Sanrise Tech 尚阳通

Datasheet

60A 650V Trench Fieldstop IGBT — SRE60N065FSU2S2

General Description

The SRE60N065FSU2S2 is a Field Stop Trench IGBT, which offers ultra-low switching losses, high energy efficiency for switching applications such as PFC, Power Supply, Inverter, etc.

The SRE60N065FSU2S2 package is TO-263.

Symbol

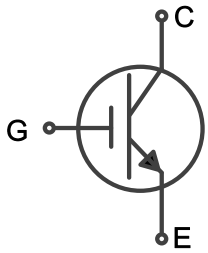
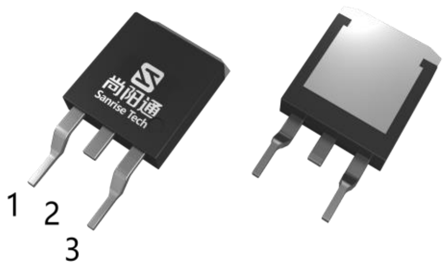


Figure 1 Symbol of SRE60N065FSU2S2

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 $V_{CE(SAT)}$
- Low $V_{CE(SAT)}$
- Enhanced Avalanche Capability
- Non-Automotive Qualified

Package Type



TO-263

Pin 1- gate

Pin 2&backside-collector

Pin 3-emitter

Figure 2 Package Type of SRE60N065FSU2S2

Application

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

Ordering Information

SRE60N065FSU2S2□□–□

Circuit Type

Package

S2: TO-263

G: Green

Blank: Tube

TR: Tape & Reel

Package	Part Number	Marking ID	Packing Type
TO-263	SRE60N065FSU2S2TR-G1	SRE60N065FSU2S2TRG1	Tube

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	100	A
	T_C=100ºC		60	
Pulsed Collector Current,Limited by T_{Jmax}		I_{CM}	300	A
Power Dissipation	T_C=25ºC	P_{tot}	306	W
	T_C=100ºC		153	
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_max=175℃.

Thermal Resistance

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

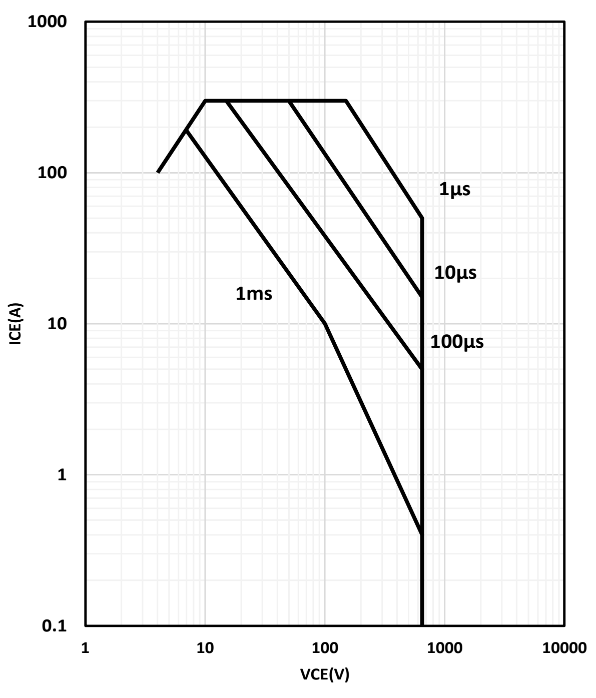
Electrical Characteristics

T_J = 25°C, 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	3.8	4.8	5.8	V
Collector-emitter saturation voltage		V_{CEsat}	V_{GE}=15V, I_C=60A, T_J=25°C		1.51	2.0	V
			T_J=125°C		1.81		V
			T_J=175°C		2.05		V
Zero Gate Voltage Collector Current		I_{CES}	V_{CE}=650V,V_{GE}=0V T_J=25°C		0.1	40	μA
			T_J=175°C			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=25°C V_{CC}=400V, I_C=60A R_G=10Ω, V_{GE}=0/15V Without diode's reverse recovery energy		18		ns
Rise Time		t_r			36		ns
Turn-off Delay Time		$t_{d(off)}$			110		ns
Fall Time		t_f			60		ns
Turn-on energy		E_{on}			0.93		mJ
Turn-off energy		E_{off}			0.53		mJ
Total switching energy		E_{ts}			1.46		mJ
Turn-on Delay Time		$t_{d(on)}$	T_J=150°C V_{CC}=400V, I_C=60A R_G=10Ω,V_{GE}=0/15V Without diode's reverse recovery energy		15		ns
Rise Time		t_r			38		ns
Turn-off Delay Time		$t_{d(off)}$			131		ns
Fall Time		t_f			102		ns
Turn-on energy		E_{on}			1.92		mJ
Turn-off energy		E_{off}			0.85		mJ
Total switching energy		E_{ts}			2.77		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		

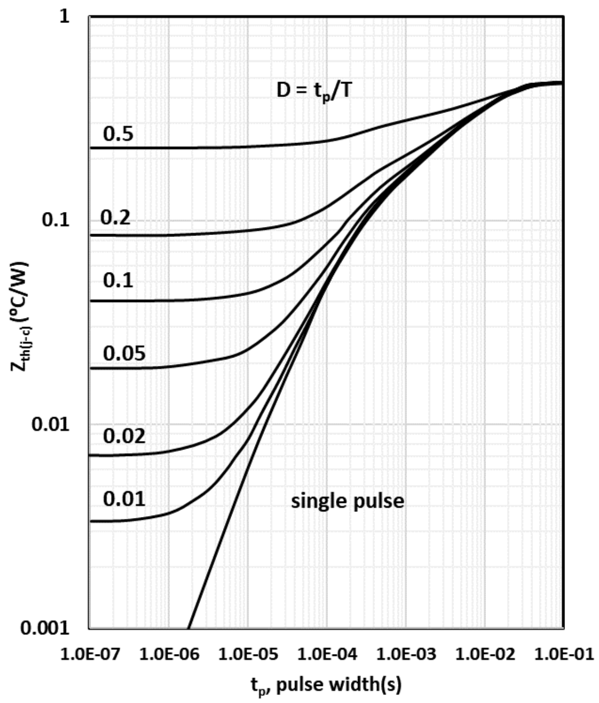
Typical Performance Characteristics

Figure 3: IGBT FBSOA



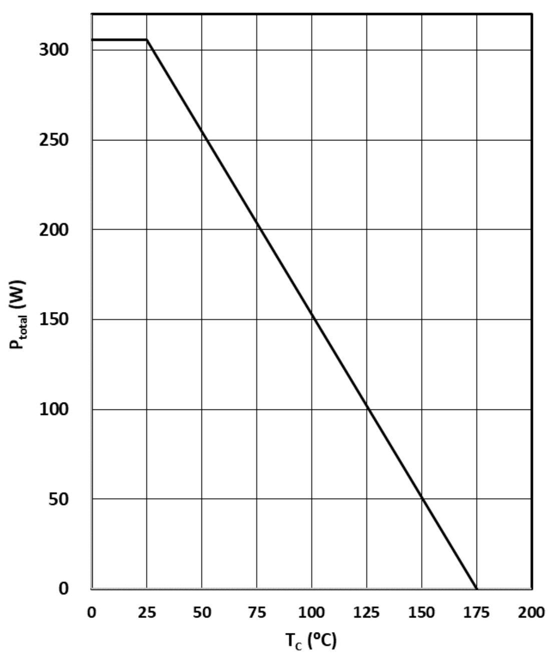
$I_C = f(V_{CE})$; $V_{GE} \geq 15/0V$; $Tj \leq 175°C$

Figure 4: IGBT transient thermal impedance



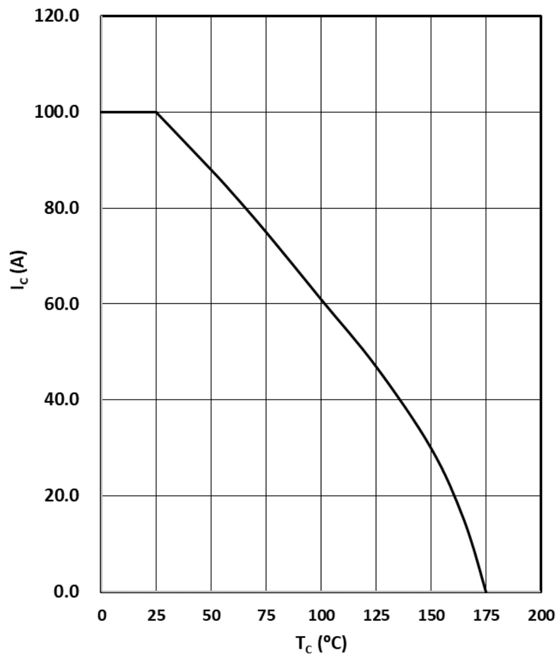
$R_{th(J-C)} = f(t_p)$; duty cycle: $D = t_p/T$

Figure 5: Power dissipation



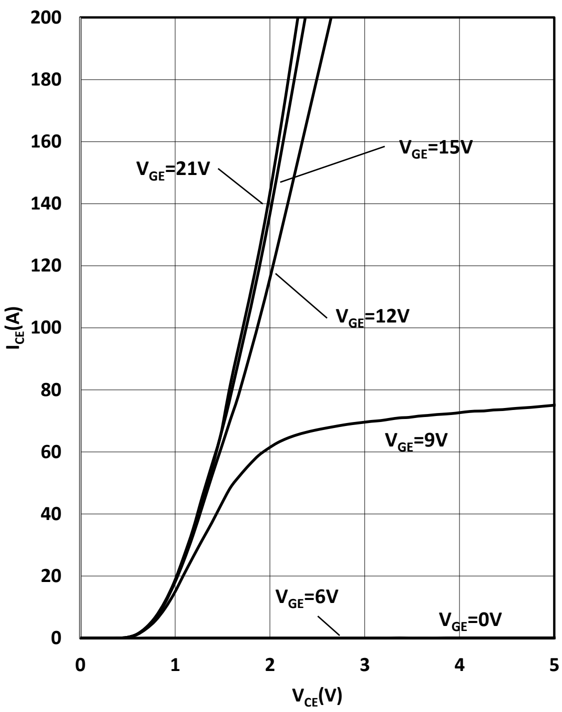
Ptot= f(Tc);

Figure 6: Collector current vs. temperature



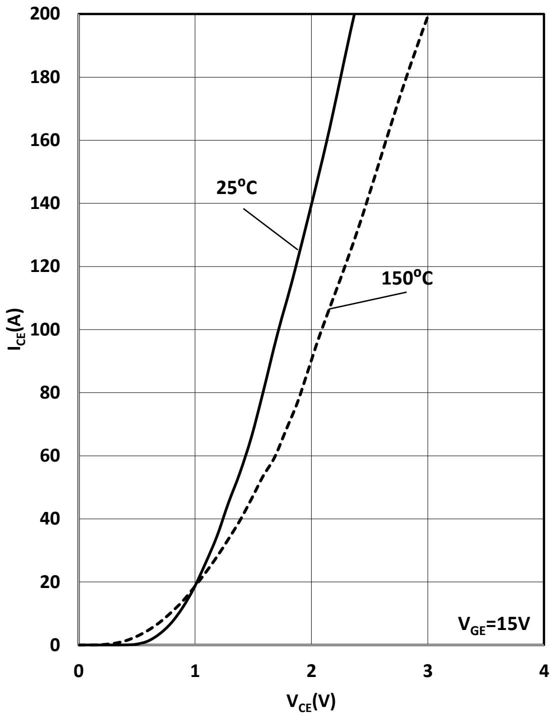
Ic= f(Tj); $V_{GE} \geq 15V$; $Tj \leq 175°C$

Figure 7: Typical Output Characteristics



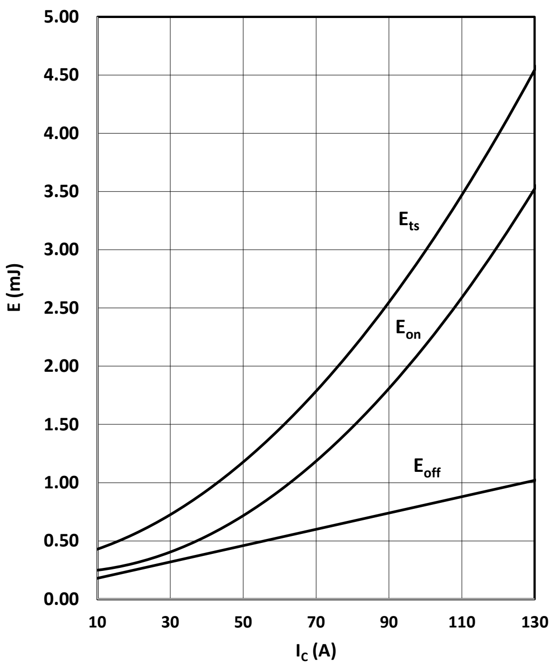
$I_C = f(V_{CE})$; Tj= 25ºC; parameter: V_{GE}

Figure 8: Typical transfer characteristic



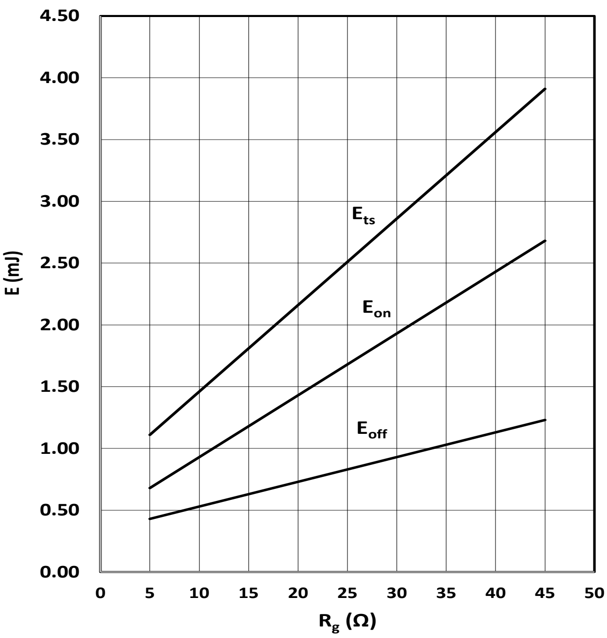
$I_C = f(V_{CE})$; Tj= 25ºC vs 150ºC

Figure 9: Typical switching energy losses as a function of collector current



E=f(Ic); V_{CE}=400V; Tj=25ºC; R_G=10Ω

Figure10: Typical switching energy losses as a function of gate resistor



E=f(R_G); V_{CE}=400V; Tj=25ºC; Ic=60A

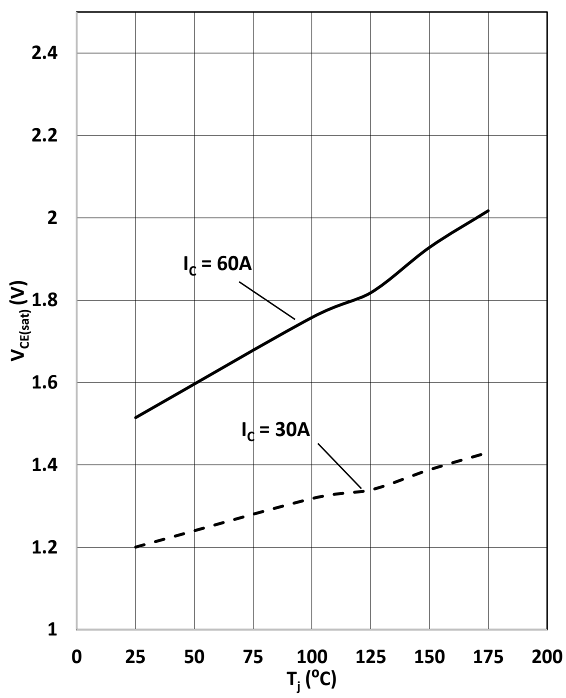
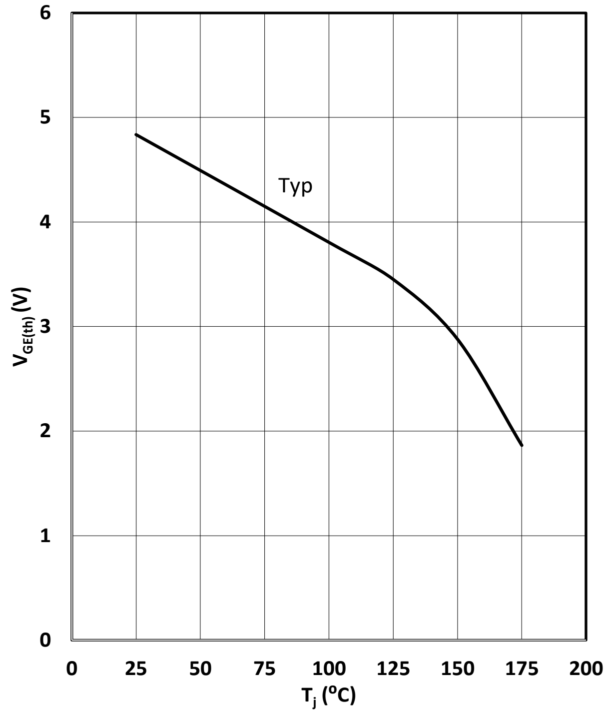
Figure 11: Typical collector-emitter saturation voltage as a function of junction temperature	Figure 12: Gate-emitter threshold voltage as a function of junction temperature
	
V_{CE} =f(T_j); V_{GE}=15V	V_{GE} =f(T_j); I_{CE} = 250µA

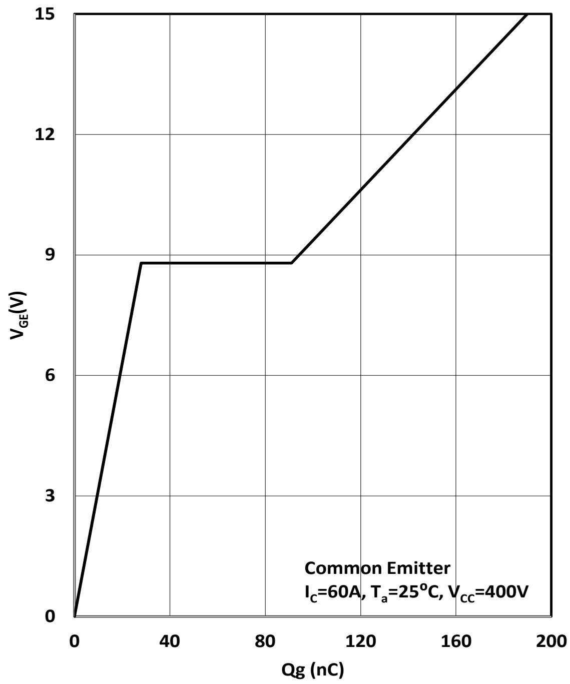
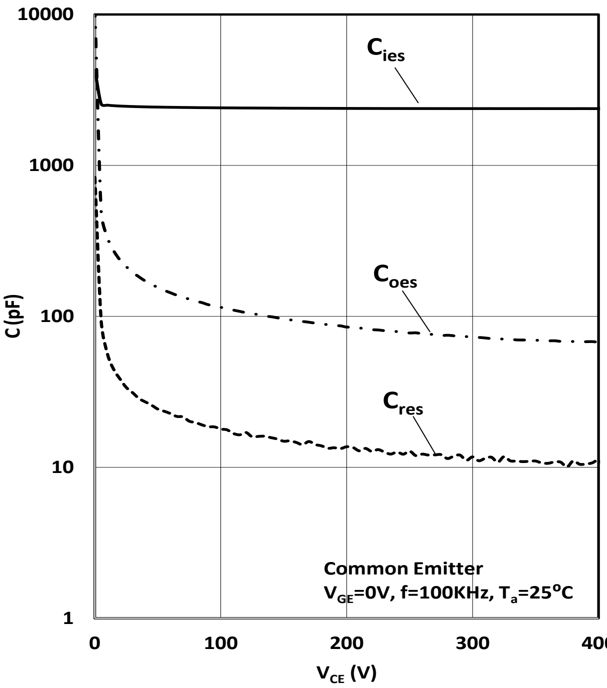
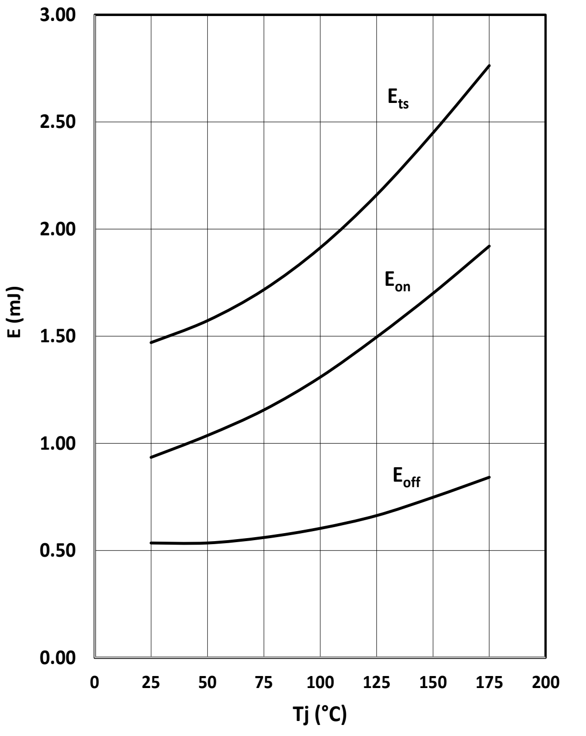
Figure 13: Typical Gate Charge	Figure 14 Typical Capacitances
	
V_{GE}= f(Q_{gate}); I_C= 60A	C=f(V_{CE}); V_{GE}=0; f=100KHz

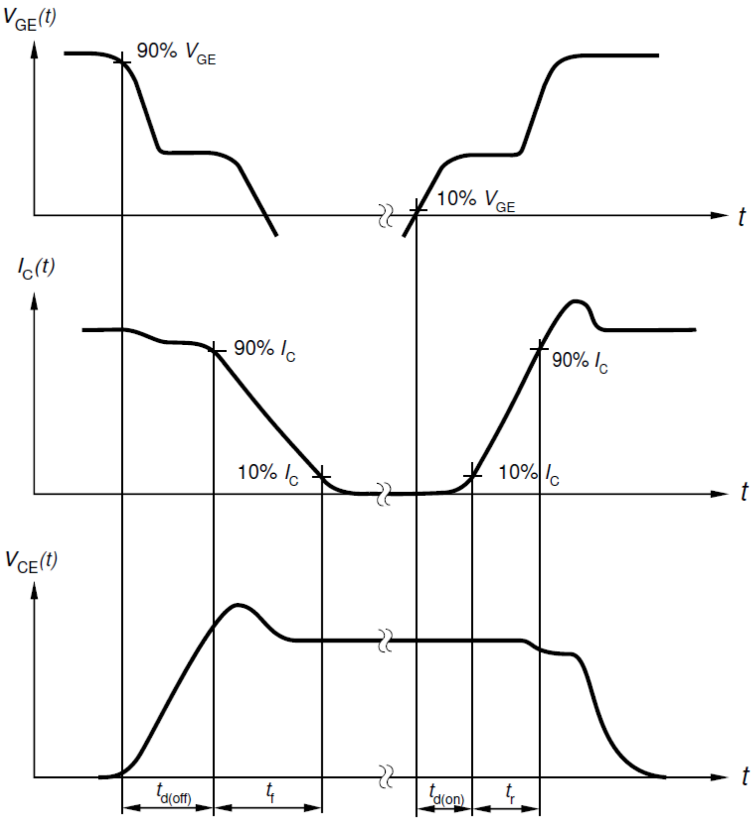
Figure 15: Typical switching energy losses as a function of junction temperature



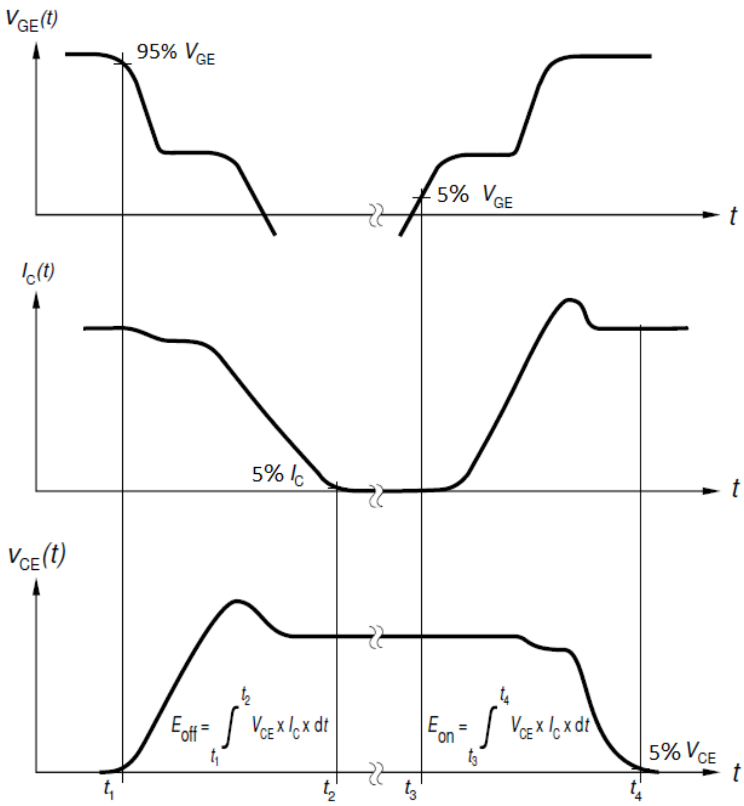
E=f(Tj); V_{CE}=400V; Ic=60A; R_G=10Ω

Test Circuits

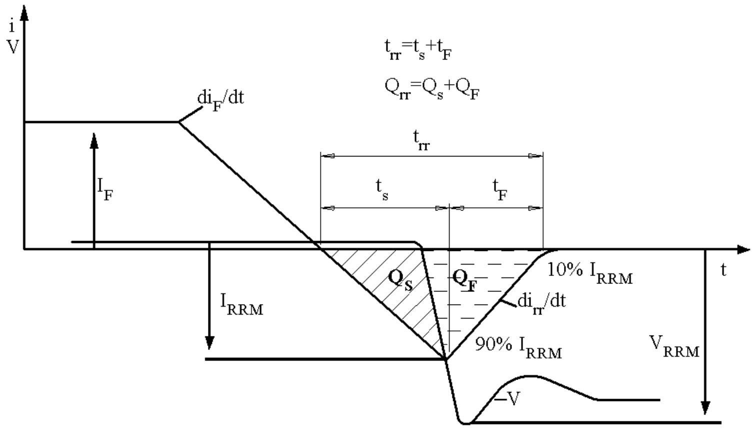
1. Definition Switching times



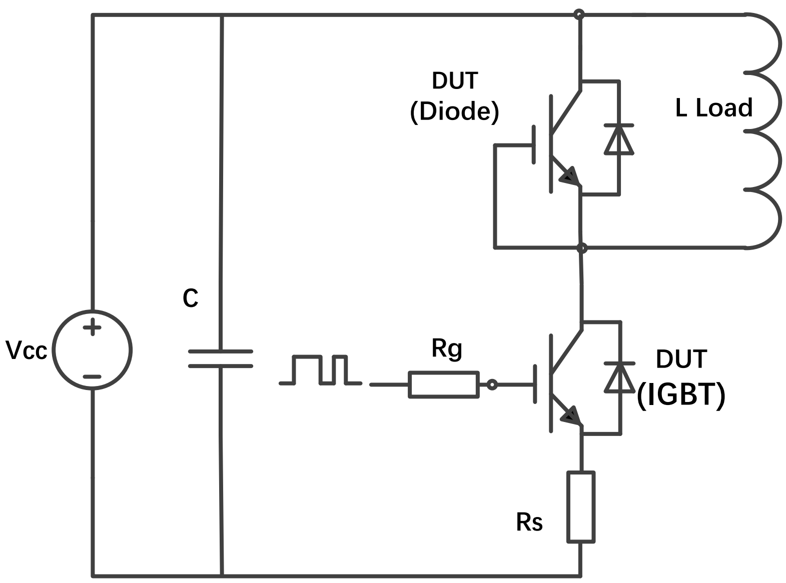
2. Definition Switching losses



3. Definition Diode Switching Characteristics

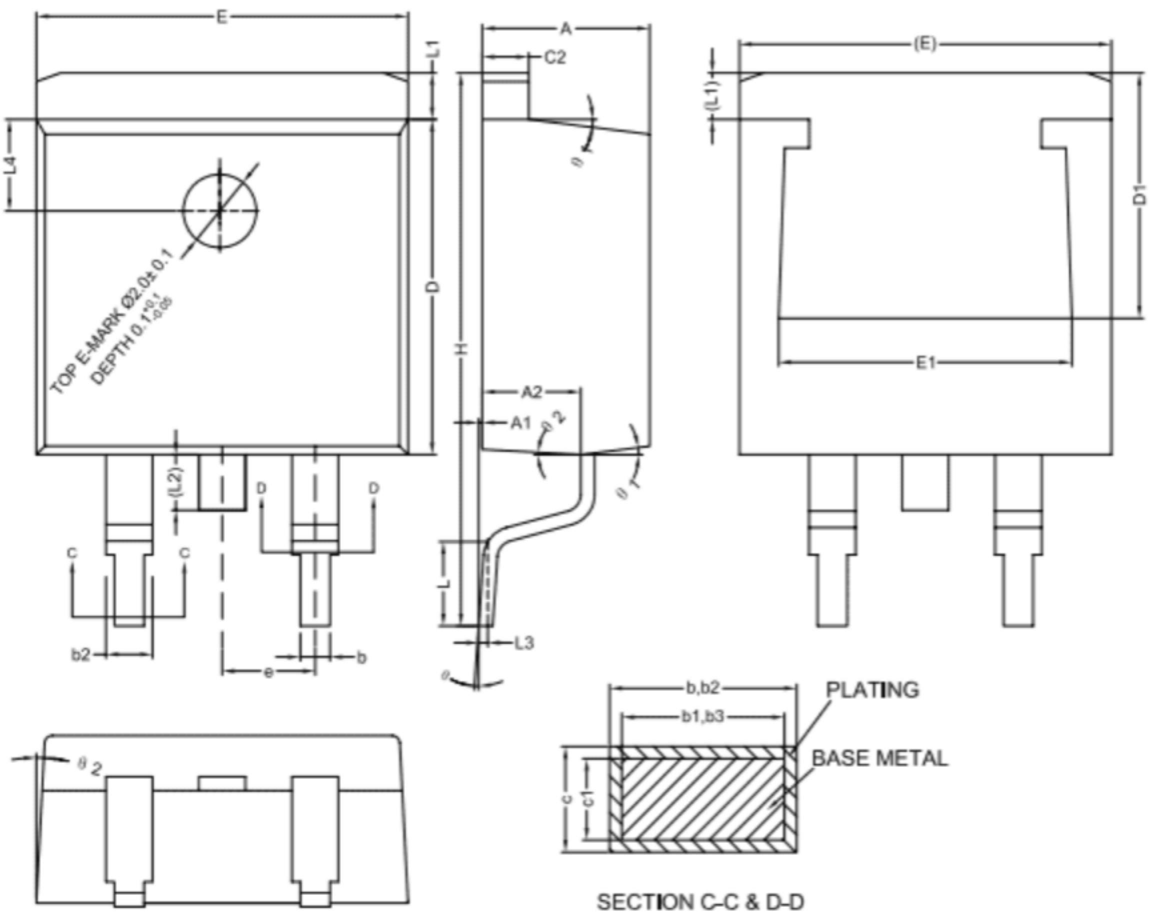


4. Dynamic test circuit



Mechanical Dimensions

TO-263 **Unit: mm**



Symbol	Dimensions (mm)			Symbol	Dimensions (mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.40	4.57	4.70	E	10.06	10.16	10.26
A1	0.00	0.10	0.25	E1	7.80	–	8.20
A2	2.59	2.69	2.79	e	–	2.54BSC	–
b	0.77	–	0.90	H	14.70	15.10	15.50
b1	0.76	0.81	0.86	L	2.00	2.30	2.60
b2	1.23	–	1.36	L1	1.17	1.27	1.40
b3	1.22	1.27	1.32	L2	–	–	1.75
c	0.34	–	0.47	L3	–	0.25BSC	–
c1	0.33	0.38	0.43	L4	–	2.00REF	–
c2	1.22	–	1.32	Θ	0°	–	8°
D	9.05	9.15	9.25	Θ1	5°	7°	9°
D1	6.60	–	–	Θ2	1°	3°	5°

Sanrise Tech
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IMPORTANT NOTICE

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