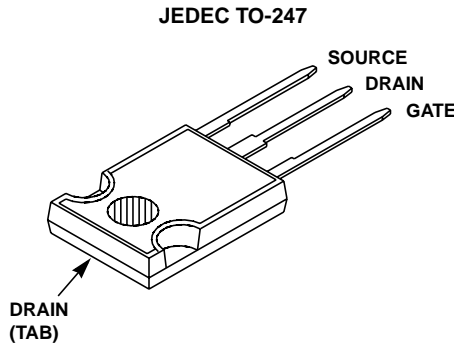
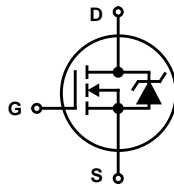


**75A, 150V, 0.016 Ohm, N-Channel,  
UltraFET Power MOSFET**

**Packaging**



**Symbol**



**Features**

- Ultra Low On-Resistance
  - $r_{DS(ON)} = 0.016\Omega$ ,  $V_{GS} = 10V$
- Simulation Models
  - Temperature Compensated PSPICE<sup>TM</sup> and SABER<sup>®</sup> Electrical Models
  - Spice and SABER<sup>®</sup> Thermal Impedance Models
  - www.intersil.com
- Peak Current vs Pulse Width Curve
- UIS Rating Curve

**Ordering Information**

PART NUMBER	PACKAGE	BRAND
HUF75852G3	TO-247	75852G

**Absolute Maximum Ratings**  $T_C = 25^\circ C$ , Unless Otherwise Specified

	HUF75852G3	UNITS
Drain to Source Voltage (Note 1) . . . . .	$V_{DSS}$ 150	V
Drain to Gate Voltage ( $R_{GS} = 20k\Omega$ ) (Note 1) . . . . .	$V_{DGR}$ 150	V
Gate to Source Voltage . . . . .	$V_{GS}$ $\pm 20$	V
Drain Current		
Continuous ( $T_C = 25^\circ C$ , $V_{GS} = 10V$ ) (Figure 2) . . . . .	$I_D$ 75	A
Continuous ( $T_C = 100^\circ C$ , $V_{GS} = 10V$ ) (Figure 2) . . . . .	$I_D$ 75	A
Pulsed Drain Current . . . . .	$I_{DM}$ Figure 4	
Pulsed Avalanche Rating . . . . .	UIS Figures 6, 14, 15	
Power Dissipation . . . . .	$P_D$ 500	W
Derate Above $25^\circ C$ . . . . .	3.33	W/ $^\circ C$
Operating and Storage Temperature . . . . .	$T_J, T_{STG}$ -55 to 175	$^\circ C$
Maximum Temperature for Soldering		
Leads at 0.063in (1.6mm) from Case for 10s . . . . .	$T_L$ 300	$^\circ C$
Package Body for 10s, See Techbrief TB334 . . . . .	$T_{pkg}$ 260	$^\circ C$

**NOTE:**

1.  $T_J = 25^\circ C$  to  $150^\circ C$ .

**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.

# HUF75852G3

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS	
<b>OFF STATE SPECIFICATIONS</b>							
Drain to Source Breakdown Voltage	$BV_{DSS}$	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$ (Figure 11)	150	-	-	V	
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 140\text{V}$ , $V_{GS} = 0\text{V}$	-	-	1	$\mu\text{A}$	
		$V_{DS} = 135\text{V}$ , $V_{GS} = 0\text{V}$ , $T_C = 150^\circ\text{C}$	-	-	250	$\mu\text{A}$	
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA	
<b>ON STATE SPECIFICATIONS</b>							
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)	-	0.013	0.016	W	
<b>THERMAL SPECIFICATIONS</b>							
Thermal Resistance Junction to Case	$R_{\theta JC}$	TO-247	-	-	0.30	$^\circ\text{C/W}$	
Thermal Resistance Junction to Ambient	$R_{\theta JA}$		-	-	30	$^\circ\text{C/W}$	
<b>SWITCHING SPECIFICATIONS (<math>V_{GS} = 10\text{V}</math>)</b>							
Turn-On Time	$t_{ON}$	$V_{DD} = 75\text{V}$ , $I_D = 75\text{A}$ $V_{GS} = 10\text{V}$ , $R_{GS} = 2.0\Omega$ (Figures 18, 19)	-	-	260	ns	
Turn-On Delay Time	$t_{d(ON)}$		-	22	-	ns	
Rise Time	$t_r$		-	151	-	ns	
Turn-Off Delay Time	$t_{d(OFF)}$		-	82	-	ns	
Fall Time	$t_f$		-	107	-	ns	
Turn-Off Time	$t_{OFF}$		-	-	285	ns	
<b>GATE CHARGE SPECIFICATIONS</b>							
Total Gate Charge	$Q_{g(TOT)}$	$V_{GS} = 0\text{V}$ to $20\text{V}$	$V_{DD} = 75\text{V}$ , $I_D = 75\text{A}$ , $I_{g(REF)} = 1.0\text{mA}$ (Figures 13, 16, 17)	-	400	480	nC
Gate Charge at 10V	$Q_{g(10)}$	$V_{GS} = 0\text{V}$ to $10\text{V}$		-	215	260	nC
Threshold Gate Charge	$Q_{g(TH)}$	$V_{GS} = 0\text{V}$ to $2\text{V}$		-	15	17.5	nC
Gate to Source Gate Charge	$Q_{gs}$			-	25	-	nC
Gate to Drain "Miller" Charge	$Q_{gd}$			-	66	-	nC
<b>CAPACITANCE SPECIFICATIONS</b>							
Input Capacitance	$C_{ISS}$	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$ (Figure 12)	-	7690	-	pF	
Output Capacitance	$C_{OSS}$		-	1650	-	pF	
Reverse Transfer Capacitance	$C_{RSS}$		-	535	-	pF	

## Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Source to Drain Diode Voltage	$V_{SD}$	$I_{SD} = 75\text{A}$	-	-	1.25	V
		$I_{SD} = 35\text{A}$	-	-	1.00	V
Reverse Recovery Time	$t_{rr}$	$I_{SD} = 75\text{A}$ , $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	260	ns
Reverse Recovered Charge	$Q_{RR}$	$I_{SD} = 75\text{A}$ , $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	1830	nC

Typical Performance Curves

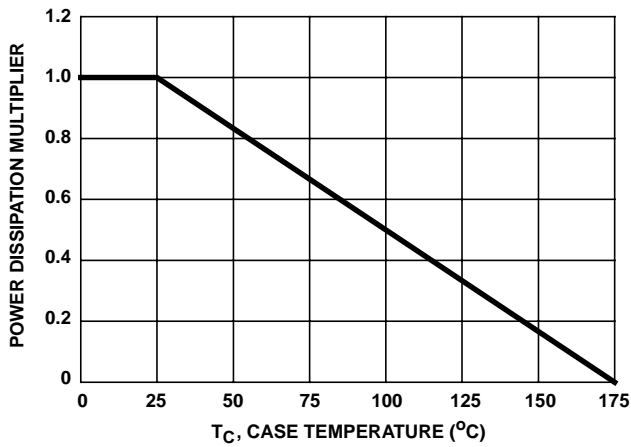


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

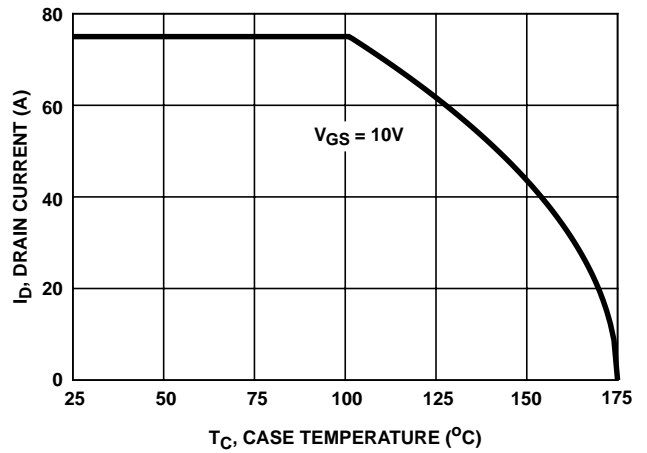


FIGURE 2. MAXIMUM CONTINUOUS DRAIN CURRENT vs CASE TEMPERATURE

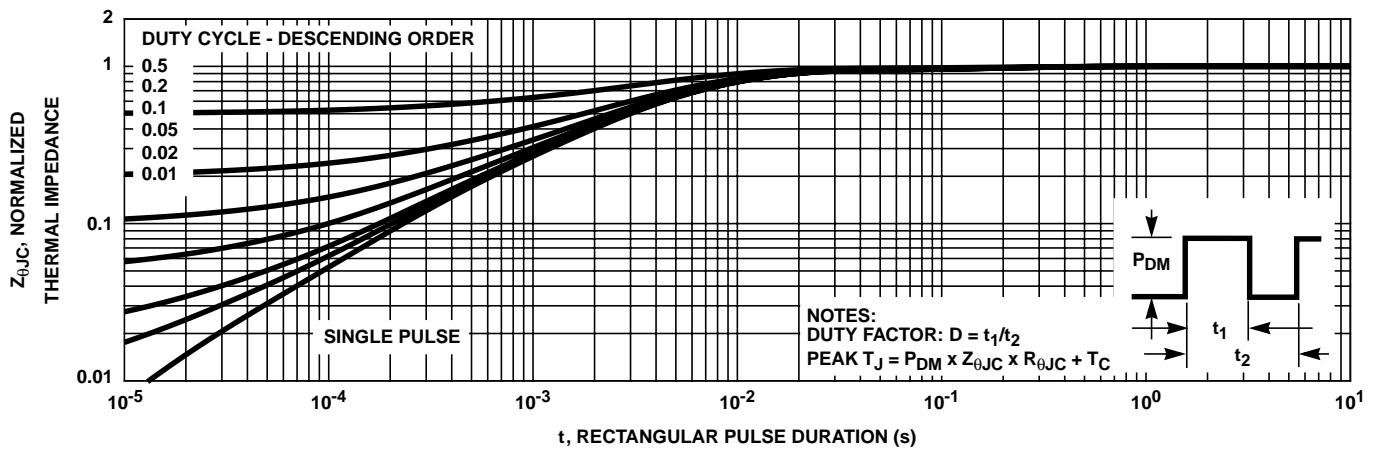


FIGURE 3. NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

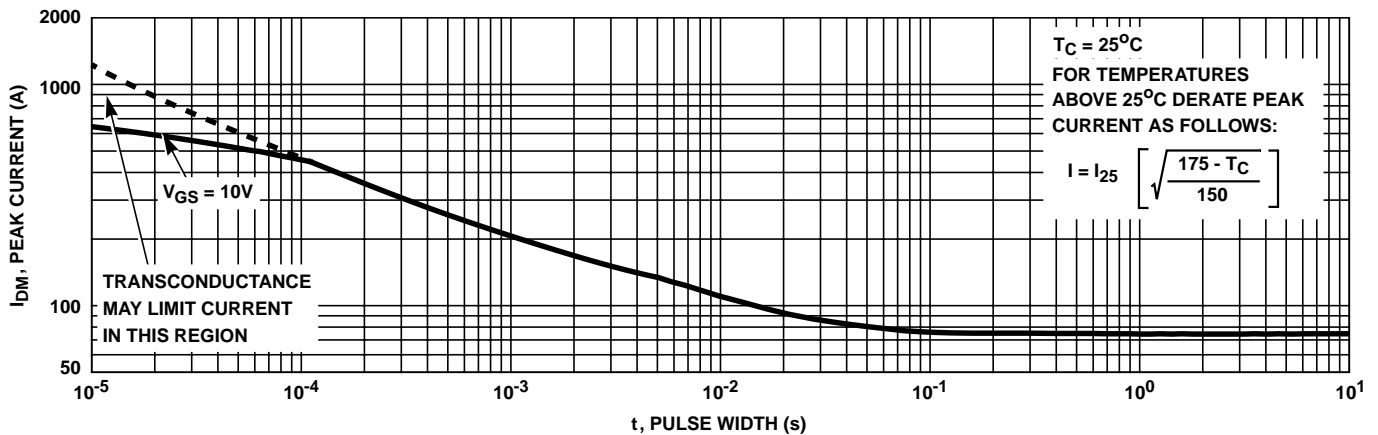


FIGURE 4. PEAK CURRENT CAPABILITY

Typical Performance Curves (Continued)

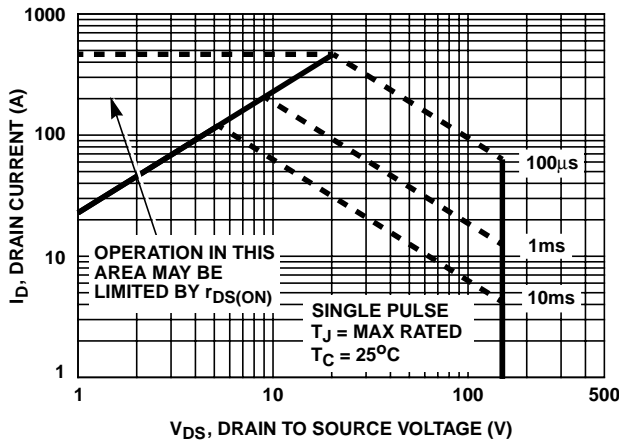
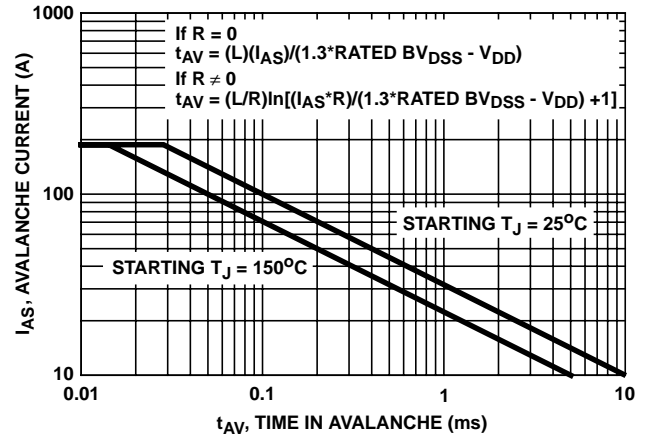


FIGURE 5. FORWARD BIAS SAFE OPERATING AREA



NOTE: Refer to Intersil Application Notes AN9321 and AN9322.

FIGURE 6. UNCLAMPED INDUCTIVE SWITCHING CAPABILITY

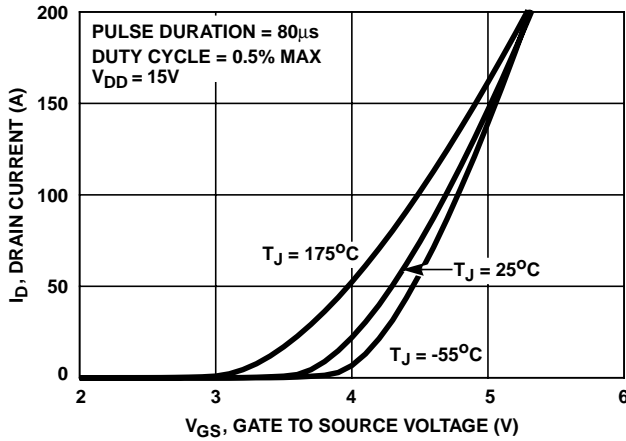


FIGURE 7. TRANSFER CHARACTERISTICS

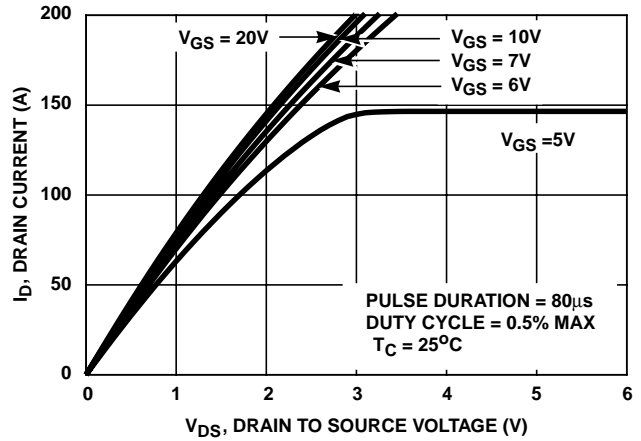


FIGURE 8. SATURATION CHARACTERISTICS

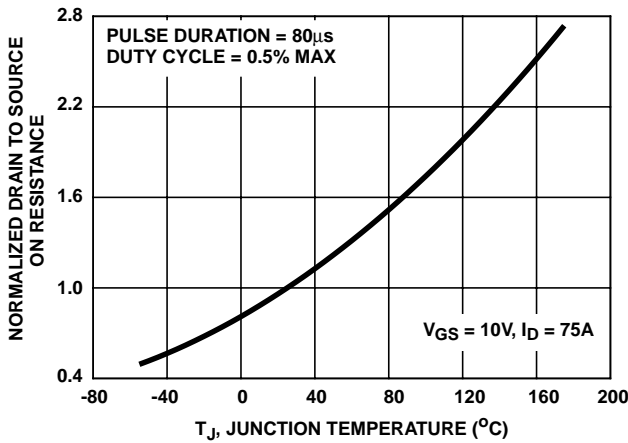


FIGURE 9. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

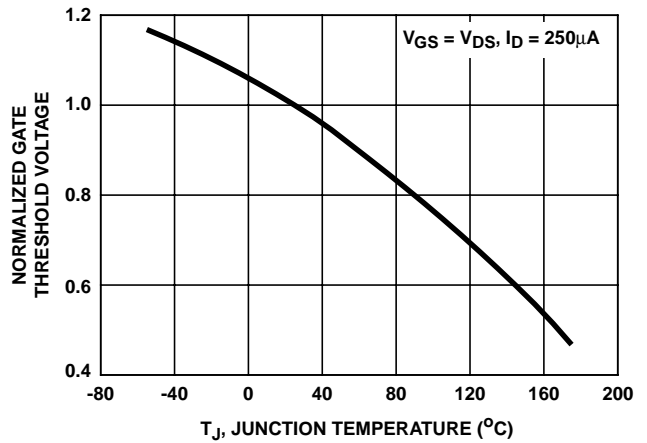


FIGURE 10. NORMALIZED GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

Typical Performance Curves (Continued)

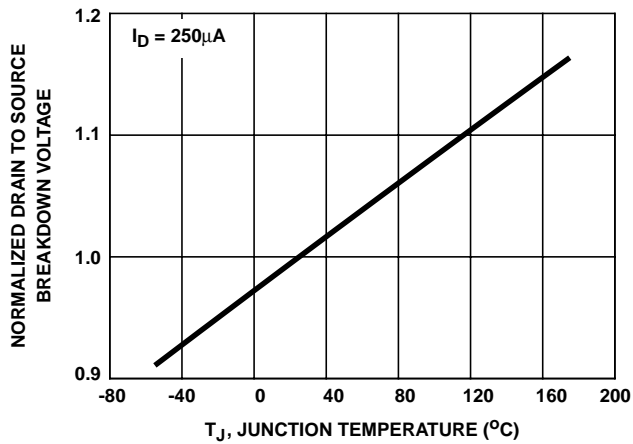


FIGURE 11. NORMALIZED DRAIN TO SOURCE BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE

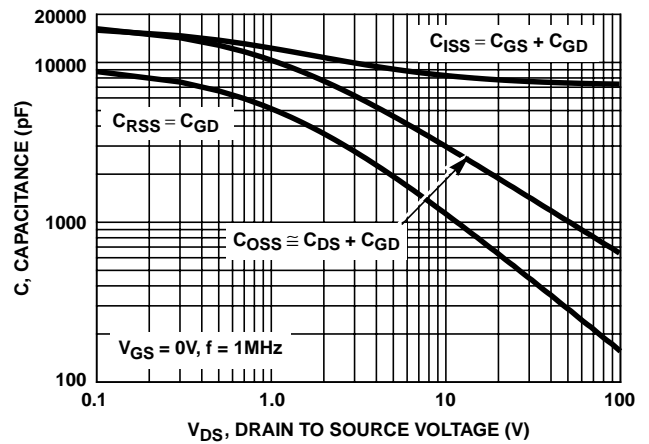
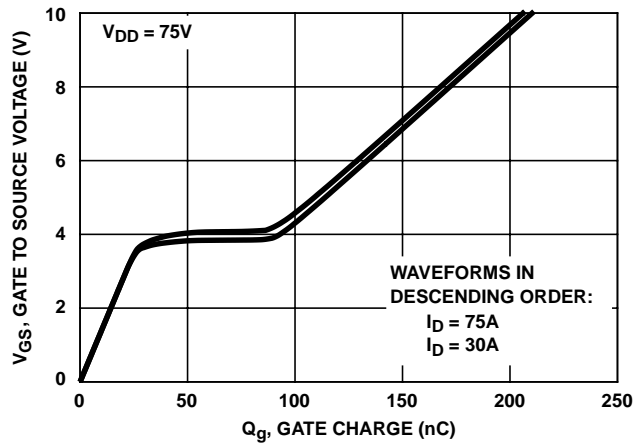


FIGURE 12. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE



NOTE: Refer to Intersil Application Notes AN7254 and AN7260.

FIGURE 13. GATE CHARGE WAVEFORMS FOR CONSTANT GATE CURRENT

Test Circuits and Waveforms

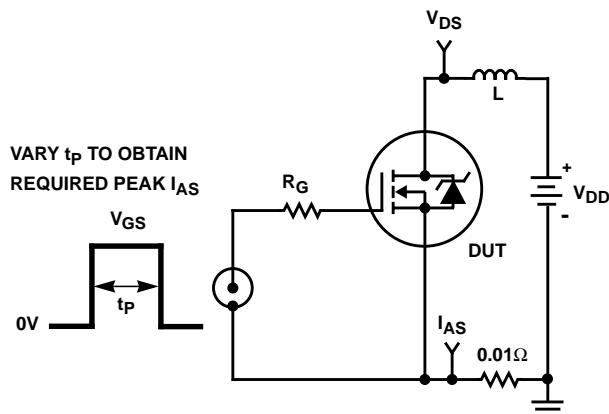


FIGURE 14. UNCLAMPED ENERGY TEST CIRCUIT

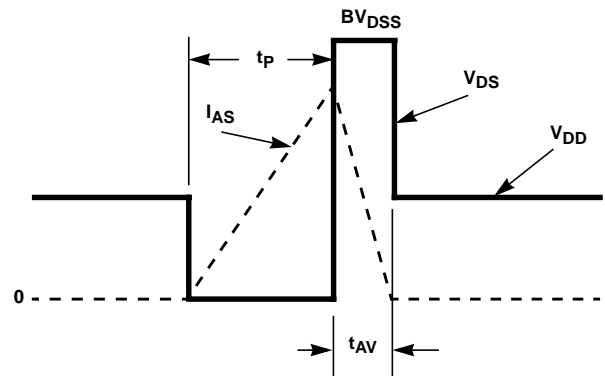


FIGURE 15. UNCLAMPED ENERGY WAVEFORMS

Test Circuits and Waveforms (Continued)

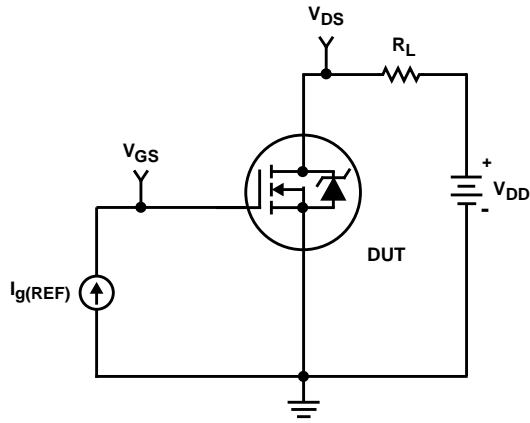


FIGURE 16. GATE CHARGE TEST CIRCUIT

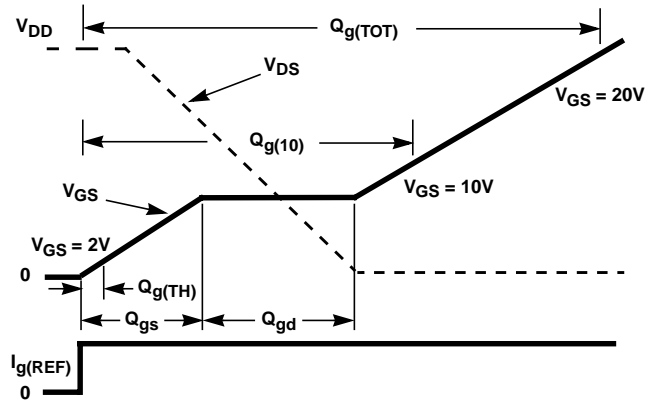


FIGURE 17. GATE CHARGE WAVEFORMS

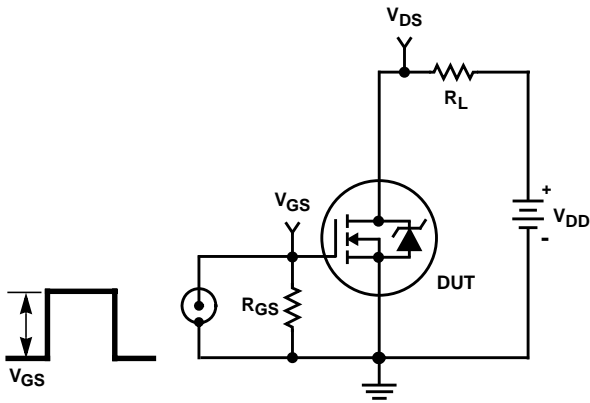


FIGURE 18. SWITCHING TIME TEST CIRCUIT

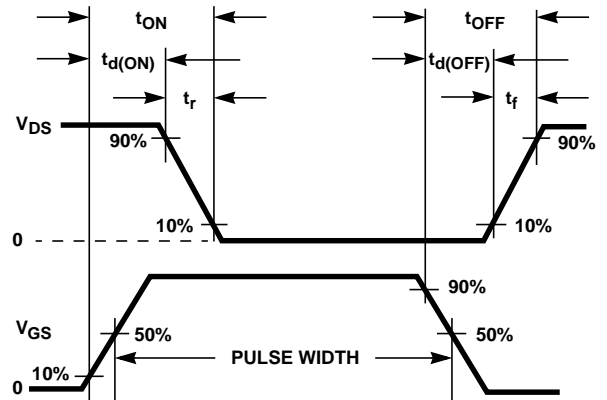


FIGURE 19. SWITCHING TIME WAVEFORM

**PSPICE Electrical Model**

.SUBCKT HUF75852 2 1 3 ; rev 26 Oct 1999

CA 12 8 12.0e-9  
 CB 15 14 12.0e-9  
 CIN 6 8 7.15e-9

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

EBREAK 11 7 17 18 159.2  
 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 1.0e-9  
 LGATE 1 9 7.46e-9  
 LSOURCE 3 7 3.87e-9

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 9.50e-3  
 RGATE 9 20 0.80  
 RLDRAIN 2 5 10  
 RLGATE 1 9 74.6  
 RLSOURCE 3 7 38.7  
 RSLC1 5 51 RSLCMOD 1e-6  
 RSLC2 5 50 1e3  
 RSOURCE 8 7 RSOURCEMOD 2.37e-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

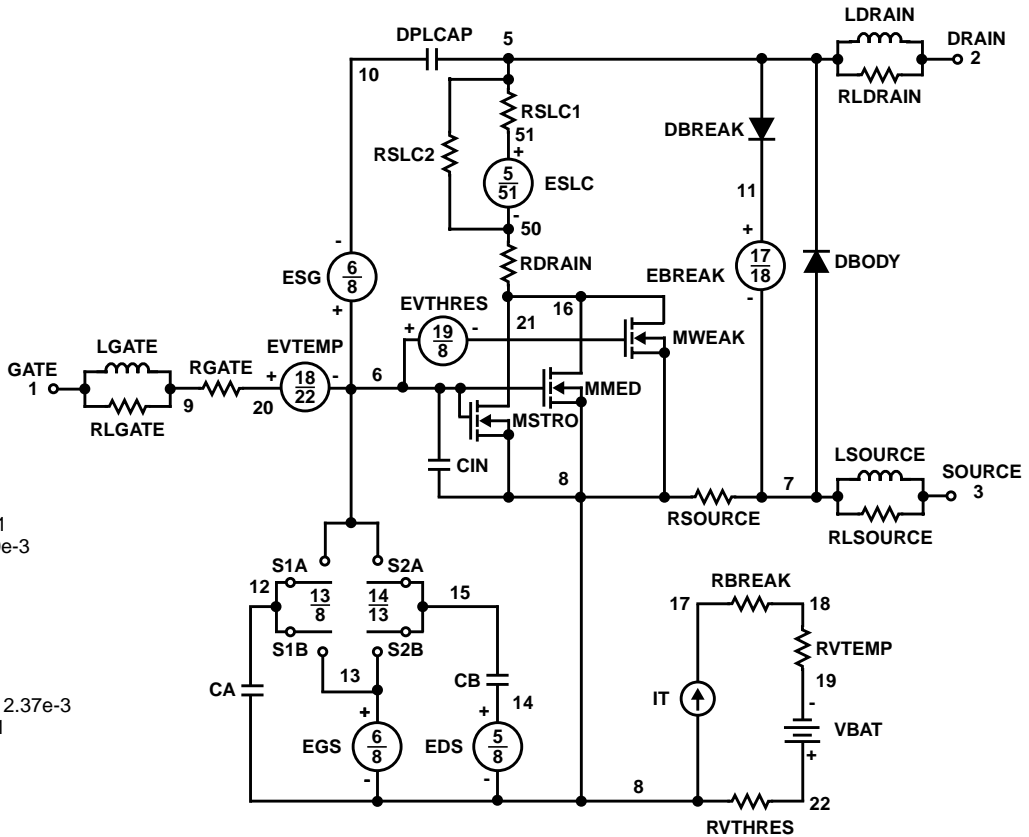
ESLC 51 50 VALUE={(V(5,51)/ABS(V(5,51)))\*(PWR(V(5,51))/(1e-6\*245),2.5))}

.MODEL DBODYMOD D (IS = 6.03e-12 RS = 2.17e-3 TRS1 = 1.97e-3 TRS2 = 1.03e-6 CJO = 7.91e-9 TT = 1.69e-7 M = 0.60)  
 .MODEL DBREAKMOD D (RS = 3.53e-1 TRS1 = 0 TRS2 = 0)  
 .MODEL DPLCAPMOD D (CJO = 9.52e-9 IS = 1e-30 N = 1 M = 0.88)  
 .MODEL MMEDMOD NMOS (VTO = 3.05 KP = 8.50 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u RG = 0.80)  
 .MODEL MSTROMOD NMOS (VTO = 3.53 KP = 215 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u)  
 .MODEL MWEAKMOD NMOS (VTO = 2.63 KP = 0.075 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u RG = 8.0)  
 .MODEL RBREAKMOD RES (TC1 = 1.12e-3 TC2 = -1.00e-7)  
 .MODEL RDRAINMOD RES (TC1 = 1.03e-2 TC2 = 3.04e-5)  
 .MODEL RSLCMOD RES (TC1 = 2.52e-3 TC2 = 0)  
 .MODEL RSOURCEMOD RES (TC1 = 1.01e-3 TC2 = 0)  
 .MODEL RVTHRESMOD RES (TC1 = -3.65e-3 TC2 = -1.55e-5)  
 .MODEL RVTEMPMOD RES (TC1 = -2.85e-3 TC2 = 0)

.MODEL S1AMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -3.5 VOFF = -3.0)  
 .MODEL S1BMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -3.0 VOFF = -3.5)  
 .MODEL S2AMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -2.5 VOFF = -0.5)  
 .MODEL S2BMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -0.5 VOFF = -2.5)

.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 19 Oct 1999

HUF75852T

CTHERM1 th 6 9.75e-3  
 CHERM2 6 5 3.90e-2  
 CHERM3 5 4 2.50e-2  
 CHERM4 4 3 2.95e-2  
 CHERM5 3 2 6.55e-2  
 CHERM6 2 tl 12.55

RHERM1 th 6 1.96e-3  
 RHERM2 6 5 4.89e-3  
 RHERM3 5 4 1.38e-2  
 RHERM4 4 3 7.73e-2  
 RHERM5 3 2 1.17e-1  
 RHERM6 2 tl 1.55e-2

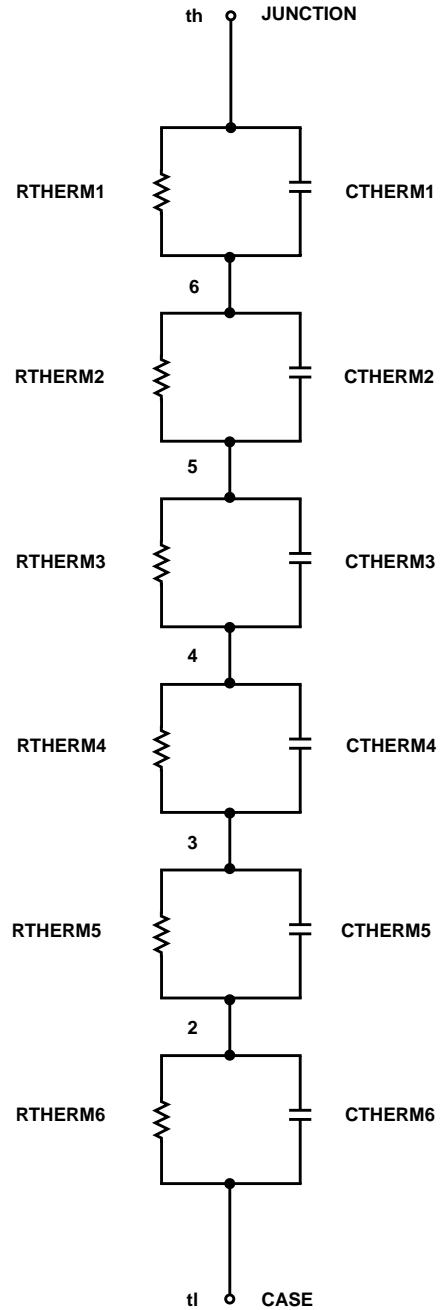
**SABER Thermal Model**

SABER thermal model HUF75852T

```

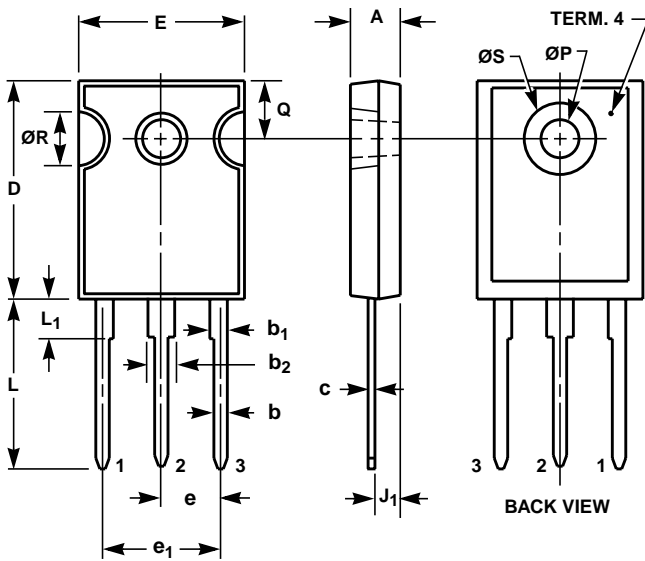
template thermal_model th tl
thermal_c th, tl
{
    ctherm.ctherm1 th 6 = 9.75e-3
    ctherm.ctherm2 6 5 = 3.90e-2
    ctherm.ctherm3 5 4 = 2.50e-2
    ctherm.ctherm4 4 3 = 2.95e-2
    ctherm.ctherm5 3 2 = 6.55e-2
    ctherm.ctherm6 2 tl = 12.55

    rtherm.rtherm1 th 6 = 1.96e-3
    rtherm.rtherm2 6 5 = 4.89e-3
    rtherm.rtherm3 5 4 = 1.38e-2
    rtherm.rtherm4 4 3 = 7.73e-2
    rtherm.rtherm5 3 2 = 1.17e-1
    rtherm.rtherm6 2 tl = 1.55e-2
}
    
```



**TO-247**

**3 LEAD JEDEC STYLE TO-247 PLASTIC PACKAGE**



SYMBOL	INCHES		MILLIMETERS		NOTES
	MIN	MAX	MIN	MAX	
A	0.180	0.190	4.58	4.82	-
b	0.046	0.051	1.17	1.29	2, 3
b <sub>1</sub>	0.060	0.070	1.53	1.77	1, 2
b <sub>2</sub>	0.095	0.105	2.42	2.66	1, 2
c	0.020	0.026	0.51	0.66	1, 2, 3
D	0.800	0.820	20.32	20.82	-
E	0.605	0.625	15.37	15.87	-
e	0.219 TYP		5.56 TYP		4
e <sub>1</sub>	0.438 BSC		11.12 BSC		4
J <sub>1</sub>	0.090	0.105	2.29	2.66	5
L	0.620	0.640	15.75	16.25	-
L <sub>1</sub>	0.145	0.155	3.69	3.93	1
ØP	0.138	0.144	3.51	3.65	-
Q	0.210	0.220	5.34	5.58	-
ØR	0.195	0.205	4.96	5.20	-
ØS	0.260	0.270	6.61	6.85	-

**NOTES:**

1. Lead dimension and finish uncontrolled in L<sub>1</sub>.
2. Lead dimension (without solder).
3. Add typically 0.002 inches (0.05mm) for solder coating.
4. Position of lead to be measured 0.250 inches (6.35mm) from bottom of dimension D.
5. Position of lead to be measured 0.100 inches (2.54mm) from bottom of dimension D.
6. Controlling dimension: Inch.
7. Revision 1 dated 1-93.

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