60A 650V Trench Fieldstop IGBT with anti-parallel diode SRE60N065FSU2DG

General Description

The SRE60N065FSU2DG is a Field Stop Trench IGBT with anti-parallel diode, which offers ultra-low switching losses, high energy efficiency for switching applications such as PFC, Power Supply, Inverter, etc.

The SRE60N065FSU2DG package is TO-247.

Features

- High Breakdown Voltage to 650V
- Advanced Trench Fieldstop technology
  - Smooth Switching Off with Lower Spike
  - High Ruggedness, Temperature Stability
  - Easy Parallel Switching Capability due to Positive Temperature Coefficient in $V_{CE(SAT)}$
- Low $V_{CE(SAT)}$
- Enhanced Avalanche Capability
- Non-Automotive Qualified

Application

- Inverter
- Uninterruptible power supplies
- PFC application
- Converter with high switching frequency

Symbol

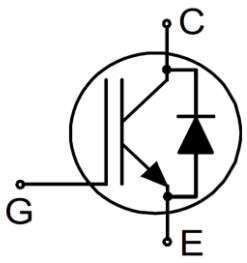
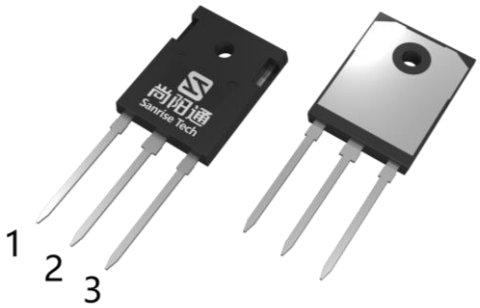


Figure 1 Symbol of SRE60N065FSU2DG

Package Type



TO-247

Pin 1- gate
Pin 2&backside-collector
Pin 3-emitter

Figure 2 Package Type of SRE60N065FSU2DG

Ordering Information

SRE60N065FSU2DG□□–□

Circuit Type
Package
T: TO-247

G: Green
Blank: Tube
TR: Tape & Reel

Package	Part Number	Marking ID	Packing Type
TO-247	SRE60N065FSU2DGT-G1	SRE60N065FSU2DGTG1	Tube

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Absolute Maximum Ratings

Parameter		Symbol	Rating	Unit
Collector-emitter Voltage		V_{CES}	650	V
Gate-emitter Voltage		V_{GES}	±20	V
Transient Gate-emitter Voltage			±30	V
Continuous Collector Current	T_C=25ºC	I_C	120	A
	T_C=100ºC		60	
Pulsed Collector Current,Limited by T_{Jmax}		I_{CM}	240	A
Diode Continuous Collector Current	T_C=25ºC	I_F	70	A
	T_C=100ºC		40(1)	
Diode Pulsed Current, Limited by T_{Jmax}		I_{FM}	120	A
Power Dissipation	T_C=25ºC	P_{tot}	306	W
	T_C=100ºC		153	
Operating Junction Temperature Range		T_J	-40 ~ 175(2)	ºC
Storage Temperature Range		T_{STG}	-55 ~ 150	ºC
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	ºC

Note:
1. Current level is limited by Tj_max.
2. Reliability testing conducted at T_{Jmax}=175℃.

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
IGBT Thermal Resistance，Junction-to-Case	R_{thJC}	-	-	0.49	ºC/W
Diode Thermal Resistance，Junction-to-Case	R_{thJC}	-	-	1.0	
Thermal Resistance，Junction-to-Ambient	R_{thJA}	-	-	40	

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Electrical Characteristics

T_J = 25ºC, unless otherwise specified.

Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Statistic Characteristics							
Collector-emitter Breakdown Voltage		BV_{CES}	V_{GE}=0V, I_C=250μA	650			V
Gate Threshold Voltage		$V_{GE(th)}$	V_{CE}=V_{GE}, I_C=250μA	4.2	4.8	5.4	V
Collector-emitter saturation voltage		V_{CEsat}	V_{GE}=15V, I_C=60A, T_J=25ºC	1.45	1.51	1.68	V
			T_J=125ºC		1.81		V
			T_J=175ºC		2.02		V
Zero Gate Voltage Collector Current		I_{CES}	V_{CE}=650V,V_{GE}=0V T_J=25ºC		0.1	40	μA
			T_J=175ºC			1	mA
Gate-emitter Leakage Current	Forward	I_{GESF}	V_{GE}=20V, V_{CE}=0V			100	nA
	Reverse	I_{GESR}	V_{GE}=-20V, V_{CE}=0V			-100	nA
Dynamic Characteristics							
Input Capacitance		C_{IES}	V_{CE}=25V, V_{GE}=0V, f=100KHz		2460		pF
Output Capacitance		C_{OES}			247		
Reverse Transfer Capacitance		C_{RES}			48		
Gate Resistance		R_G	f=1 MHz, Open Drain		1.7		Ω
Turn-on Delay Time		$t_{d(on)}$	T_J=25ºC V_{CC}=400V, I_C=60A R_G=10Ω, V_{GE}=0/15V Energy losses include "tail" and diode reverse recovery		21		ns
Rise Time		t_r			38		ns
Turn-off Delay Time		$t_{d(off)}$			122		ns
Fall Time		t_f			70		ns
Turn-on energy		E_{on}			1.34		mJ
Turn-off energy		E_{off}			0.63		mJ
Total switching energy		E_{ts}			1.97		mJ
Turn-on Delay Time		$t_{d(on)}$	T_J=150ºC V_{CC}=400V, I_C=60A R_G=10Ω,V_{GE}=0/15V Energy losses include "tail" and diode reverse recovery		18		ns
Rise Time		t_r			39		ns
Turn-off Delay Time		$t_{d(off)}$			149		ns
Fall Time		t_f			118		ns
Turn-on energy		E_{on}			2.43		mJ
Turn-off energy		E_{off}			0.92		mJ
Total switching energy		E_{ts}			3.35		mJ
Gate to Emitter Charge		Q_{GE}	V_{CC}=400V, I_C=60A V_{GE}=0 to 15V		28		nC
Gate to Collector Charge		Q_{GC}			91		
Gate Charge Total		Q_G			190		

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Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Reverse Diode Characteristics						
Diode Forward Voltage	V_F	I_F=30A T_J=25ºC		1.61	1.89	V
		I_F=30A T_J=125ºC		1.44		
		I_F=30A T_J=175ºC		1.34		
		I_F=60A T_J=25ºC		1.89	2.22	V
		I_F=60A T_J=125ºC		1.79		
		I_F=60A T_J=175ºC		1.68		
Reverse Recovery Time	t_{rr}	T_J=25ºC V_R=400V, I_F=30A dI_F/dt=1100A/us		130		ns
Reverse Recovery Charge	Q_{rr}			0.72		uC
Peak Reverse Recovery Current	I_{rrm}			18		A
Diode peak rate of fall of reverse Recovery current during tb	dirr/dt			-456		A/us
Reverse Recovery Time	t_{rr}	T_J=25ºC V_R=400V, I_F=60A dI_F/dt=1000A/us		179		ns
Reverse Recovery Charge	Q_{rr}			0.84		uC
Peak Reverse Recovery Current	I_{rrm}			19		A
Diode peak rate of fall of reverse Recovery current during tb	dirr/dt			-375		A/us
Reverse Recovery Time	t_{rr}	T_J=150ºC V_R=400V, I_F=30A dI_F/dt=1100A/us		143		ns
Reverse Recovery Charge	Q_{rr}			1.34		nC
Peak Reverse Recovery Current	I_{rrm}			25		A
Diode peak rate of fall of reverse Recovery current during tb	dirr/dt			-523		A/us
Reverse Recovery Time	t_{rr}	T_J=150ºC V_R=400V, I_F=60A dI_F/dt=1000A/us		223		ns
Reverse Recovery Charge	Q_{rr}			1.93		uC
Peak Reverse Recovery Current	I_{rrm}			26		A
Diode peak rate of fall of reverse Recovery current during tb	dirr/dt			-394		A/us

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