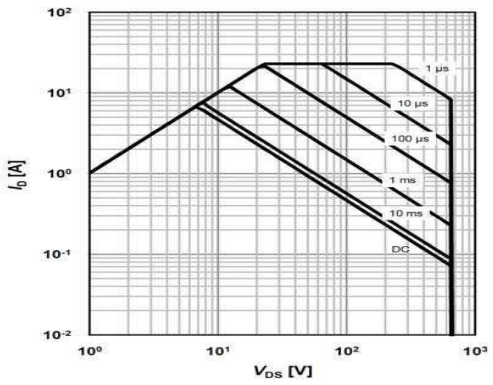


Figure 4. Maximum Safe Operating Area for TO-251,TO-252@80℃

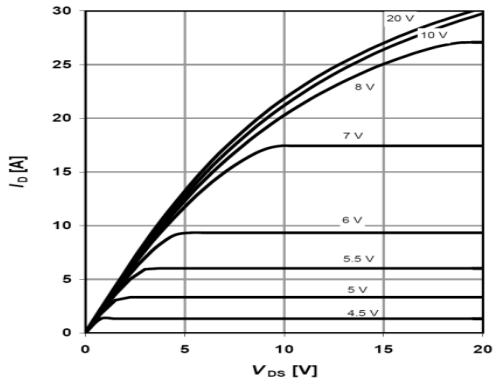


Figure 5. Output Characteristics@25℃

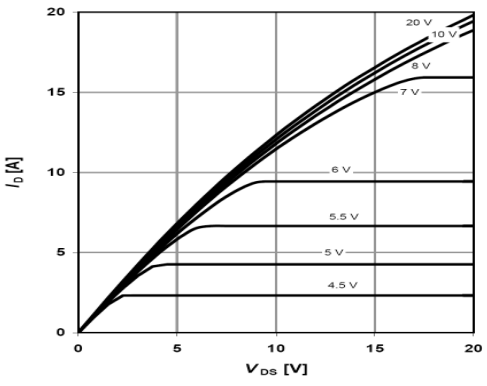


Figure 6. Output Characteristics@125℃

Typical Characteristics (Continued)

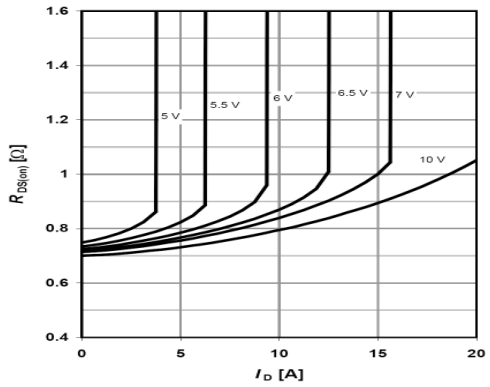


Figure 7. On-Resistance Variation vs Drain Current and Gate Voltage@125℃

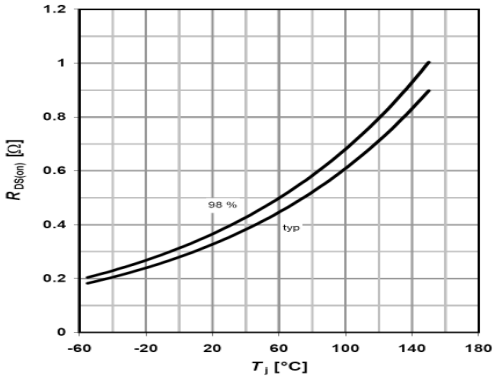


Figure 8. On-Resistance Variation vs Temperature

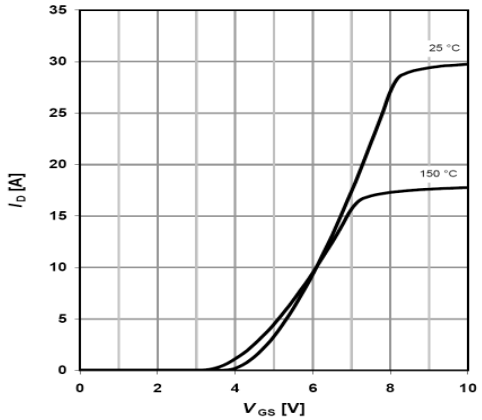


Figure 9. Transfer characteristics

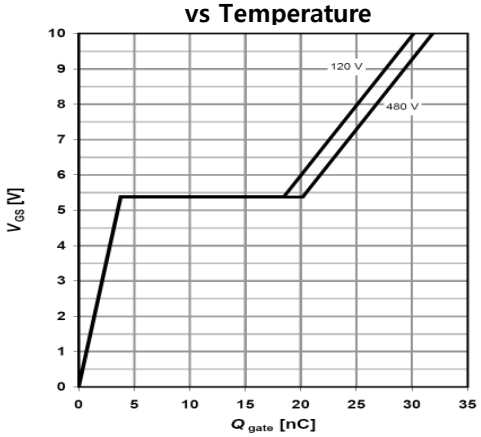


Figure 10. Gate charge

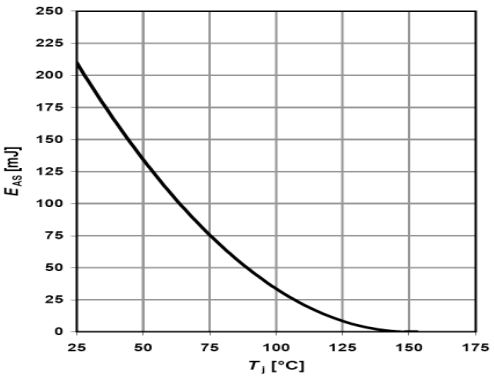


Figure 11. Avalanche Energy Characteristics

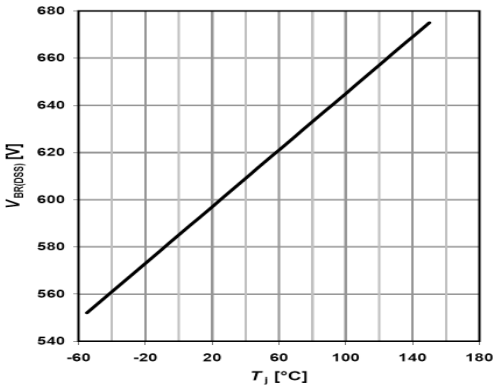


Figure 12. Breakdown Voltage Variation vs Temperature

Typical Characteristics (Continued)

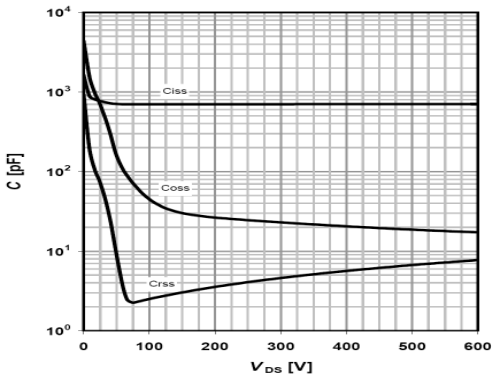


Figure 13. Capacitance Characteristics

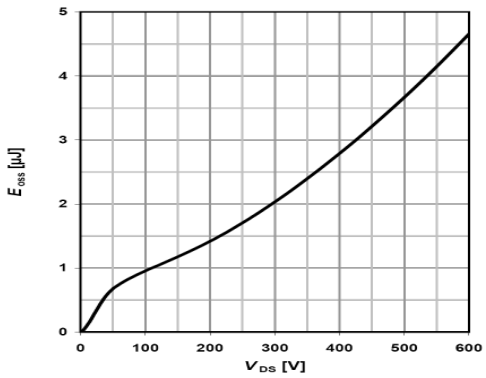


Figure 14. On-Resistance Variation vs Temperature

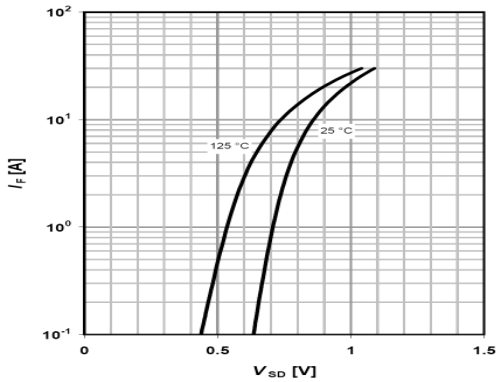
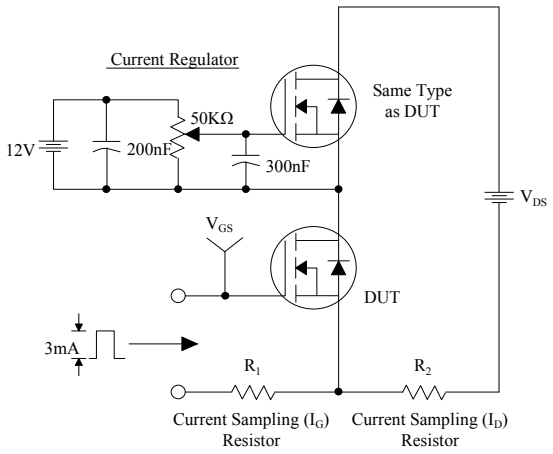
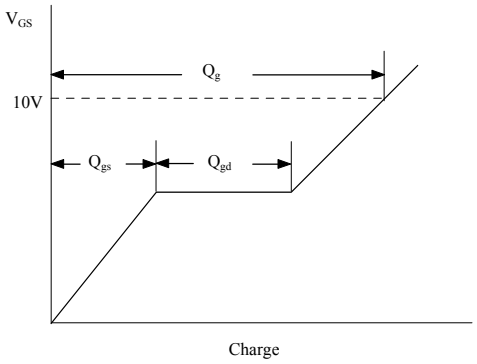


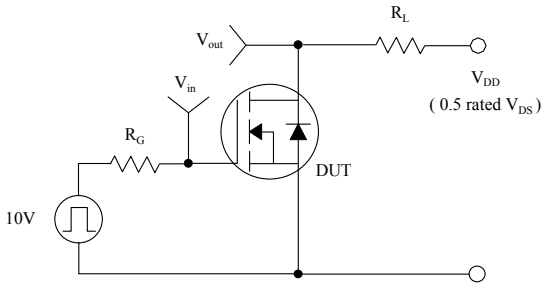
Figure 15. Body Diode Forward Voltage Variation with Source Current and Temperature

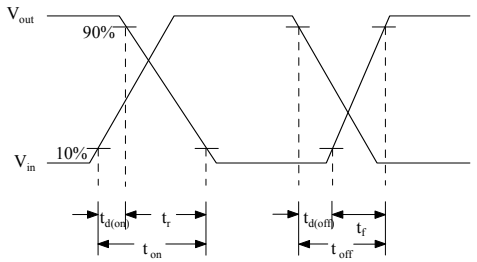
Gate Charge Test Circuit & Waveform



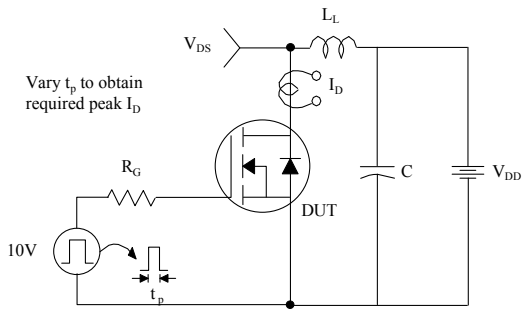


Resistive Switching Test Circuit & Waveforms

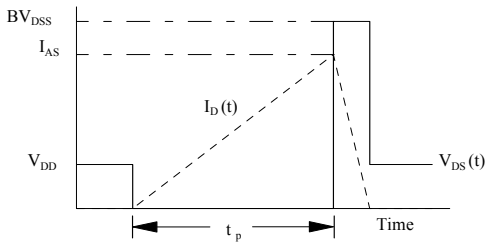




Unclamped Inductive Switching Test Circuit & Waveforms



$$E_{AS} = \frac{1}{2} L_L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$



Peak Diode Recovery dv/dt Test Circuit & Waveforms