



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^{1/}

SGF46E70

Screening^{2/}

- = 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:

- 3rd Generation Gallium Nitride Technology
- Combines GaN HEMT and Low Voltage Si MOSFET (Cascode) for Superior Performance
- Works with Common Gate Drivers
- Low R_{DSon}
- Low Q_g Simplifies Gate Drive Circuit
- Very Fast Switching for High Frequency Applications
- Low Thermal Resistance
- Hermetically Sealed Package
- TX, TXV, and S-Level Screening Available^{2/}
- 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_{RR}, low gate charge, low R_{DS(ON)}, 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 ^{3/}	Symbol	Value	Units
Continuous Drain - Source Voltage	V _{DSS}	700	V
Transient Drain - Source Voltage In off-state, spike duty cycle D < 0.01, spike duration < 1 μs	V _{TDS}	800	V
Gate - Source Voltage	V _{GS}	±20	V
Continuous Drain Current T _C = 25°C	I _{D1}	46	A
Continuous Drain Current T _C = 100°C	I _{D2}	29	A
Pulsed Drain Current (T _{op} / P _{width} limited) Pulse width = 10 μs	I _{D3}	240	A
Total Power Dissipation	P _D	125	W
Operating & Storage Temperature	T _{OP} & T _{STG}	-55 to +150	°C
Thermal Resistance (Junction to Case)	R _{θJC}	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_w = 300 μs, D.C. = 2%.

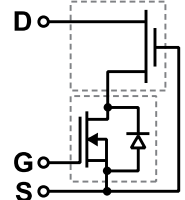
SMD1



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.

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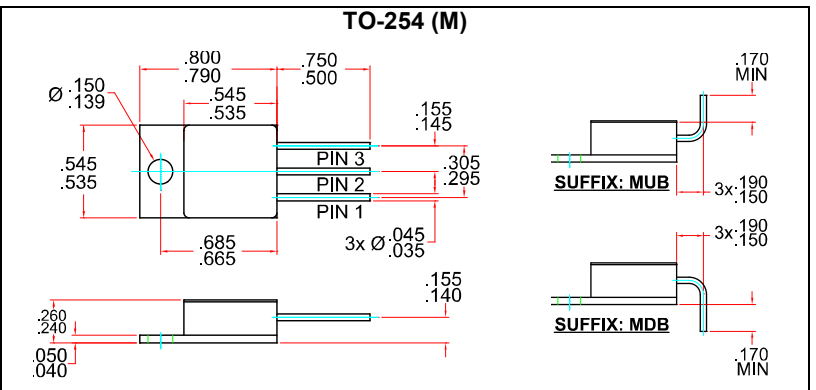
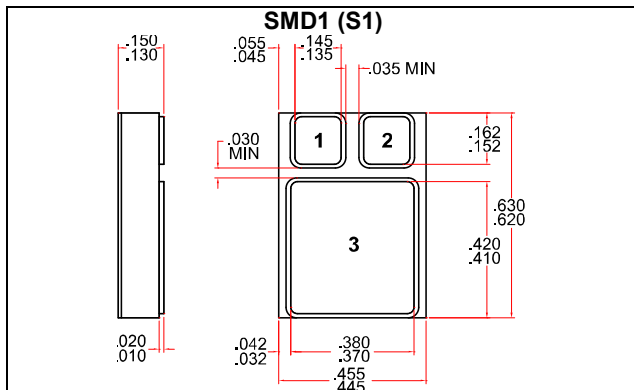


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SGF46E70M & SGF46E70S1

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



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

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

* Substrate internally tied to Source

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