50A 650V Trench Fieldstop IGBT with anti-parallel diode SRE50N065FSUD6

General Description

The SRE50N065FSUD6 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 SRE50N065FSUD6 package is TO-247.

Features

- High Breakdown Voltage to 650V
- Advanced Trench Fieldstop Technology
  - Ultra low E_{off}
  - High Ruggedness, Temperature Stability
  - Easy Parallel Switching Capability due to Positive Temperature Coefficient in $V_{CE(SAT)}$
- Non-automotive Qualified
- Enhanced Avalanche Capability

Application

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

Symbol

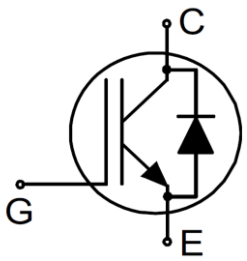
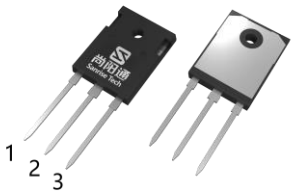


Figure 1 Symbol of SRE50N065FSUD6

Package Type



TO-247

Figure 2 Package Type of SRE50N065FSUD6

Ordering Information

SRE50N065FSUD6□□–□

Circuit Type
Package
T: TO-247

G: Green
Blank: Tube
TR: Tape & Reel

Package	Part Number	Marking ID	Packing Type
TO-247	SRE50N065FSUD6T-G	SRE50N065FSUD6TG	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	80	A
	T_C=100ºC		50	
Pulsed Collector Current,Limited by T_{Jmax}		I_{CM}	200	A
Diode Continuous Collector Current	T_C=25ºC	I_F	80	A
	T_C=100ºC		50	
Diode Pulsed Current, Limited by T_{Jmax}		I_{FM}	200	A
Power Dissipation	T_C=25ºC	P_{tot}	288	W
	T_C=100ºC		144	
Operating Junction Temperature Range		T_J	-40 ~ 175(1)	ºC
Storage Temperature Range		T_{STG}	-55 ~ 150	ºC
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	ºC

Note:
1. Reliability testing conducted at Tj=175℃.

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
IGBT Thermal Resistance，Junction-to-Case	R_{thJC}	-	-	0.52	ºC/W
Diode Thermal Resistance，Junction-to-Case	R_{thJC}	-	-	0.65	
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	5.0	5.8	V
Collector-emitter saturation voltage		V_{CEsat}	V_{GE}=15V, I_C=50A, T_J=25ºC		1.50	2.0	V
			T_J=125ºC		2.2		V
			T_J=175ºC		2.6		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=1 MHz		2350		pF
Output Capacitance		C_{OES}			220		
Reverse Transfer Capacitance		C_{RES}			25		
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=50A R_G=10Ω, V_{GE}=0/15V Energy losses include "tail" and diode reverse recovery		17		ns
Rise Time		t_r			55		ns
Turn-off Delay Time		$t_{d(off)}$			133		ns
Fall Time		t_f			15		ns
Turn-on energy		E_{on}			1.70		mJ
Turn-off energy		E_{off}			0.30		mJ
Total switching energy		E_{ts}			2.00		mJ
Turn-on Delay Time		$t_{d(on)}$	T_J=150ºC V_{CC}=400V, I_C=50A R_G=10Ω,V_{GE}=0/15V Energy losses include "tail" and diode reverse recovery		14.5		ns
Rise Time		t_r			52		ns
Turn-off Delay Time		$t_{d(off)}$			173		ns
Fall Time		t_f			24		ns
Turn-on energy		E_{on}			2.23		mJ
Turn-off energy		E_{off}			0.44		mJ
Total switching energy		E_{ts}			2.67		mJ
Gate to Emitter Charge		Q_{GE}	V_{CC}=400V, I_C=50A V_{GE}=0 to 15V		19		nC
Gate to Collector Charge		Q_{GC}			55		
Gate Charge Total		Q_G			110		

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Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Reverse Diode Characteristics						
Diode Forward Voltage	V_F	I_F=25A T_J=25ºC		1.22	1.5	V
		I_F=25A T_J=125ºC		1.07		
		I_F=25A T_J=175ºC		0.98		
		I_F=50A T_J=25ºC		1.3	1.7	
		I_F=50A T_J=125ºC		1.2		
		I_F=50A T_J=175ºC		1.12		
Reverse Recovery Time	t_{rr}	T_J=25ºC V_R=400V, I_F=50A dI_F/dt=700A/μs		70		ns
Reverse Recovery Charge	Q_{rr}			860		nC
Peak Reverse Recovery Current	I_{rrm}			20.0		A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt			-590		A/μs
Reverse Recovery Time	t_{rr}	T_J=150ºC V_R=400V, I_F=50A dI_F/dt=700A/μs		250		ns
Reverse Recovery Charge	Q_{rr}			5.3		μC
Peak Reverse Recovery Current	I_{rrm}			46.0		A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt			-330		A/μs

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