

HM740 / HM740F

400V N-Channel MOSFET

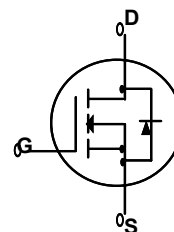
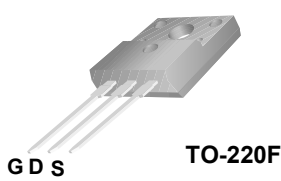
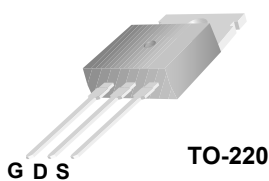
General Description

This Power MOSFET is produced using SL semi's advanced planar stripe DMOS technology.

This advanced technology 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, active power factor correction based on half bridge topology.

Features

- 10.5A, 400V, $R_{DS(on)} = 0.55\Omega$ @ $V_{GS} = 10V$
- Low gate charge (typical 30nC)
- Fast switching
- 100% avalanche tested
- Improved dv/dt capability



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	HM740	HM740F	Units
V_{DSS}	Drain-Source Voltage	400		V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	10.5	10.5*	A
	- Continuous ($T_C = 100^\circ\text{C}$)	6.6	6.6 *	A
I_{DM}	Drain Current - Pulsed (Note 1)	42	42 *	A
V_{GSS}	Gate-Source Voltage	± 30		V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	378		mJ
E_{AR}	Repetitive Avalanche Energy (Note 1)	13.9		mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	4.5		V/ns
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	139	45.5	W
	- Derate above 25°C	1.11	0.36	W/ $^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150		$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300		$^\circ\text{C}$

* Drain current limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	HM740	HM740F	Units
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.90	2.75	$^\circ\text{C}/\text{W}$
$R_{\theta CS}$	Thermal Resistance, Case-to-Sink Typ.	0.5	--	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	62.5	$^\circ\text{C}/\text{W}$

Electrical Characteristics

$T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	400	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C	--	0.6	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	μA
		$V_{DS} = 320\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	2.0	--	4.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 5.25\text{ A}$	--	0.43	0.55	Ω

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	870	--	pF
C_{oss}	Output Capacitance		--	250	--	pF
C_{rss}	Reverse Transfer Capacitance		--	85	--	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 200\text{ V}, I_D = 10.5\text{ A},$ $R_G = 25\text{ }\Omega$ (Note 4, 5)	--	15	--	ns
t_r	Turn-On Rise Time		--	90	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	80	--	ns
t_f	Turn-Off Fall Time		--	80	--	ns
Q_g	Total Gate Charge	$V_{DS} = 320\text{ V}, I_D = 10.5\text{ A},$ $V_{GS} = 10\text{ V}$ (Note 4, 5)	--	30	-	nC
Q_{gs}	Gate-Source Charge		--	4.0	--	nC
Q_{gd}	Gate-Drain Charge		--	15	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I _S	Maximum Continuous Drain-Source Diode Forward Current		--	--	10.5	A
I _{SM}	Maximum Pulsed Drain-Source Diode Forward Current		--	--	42.0	A
V _{SD}	Drain-Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 10.5 A	--	--	1.5	V
t _{rr}	Reverse Recovery Time	V _{GS} = 0 V, I _S = 10.5 A,	--	300	--	ns
Q _{rr}	Reverse Recovery Charge	di _F / dt = 100 A/μs (Note 4)	--	2.5	--	μC

Notes:

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2. $L = 6\text{ mH}, I_{AS} = 10.5\text{ A}, V_{DD} = 50\text{ V}, R_G = 25\text{ }\Omega$, Starting $T_J = 25^\circ\text{C}$
3. $I_{SD} \leq 10.5\text{ A}, di/dt \leq 200\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS}$, Starting $T_J = 25^\circ\text{C}$
4. Pulse Test : Pulse width $\leq 300\mu\text{s}$, Duty cycle $\leq 2\%$
5. Essentially independent of operating temperature

Typical Characteristics

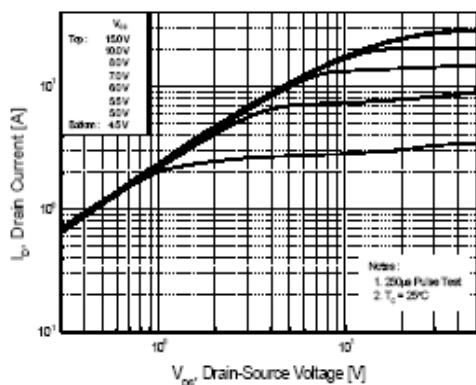


Figure 1. On-Region Characteristics

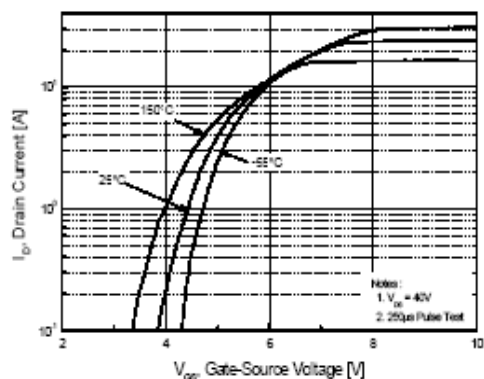


Figure 2. Transfer Characteristics

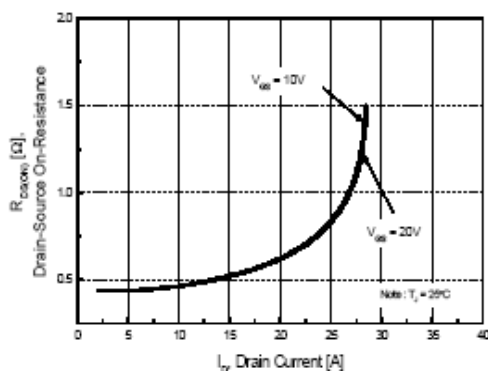


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

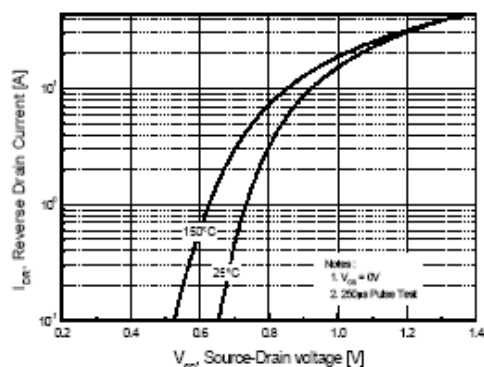


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

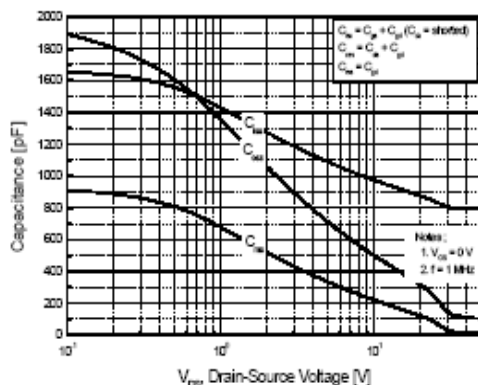


Figure 5. Capacitance Characteristics

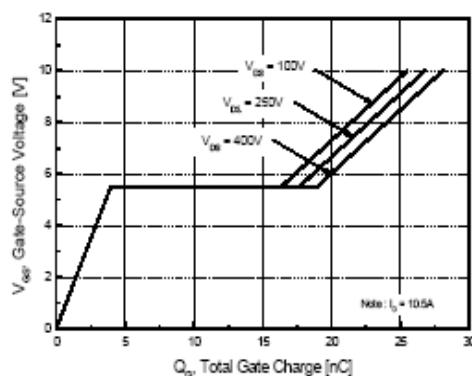


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

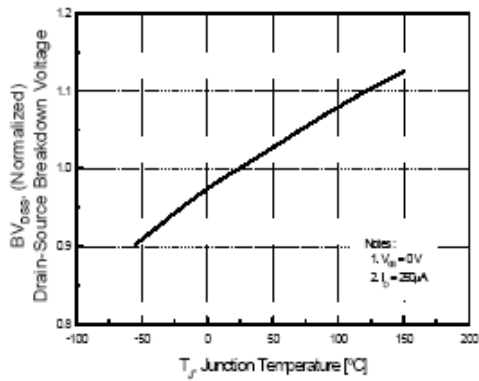


Figure 7. Breakdown Voltage Variation vs Temperature

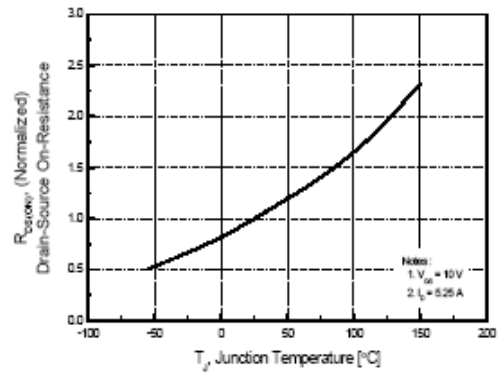


Figure 8. On-Resistance Variation vs Temperature

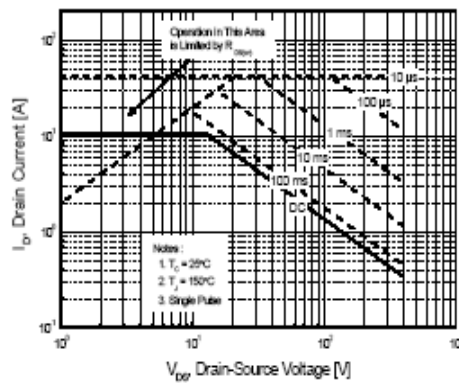


Figure 9-1. Maximum Safe Operating Area for HM740

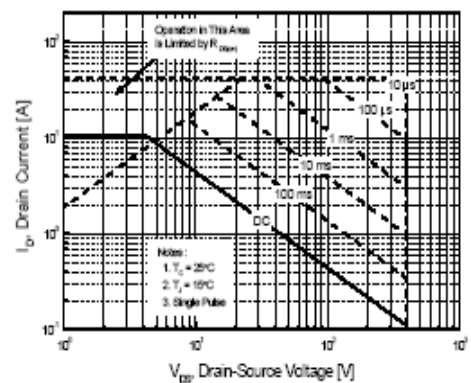


Figure 9-2. Maximum Safe Operating Area for HM740F

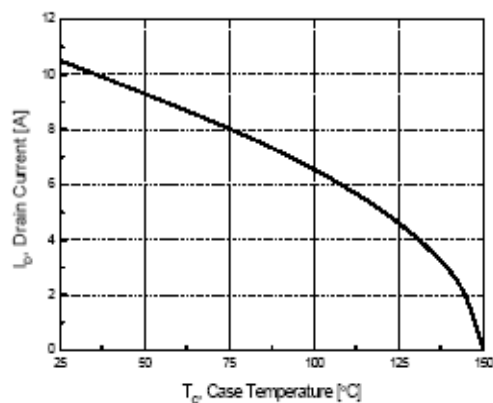


Figure 10. Maximum Drain Current vs Case Temperature

Typical Characteristics (Continued)

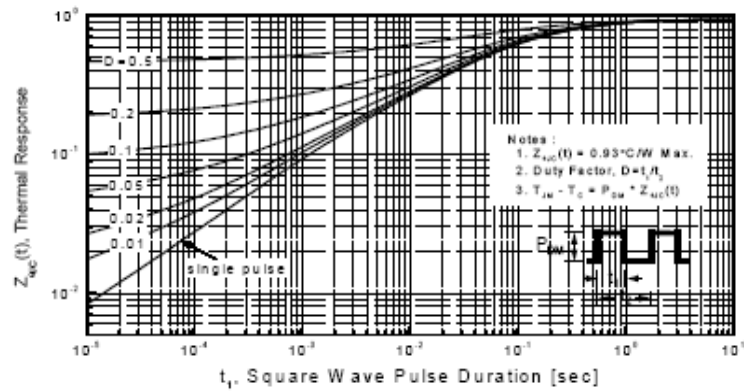


Figure 11-1. Transient Thermal Response Curve
for HM740

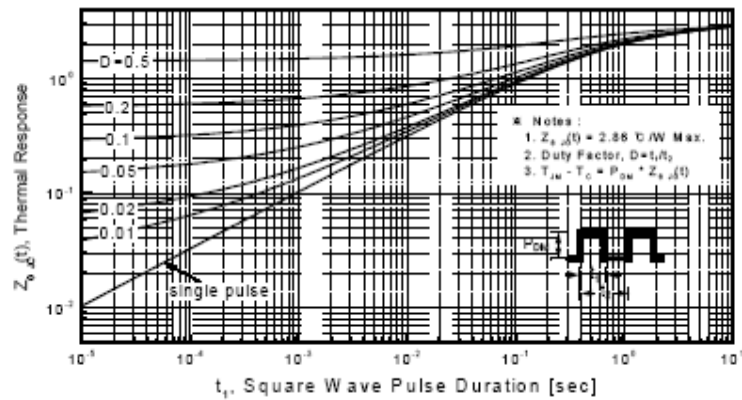
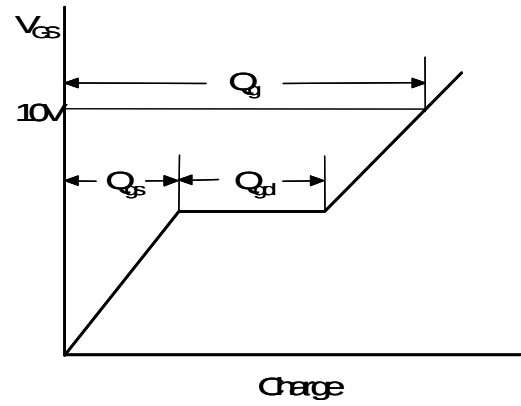
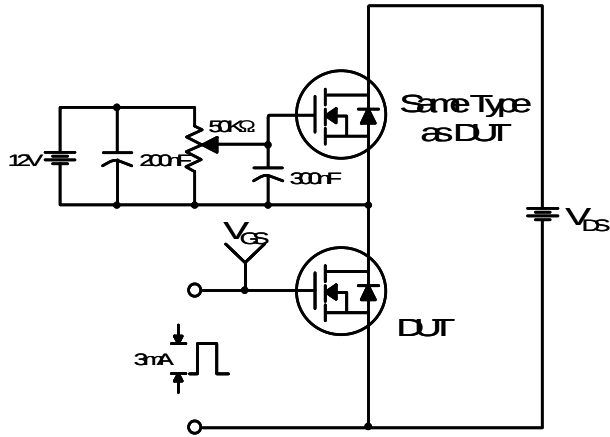
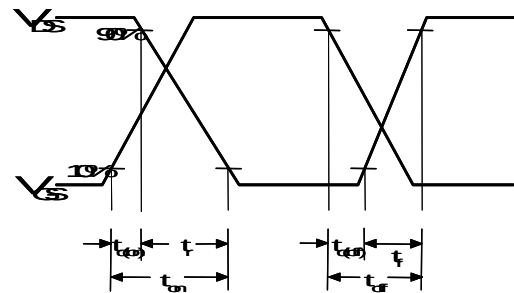
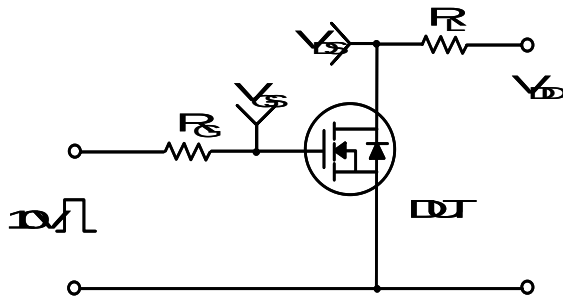


Figure 11-2. Transient Thermal Response Curve
for HM740F

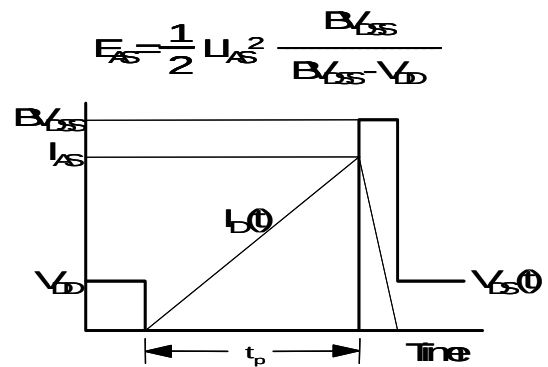
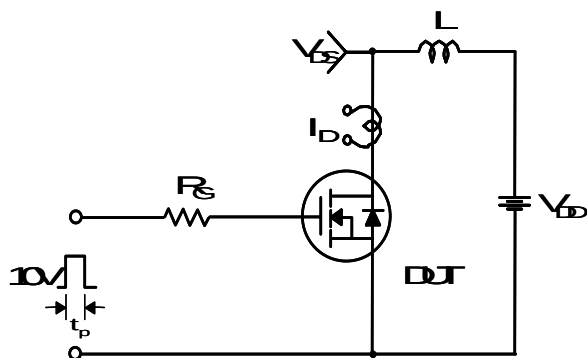
Gate Charge Test Circuit & Waveform



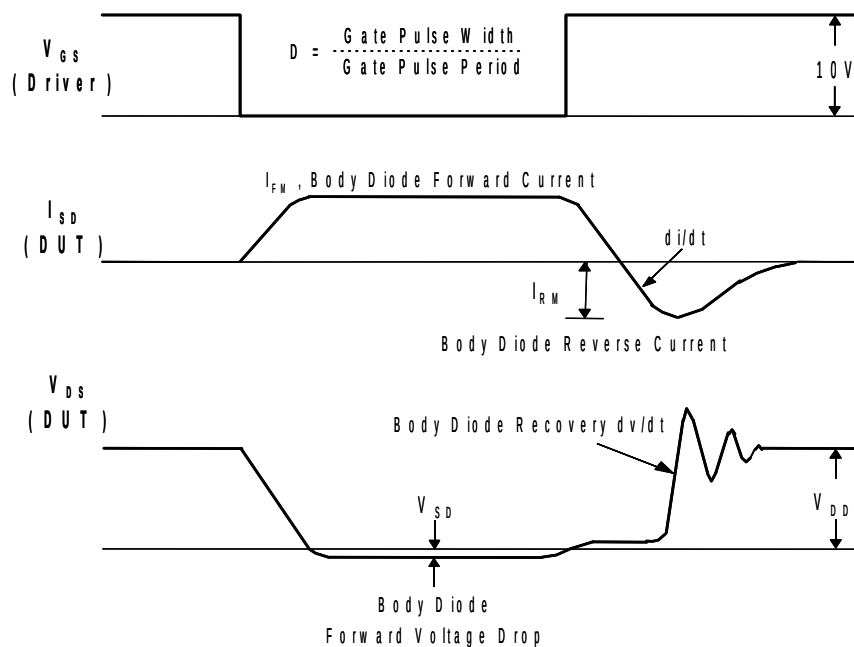
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms



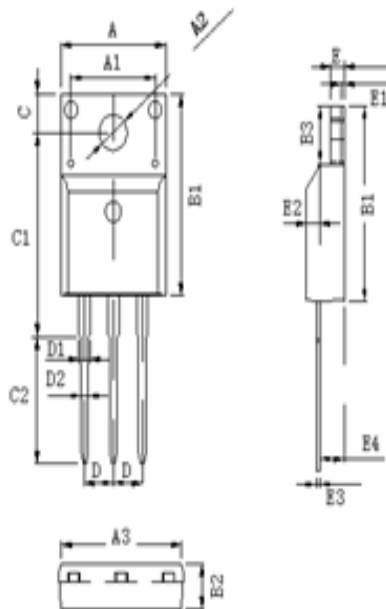
The diagram illustrates a voltage divider circuit for a Device Under Test (DUT). The DUT is connected in series with a MOSFET driver. The driver consists of a MOSFET, a gate resistor R_G , and a gate voltage source V_{GS} . The DUT is connected to the drain of the MOSFET. The source of the MOSFET is connected to ground. The gate of the MOSFET is connected to V_{GS} through R_G . The drain of the MOSFET is connected to the DUT. The DUT is connected to the source of the MOSFET. The DUT is labeled DUT. The MOSFET is labeled Driver. The gate resistor is labeled R_G . The gate voltage source is labeled V_{GS} . The drain voltage is labeled V_{DS} . The source current is labeled I_{SD} . The inductor is labeled L. The output voltage is labeled V_{DD} . The circuit is controlled by dv/dt controlled by R_G and I_{SD} controlled by pulse period.



Package Dimensions

TO-220F

TO-220F 外形尺寸图



DIM.	MILLIMETERS	
A	10.03 ± 0.20	
A1	7.00	
A2	3.12 ± 0.10	
A3	9.70 ± 0.20	
B1	15.75 ± 0.20	
B2	4.72 ± 0.20	
B3	6.70 ± 0.20	
C	3.30 ± 0.10	
C1	15.80 ± 0.20	
C2	9.80 ± 0.2	
D	Typical 2.54	
D1	1.47 (MAX)	
D2	0.80 ± 0.10	
E	2.55 ± 0.20	
E1	0.70	
E2	1.00 × 45°	
E3	0.50	+0.1
		-0.05
E4	2.80 ± 0.20	