

ON Semiconductor

Is Now

onsemi™

To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and **onsemi** and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi** product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.



N-Channel UltraFET Power MOSFET 55 V, 75 A, 8 mΩ

These N-Channel power MOSFETs are manufactured using the innovative UltraFET process. This advanced process technology achieves the lowest possible on-resistance per silicon area, resulting in outstanding performance. This device is capable of withstanding high energy in the avalanche mode and the diode exhibits very low reverse recovery time and stored charge. It was designed for use in applications where power efficiency is important, such as switching regulators, switching converters, motor drivers, relay drivers, low-voltage bus switches, and power management in portable and battery-operated products.

Formerly developmental type TA75344.

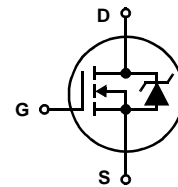
Ordering Information

PART NUMBER	PACKAGE	BRAND
HUF75344G3	TO-247	75344G
HUF75344P3	TO-220AB	75344P

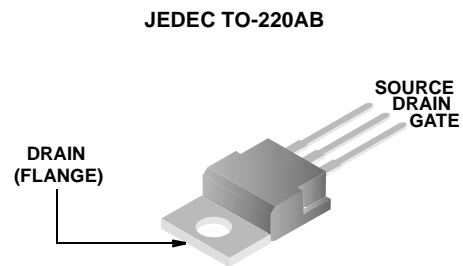
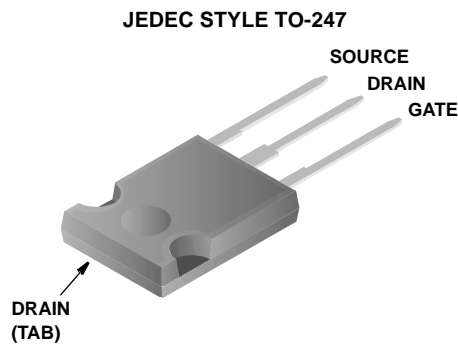
Features

- 75A, 55V
- Simulation Models
 - Temperature Compensated PSPICE® and SABER™ Models
 - Thermal Impedance PSPICE and SABER Models Available on the web at: www.fairchildsemi.com
- Peak Current vs Pulse Width Curve
- UIS Rating Curve
- Related Literature
 - TB334, "Guidelines for Soldering Surface Mount Components to PC Boards"

Symbol



Packaging



All ON Semiconductor products are manufactured, assembled and tested under ISO9000 and QS9000 quality systems certification.

HUF75344G3, HUF75344P3

Absolute Maximum Ratings $T_C = 25^{\circ}\text{C}$, Unless Otherwise Specified

			UNITS
Drain to Source Voltage (Note 1)	V_{DSS}	55	V
Drain to Gate Voltage ($R_{GS} = 20\text{k}\Omega$) (Note 1)	V_{DGR}	55	V
Gate to Source Voltage	V_{GS}	± 20	V
Drain Current			
Continuous (Figure 2)	I_D	75	A
Pulsed Drain Current	I_{DM}	Figure 4	
Pulsed Avalanche Rating	E_{AS}	Figure 6	
Power Dissipation	P_D	285	W
Derate Above 25°C		1.90	W/ $^{\circ}\text{C}$
Operating and Storage Temperature	T_J, T_{STG}	-55 to 175	$^{\circ}\text{C}$
Maximum Temperature for Soldering			
Leads at 0.063in (1.6mm) from Case for 10s	T_L	300	$^{\circ}\text{C}$
Package Body for 10s, See Techbrief 334	T_{pkg}	260	$^{\circ}\text{C}$

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTE:

- $T_J = 25^{\circ}\text{C}$ to 150°C .

Electrical Specifications $T_C = 25^{\circ}\text{C}$, Unless Otherwise Specified

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS	
OFF STATE SPECIFICATIONS							
Drain to Source Breakdown Voltage	BV_{DSS}	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$ (Figure 11)	55	-	-	V	
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 50\text{V}, V_{GS} = 0\text{V}$	-	-	1	μA	
		$V_{DS} = 45\text{V}, V_{GS} = 0\text{V}, T_C = 150^{\circ}\text{C}$	-	-	250	μA	
Gate to Source Leakage Current	I_{GSS}	$V_{GS} = \pm 20\text{V}$	-	-	± 100	nA	
ON STATE SPECIFICATIONS							
Gate to Source Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$ (Figure 10)	2	-	4	V	
Drain to Source On Resistance	$r_{DS(ON)}$	$I_D = 75\text{A}, V_{GS} = 10\text{V}$ (Figure 9)	-	6.5	8.0	m Ω	
THERMAL SPECIFICATIONS							
Thermal Resistance Junction to Case	$R_{\theta JC}$	(Figure 3)	-	-	0.52	$^{\circ}\text{C}/\text{W}$	
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	TO-247	-	-	30	$^{\circ}\text{C}/\text{W}$	
		TO-220	-	-	62	$^{\circ}\text{C}/\text{W}$	
SWITCHING SPECIFICATIONS ($V_{GS} = 10\text{V}$)							
Turn-On Time	t_{ON}	$V_{DD} = 30\text{V}, I_D \cong 75\text{A},$ $R_L = 0.4\Omega, V_{GS} = 10\text{V},$ $R_{GS} = 3.0\Omega$	-	-	187	ns	
Turn-On Delay Time	$t_{d(ON)}$		-	13	-	ns	
Rise Time	t_r		-	125	-	ns	
Turn-Off Delay Time	$t_{d(OFF)}$		-	46	-	ns	
Fall Time	t_f		-	57	-	ns	
Turn-Off Time	t_{OFF}		-	-	147	ns	
GATE CHARGE SPECIFICATIONS							
Total Gate Charge	$Q_{g(TOT)}$	$V_{GS} = 0\text{V}$ to 20V	$V_{DD} = 30\text{V},$ $I_D \cong 75\text{A},$ $R_L = 0.4\Omega$ $I_{g(REF)} = 1.0\text{mA}$ (Figure 13)	-	175	210	nC
Gate Charge at 10V	$Q_{g(10)}$	$V_{GS} = 0\text{V}$ to 10V		-	90	108	nC
Threshold Gate Charge	$Q_{g(TH)}$	$V_{GS} = 0\text{V}$ to 2V		-	5.9	7.0	nC
Gate to Source Gate Charge	Q_{gs}			-	14	-	nC
Reverse Transfer Capacitance	Q_{gd}			-	39	-	nC
CAPACITANCE SPECIFICATIONS							
Input Capacitance	C_{ISS}	$V_{DS} = 25\text{V}, V_{GS} = 0\text{V},$ $f = 1\text{MHz}$ (Figure 12)	-	3200	-	pF	
Output Capacitance	C_{OSS}		-	1170	-	pF	
Reverse Transfer Capacitance	C_{RSS}		-	310	-	pF	

Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Source to Drain Diode Voltage	V_{SD}	$I_{SD} = 75A$	-	-	1.25	V
Reverse Recovery Time	t_{rr}	$I_{SD} = 75A, di_{SD}/dt = 100A/\mu s$	-	-	105	ns
Reverse Recovered Charge	Q_{RR}	$I_{SD} = 75A, di_{SD}/dt = 100A/\mu s$	-	-	210	nC

Typical Performance Curves

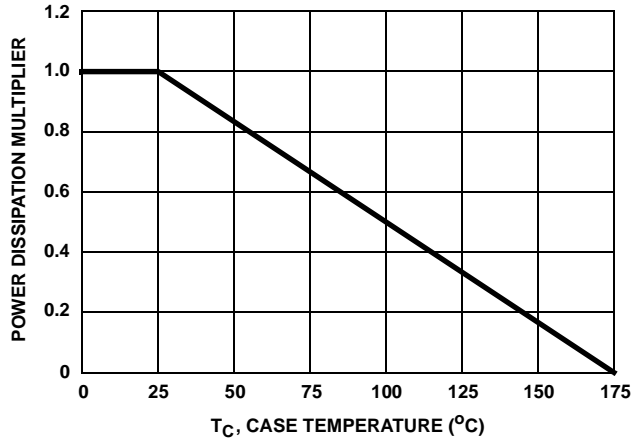


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

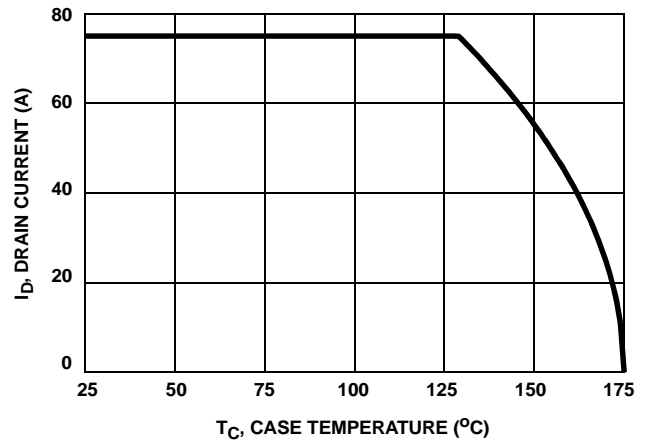


FIGURE 2. MAXIMUM CONTINUOUS DRAIN CURRENT vs CASE TEMPERATURE

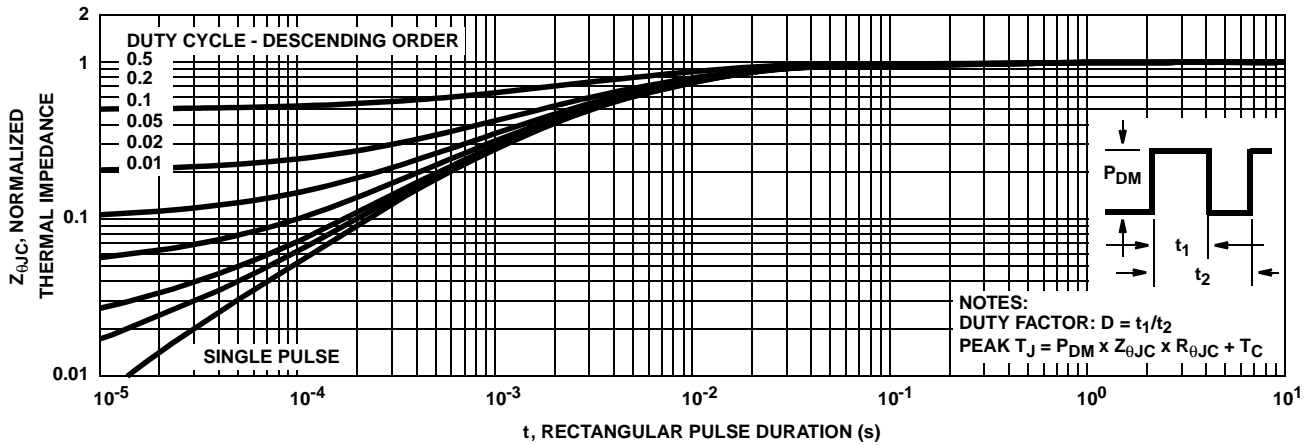


FIGURE 3. NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

Typical Performance Curves (Continued)

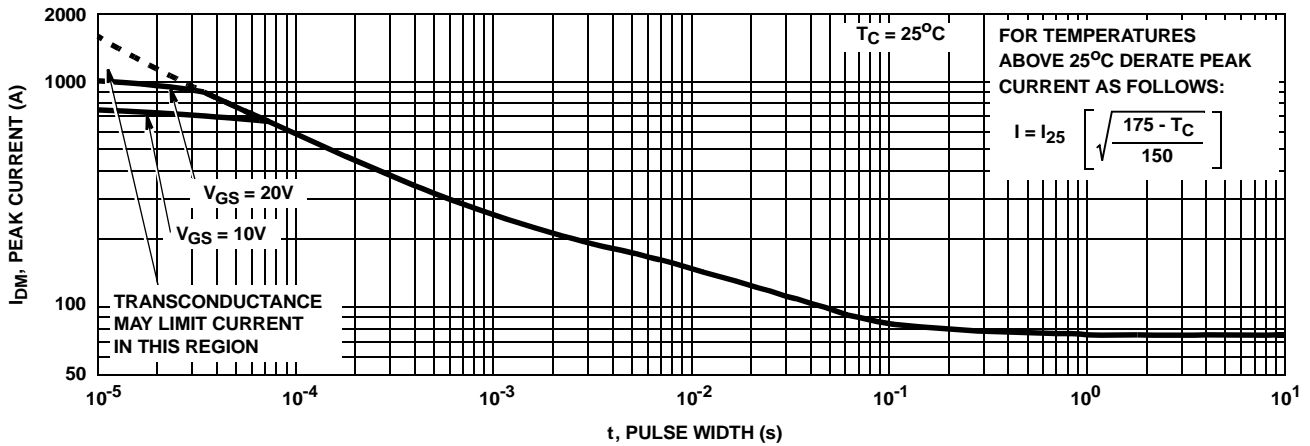


FIGURE 4. PEAK CURRENT CAPABILITY

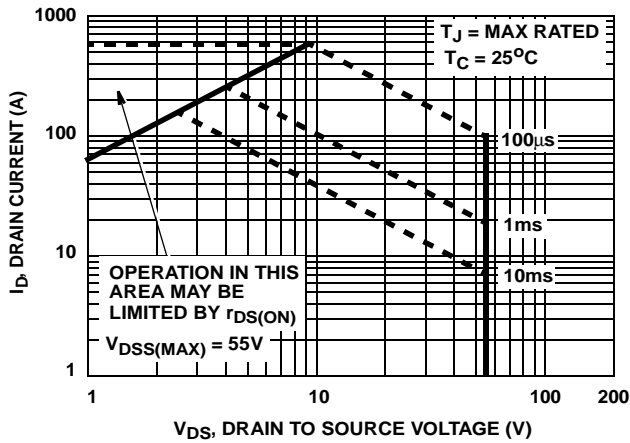
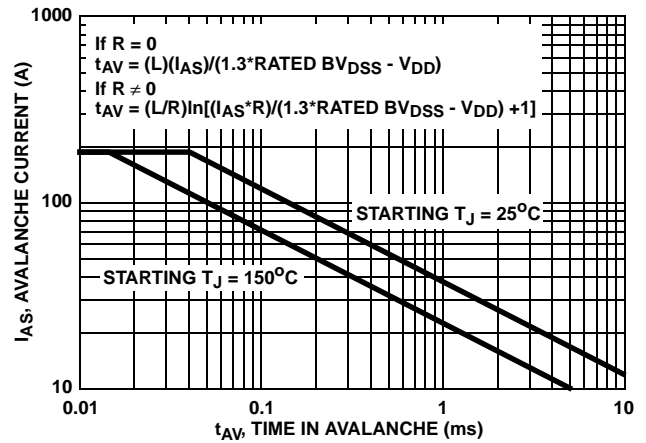


FIGURE 5. FORWARD BIAS SAFE OPERATING AREA



NOTE: Refer to ON Semiconductor Application Notes AN9321 and AN9322.

FIGURE 6. UNCLAMPED INDUCTIVE SWITCHING CAPABILITY

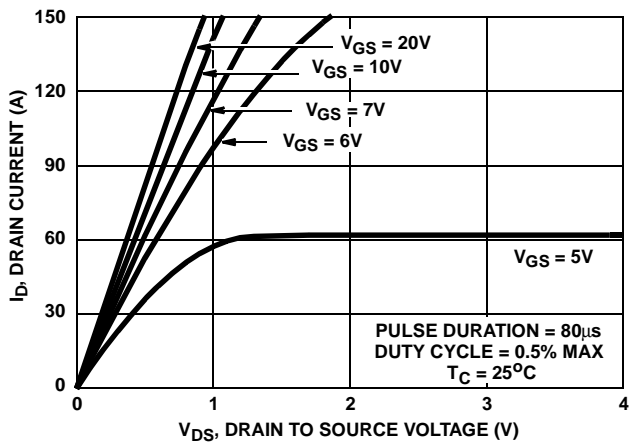


FIGURE 7. SATURATION CHARACTERISTICS

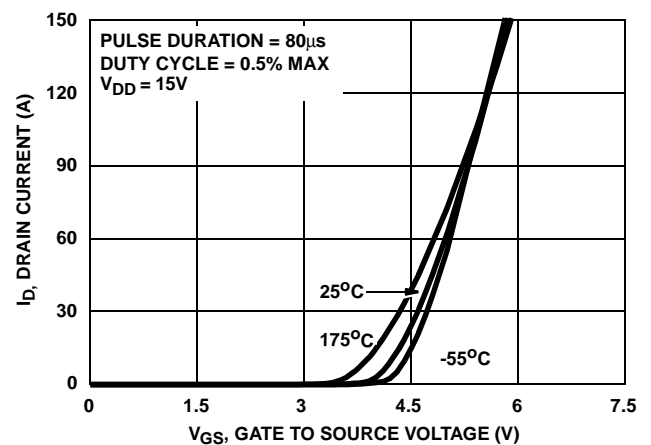


FIGURE 8. TRANSFER CHARACTERISTICS

Typical Performance Curves (Continued)

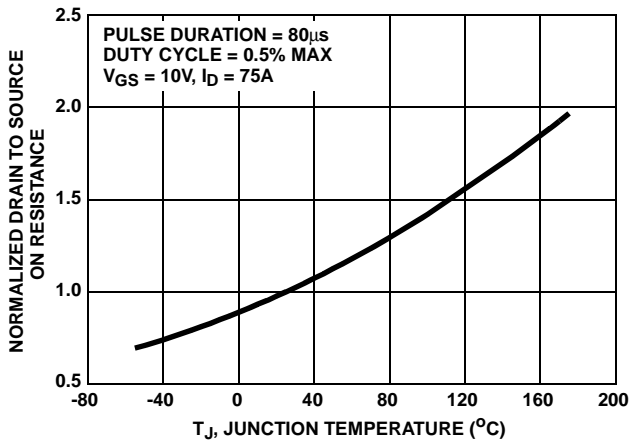


FIGURE 9. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

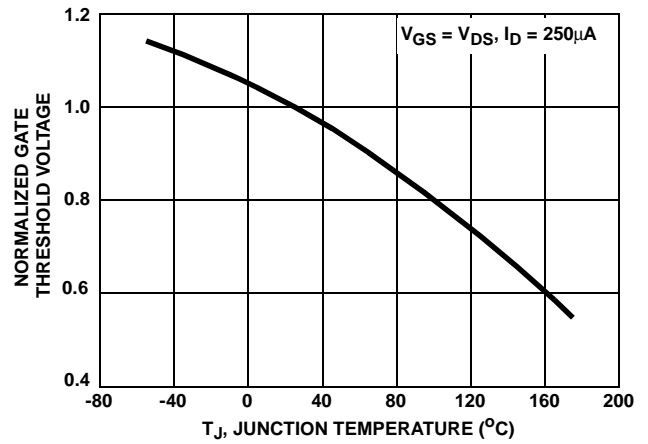


FIGURE 10. NORMALIZED GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

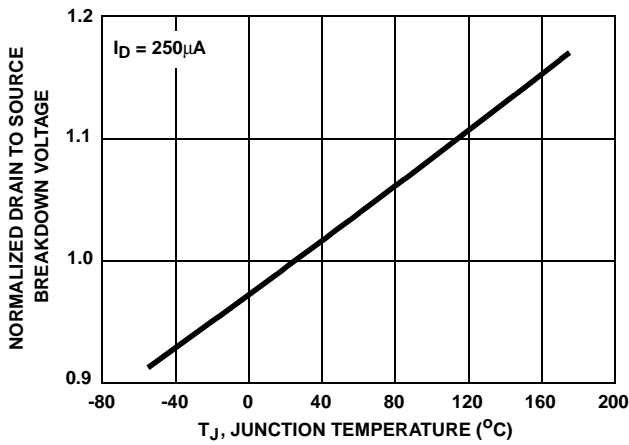


FIGURE 11. NORMALIZED DRAIN TO SOURCE BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE

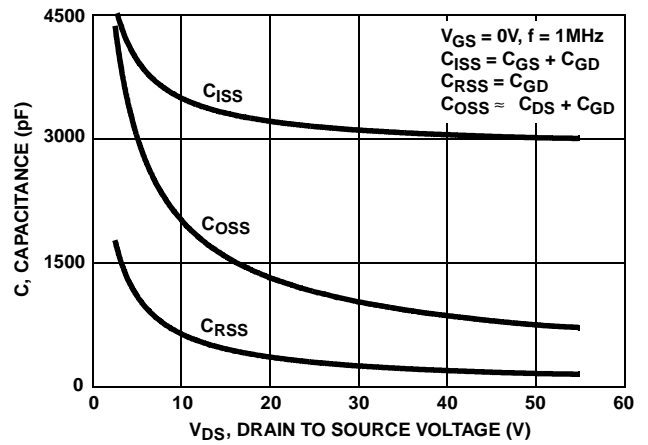
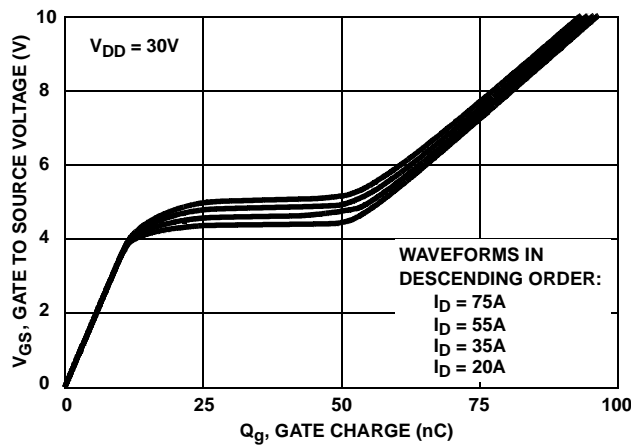


FIGURE 12. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE



NOTE: Refer to ON Semiconductor Application Notes AN7254 and AN7260.
 FIGURE 13. GATE CHARGE WAVEFORMS FOR CONSTANT GATE CURRENT

Test Circuits and Waveforms

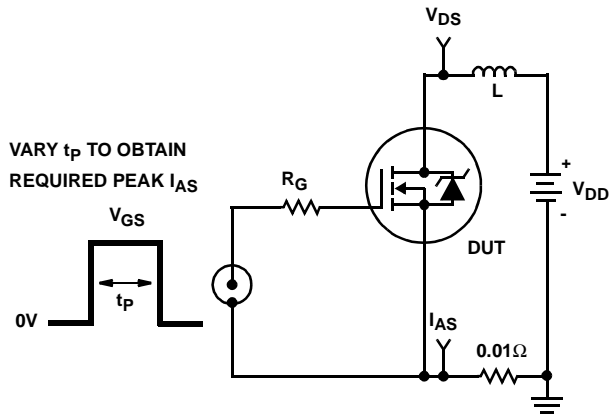


FIGURE 14. UNCLAMPED ENERGY TEST CIRCUIT

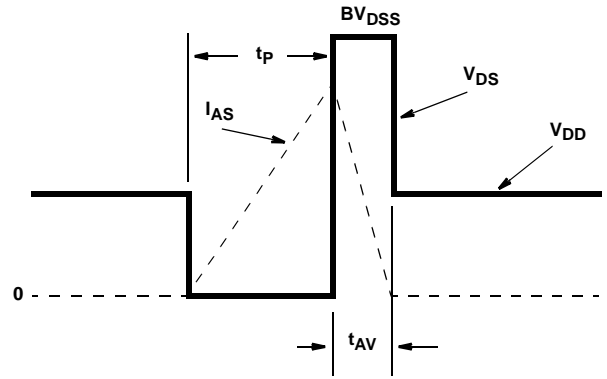


FIGURE 15. UNCLAMPED ENERGY WAVEFORMS

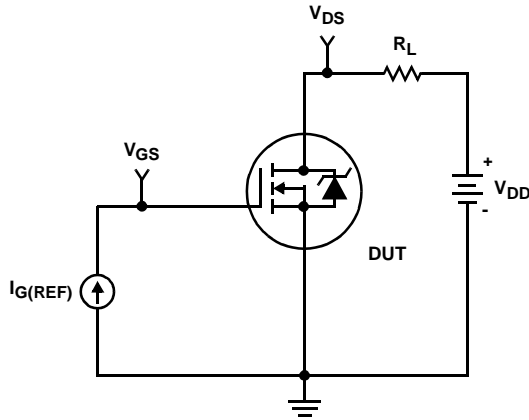


FIGURE 16. GATE CHARGE TEST CIRCUIT

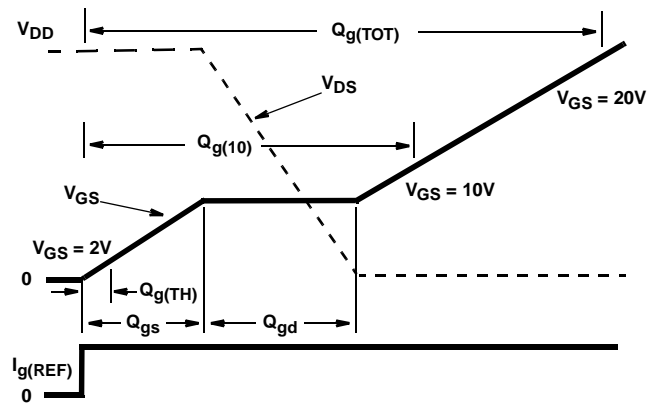


FIGURE 17. GATE CHARGE WAVEFORM

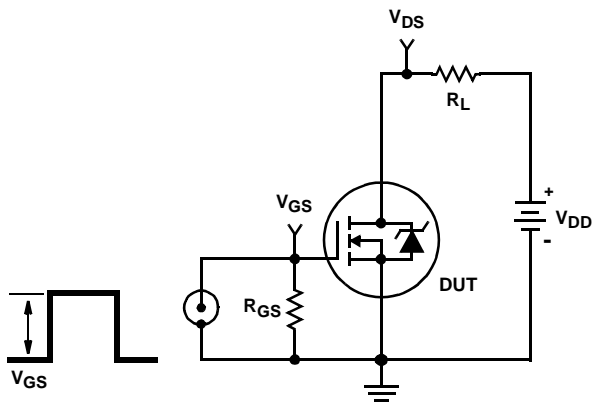


FIGURE 18. SWITCHING TIME TEST CIRCUIT

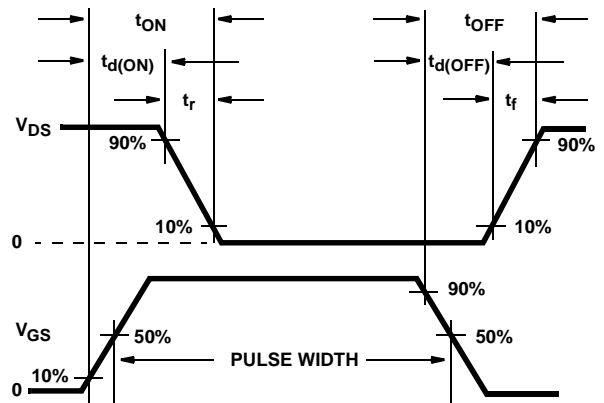


FIGURE 19. RESISTIVE SWITCHING WAVEFORMS

HUF75344G3, HUF75344P3

PSPICE Electrical Model

.SUBCKT HUF75337 2 1 3 ; rev 3 Feb 1999

CA 12 8 4.9e-9
 CB 15 14 4.75e-9
 CIN 6 8 2.85e-9

DBODY 7 5 DBODYMOD
 DBREAK 5 11 DBREAKMOD
 DPLCAP 10 5 DPLCAPMOD

EBREAK 11 7 17 18 59.7
 EDS 14 8 5 8 1
 EGS 13 8 6 8 1
 ESG 6 10 6 8 1
 EVTHRES 6 21 19 8 1
 EVTEMP 20 6 18 22 1

IT 8 17 1

LDRAIN 2 5 1e-9
 LGATE 1 9 2.6e-9
 LSOURCE 3 7 1.1e-9
 KGATE LSOURCE LGATE 0.0085

MMED 16 6 8 8 MMEDMOD
 MSTRO 16 6 8 8 MSTROMOD
 MWEAK 16 21 8 8 MWEAKMOD

RBREAK 17 18 RBREAKMOD 1
 RDRAIN 50 16 RDRAINMOD 1.94e-3
 RGATE 9 20 0.36
 RLDRAIN 2 5 10
 RLGATE 1 9 26
 RLSOURCE 3 7 11
 RSLC1 5 51 RSLCMOD 1e-6
 RSLC2 5 50 1e3
 RSOURCE 8 7 RSOURCEMOD 3.5e-3
 RVTHRES 22 8 RVTHRESMOD 1
 RVTEMP 18 19 RVTEMPMOD 1

S1A 6 12 13 8 S1AMOD
 S1B 13 12 13 8 S1BMOD
 S2A 6 15 14 13 S2AMOD
 S2B 13 15 14 13 S2BMOD

VBAT 22 19 DC 1

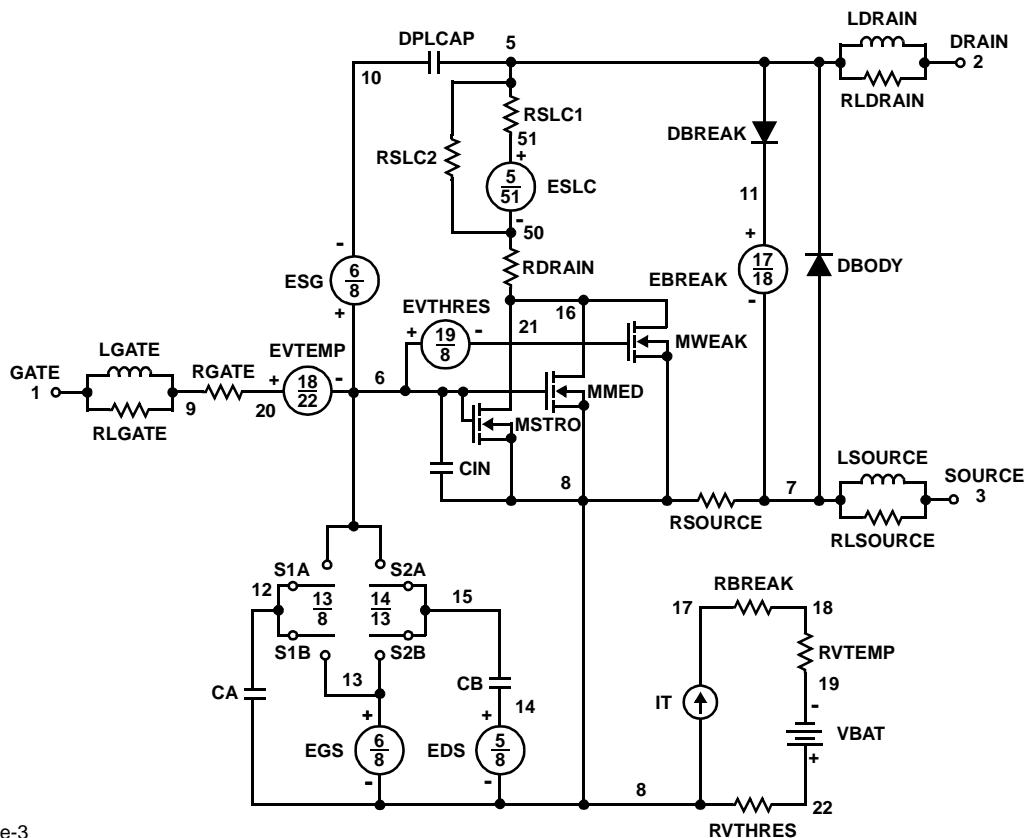
ESLC 51 50 VALUE={(V(5,51)/ABS(V(5,51)))*(PWR(V(5,51))/(1e-6*400),3))}

.MODEL DBODYMOD D (IS = 2.95e-12 RS = 2.6e-3 TRS1 = 1.05e-3 TRS2 = 5.0e-7 CJO = 5.19e-9 TT = 5.9e-8 M = 0.55)
 .MODEL DBREAKMOD D (RS = 1.65e-1 IKF = 30 TRS1 = 1.15e-4 TRS2 = 2.27e-6)
 .MODEL DPLCAPMOD D (CJO = 5.40e-9 IS = 1e-30 N=1 M = 0.88)
 .MODEL MMEDMOD NMOS (VTO = 3.29 KP = 5.5 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u RG = 0.36)
 .MODEL MSTROMOD NMOS (VTO = 3.83 KP = 123 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u)
 .MODEL MWEAKMOD NMOS (VTO = 2.90 KP = 0.04 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u RG = 3.6)
 .MODEL RBREAKMOD RES (TC1 = 1.15e-3 TC2 = 2.0e-7)
 .MODEL RDRAINMOD RES (TC1 = 1.37e-2 TC2 = 3.85e-5)
 .MODEL RSLCMOD RES (TC1 = 1.45e-4 TC2 = 2.11e-6)
 .MODEL RSOURCEMOD RES (TC1 = 0 TC2 = 0)
 .MODEL RVTHRESMOD RES (TC1 = -3.7e-3 TC2 = -1.6e-5)
 .MODEL RVTEMPMOD RES (TC1 = -2.4e-3 TC2 = 7e-7)

.MODEL S1AMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -6.9 VOFF= -3.9)
 .MODEL S1BMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -3.9 VOFF= -6.9)
 .MODEL S2AMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -2.99 VOFF= 2.39)
 .MODEL S2BMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = 2.39 VOFF= -2.99)

.ENDS

NOTE: For further discussion of the PSPICE model, consult **A New PSPICE Sub-Circuit for the Power MOSFET Featuring Global Temperature Options**; IEEE Power Electronics Specialist Conference Records, 1991, written by William J. Hepp and C. Frank Wheatley.



SPICE Thermal Model

REV 5 February 1999

HUF75344

CTHERM1 th 6 5.0e-3
 CTHERM2 6 5 1.0e-2
 CTHERM3 5 4 1.3e-2
 CTHERM4 4 3 1.5e-2
 CTHERM5 3 2 2.2e-2
 CTHERM6 2 tl 8.5e-2

RTHERM1 th 6 6.0e-4
 RTHERM2 6 5 3.5e-3
 RTHERM3 5 4 2.5e-2
 RTHERM4 4 3 4.8e-2
 RTHERM5 3 2 1.6e-1
 RTHERM6 2 tl 1.8e-1

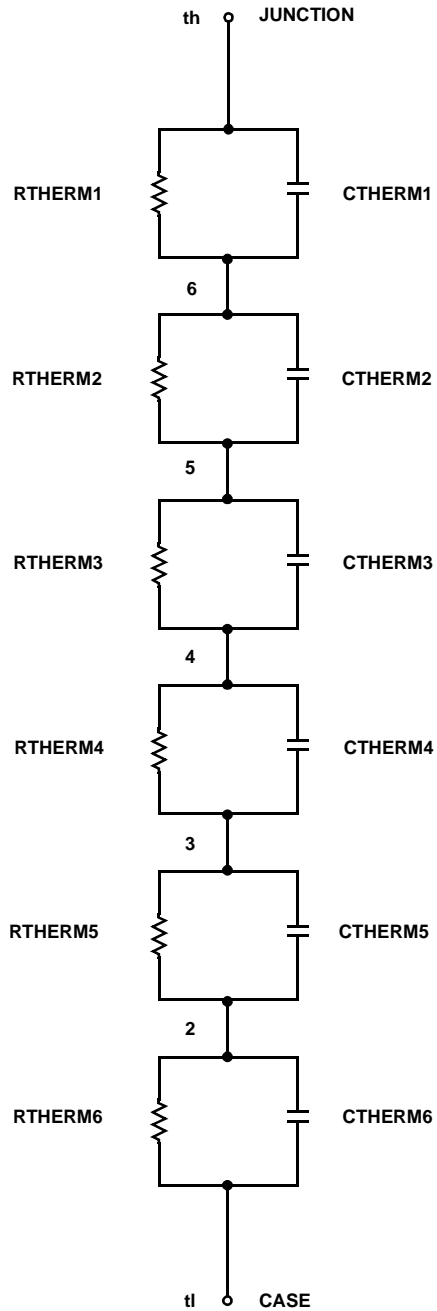
SABER Thermal Model

SABER thermal model HUF75344

template thermal_model th tl
 thermal_c th, tl

```
{
ctherm.ctherm1 th 6 = 5.0e-3
ctherm.ctherm2 6 5 = 1.0e-2
ctherm.ctherm3 5 4 = 1.3e-2
ctherm.ctherm4 4 3 = 1.5e-2
ctherm.ctherm5 3 2 = 2.2e-2
ctherm.ctherm6 2 tl = 5.5e-2
```

```
rtherm.rtherm1 th 6 = 6.0e-4
rtherm.rtherm2 6 5 = 3.5e-3
rtherm.rtherm3 5 4 = 2.5e-2
rtherm.rtherm4 4 3 = 4.8e-2
rtherm.rtherm5 3 2 = 1.6e-1
rtherm.rtherm6 2 tl = 1.8e-1
}
```



ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local
Sales Representative