

NTMFS4841NH

Power MOSFET

30 V, 59 A, Single N-Channel, SO-8FL

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- Low R_G
- These are Pb-Free Devices*

Applications

- Refer to Application Note AND8195/D
- CPU Power Delivery
- DC-DC Converters

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter			Sym- bol	Value	Unit
Drain-to-Source Voltage			V_{DS}	30	V
Gate-to-Source Voltage			V_{GS}	± 20	V
Steady State	Continuous Drain Current $R_{\theta JA}$ (Note 1)	$T_A = 25^\circ\text{C}$	I_D	13.5	A
		$T_A = 85^\circ\text{C}$		9.7	
	Power Dissipation $R_{\theta JA}$ (Note 1)	$T_A = 25^\circ\text{C}$	P_D	2.16	W
		$T_A = 85^\circ\text{C}$		1.1	
	Continuous Drain Current $R_{\theta JA} \leq 10$ s	$T_A = 25^\circ\text{C}$	I_D	21.8	A
		$T_A = 85^\circ\text{C}$		15.7	
	Power Dissipation $R_{\theta JA} \leq 10$ s	$T_A = 25^\circ\text{C}$	P_D	5.7	W
		$T_A = 85^\circ\text{C}$		2.9	
	Continuous Drain Current $R_{\theta JA}$ (Note 2)	$T_A = 25^\circ\text{C}$	I_D	8.6	A
		$T_A = 85^\circ\text{C}$		6.2	
	Power Dissipation $R_{\theta JA}$ (Note 2)	$T_A = 25^\circ\text{C}$	P_D	0.87	W
		$T_A = 85^\circ\text{C}$		0.45	
	Continuous Drain Current $R_{\theta JC}$ (Note 1)	$T_C = 25^\circ\text{C}$	I_D	59	A
		$T_C = 85^\circ\text{C}$		42.5	
	Power Dissipation $R_{\theta JC}$ (Note 1)	$T_C = 25^\circ\text{C}$	P_D	41.7	W
		$T_C = 85^\circ\text{C}$		21.7	
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$T_A = 25^\circ\text{C}$	I_{DM}	177	A
Operating Junction and Storage Temperature			T_J, T_{STG}	-55 to +150	$^\circ\text{C}$
Source Current (Body Diode)			I_S	35	A
Drain to Source dV/dt			dV/dt	6	V/ns
Single Pulse Drain-to-Source Avalanche Energy ($V_{DD} = 24$ V, $V_{GS} = 10$ V, $I_L = 25.6$ A, $L = 0.3$ mH, $R_G = 25 \Omega$)			EAS	98	mJ
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)			T_L	260	$^\circ\text{C}$

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

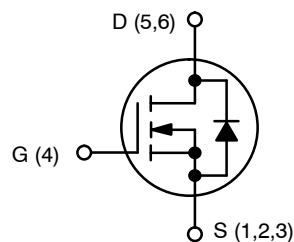
1. Surface-mounted on FR4 board using 1 sq-in pad, 1 oz Cu.
2. Surface-mounted on FR4 board using the minimum recommended pad size.



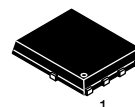
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$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
30 V	7.0 m Ω @ 10 V	59 A
	11.6 m Ω @ 4.5 V	

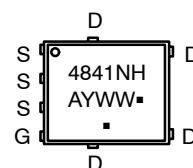


N-CHANNEL MOSFET



SO-8 FLAT LEAD
CASE 488AA
STYLE 1

MARKING DIAGRAM



A = Assembly Location
Y = Year
WW = Work Week
■ = Pb-Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NTMFS4841NHT1G	SO-8FL (Pb-Free)	1500 / Tape & Reel
NTMFS4841NHT3G	SO-8FL (Pb-Free)	5000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case (Drain)	$R_{\theta JC}$	3	°C/W
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	57.8	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	143.5	
Junction-to-Ambient ($t \leq 10$ s)	$R_{\theta JA}$	22.1	

ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$			28		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$	$T_J = 25^\circ\text{C}$		1	μA
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$			± 100	nA

ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.5	2.1	2.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$			5.6		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V to } 11.5\text{ V}$	$I_D = 30\text{ A}$		4.8	m Ω
			$I_D = 15\text{ A}$		4.8	
		$V_{GS} = 4.5\text{ V}$	$I_D = 30\text{ A}$		8.8	
			$I_D = 15\text{ A}$		8.5	
Forward Transconductance	g_{FS}	$V_{DS} = 1.5\text{ V}, I_D = 50\text{ A}$		57		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 12\text{ V}$		1565	2113	pF
Output Capacitance	C_{OSS}			325	439	
Reverse Transfer Capacitance	C_{RSS}			173	268	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}; I_D = 30\text{ A}$		11.3	16.7	nC
Threshold Gate Charge	$Q_{G(TH)}$			1.4	2.1	
Gate-to-Source Charge	Q_{GS}			5.3	7.9	
Gate-to-Drain Charge	Q_{GD}			4.5	6.8	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 30\text{ A}$		24.4	33	nC

SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\text{ }\Omega$		12.1	18.1	ns
Rise Time	t_r			23.3	34.9	
Turn-Off Delay Time	$t_{d(OFF)}$			14.1	21.1	
Fall Time	t_f			4.9	7.3	
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 11.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 15\text{ A}, R_G = 3.0\text{ }\Omega$		7.2	10.7	ns
Rise Time	t_r			20.6	30.9	
Turn-Off Delay Time	$t_{d(OFF)}$			21.9	32.9	
Fall Time	t_f			2.9	4.4	

3. Pulse Test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

4. Switching characteristics are independent of operating junction temperatures.

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ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V},$ $I_S = 30\text{ A}$	$T_J = 25^\circ\text{C}$		0.86	1.2	V
			$T_J = 125^\circ\text{C}$		0.71		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s},$ $I_S = 30\text{ A}$			18.8		ns
Charge Time	t_a				11.4		
Discharge Time	t_b				7.4		
Reverse Recovery Charge	Q_{RR}				6.7		nC

PACKAGE PARASITIC VALUES

Source Inductance	L_S	$T_A = 25^\circ\text{C}$		0.93		nH
Drain Inductance	L_D			0.005		
Gate Inductance	L_G			1.84		
Gate Resistance	R_G			0.90		Ω

- Pulse Test: pulse width $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.
- Switching characteristics are independent of operating junction temperatures.

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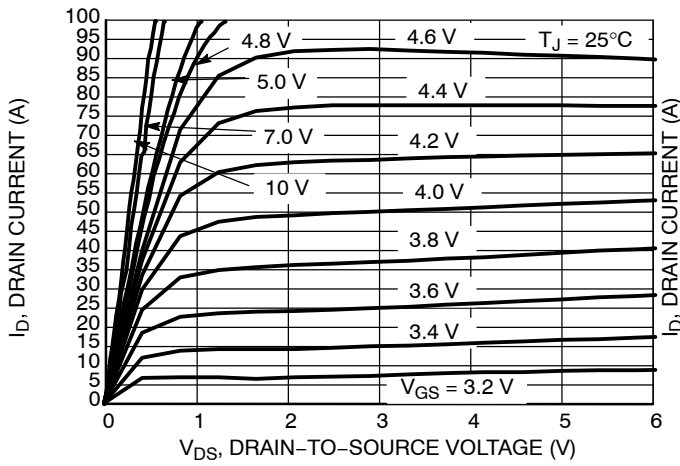


Figure 1. On-Region Characteristics

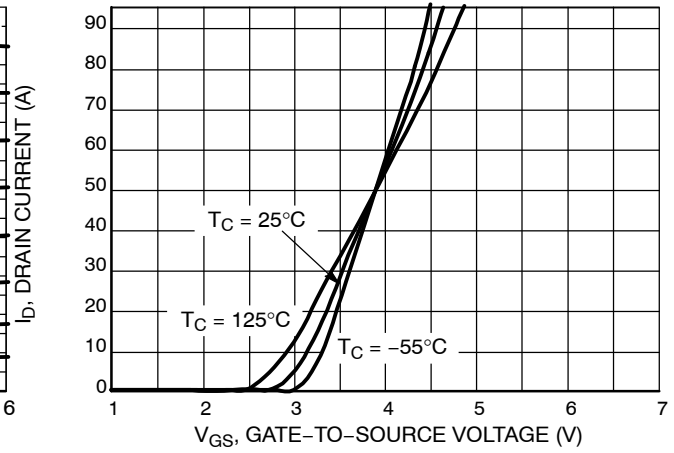


Figure 2. Transfer Characteristics

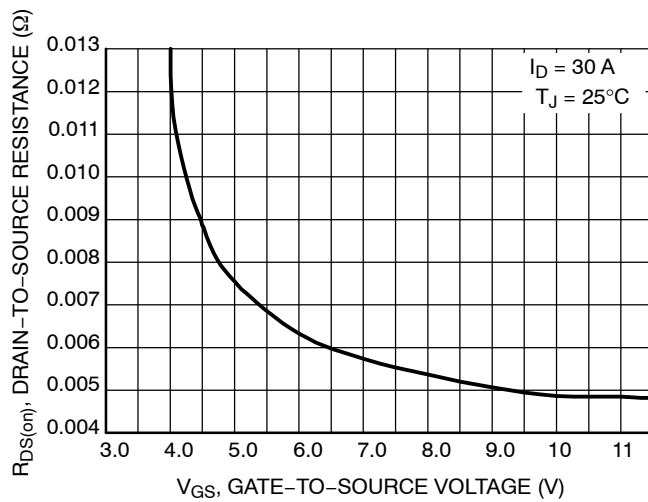


Figure 3. On-Resistance versus Gate-to-Source Voltage

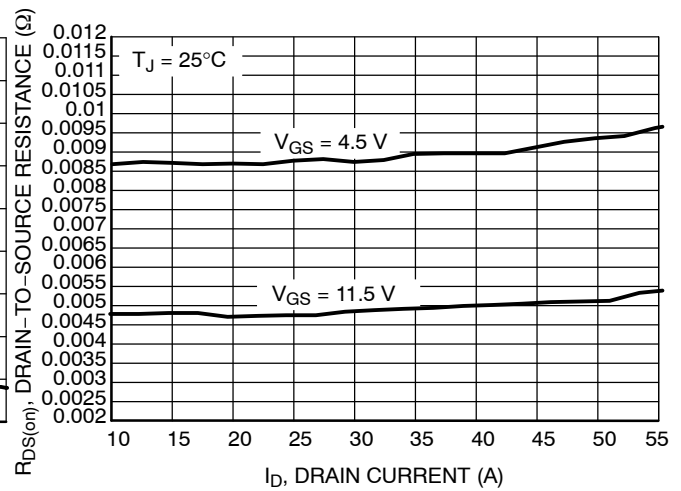


Figure 4. On-Resistance versus Drain Current and Gate Voltage

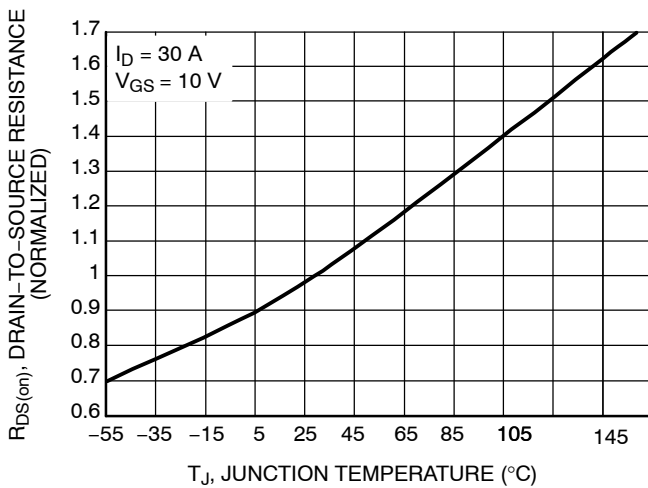


Figure 5. On-Resistance Variation with Temperature

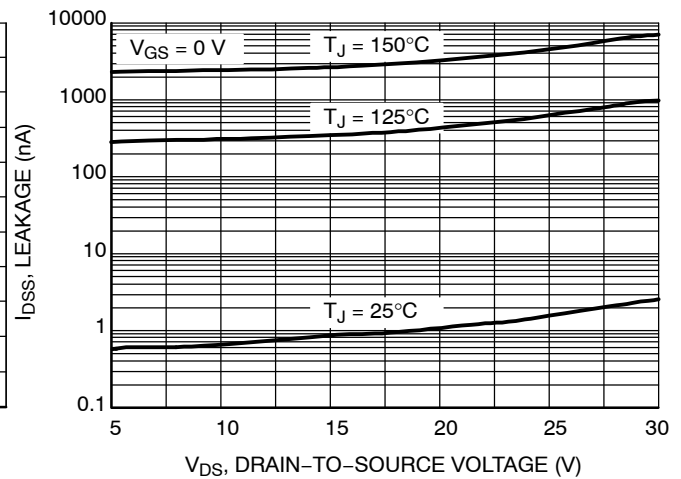


Figure 6. Drain-to-Source Leakage Current versus Voltage

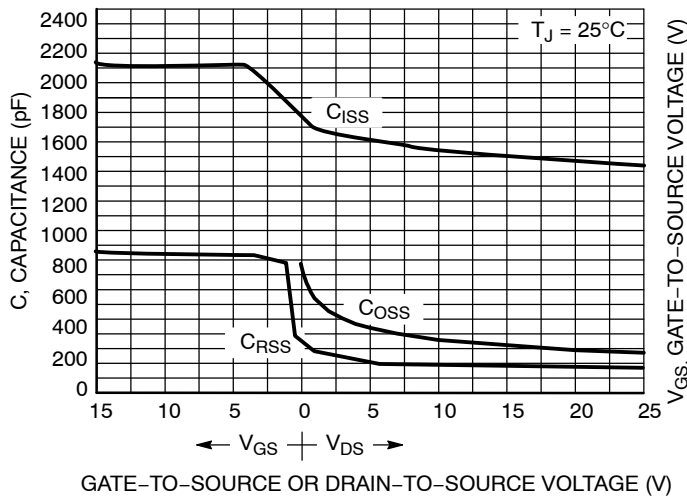


Figure 7. Capacitance Variation

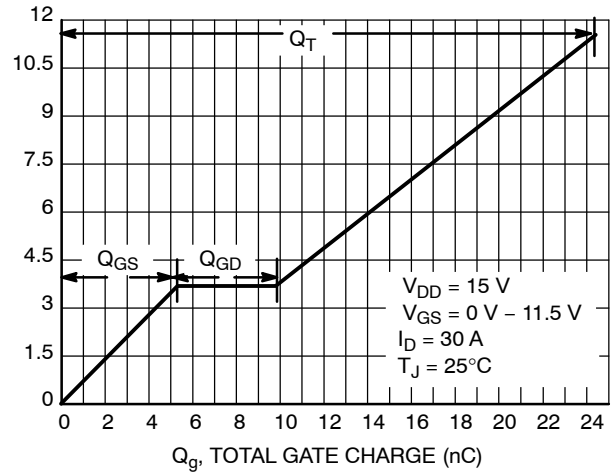


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Gate Charge

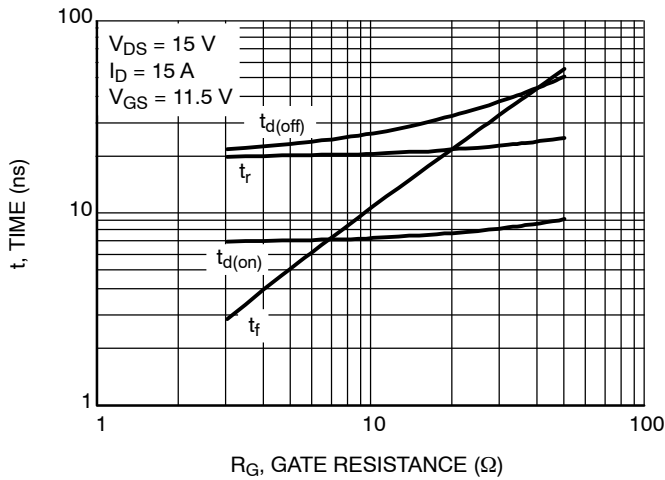


Figure 9. Resistive Switching Time Variation versus Gate Resistance

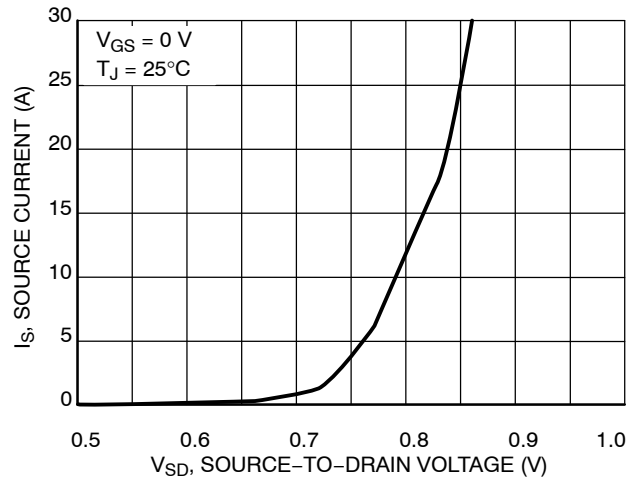


Figure 10. Diode Forward Voltage versus Current

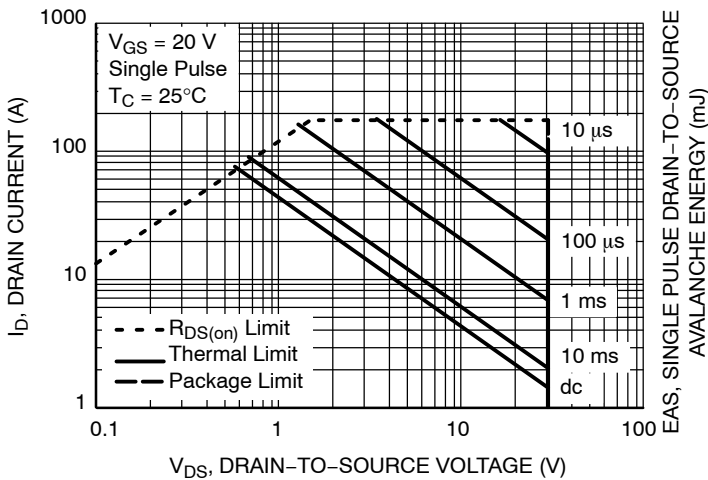


Figure 11. Maximum Rated Forward Biased Safe Operating Area

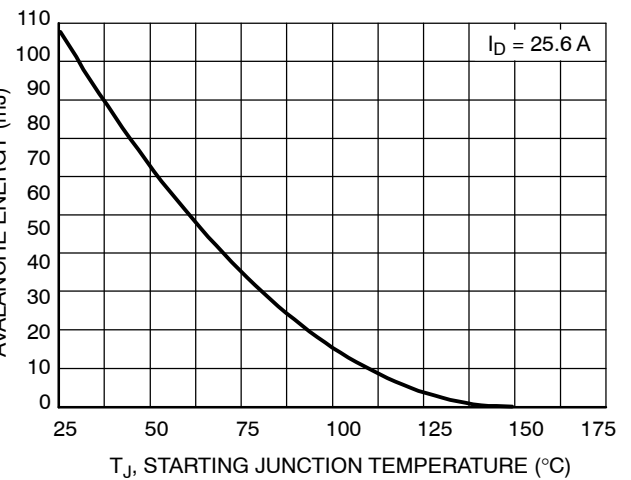


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

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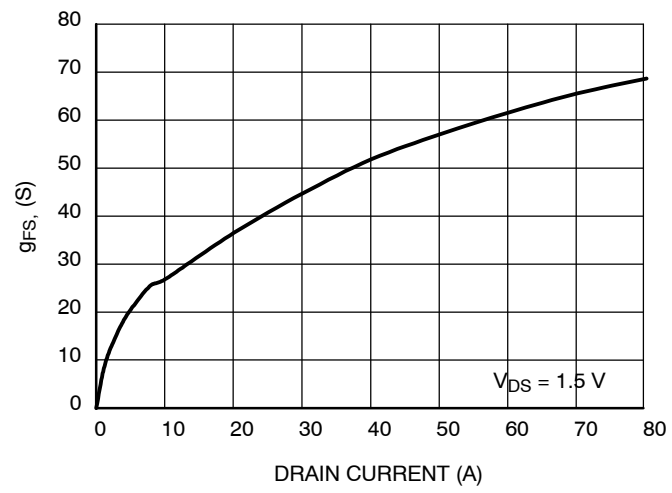


Figure 13. g_{FS} versus Drain Current

