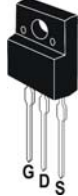
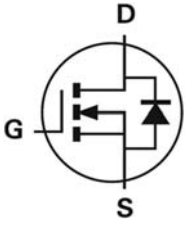


V_{DSS} , 60V R_{DS(ON)} , 9mΩ (max.) @ V_{GS}=10V R_{DS(ON)} , 11mΩ (max.) @ V_{GS}=4.5V I_D , 44A	TO-220F 	

Description	Features
<p>The SG60N15F uses advanced Trench technology and designs to provide excellent R_{DS(ON)} with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.</p>	<ul style="list-style-type: none"> • Low On-Resistance • Low Input Capacitance • Low Miller Charge • Low Input / Output Leakage • Pb-free lead plating; RoHS compliant
	Applications
	<ul style="list-style-type: none"> • Motor / Body Load Control • Automotive Systems • Load Switch • DC-DC converters and Off-line UPS

Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG60N15F	Halogen-Free	TO-220F	F	Tube	50

Absolute Maximum Ratings (T_A=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V _{DS}	60	V
Gate-Source Voltage	V _{GS}	±20	V
Drain Current-Continuous	I _D	T _C =25°C	44
		T _C =100°C	28
Drain Current-Pulsed ^{Note 1}	I _{DM}	100	A
Avalanche Current	I _{AS}	35	A
Avalanche Energy, L=0.1mH	E _{AS}	61	mJ
Maximum Power Dissipation	P _D	T _C =25°C	31.3
		T _C =100°C	12.5
Storage Temperature Range	T _{STG}	-55 to +150	°C
Operating Junction Temperature Range	T _J	-55 to +150	°C

Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient	R _{θJA}	Steady State	-	-	62	°C/W
Maximum Junction-to-Case	R _{θJC}	Steady State	-	-	4	°C/W

Electrical Characteristics (T_J=25°C unless otherwise noted)

OFF CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V, I _{DS} =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =48V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
ON CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V _{GS(TH)}	V _{DS} =V _{GS} , I _{DS} =250μA	1.3	1.7	2.4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _{DS} =12A	-	-	9	mΩ
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =4.5V, I _{DS} =9A	-	-	11	mΩ

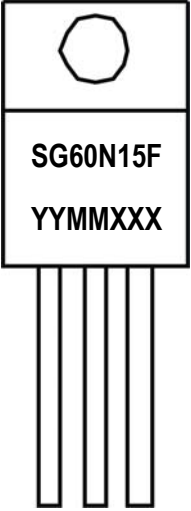
DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C _{iss}	V _{DS} =30V, V _{GS} =0V, f=1MHz	-	1486	-	pF
Output Capacitance	C _{oss}		-	123	-	
Reverse Transfer Capacitance	C _{rss}		-	71	-	

SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T _{d(on)}	V _{GS} =10V, V _{DS} =30V, R _L =5Ω, R _{GEN} =3Ω	-	14.8	-	ns
Rise Time	t _r		-	127	-	
Turn-Off Delay Time	T _{d(off)}		-	54.2	-	
Fall Time	t _f		-	75.9	-	
Total Gate Charge	Q _g	V _{GS} =10V, V _{DS} =30V, I _D =12A	-	68	-	nC
Gate to Source Gate Charge	Q _{gs}		-	15.6	-	
Gate to Drain "Miller" Charge	Q _{gd}		-	18	-	
Gate resistance	R _g	V _{DS} =0V, V _{GS} =0V, f=1MHz	-	1.5	-	Ω

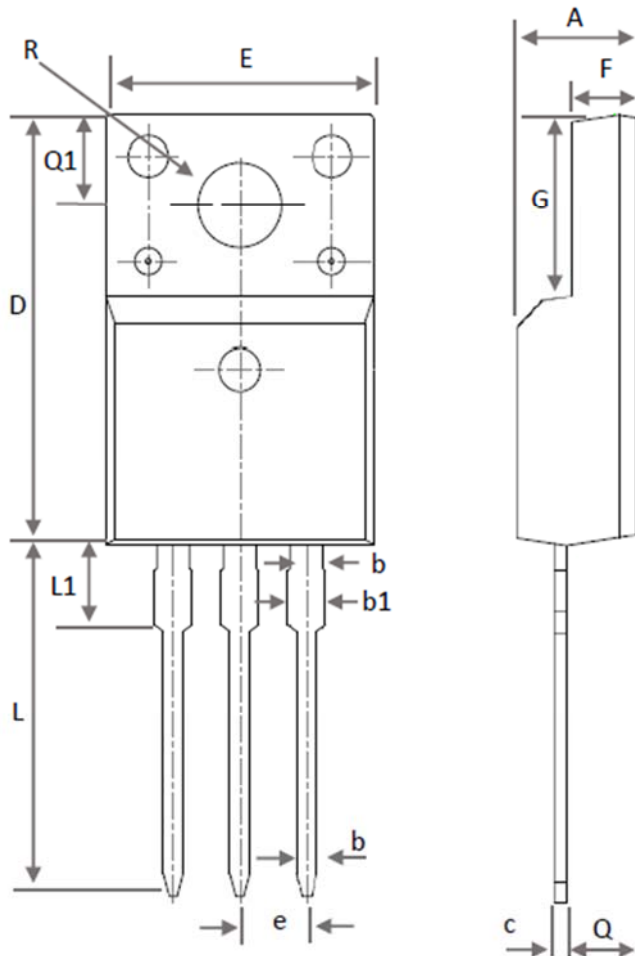
DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =12A	-	-	1.3	V
Continuous Source Current	I _S	V _G =V _D =0V, Force Current	-	-	52	A
Pulsed Source Current	I _{SM}		-	-	120	A

- Notes:**
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
 2. R_{θJA} is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R_{θJC} is guaranteed by design while R_{θCA} is determined by the user's board design. R_{θJA} shown below for single device operation on FR-4 in still air.

Marking Information

TO-220F (F)	Marking Rule
<p>Laser Marking</p>  <p>Diagram</p>	<p><u>Line 1</u> : Device SG60N15F</p> <p><u>Line 2</u> : Date Code YYMMXXX</p> <p>YY : Year Code MM : Month Code XXX : Serial Number</p>

Package of Dimension



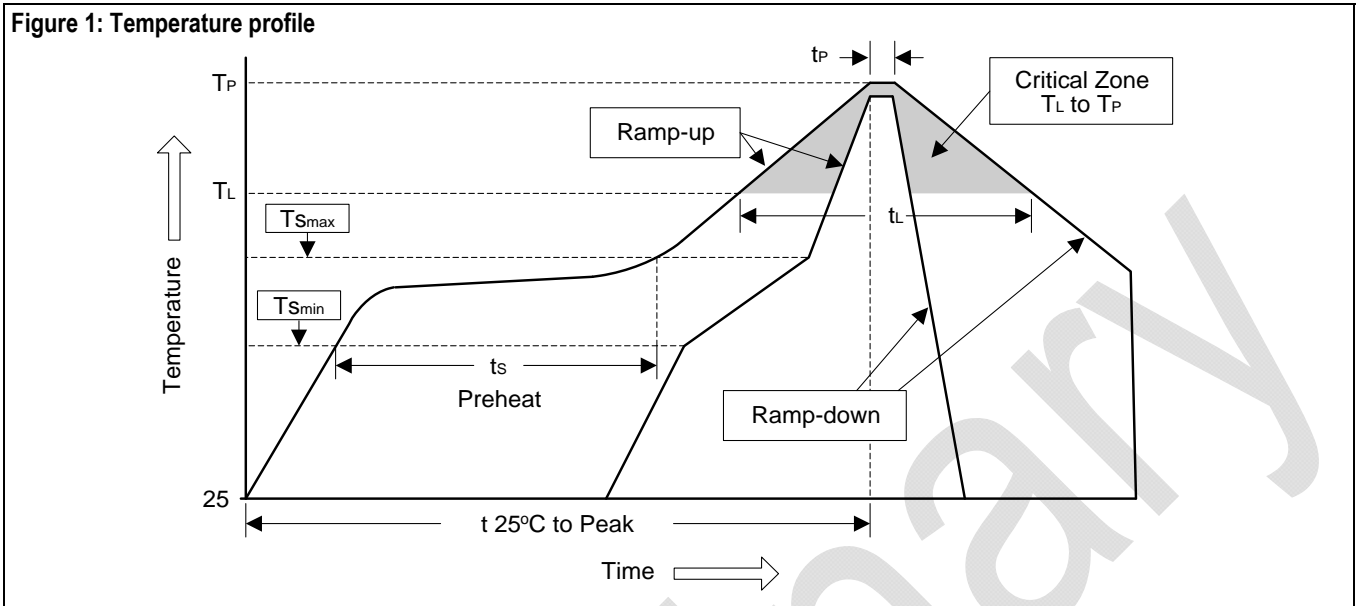
Symbol	Min	Nor	Max
A	4.50	4.67	4.83
b	0.70	0.81	0.91
b1	1.20	1.34	1.47
b2	1.10	1.24	1.38
C	0.40	0.52	0.63
D	15.67	15.87	16.07
e	2.54 BSC		
E	9.96	10.16	10.36
F	2.34	2.54	2.74
G	6.48	6.69	6.90
L	12.68	12.99	13.30
L1	3.13	3.32	3.50
Q	2.54	2.74	2.93
Q1	3.20	3.30	3.40
R	3.08	3.18	3.28

Preliminary

Soldering Methods for Silicongear's Products

1. Storage environment: Temperature=10°C to 35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min (T_{Smin})	100°C	150°C
- Temperature Max (T_{Smax})	150°C	200°C
- Time (min to max) (t_s)	60 to 120 sec	60 to 180 sec
T_{Smax} to T_L		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature (T_L)	183°C	217°C
- Time (t_L)	60 to 150 sec	60 to 150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	10 to 30 sec	20 to 40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak Temperature	Dipping Time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec

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