



Solid State Devices, Inc.

14701 Firestone Blvd \* La Mirada, Ca 90638  
Phone: (562) 404-4474 \* Fax: (562) 404-1773  
ssdi@ssdi-power.com \* www.ssdi-power.com

# SGF46E70M & SGF46E70S1

**46 AMP**  
**GaN FET Normally-Off**  
**700 VOLTS, 30 mΩ typical**

## Designer's Data Sheet

### Part Number/Ordering Information<sup>1/</sup>

SGF46E70

#### Screening<sup>2/</sup>

— = Not Screened  
TX = TX Level  
TXV = TXV Level  
S = S Level

#### Lead Bend Options (TO-254 only)

— = Straight Leads  
UB = Up Bend  
DB = Down Bend

#### Package

M = TO-254  
S1 = SMD1

### FEATURES:

- 3<sup>rd</sup> Generation Gallium Nitride Technology
- Combines GaN HEMT and Low Voltage Si MOSFET (Cascode) for Superior Performance
- Works with Common Gate Drivers
- Low RDSon
- Low Qg Simplifies Gate Drive Circuit
- Very Fast Switching for High Frequency Applications
- Low Thermal Resistance
- Hermetically Sealed Package
- TX, TXV, and S-Level Screening Available<sup>2/</sup>
- Available as Normally-On (without the Si Mosfet Driver)

### APPLICATIONS:

- High Efficiency DC-DC / PoL Converters
- Motor Controller
- Robotics/Automation
- Military and Aerospace

### BENEFITS:

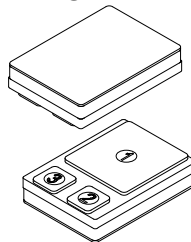
- GaN Transistor offers superior advantages over Si based MOSFET: low Q<sub>RR</sub>, low gate charge, low R<sub>DS(ON)</sub>, fast switching speed and low temperature coefficient
- Benefits circuit designer through higher efficiency, lower cross-over losses and On-state losses
- Eliminates the need to add free-wheeling diode

Maximum Ratings <sup>3/</sup>	Symbol	Value	Unit
Continuous Drain – Source Voltage	V <sub>DSS</sub>	700	V
Transient Drain – Source Voltage In off-state, spike duty cycle D < 0.01, spike duration < 1 μs	V <sub>TDS</sub>	800	V
Gate – Source Voltage	V <sub>GS</sub>	±20	V
Continuous Drain Current T <sub>C</sub> = 25°C	I <sub>D1</sub>	46	A
Continuous Drain Current T <sub>C</sub> = 100°C	I <sub>D2</sub>	29	A
Pulsed Drain Current (T <sub>op</sub> / P <sub>width</sub> limited) Pulse width = 10 μs	I <sub>D3</sub>	240	A
Total Power Dissipation	P <sub>D</sub>	125	W
Operating & Storage Temperature	T <sub>OP</sub> & T <sub>STG</sub>	-55 to +150	°C
Thermal Resistance (Junction to Case)	R <sub>θJC</sub>	1.0	°C/W

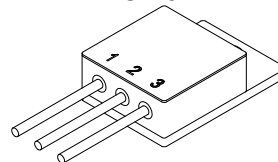
### NOTES:

- 1/ For ordering information, price, operating curves, and availability- contact factory.
- 2/ Screening based on MIL-PRF-19500. Screening flows available on request.
- 3/ Unless otherwise specified, all electrical characteristics @ 25°C.
- 4/ Pulse test, P<sub>w</sub> = 300 μs, D.C. = 2%.

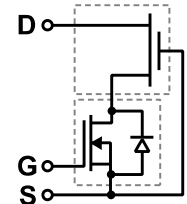
SMD1



TO-254



Cascode Device Structure



NOTE: All specifications are subject to change without notification. SCD's for these devices should be reviewed by SSDI prior to release.

DATA SHEET #: FT0074D

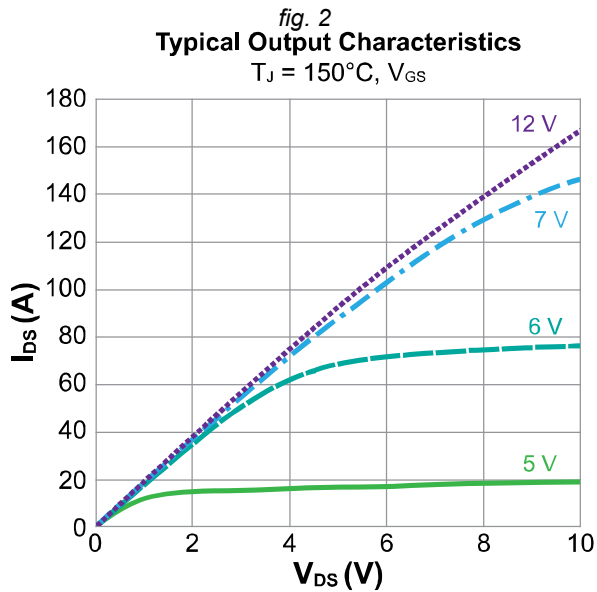
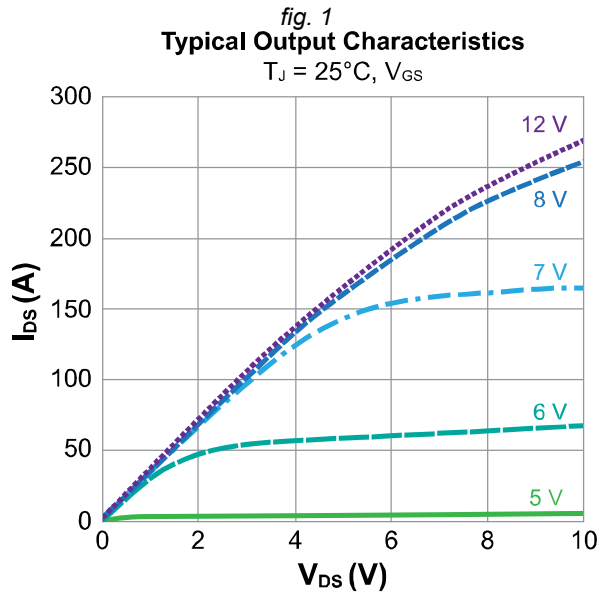
DOCX



**Solid State Devices, Inc.**  
 14701 Firestone Blvd \* La Mirada, Ca 90638  
 Phone: (562) 404-4474 \* Fax: (562) 404-1773  
 ssdi@ssdi-power.com \* www.ssdi-power.com

# SGF46E70M & SGF46E70S1

Electrical Characteristics <sup>3/</sup>		Symbol	Min	Typ	Max	Unit
<b>Drain to Source Breakdown Voltage</b>	$I_D = 100 \mu A, V_{GS} = 0 V$	$V_{DSS}$	700	-	-	V
<b>Gate to Source Leakage</b>	$V_{GS} = 20 V$	$I_{GSSF}$	-	-	400	nA
	$V_{GS} = -20 V$	$I_{GSSR}$	-	-	-400	nA
<b>Drain to Source Leakage Current</b>	$T_J = 25^\circ C$ $V_{DS} = 650 V, V_{GS} = 0 V$	$I_{DSS}$	-	3	25	$\mu A$
	$T_J = 150^\circ C$		-	15	-	
<b>Gate Threshold Voltage</b>	$V_{DS} = V_{GS}, I_D = 1 mA$	$V_{GS(th)}$	3.3	4	4.8	V
<b>Drain to Source On State Resistance<sup>4/</sup></b>	$T_J = 25^\circ C$ $V_{GS} = 10 V, I_D = 30 A$	$R_{DS(on)}$	-	30	41	m $\Omega$
	$T_J = 150^\circ C$		-	72	-	
<b>Total Gate Charge</b>	$V_{DS} = 400 V$ $I_D = 32 A$	$Q_g$	-	24	36	nC
<b>Gate to Source Charge</b>		$Q_{gs}$	-	10	-	nC
<b>Gate to Drain Charge</b>		$Q_{gd}$	-	6	-	nC
<b>Total Output Charge</b>	$V_{GS} = 0 V, V_{DS} = 0 V - 400 V$	$Q_{oss}$	-	178	-	nC
<b>Input Capacitance</b>	$V_{GS} = 0 V$	$C_{iss}$	-	1500	-	pF
<b>Output Capacitance</b>	$V_{DS} = 400 V$	$C_{oss}$	-	190	-	pF
<b>Reverse Transfer Capacitance</b>	$f = 1 MHz$	$C_{rss}$	-	10	-	pF
<b>Output Capacitance, Energy Related</b>	$V_{GS} = 0 V, V_{DS} = 0 V - 400 V$	$C_{O(er)}$	-	290	-	pF
<b>Output Capacitance, Time Related</b>	$V_{GS} = 0 V, V_{DS} = 0 V - 400 V$	$C_{O(er)}$	-	440	-	pF
<b>Turn-on Delay</b>	<i>fig. 6</i> $V_{DS} = 400 V$ $V_{GS} = 12 V$ $I_D = 32 A$ $R_G = 30 \Omega$	$t_{D(ON)}$	-	69	-	ns
<b>Rise Time</b>		$t_R$	-	14	-	
<b>Turn-off Delay</b>		$t_{D(OFF)}$	-	99	-	
<b>Fall Time</b>		$t_F$	-	12	-	
<b>Source to Drain Forward Current<sup>4/</sup></b>	$V_{GS} = 0 V, T_C = 100^\circ C$	$I_{SD}$	-	-	29.5	A
<b>Source to Drain Forward Voltage<sup>4/</sup></b>	$I_S = 32 A, V_{GS} = 0 V$	$V_{SD}$	-	1.8	-	V
	$I_S = 15 A, V_{GS} = 0 V$		-	1.3	-	
<b>Source to Drain Reverse Recovery Time</b>	$I_S = 30 A, V_{DD} = 400 V$ $di/dt = 1000 A/\mu s$	$t_{RR}$	-	65	-	ns
<b>Source to Drain Reverse Recovery Charge</b>	$I_S = 30 A, V_{DD} = 400 V$ $di/dt = 1000 A/\mu s$	$Q_{RR}$	-	178	-	nC

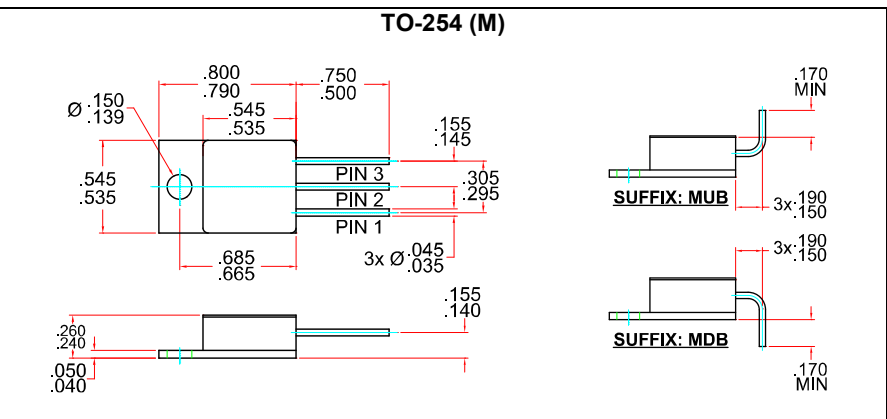
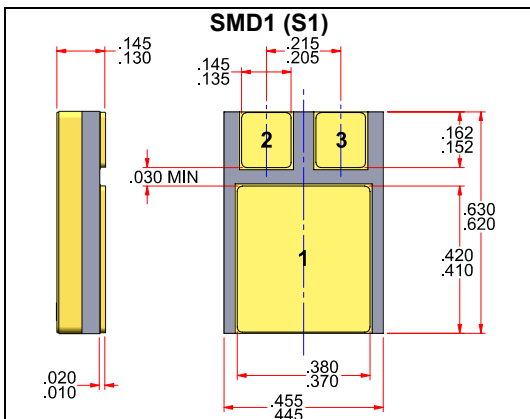
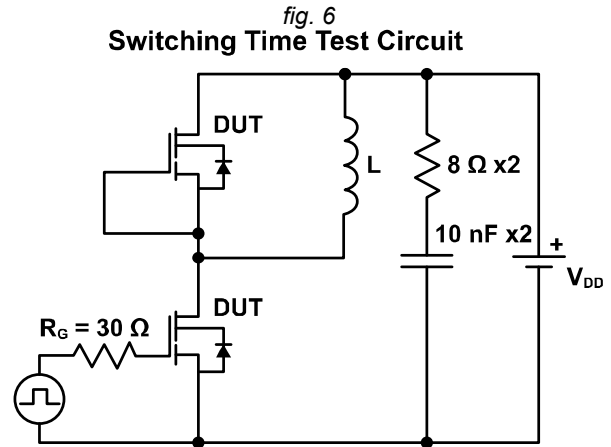
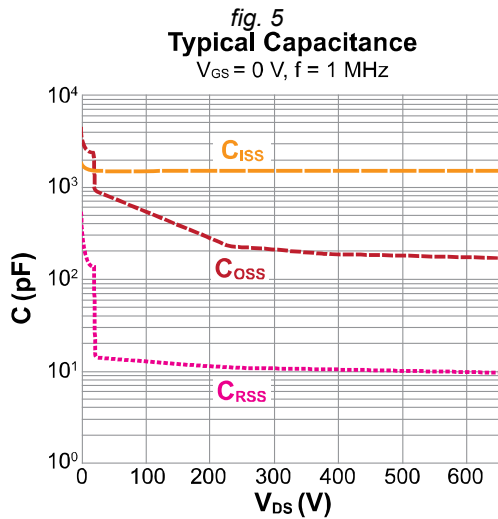
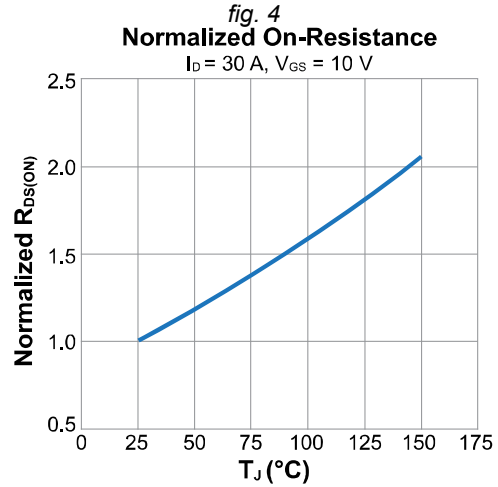
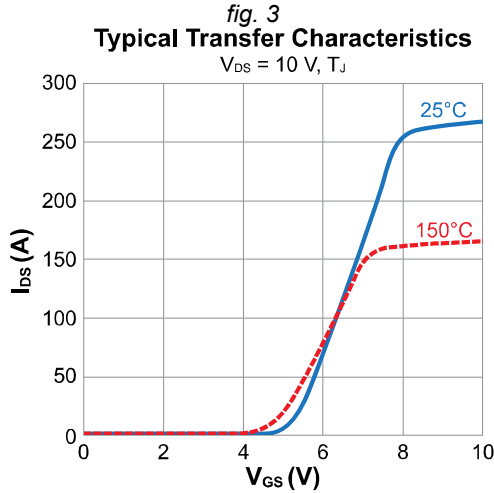




**Solid State Devices, Inc.**

14701 Firestone Blvd \* La Mirada, Ca 90638  
 Phone: (562) 404-4474 \* Fax: (562) 404-1773  
 ssdi@ssdi-power.com \* www.ssdi-power.com

# SGF46E70M & SGF46E70S1



**AVAILABLE PART NUMBERS:** SMD1: SGF46E70S1  
 TO-254: SGF46E70M, SGF46E70MDB, SGF46E70MUB

**NOTES:**

- 1/ For ordering information, price, operating curves, and availability- contact factory.
- 2/ Screening based on MIL-PRF-19500. Screening flows available on request.
- 3/ Unless otherwise specified, all electrical characteristics @ 25°C.
- 4/ Pulse test,  $P_W = 300\ \mu\text{s}$ , D.C. = 2%.

**PIN ASSIGNMENT**

	SMD1	TO-254
Source	1	3
Drain	2	1
Gate	3	2
Substrate	*	NC

\* Substrate internally tied to Source

**NOTE:** All specifications are subject to change without notification. SCD's for these devices should be reviewed by SSDI prior to release.

**DATA SHEET #: FT0074D**

**DOCX**