

ANTREX Electronics

Electronic Components Sourcing Information

Product Reference Information

Part Number:	HUFA76645S3ST-F085
Manufacturer:	onsemi
Package:	Please confirm with sales
Availability:	Please confirm with sales

Product Page:

<https://antrexco.com/product/details/onsemi/hufa76645s3st-f085.html>

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Contact Information

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New & Original Components

Supplier verification and packaging condition review

CoC / RoHS / REACH documents available on request

Secure sourcing support for OEM / EMS projects

Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.



Is Now Part of

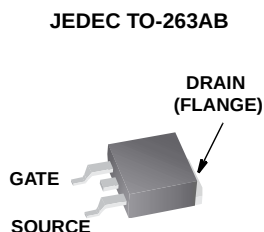
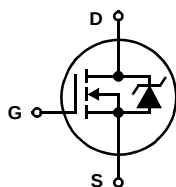


ON Semiconductor®

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

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

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**75A, 100V, 0.015 Ohm, N-Channel, Logic
Level UltraFET® Power MOSFET**
Packaging

Symbol

Features

- Ultra Low On-Resistance
 - $r_{DS(ON)} = 0.014\Omega$, $V_{GS} = 10V$
 - $r_{DS(ON)} = 0.015\Omega$, $V_{GS} = 5V$
- 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
- Qualified to AEC Q101
- RoHS Compliant

Ordering Information

PART NUMBER	PACKAGE	BRAND
HUFA76645S3ST_F085	TO-263AB	76645S

NOTE: When ordering, use the entire part number. Add the suffix T to obtain the variant in tape and reel, e.g., HUFA76645S3ST.

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

	HUFA76645S3ST_F085	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 ($T_C = 25^\circ\text{C}$, $V_{GS} = 5V$)	75	A
Continuous ($T_C = 25^\circ\text{C}$, $V_{GS} = 10V$) (Figure 2)	75	A
Continuous ($T_C = 100^\circ\text{C}$, $V_{GS} = 5V$)	63	A
Continuous ($T_C = 100^\circ\text{C}$, $V_{GS} = 4.5V$) (Figure 2)	62	A
Pulsed Drain Current	Figure 4	
Pulsed Avalanche Rating	Figures 6, 17, 18	
Power Dissipation	310	W
Derate Above 25°C	2.07	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	$^\circ\text{C}$

NOTES:

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.

This product has been designed to meet the extreme test conditions and environment demanded by the automotive industry. For a copy of the requirements, see AEC Q101 at: <http://www.aecouncil.com/>

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

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

HUFA76645S3ST_F085

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 = 75A, V _{GS} = 10V (Figures 9, 10)	-	0.012	0.014	Ω	
		I _D = 63A, V _{GS} = 5V (Figure 9)	-	0.013	0.015	Ω	
		I _D = 62A, V _{GS} = 4.5V (Figure 9)	-	0.0135	0.0155	Ω	
THERMAL SPECIFICATIONS							
Thermal Resistance Junction to Case	R _{θJC}	TO-220 and TO-263	-	-	0.48	⁰ C/W	
Thermal Resistance Junction to Ambient	R _{θJA}		-	-	62	⁰ C/W	
SWITCHING SPECIFICATIONS (V _{GS} = 4.5V)							
Turn-On Time	t _{ON}	V _{DD} = 50V, I _D = 62A V _{GS} = 4.5V, R _{GS} = 2.4Ω (Figures 15, 21, 22)	-	-	490	ns	
Turn-On Delay Time	t _{d(ON)}		-	17	-	ns	
Rise Time	t _r		-	310	-	ns	
Turn-Off Delay Time	t _{d(OFF)}		-	46	-	ns	
Fall Time	t _f		-	155	-	ns	
Turn-Off Time	t _{OFF}		-	-	300	ns	
SWITCHING SPECIFICATIONS (V _{GS} = 10V)							
Turn-On Time	t _{ON}	V _{DD} = 50V, I _D = 75A V _{GS} = 10V, R _{GS} = 2.4Ω (Figures 16, 21, 22)	-	-	175	ns	
Turn-On Delay Time	t _{d(ON)}		-	11	-	ns	
Rise Time	t _r		-	106	-	ns	
Turn-Off Delay Time	t _{d(OFF)}		-	69	-	ns	
Fall Time	t _f		-	175	-	ns	
Turn-Off Time	t _{OFF}		-	-	365	ns	
GATE CHARGE SPECIFICATIONS							
Total Gate Charge	Q _{g(TOT)}	V _{GS} = 0V to 10V	V _{DD} = 50V, I _D = 63A, I _{g(REF)} = 1.0mA (Figures 14, 19, 20)	-	127	153	nC
Gate Charge at 5V	Q _{g(5)}	V _{GS} = 0V to 5V		-	70	84	nC
Threshold Gate Charge	Q _{g(TH)}	V _{GS} = 0V to 1V		-	3.8	4.6	nC
Gate to Source Gate Charge	Q _{gs}			-	10	-	nC
Gate to Drain “Miller” Charge	Q _{gd}			-	34	-	nC
CAPACITANCE SPECIFICATIONS							
Input Capacitance	C _{ISS}	V _{DS} = 25V, V _{GS} = 0V, f = 1MHz (Figure 13)	-	4400	-	pF	
Output Capacitance	C _{OSS}		-	900	-	pF	
Reverse Transfer Capacitance	C _{RSS}		-	280	-	pF	

Source to Drain Diode Specifications

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Source to Drain Diode Voltage	V_{SD}	$I_{SD} = 63\text{A}$	-	-	1.25	V
		$I_{SD} = 30\text{A}$	-	-	1.0	V
Reverse Recovery Time	t_{rr}	$I_{SD} = 63\text{A}$, $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	128	ns
Reverse Recovered Charge	Q_{RR}	$I_{SD} = 63\text{A}$, $dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	-	520	nC

Typical Performance Curves

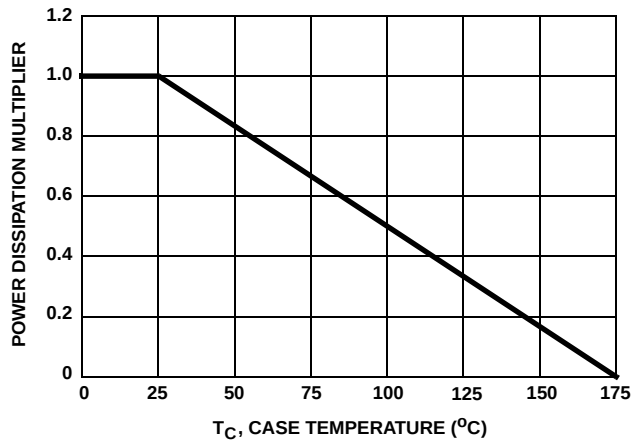


FIGURE 1. NORMALIZED POWER DISSIPATION vs CASE TEMPERATURE

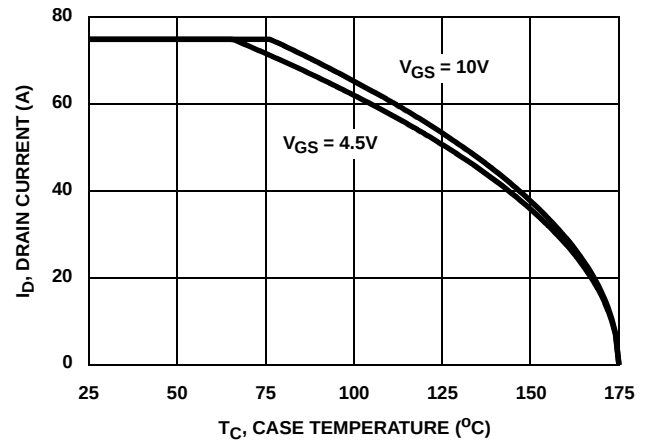


FIGURE 2. MAXIMUM CONTINUOUS DRAIN CURRENT vs CASE TEMPERATURE

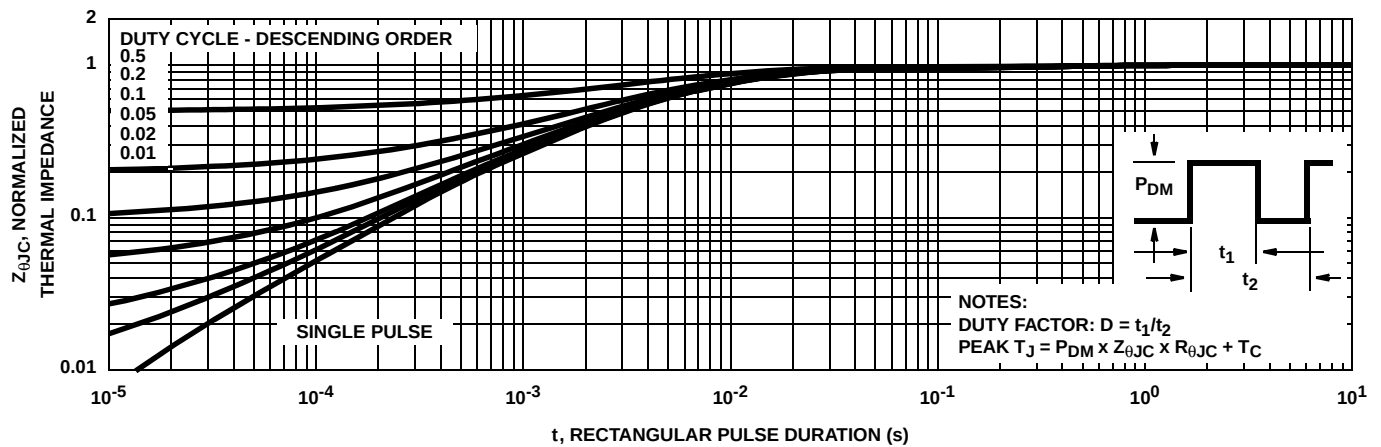


FIGURE 3. NORMALIZED MAXIMUM TRANSIENT THERMAL IMPEDANCE

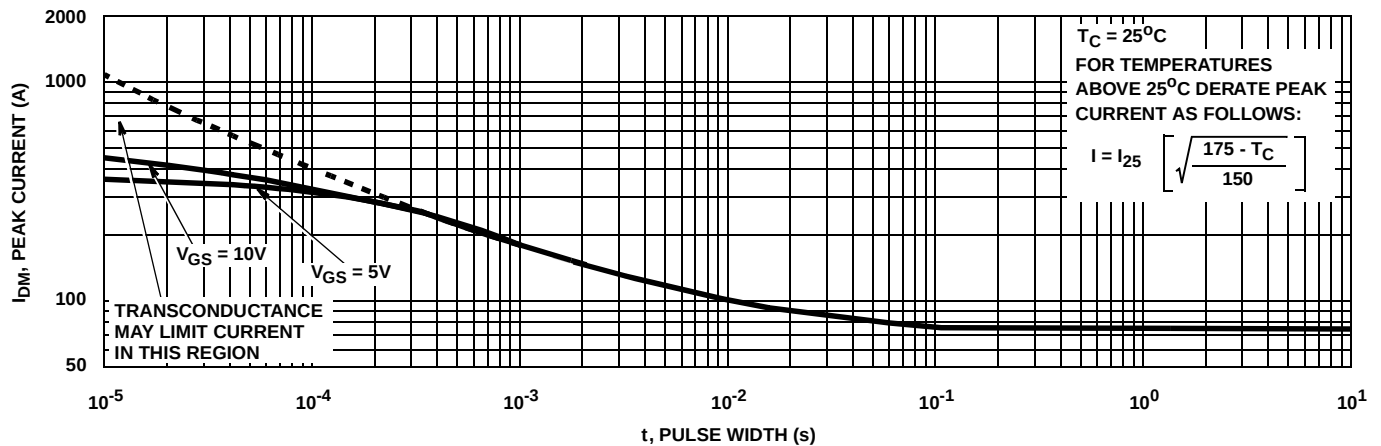


FIGURE 4. PEAK CURRENT CAPABILITY

Typical Performance Curves (Continued)

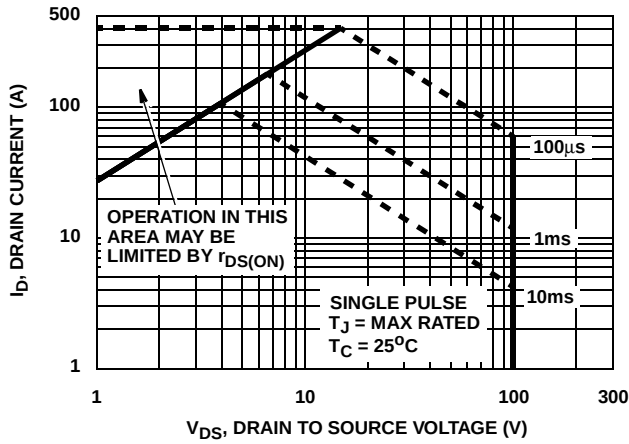
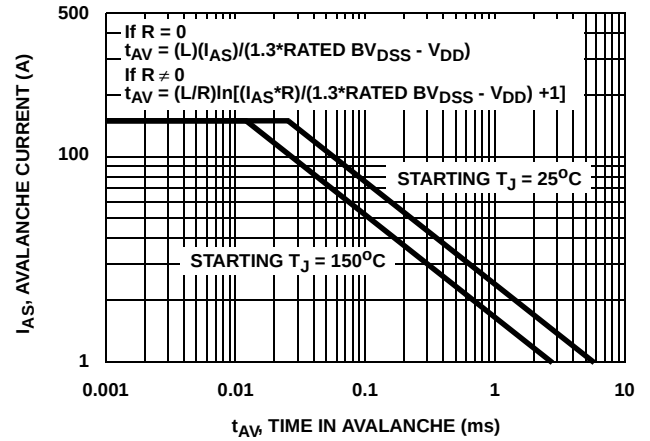


FIGURE 5. FORWARD BIAS SAFE OPERATING AREA



NOTE: Refer to Fairchild Application Notes AN9321 and AN9322.

FIGURE 6. UNCLAMPED INDUCTIVE SWITCHING CAPABILITY

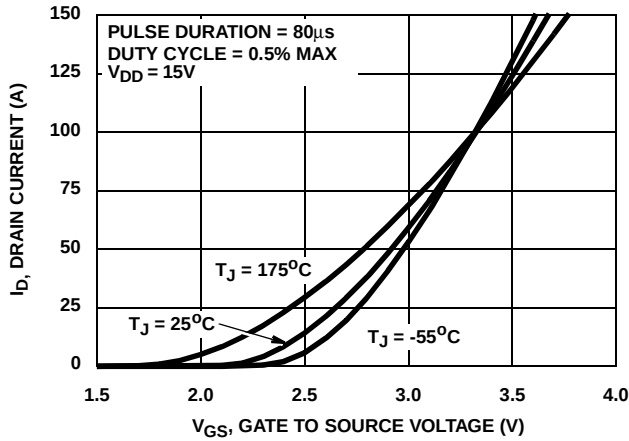


FIGURE 7. TRANSFER CHARACTERISTICS

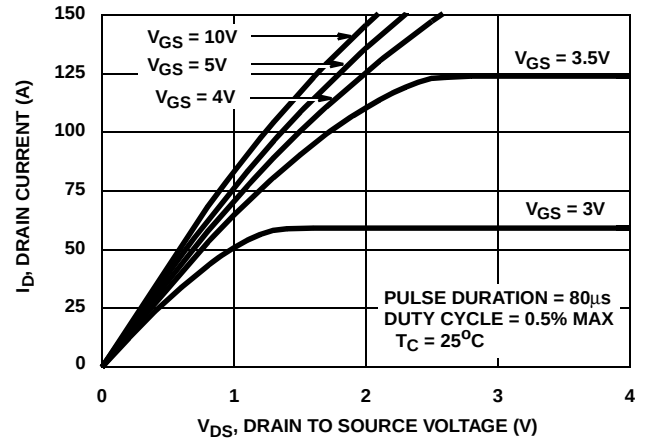


FIGURE 8. SATURATION CHARACTERISTICS

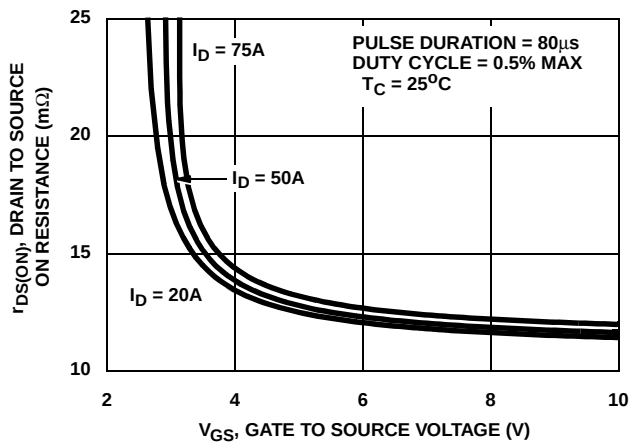


FIGURE 9. DRAIN TO SOURCE ON RESISTANCE vs. GATE VOLTAGE AND DRAIN CURRENT

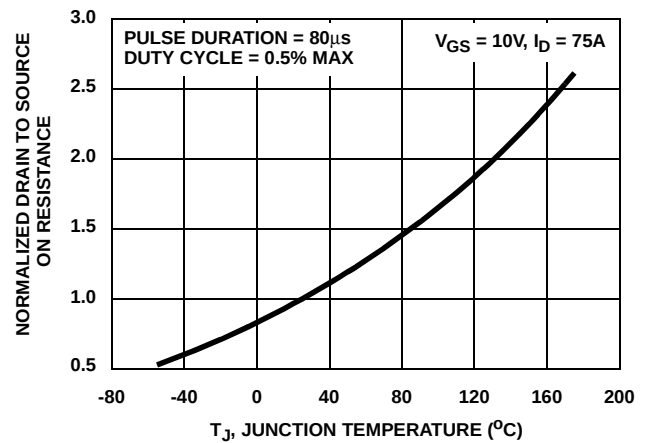


FIGURE 10. NORMALIZED DRAIN TO SOURCE ON RESISTANCE vs. JUNCTION TEMPERATURE

Typical Performance Curves (Continued)

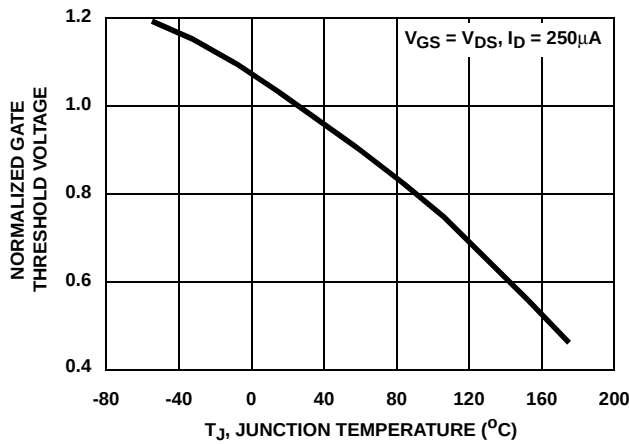


FIGURE 11. NORMALIZED GATE THRESHOLD VOLTAGE vs JUNCTION TEMPERATURE

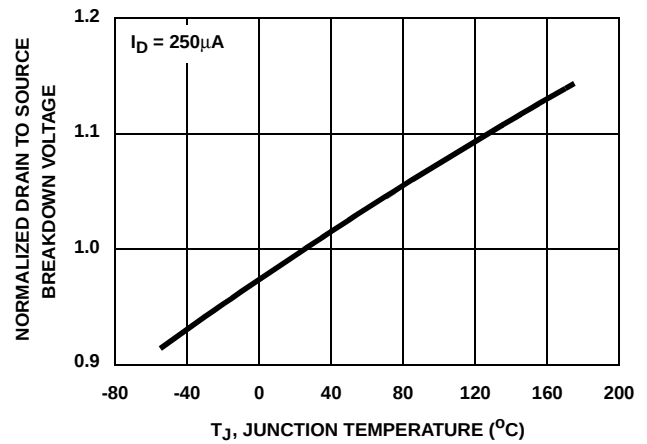


FIGURE 12. NORMALIZED DRAIN TO SOURCE BREAKDOWN VOLTAGE vs JUNCTION TEMPERATURE

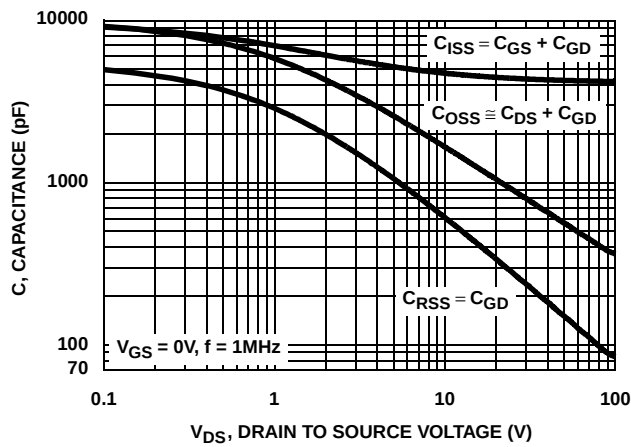
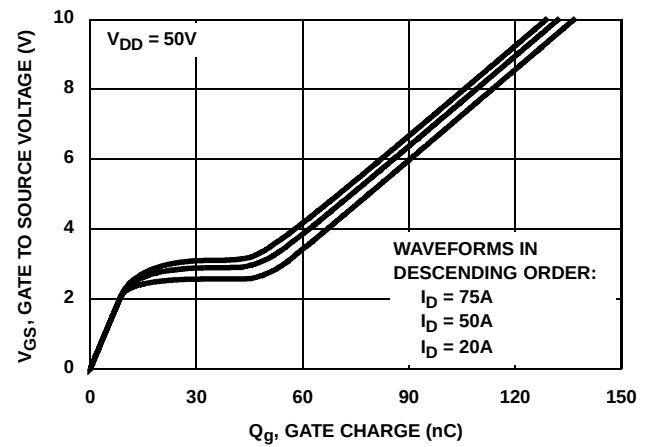


FIGURE 13. CAPACITANCE vs DRAIN TO SOURCE VOLTAGE



NOTE: Refer to Fairchild Application Notes AN7254 and AN7260.

FIGURE 14. GATE CHARGE WAVEFORMS FOR CONSTANT GATE CURRENT

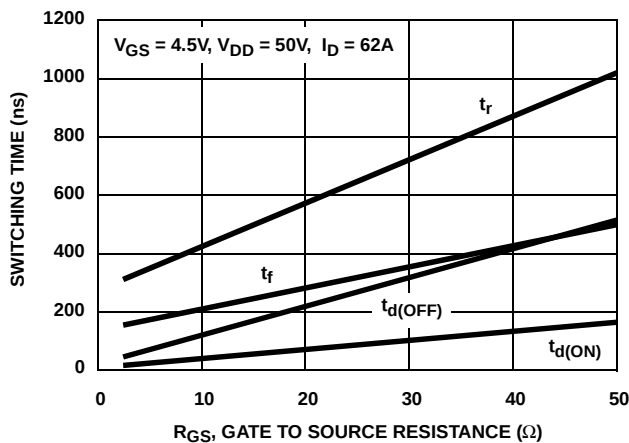


FIGURE 15. SWITCHING TIME vs GATE RESISTANCE

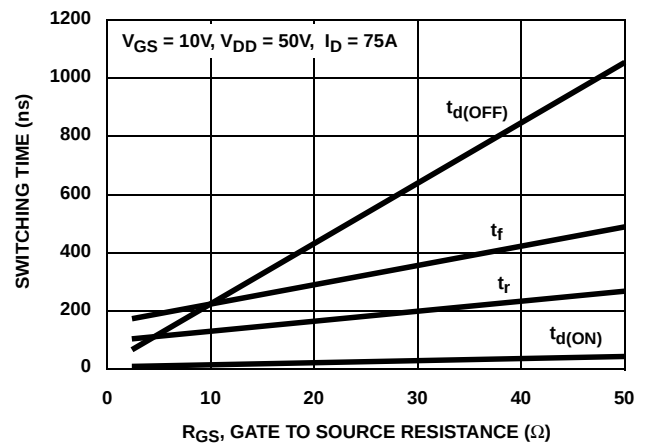


FIGURE 16. SWITCHING TIME vs GATE RESISTANCE

Test Circuits and Waveforms

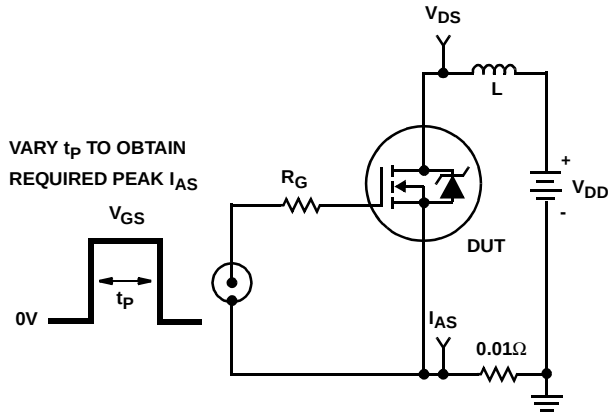


FIGURE 17. UNCLAMPED ENERGY TEST CIRCUIT

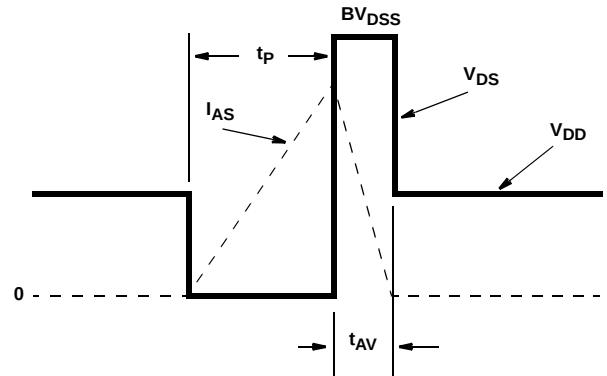


FIGURE 18. UNCLAMPED ENERGY WAVEFORMS

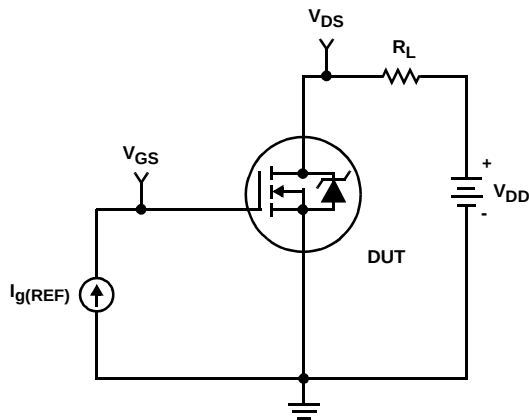


FIGURE 19. GATE CHARGE TEST CIRCUIT

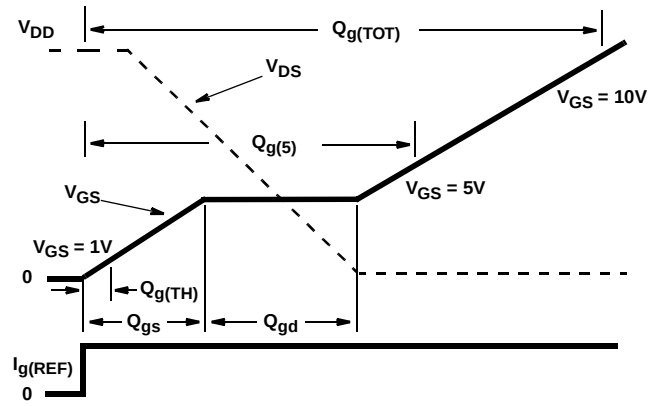


FIGURE 20. GATE CHARGE WAVEFORMS

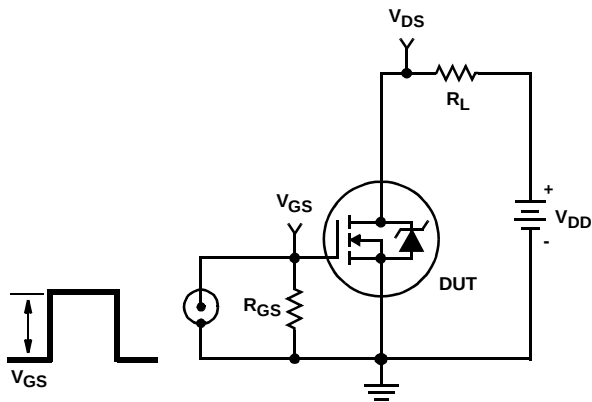


FIGURE 21. SWITCHING TIME TEST CIRCUIT

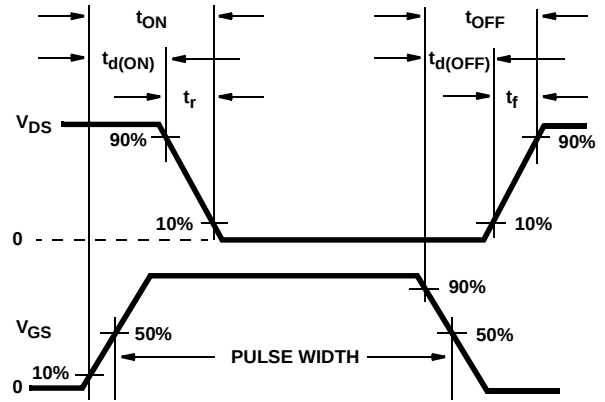


FIGURE 22. SWITCHING TIME WAVEFORM

PSPICE Electrical Model

.SUBCKT HUFA76645 2 1 3 ; rev 7 June 1999

CA 12 8 7.4e-9
CB 15 14 7.4e-9
CIN 6 8 4.13e-9

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

EBREAK 11 7 17 18 121
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 5.1e-9
LSOURCE 3 7 4.4e-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 8.3e-3
RGATE 9 20 0.96
RLDRAIN 2 5 10
RLGATE 1 9 51
RLSOURCE 3 7 44
RSLC1 5 51 RSLCMOD 1e-6
RSLC2 5 50 1e3
RSOURCE 8 7 RSOURCEMOD 2.5e-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

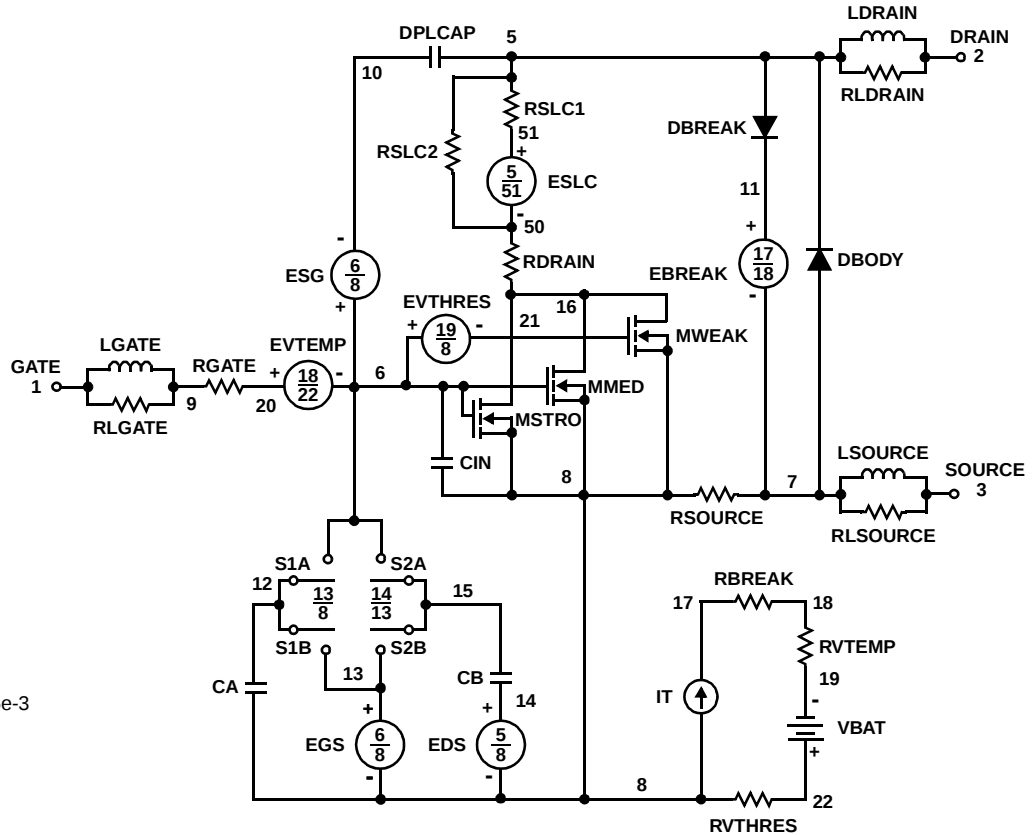
ESLC 51 50 VALUE={(V(5,51)/ABS(V(5,51)))*(PWR(V(5,51)/(1e-6*200),3.2))}

.MODEL DBODYMOD D (IS = 3.6e-12 RS = 2.24e-3 TRS1 = 2e-3 TRS2 = 1.03e-6 CJO = 4.5e-9 TT = 5.1e-8 M = 0.60)
.MODEL DBREAKMOD D (RS = 2.5e-1 TRS1 = 1e-4 TRS2 = 1e-7)
.MODEL DPLCAPMOD D (CJO = 5.4e-9 IS = 1e-30 VJ = 1.0 M = 0.9)
.MODEL MMEDMOD NMOS (VTO = 1.77 KP = 7 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u RG = 0.96)
.MODEL MSTROMOD NMOS (VTO = 2.11 KP = 200 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u)
.MODEL MWEAKMOD NMOS (VTO = 1.5 KP = 0.12 IS = 1e-30 N = 10 TOX = 1 L = 1u W = 1u RG = 9.6 RS = 0.1)
.MODEL RBREAKMOD RES (TC1 = 1.05e-3 TC2 = -5e-7)
.MODEL RDRAINMOD RES (TC1 = 8.8e-3 TC2 = 1.7e-5)
.MODEL RSLCMOD RES (TC1 = 4e-3 TC2 = 1.5e-5)
.MODEL RSOURCEMOD RES (TC1 = 1e-3 TC2 = 2e-6)
.MODEL RVTHRESMOD RES (TC1 = -1.9e-3 TC2 = -8e-6)
.MODEL RVTEMPMOD RES (TC1 = -1.7e-3 TC2 = 1e-7)

.MODEL S1AMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -4.5 VOFF = -2.0)
.MODEL S1BMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -2.0 VOFF = -4.5)
.MODEL S2AMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = -1.0 VOFF = 0.5)
.MODEL S2BMOD VSWITCH (RON = 1e-5 ROFF = 0.1 VON = 0.5 VOFF = -1.0)

.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 7 June 1999

HUFA76645T

CTHERM1 th 6 6.4e-3
 CTHERM2 6 5 3.0e-2
 CTHERM3 5 4 1.4e-2
 CTHERM4 4 3 1.6e-2
 CTHERM5 3 2 5.5e-2
 CTHERM6 2 tl 1.5

RTHERM1 th 6 3.4e-3
 RTHERM2 6 5 8.6e-3
 RTHERM3 5 4 2.3e-2
 RTHERM4 4 3 1.3e-1
 RTHERM5 3 2 1.8e-1
 RTHERM6 2 tl 3.9e-2

SABER Thermal Model

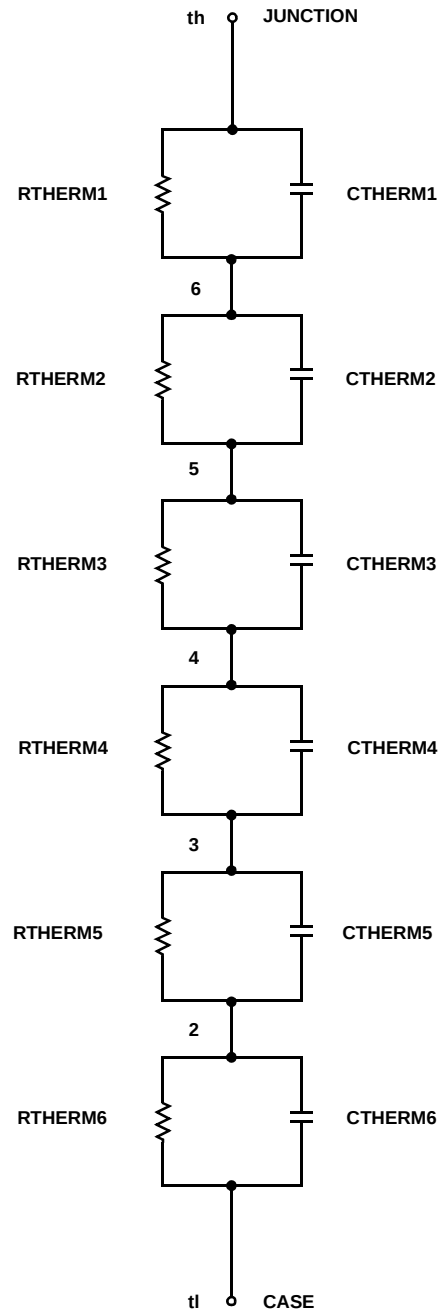
SABER thermal model HUFA76645T

template thermal_model th tl
 thermal_c th, tl

```
{
    ctherm.ctherm1 th 6 = 6.4e-3
    ctherm.ctherm2 6 5 = 3.0e-2
    ctherm.ctherm3 5 4 = 1.4e-2
    ctherm.ctherm4 4 3 = 1.6e-2
    ctherm.ctherm5 3 2 = 5.5e-2
    ctherm.ctherm6 2 tl = 1.5
```

```
    rtherm.rtherm1 th 6 = 3.4e-3
    rtherm.rtherm2 6 5 = 8.6e-3
    rtherm.rtherm3 5 4 = 2.3e-2
    rtherm.rtherm4 4 3 = 1.3e-1
    rtherm.rtherm5 3 2 = 1.8e-1
    rtherm.rtherm6 2 tl = 3.9e-2
```

```
}
```





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CorePLUS™	Green FPS™	Programmable Active Droop™	TinyBoost™
CorePOWER™	Green FPS™ e-Series™	QFET®	TinyBuck™
CROSSVOLT™	Gmax™	QS™	TinyCalc™
CTL™	GTO™	Quiet Series™	TinyLogic®
Current Transfer Logic™	IntelliMAX™	RapidConfigure™	TINYOPTO™
DEUXPEED®	ISOPANAR™	 Saving our world, 1mW/W/kW at a time™	TinyPower™
Dual Cool™	MegaBuck™	SignalWise™	TinyPWM™
EcoSPARK®	MICROCOUPLER™	SmartMax™	TinyWire™
EfficientMax™	MicroFET™	SMART START™	TriFault Detect™
ESBC™	MicroPak™	SPM®	TRUECURRENT™*
 Fairchild®	MicroPak2™	STEALTH™	µSerDes™
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FACT Quiet Series™	MotionMax™	SuperSOT™-3	UHC®
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