N-Channel Super Trench Power MOSFET

Description

The HMS4N10MR uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g. This device is ideal for high-frequency switching and synchronous rectification.

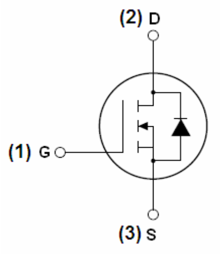
General Features

- V_{DS} =100V,I_D =4A
  $R_{DS(on)}$＜115mΩ（at V_{GS}=10V
  $R_{DS(on)}$＜130mΩ（at V_{GS}=4.5V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 150 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

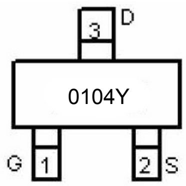
Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

100% UIS TESTED!



Schematic diagram



Marking and pin assignment

SOT-23-3L top view

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
0104Y	HMS4N10MR	SOT23-3L	Ø330mm	12mm	2500 units

Absolute Maximum Ratings (T_A=25℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	4	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	2.8	A
Pulsed Drain Current	I_{DM}	12	A
Maximum Power Dissipation	P_D	3.5	W
Derating factor		0.028	W/℃
Single pulse avalanche energy (Note 5)	E_{AS}	196	mJ
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 150	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Ambient(Note 2)	$R_{\theta JA}$	36	℃/W

Electrical Characteristics (T_A=25℃unless otherwise noted)

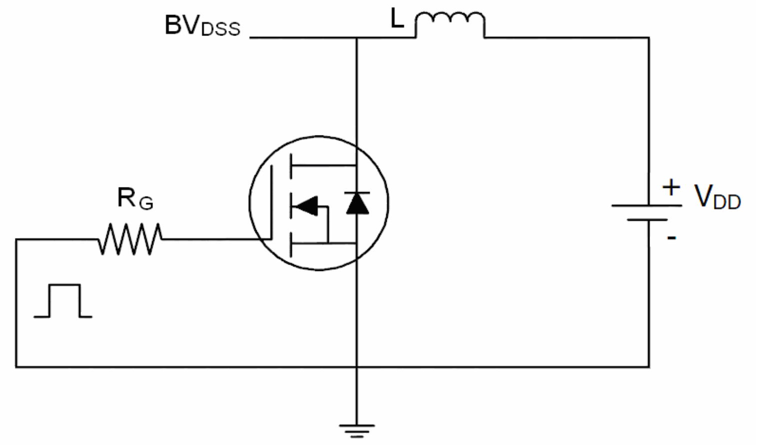
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV_{DSS}	V_{GS}=0V I_D=250μA	100	-	-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=100V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current	I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	0.8	1.2	1.5	V
Drain-Source On-State Resistance	$R_{DS(ON)}$	V_{GS}=10V, I_D=4A	-	95	115	mΩ
		V_{GS}=4.5V, I_D=4A	-	115	130	mΩ
Forward Transconductance	g_{FS}	V_{DS}=5V,I_D=4A	-	45	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C_{lss}	V_{DS}=50V,V_{GS}=0V, F=1.0MHz	3600	4200	5480	PF
Output Capacitance	C_{oss}		-	354	425	PF
Reverse Transfer Capacitance	C_{rss}		-	23	30	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	$t_{d(on)}$	V_{DD}=50V,I_D=4A V_{GS}=10V,R_G=1.6Ω	-	14	-	nS
Turn-on Rise Time	t_r		-	9	-	nS
Turn-Off Delay Time	$t_{d(off)}$		-	39	-	nS
Turn-Off Fall Time	t_f		-	5	-	nS
Total Gate Charge	Q_g	V_{DS}=50V,I_D=4A, V_{GS}=10V	-	58	-	nC
Gate-Source Charge	Q_{gs}		-	12	-	nC
Gate-Drain Charge	Q_{gd}		-	7.8	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V_{SD}	V_{GS}=0V,I_S=4A	-	-	1.2	V
Diode Forward Current (Note 2)	I_S		-	-	8	A
Reverse Recovery Time	t_{rr}	T_J = 25°C, I_F = I_S di/dt = 100A/μs(Note3)	-	101	-	nS
Reverse Recovery Charge	Qrr		-	193	-	nC

Notes:

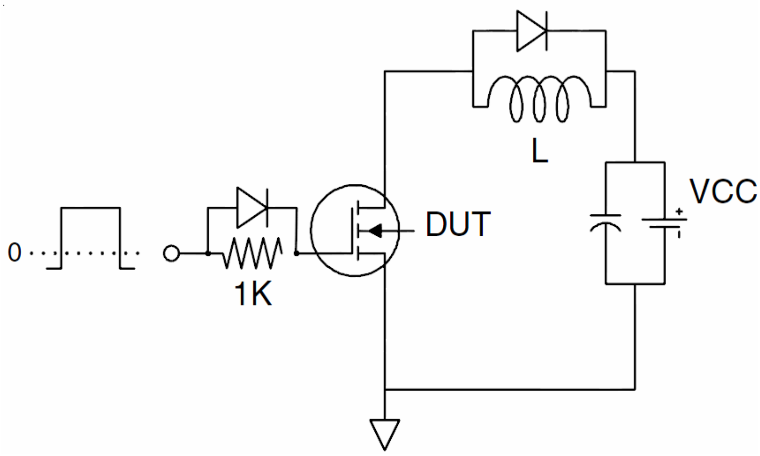
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition : Tj=25℃,V_{DD}=50V,V_G=10V,L=0.5mH,Rg=25Ω

Test Circuit

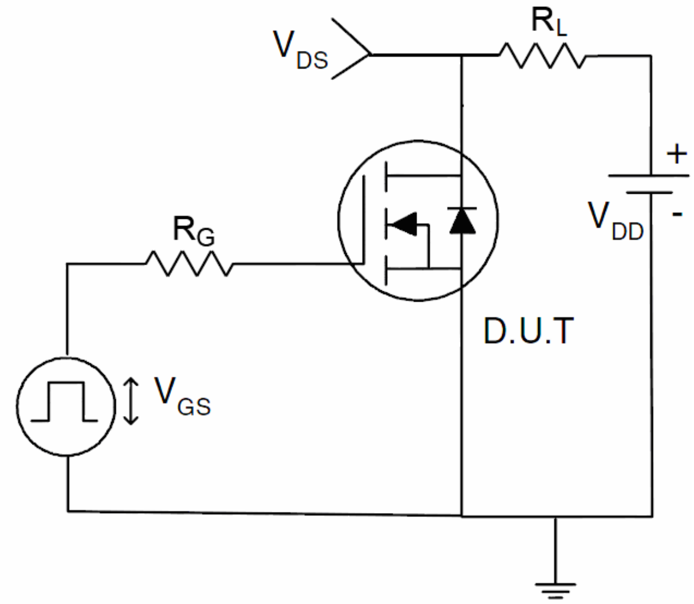
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

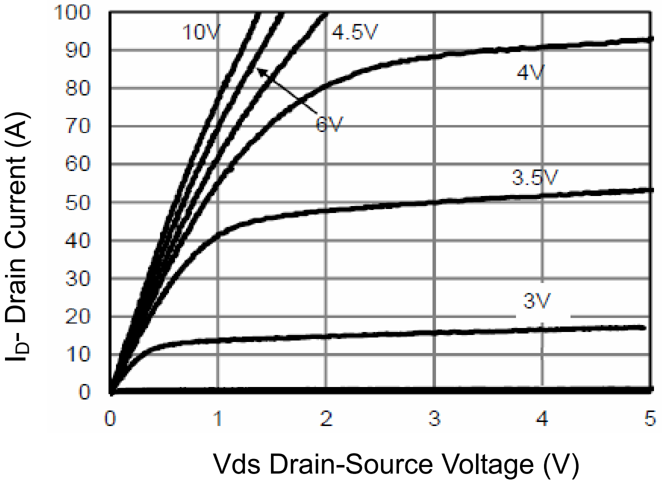


Figure 1 Output Characteristics

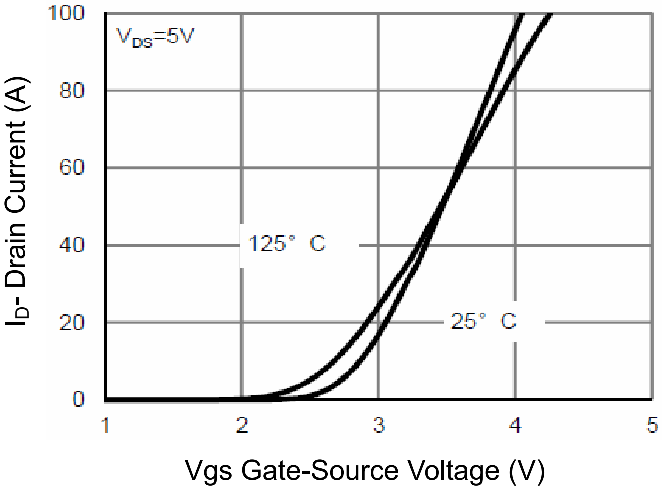


Figure 2 Transfer Characteristics

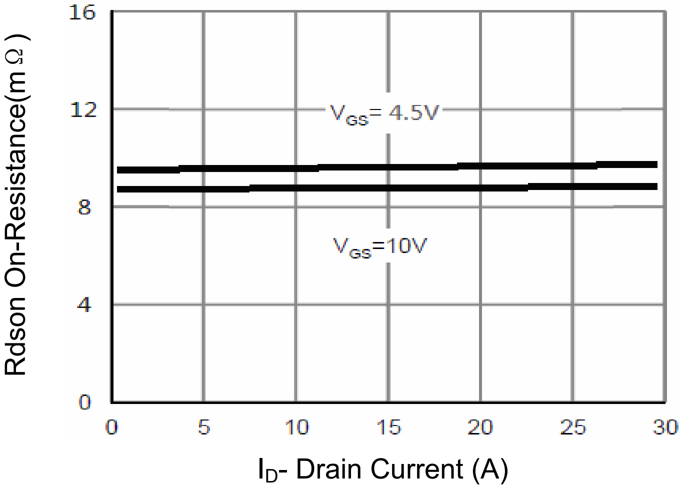


Figure 3 Rdson- Drain Current

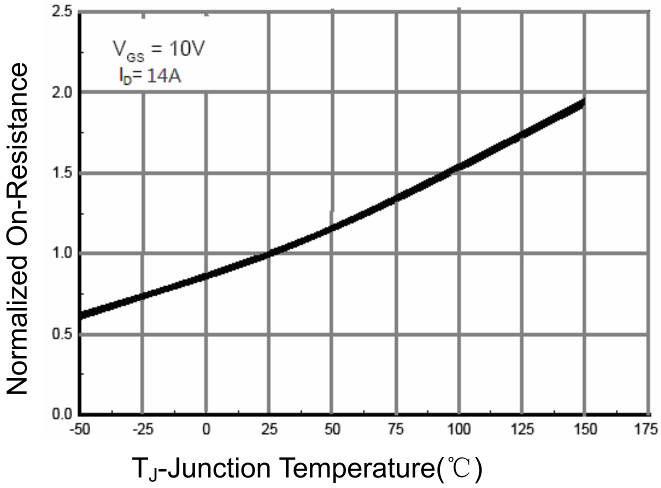


Figure 4 Rdson-Junction Temperature

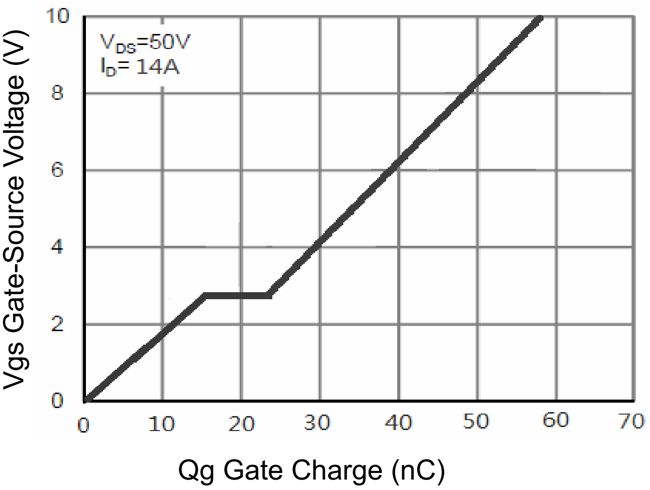


Figure 5 Gate Charge

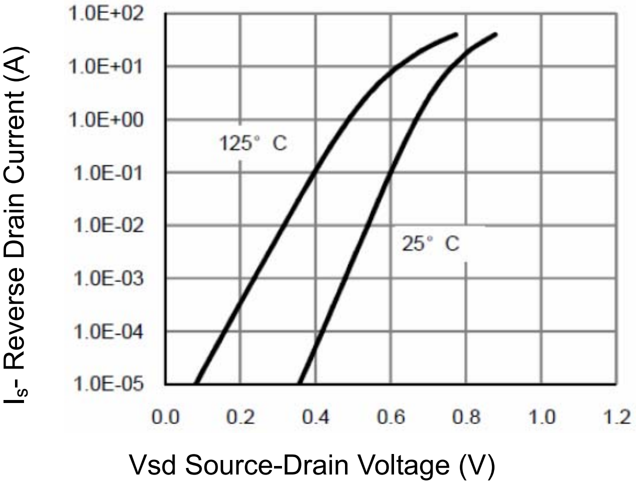


Figure 6 Source- Drain Diode Forward

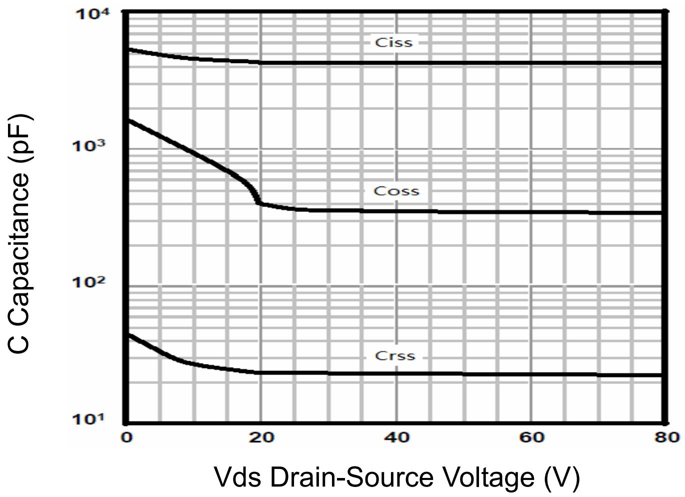


Figure 7 Capacitance vs Vds

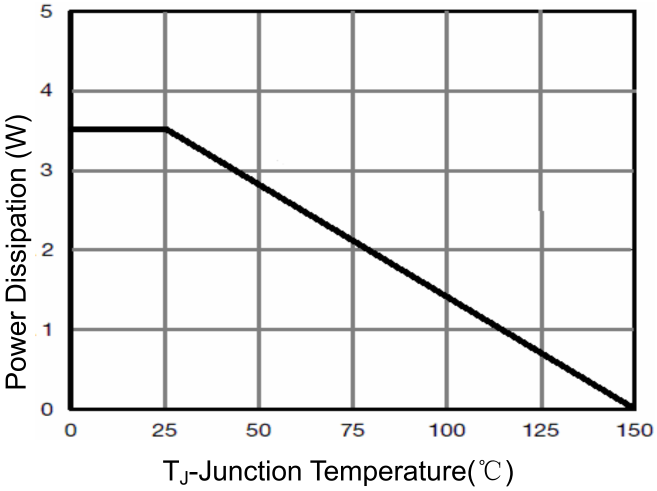


Figure 9 Power De-rating

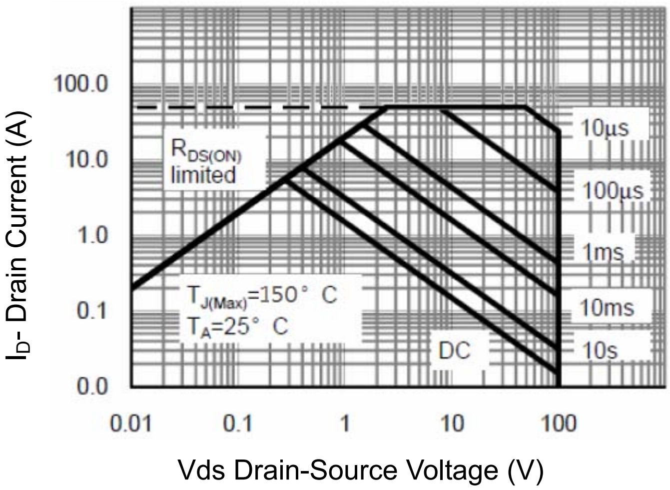


Figure 8 Safe Operation Area

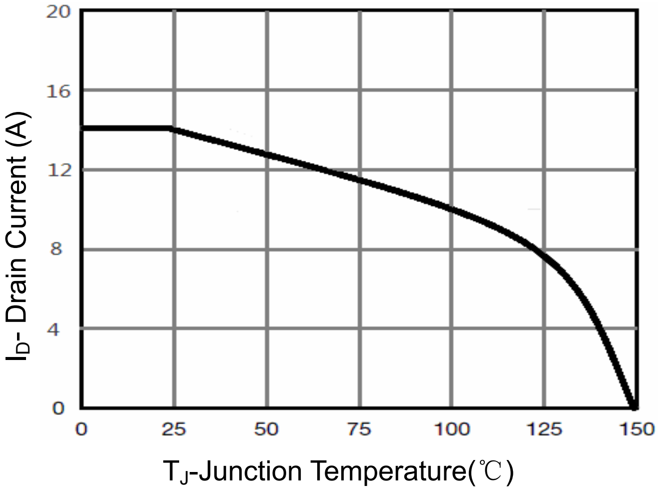


Figure 10 Current De-rating

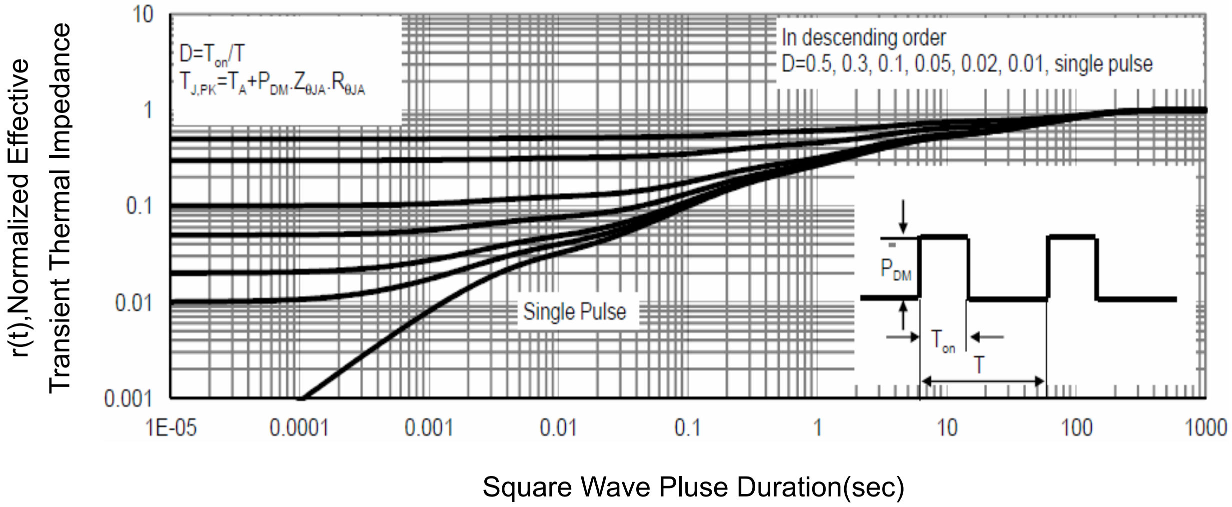
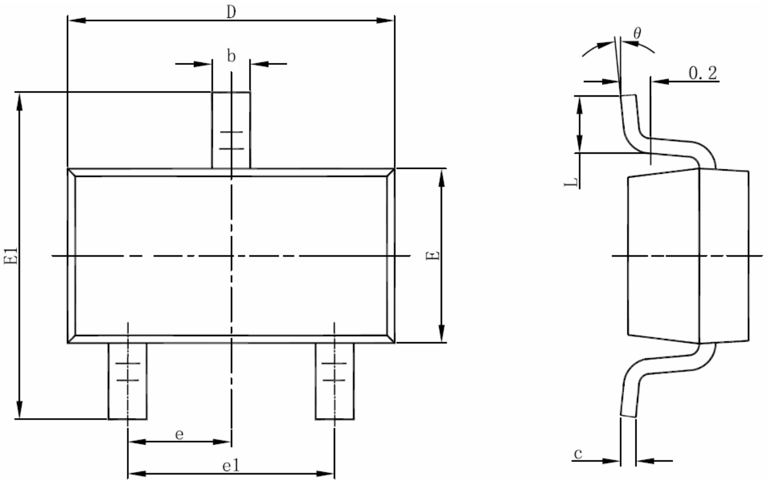
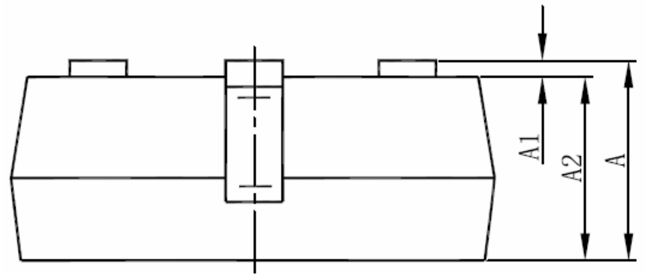


Figure 11 Normalized Maximum Transient Thermal Impedance

SOT-23-3L PACKAGE INFORMATION





Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

NOTES

1. All dimensions are in millimeters.
2. Tolerance ±0.10mm (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.