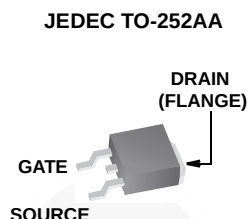
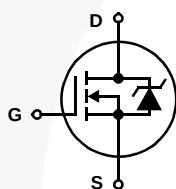


N-Channel Logic Level UltraFET Power MOSFET
100 V, 10 A, 165 mΩ
Packaging

Symbol

Features

- Ultra Low On-Resistance
 - $r_{DS(ON)} = 0.160\Omega$, $V_{GS} = 10V$
 - $r_{DS(ON)} = 0.165\Omega$, $V_{GS} = 5V$
- Simulation Models
 - Temperature Compensated PSPICE® and SABER™ Electrical Models
 - Spice and SABER Thermal Impedance Models
 - www.Fairchildsemi.com
- Peak Current vs Pulse Width Curve
- UIS Rating Curve
- Switching Time vs R_{GS} Curves

Ordering Information

PART NUMBER	PACKAGE	BRAND
HUF76609D3ST	TO-252AA	76609D

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

	HUF76609D3ST	UNITS
Drain to Source Voltage (Note 1)	100	V
Drain to Gate Voltage ($R_{GS} = 20k\Omega$) (Note 1)	100	V
Gate to Source Voltage	± 16	V
Drain Current		
Continuous ($T_C = 25^\circ\text{C}$, $V_{GS} = 5V$)	10	A
Continuous ($T_C = 25^\circ\text{C}$, $V_{GS} = 10V$) (Figure 2)	10	A
Continuous ($T_C = 100^\circ\text{C}$, $V_{GS} = 5V$)	7	A
Continuous ($T_C = 100^\circ\text{C}$, $V_{GS} = 4.5V$) (Figure 2)	7	A
Pulsed Drain Current	Figure 4	
Pulsed Avalanche Rating	Figures 6, 17, 18	
Power Dissipation	49	W
Derate Above 25°C	0.327	W/ $^\circ\text{C}$
Operating and Storage Temperature	-55 to 175	$^\circ\text{C}$
Maximum Temperature for Soldering		
Leads at 0.063in (1.6mm) from Case for 10s.	300	$^\circ\text{C}$
Package Body for 10s, See Techbrief TB334.	260	$^\circ\text{C}$

NOTE:

1. $T_J = 25^\circ\text{C}$ to 150°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.

Product reliability information can be found at <http://www.fairchildsemi.com/products/discrete/reliability/index.html>

For severe environments, see our Automotive HUFA series.

All Fairchild semiconductor products are manufactured, assembled and tested under ISO9000 and QS9000 quality systems certification.

HUF76609D3S

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 = 250μA, V _{GS} = 0V (Figure 12)	100	-	-	V	
		I _D = 250μA, V _{GS} = 0V, T _C = -40 ⁰ C (Figure 12)	90	-	-	V	
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 95V, V _{GS} = 0V	-	-	1	μA	
		V _{DS} = 90V, V _{GS} = 0V, T _C = 150 ⁰ C	-	-	250	μA	
Gate to Source Leakage Current	I _{GSS}	V _{GS} = ±16V	-	-	±100	nA	
ON STATE SPECIFICATIONS							
Gate to Source Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 250μA (Figure 11)	1	-	3	V	
Drain to Source On Resistance	r _{DS(ON)}	I _D = 10A, V _{GS} = 10V (Figures 9, 10)	-	0.130	0.160	Ω	
		I _D = 7A, V _{GS} = 5V (Figure 9)	-	0.135	0.165	Ω	
		I _D = 7A, V _{GS} = 4.5V (Figure 9)	-	0.140	0.168	Ω	
THERMAL SPECIFICATIONS							
Thermal Resistance Junction to Case	R _{θJC}	TO-252	-	-	3.06	°C/W	
Thermal Resistance Junction to Ambient	R _{θJA}		-	-	100	°C/W	
SWITCHING SPECIFICATIONS (V _{GS} = 4.5V)							
Turn-On Time	t _{ON}	V _{DD} = 50V, I _D = 7A V _{GS} = 4.5V, R _{GS} = 20Ω (Figures 15, 21, 22)	-	-	77	ns	
Turn-On Delay Time	t _{d(ON)}		-	10	-	ns	
Rise Time	t _r		-	41	-	ns	
Turn-Off Delay Time	t _{d(OFF)}		-	30	-	ns	
Fall Time	t _f		-	28	-	ns	
Turn-Off Time	t _{OFF}		-	-	87	ns	
SWITCHING SPECIFICATIONS (V _{GS} = 10V)							
Turn-On Time	t _{ON}	V _{DD} = 50V, I _D = 10A V _{GS} = 10V, R _{GS} = 24Ω (Figures 16, 21, 22)	-	-	36	ns	
Turn-On Delay Time	t _{d(ON)}		-	6	-	ns	
Rise Time	t _r		-	18	-	ns	
Turn-Off Delay Time	t _{d(OFF)}		-	55	-	ns	
Fall Time	t _f		-	39	-	ns	
Turn-Off Time	t _{OFF}		-	-	141	ns	
GATE CHARGE SPECIFICATIONS							
Total Gate Charge	Q _{g(TOT)}	V _{GS} = 0V to 10V	V _{DD} = 50V, I _D = 7A, I _{g(REF)} = 1.0mA (Figures 14, 19, 20)	-	13	16	nC
Gate Charge at 5V	Q _{g(5)}	V _{GS} = 0V to 5V		-	7.3	8.8	nC
Threshold Gate Charge	Q _{g(TH)}	V _{GS} = 0V to 1V		-	0.5	0.6	nC
Gate to Source Gate Charge	Q _{gs}			-	1.4	-	nC
Gate to Drain “Miller” Charge	Q _{gd}			-	3.4	-	nC
CAPACITANCE SPECIFICATIONS							
Input Capacitance	C _{ISS}	V _{DS} = 25V, V _{GS} = 0V, f = 1MHz (Figure 13)	-	425	-	pF	
Output Capacitance	C _{OSS}		-	75	-	pF	
Reverse Transfer Capacitance	C _{RSS}		-	22	-	pF	

Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Source to Drain Diode Voltage	V_{SD}	$I_{SD} = 7\text{A}$	-	-	1.25	V
		$I_{SD} = 4\text{A}$	-	-	1.0	V
Reverse Recovery Time	t_{rr}	$I_{SD} = 7\text{A}$, $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	92	ns
Reverse Recovered Charge	Q_{RR}	$I_{SD} = 7\text{A}$, $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	273	nC

Typical Performance Curves

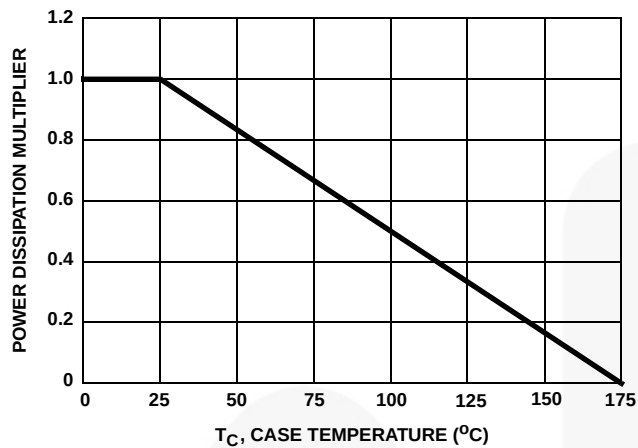


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

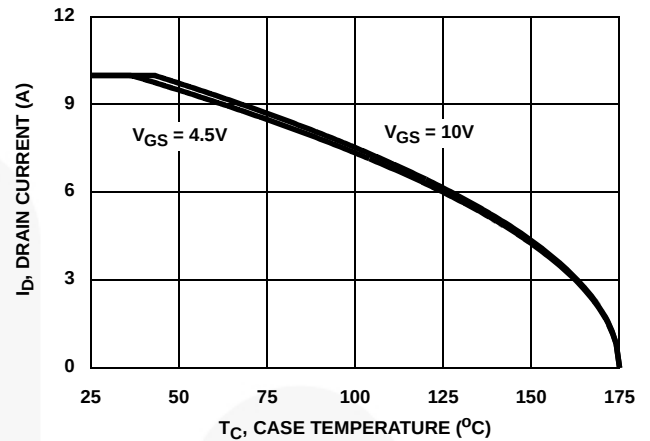


FIGURE 2. MAXIMUM CONTINUOUS DRAIN CURRENT vs CASE TEMPERATURE

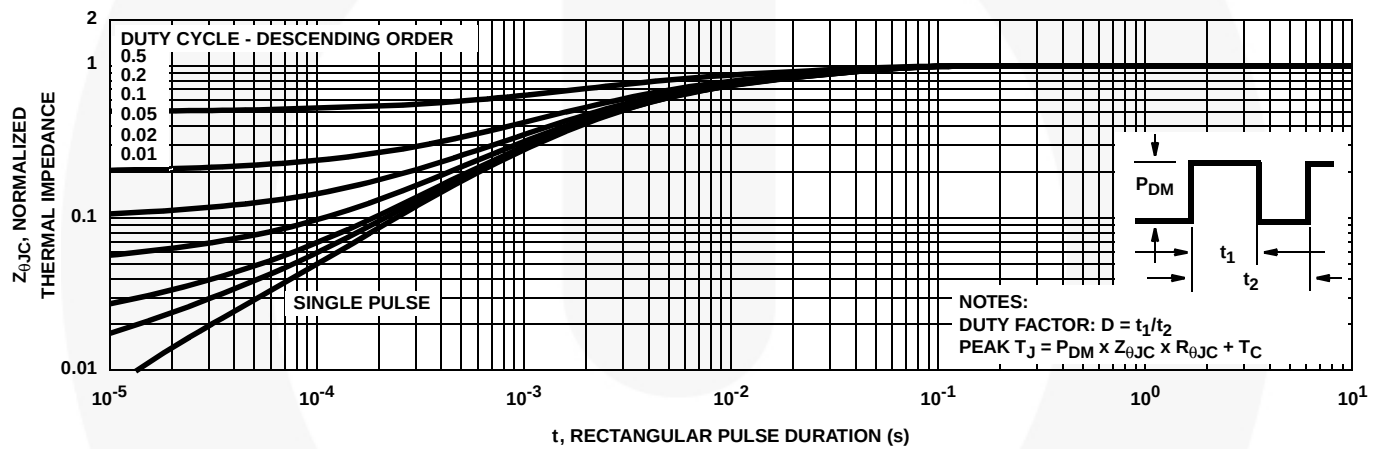


FIGURE 3. NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

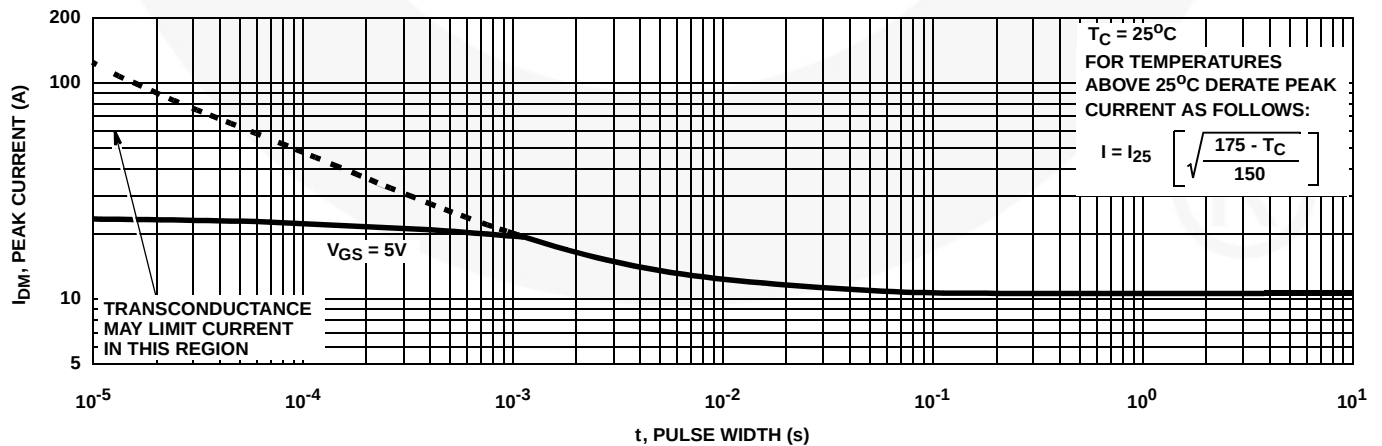


FIGURE 4. PEAK CURRENT CAPABILITY

Typical Performance Curves (Continued)

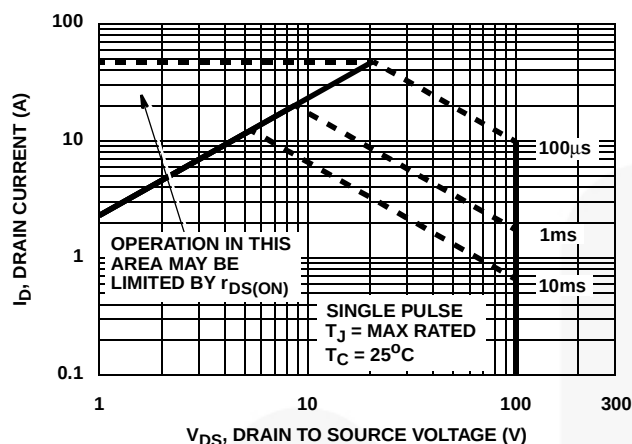
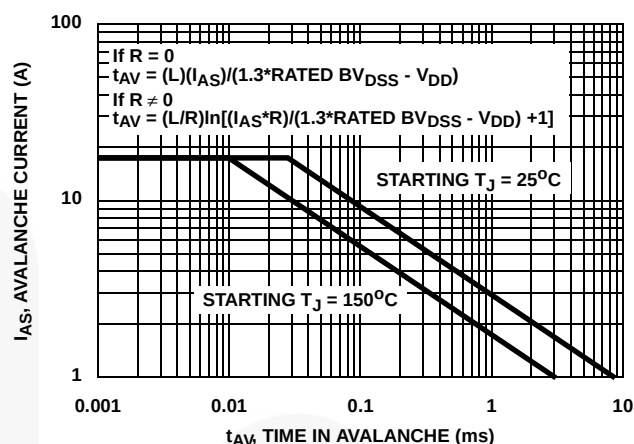


FIGURE 5. FORWARD BIAS SAFE OPERATING AREA



NOTE: Refer to Fairchild Application Notes AN9321 and AN9322.

FIGURE 6. UNCLAMPED INDUCTIVE SWITCHING CAPABILITY

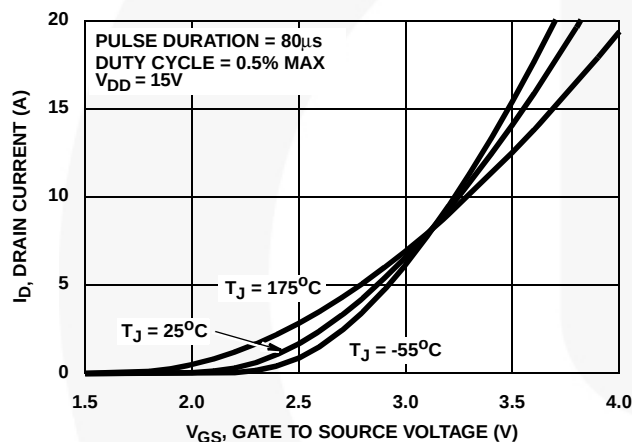


FIGURE 7. TRANSFER CHARACTERISTICS

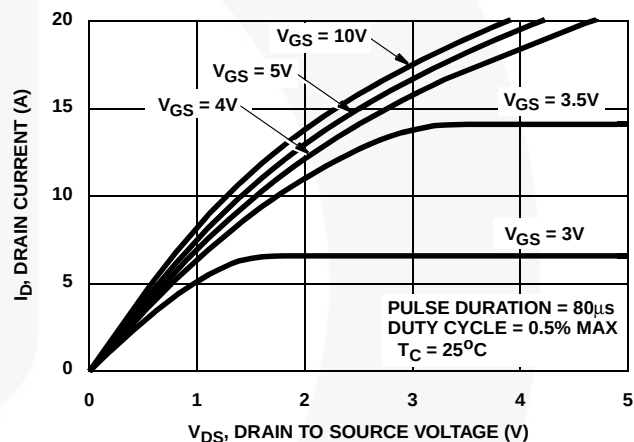


FIGURE 8. SATURATION CHARACTERISTICS

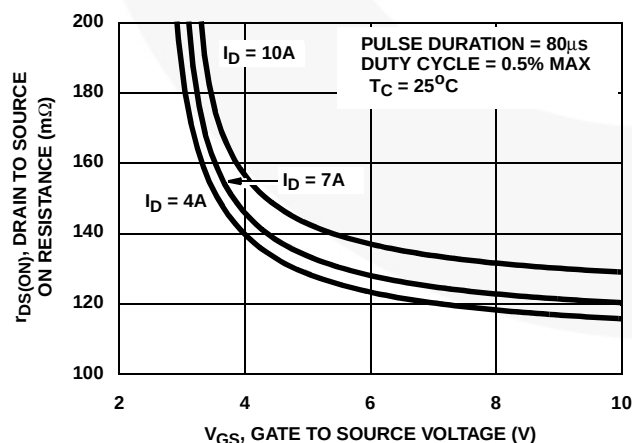


FIGURE 9. DRAIN TO SOURCE ON RESISTANCE vs GATE VOLTAGE AND DRAIN CURRENT

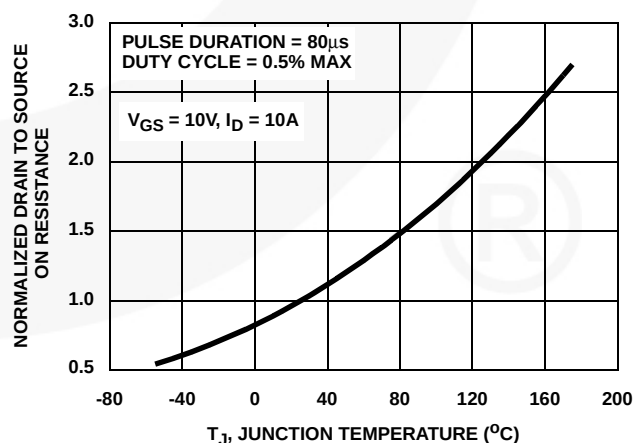


FIGURE 10. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs JUNCTION TEMPERATURE

Typical Performance Curves (Continued)

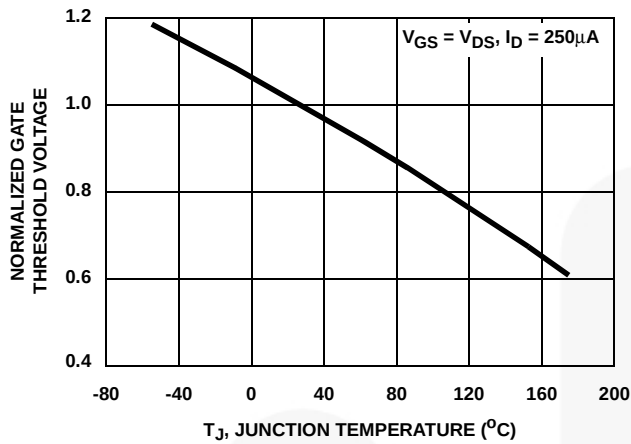


FIGURE 11. NORMALIZED GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

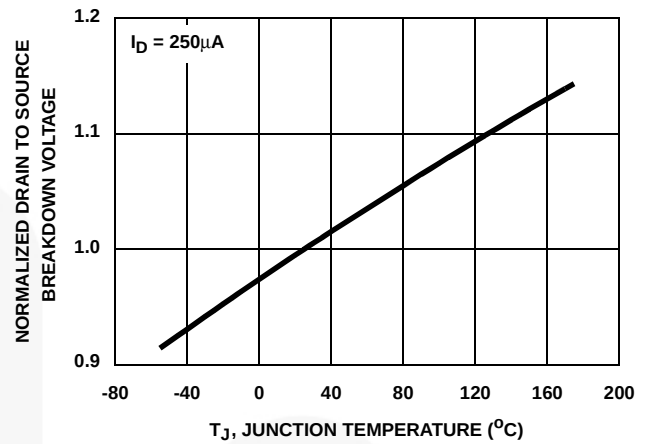


FIGURE 12. NORMALIZED DRAIN TO SOURCE BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE

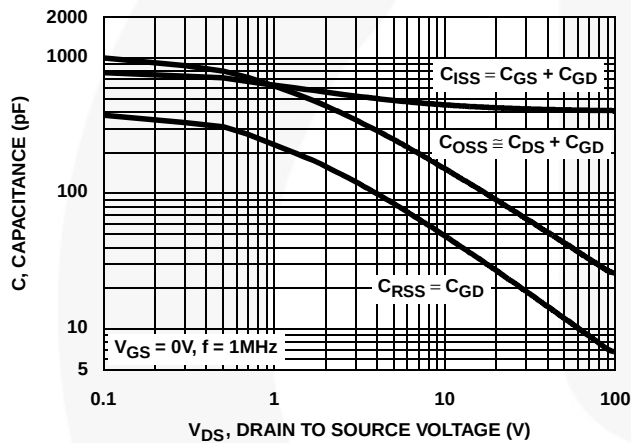
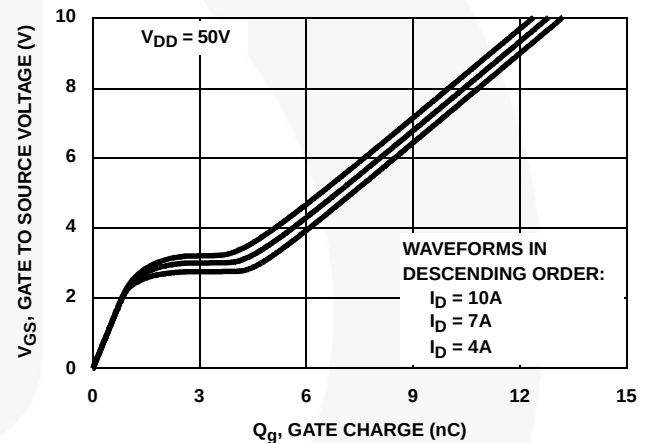


FIGURE 13. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE



NOTE: Refer to Fairchild Application Notes AN7254 and AN7260.

FIGURE 14. GATE CHARGE WAVEFORMS FOR CONSTANT GATE CURRENT

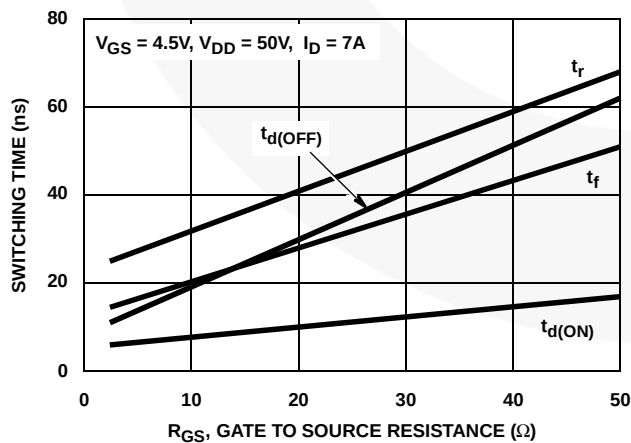


FIGURE 15. SWITCHING TIME vs GATE RESISTANCE

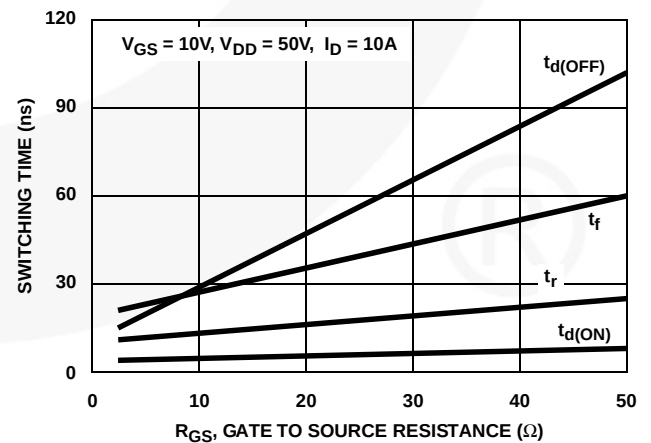


FIGURE 16. SWITCHING TIME vs GATE RESISTANCE

Test Circuits and Waveforms

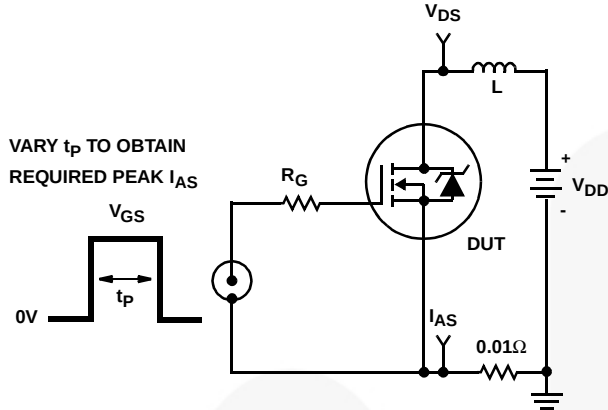


FIGURE 17. UNCLAMPED ENERGY TEST CIRCUIT

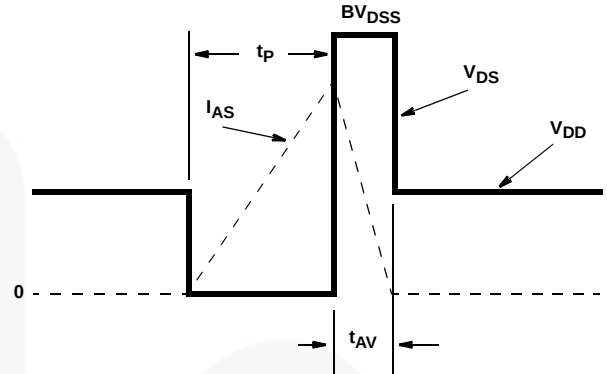


FIGURE 18. UNCLAMPED ENERGY WAVEFORMS

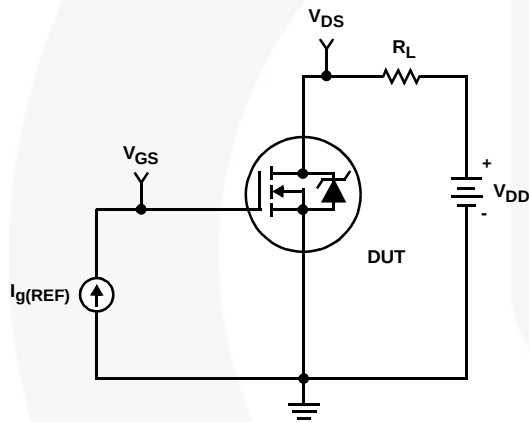


FIGURE 19. GATE CHARGE TEST CIRCUIT

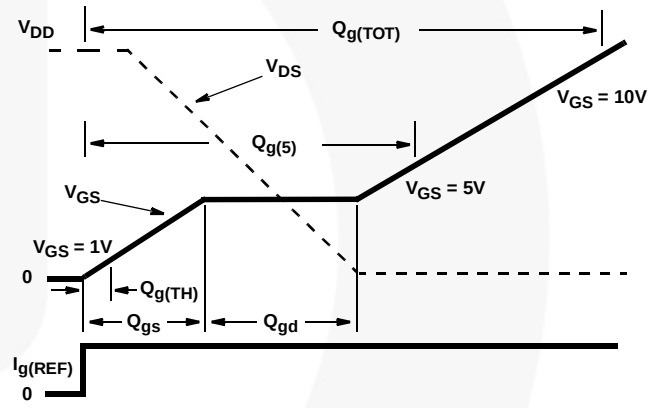


FIGURE 20. GATE CHARGE WAVEFORMS

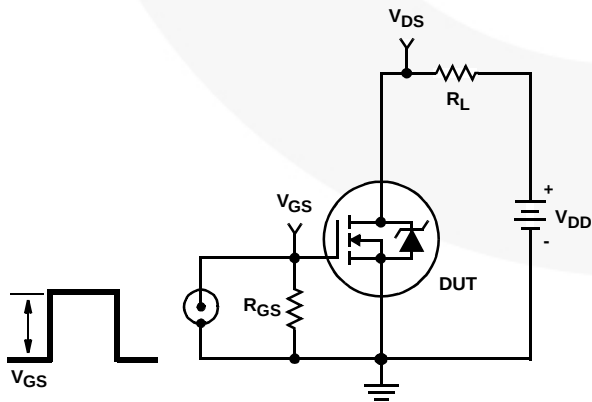


FIGURE 21. SWITCHING TIME TEST CIRCUIT

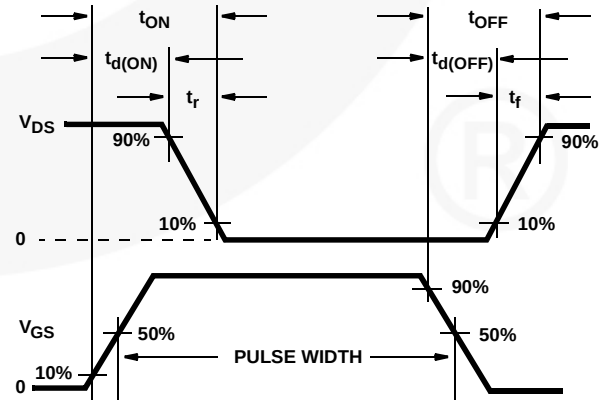


FIGURE 22. SWITCHING TIME WAVEFORM

PSpice Electrical Model

.SUBCKT HUF76609D3 2 1 3 ; rev 23 August 1999

CA 12 8 7.5e-10
 CB 15 14 7.6e-10
 CIN 6 8 4.03e-10

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

EBREAK 11 7 17 18 116.7
 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 3.7e-9
 LSOURCE 3 7 3.4e-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 9.4e-2
 RGATE 9 20 3.3
 RLDRAIN 2 5 10
 RLGATE 1 9 37
 RLSOURCE 3 7 34
 RSLC1 5 51 RSLCMOD 1e-6
 RSLC2 5 50 1e3
 RSOURCE 8 7 RSOURCEMOD 1.3e-2
 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

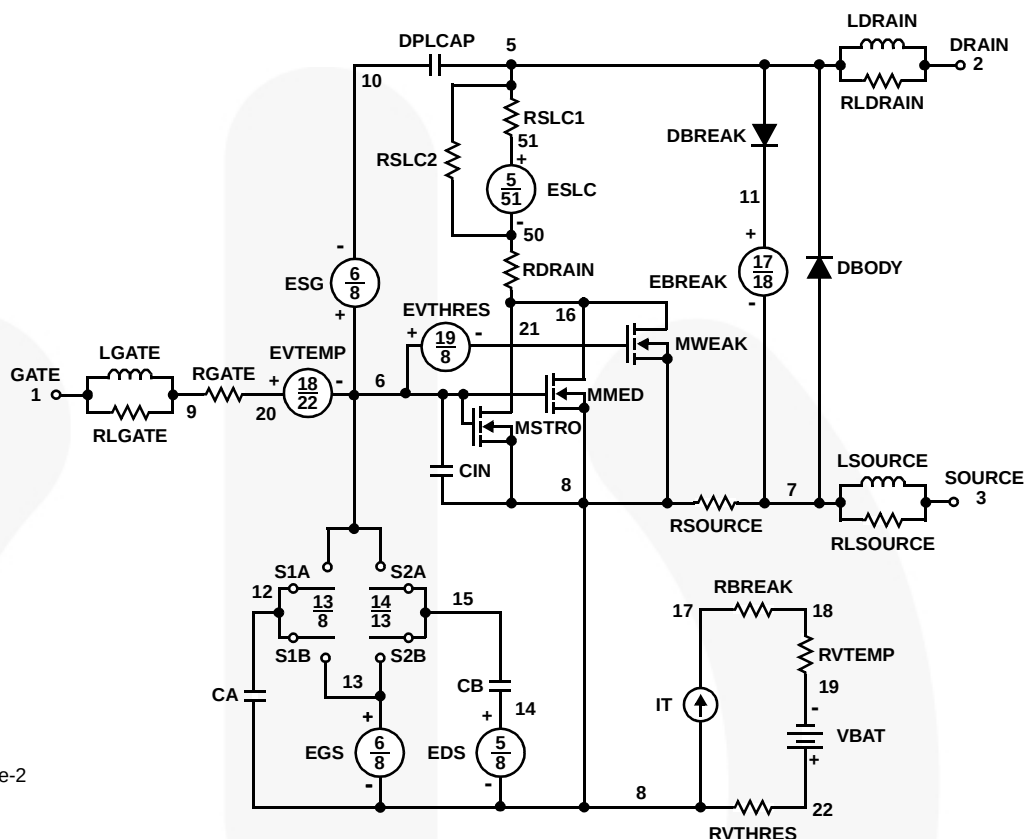
$$\text{ESLC } 51 \ 50 \ \text{VALUE} = \{ (V(5,51) / \text{ABS}(V(5,51))) * (\text{PWR}(V(5,51) / (1e-6 * 17.3), 3.5)) \}$$

.MODEL DBODYMOD D (IS = 1.2e-12 RS = 1.2e-2 TRS1 = 1.2e-3 TRS2 = 1.03e-6 CJO = 6.7e-10 TT = 6.9e-8 M = 0.77)
 .MODEL DBREAKMOD D (RS = 9.9e-1 TRS1 = 1e-3 TRS2 = -2e-5)
 .MODEL DPLCAPMOD D (CJO = 4.3e-1 OIS = 1e-3 OM = 0.9 N = 10)
 .MODEL MMEDMOD NMOS (VTO = 1.88 KP = 5 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u RG = 3.3)
 .MODEL MSTROMOD NMOS (VTO = 2.13 KP = 12.4 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u)
 .MODEL MWEAKMOD NMOS (VTO = 1.59 KP = 0.12 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u RG = 33 RS = 0.1)
 .MODEL RBREAKMOD RES (TC1 = 1.05e-3 TC2 = -5e-7)
 .MODEL RDRAINMOD RES (TC1 = 8.1e-3 TC2 = 2.4e-5)
 .MODEL RSLCMOD RES (TC1 = 3e-3 TC2 = 2e-6)
 .MODEL RSOURCEMOD RES (TC1 = 1e-3 TC2 = 1e-6)
 .MODEL RVTHRESMOD RES (TC1 = -1.5e-3 TC2 = -4.3e-6)
 .MODEL RVTEMPMOD RES (TC1 = -1.6e-3 TC2 = 1.5e-6)

.MODEL S1AMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -4.5 VOFF = -2.5)
 .MODEL S1BMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -2.5 VOFF = -4.5)
 .MODEL S2AMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -0.3 VOFF = 0.2)
 .MODEL S2BMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = 0.2 VOFF = -0.3)

.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 23 August 1999
T76609d3

CTHERM1 th 6 9.50e-4
CTHERM2 6 5 2.40e-3
CTHERM3 5 4 3.90e-3
CTHERM4 4 3 4.10e-3
CTHERM5 3 2 5.60e-3
CTHERM6 2 tl 4.00e-2

RTHERM1 th 6 2.00e-2
RTHERM2 6 5 1.10e-1
RTHERM3 5 4 2.75e-1
RTHERM4 4 3 5.53e-1
RTHERM5 3 2 7.25e-1
RTHERM6 2 tl 7.56e-1

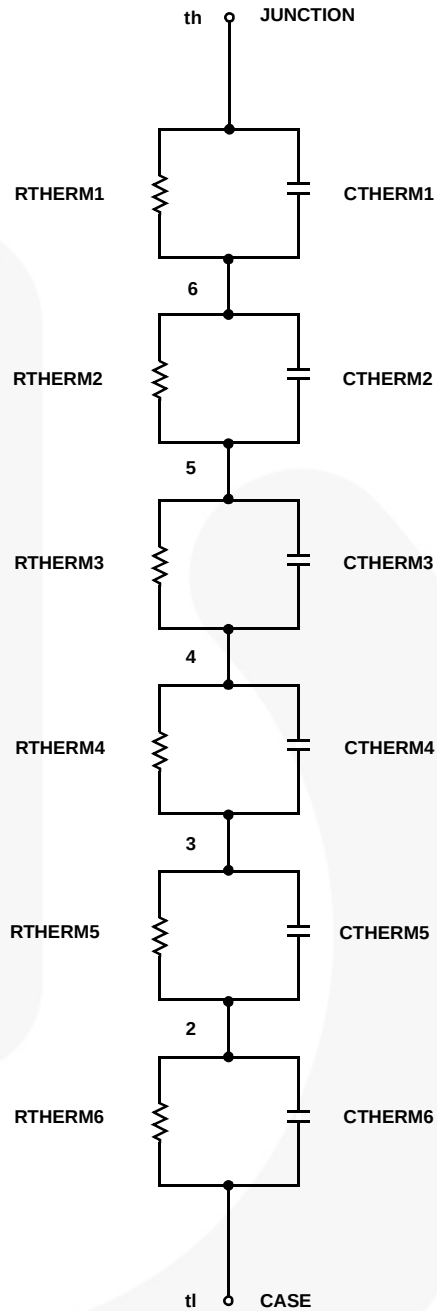
SABER Thermal Model

SABER thermal model t76609d3

template thermal_model th tl
thermal_c th, tl

```
{
ctherm.ctherm1 th 6 = 9.50e-4
ctherm.ctherm2 6 5 = 2.40e-3
ctherm.ctherm3 5 4 = 3.90e-3
ctherm.ctherm4 4 3 = 4.10e-3
ctherm.ctherm5 3 2 = 5.60e-3
ctherm.ctherm6 2 tl = 4.00e-2
```

```
rtherm.rtherm1 th 6 = 2.00e-2
rtherm.rtherm2 6 5 = 1.10e-1
rtherm.rtherm3 5 4 = 2.75e-1
rtherm.rtherm4 4 3 = 5.53e-1
rtherm.rtherm5 3 2 = 7.25e-1
rtherm.rtherm6 2 tl = 7.56e-1
}
```





TRADEMARKS

The following includes registered and unregistered trademarks and service marks, owned by Fairchild Semiconductor and/or its global subsidiaries, and is not intended to be an exhaustive list of all such trademarks.

AccuPower™	F-PFS™	PowerTrench®	Sync-Lock™
AX-CAP®*	FRFET®	PowerXS™	SYSTEM®*
BitSiC™	Global Power ResourceSM	Programmable Active Droop™	TinyBoost®
Build it Now™	GreenBridge™	QFET®	TinyBuck®
CorePLUS™	Green FPS™	QS™	TinyCalc™
CorePOWER™	Green FPS™ e-Series™	Quiet Series™	TinyLogic®
CROSSVOLT™	Gmax™	RapidConfigure™	TINYOPTO™
CTL™	GTO™	Saving our world, 1mW/W/kW at a time™	TinyPower™
Current Transfer Logic™	IntelliMAX™	SignalWise™	TinyPWM™
DEUXPEED®	ISOPLANAR™	SmartMax™	TinyWire™
Dual Cool™	Marking Small Speakers Sound Louder and Better™	SMART START™	TranSiC™
EcoSPARK®	MegaBuck™	Solutions for Your Success™	TriFault Detect™*
EfficientMax™	MICROCOUPLER™	SPM®	TRUECURRENT®*
ESBC™	MicroFET™	STEALTH™	μSerDes™
	MicroPak™	SuperFET®	UHC®
Fairchild®	MicroPak2™	SuperSOT™-3	Ultra FRFET™
Fairchild Semiconductor®	MillerDrive™	SuperSOT™-6	UniFET™
FACT Quiet Series™	MotionMax™	SuperSOT™-8	VCX™
FACT®	mWSaver®	SupreMOS®	VisualMax™
FAST®	OptoHiT™	SyncFET™	VoltagePlus™
FastvCore™	OPTOLOGIC®		XS™
FETBench™	OPTOPLANAR®		
FPS™			

*Trademarks of System General Corporation, used under license by Fairchild Semiconductor.

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION, OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS. THESE SPECIFICATIONS DO NOT EXPAND THE TERMS OF FAIRCHILD'S WORLDWIDE TERMS AND CONDITIONS, SPECIFICALLY THE WARRANTY THEREIN, WHICH COVERS THESE PRODUCTS.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF FAIRCHILD SEMICONDUCTOR CORPORATION.

As used here in:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

ANTI-COUNTERFEITING POLICY

Fairchild Semiconductor Corporation's Anti-Counterfeiting Policy. Fairchild's Anti-Counterfeiting Policy is also stated on our external website, www.Fairchildsemi.com, under Sales Support.

Counterfeiting of semiconductor parts is a growing problem in the industry. All manufacturers of semiconductor products are experiencing counterfeiting of their parts. Customers who inadvertently purchase counterfeit parts experience many problems such as loss of brand reputation, substandard performance, failed application, and increased cost of production and manufacturing delays. Fairchild is taking strong measures to protect ourselves and our customers from the proliferation of counterfeit parts. Fairchild strongly encourages customers to purchase Fairchild parts either directly from Fairchild or from Authorized Fairchild Distributors who are listed by country on our web page cited above. Products customers buy either from Fairchild directly or from Authorized Fairchild Distributors are genuine parts, have full traceability, meet Fairchild's quality standards for handling and storage and provide access to Fairchild's full range of up-to-date technical and product information. Fairchild and our Authorized Distributors will stand behind all warranties and will appropriately address and warranty issues that may arise. Fairchild will not provide any warranty coverage or other assistance for parts bought from Unauthorized Sources. Fairchild is committed to combat this global problem and encourage our customers to do their part in stopping this practice by buying direct or from authorized distributors.

PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

Rev. I66

AMEYA360

Components Supply Platform

Authorized Distribution Brand :



Website :

Welcome to visit www.ameya360.com

Contact Us :

➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
Minhang District, Shanghai , China

➤ Sales :

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype ameyasales1 ameyasales2

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com