75A 650V Trench Fieldstop IGBT with anti-parallel diode SRE75N065FSU2DH

General Description

The SRE75N065FSU2DH 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 SRE75N065FSU2DH package is TO-247.

Features

- High Breakdown Voltage to 715V
- 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

Application

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

Symbol

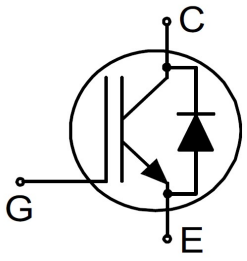
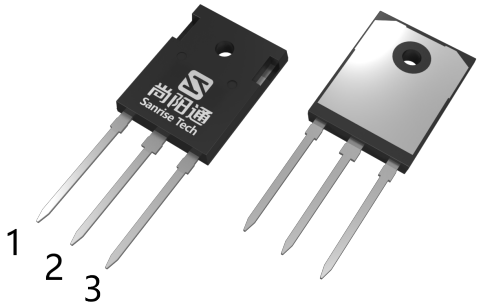


Figure 1 Symbol of SRE75N065FSU2DH

Package Type



TO-247

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

Figure 2 Package Type of SRE7565FSU2DH

Ordering Information

SRE75N065FSU2DH□□–□

Circuit Type
Package
T: TO-247

G: Green
Blank: Tube
TR: Tape & Reel

Package	Part Number	Marking ID	Packing Type
TO-247	SRE75N065FSU2DHT-G2	SRE75N065FSU2DHTG2	Tube

75A 650V Trench Fieldstop IGBT with anti-parallel diode SRE75N065FSU2DH

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		75	
Pulsed Collector Current, Limited by T_{Jmax}		I_{CM}	225	A
Diode Continuous Collector Current	T_C=25ºC	I_F	100	A
	T_C=100ºC		75	
Diode Pulsed Current, Limited by T_{Jmax}		I_{FM}	200	A
Power Dissipation	T_C=25ºC	P_{tot}	375	W
	T_C=100ºC		188	
Operating Junction Temperature Range		T_J	-40 ~ 175	ºC
Storage Temperature Range		T_{STG}	-55 ~ 150	ºC
Lead Temperature (Soldering, 10 sec)		T_{LEAD}	260	ºC

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
IGBT Thermal Resistance，Junction-to-Case	R_{thJC}	-	-	0.40	ºC/W
Diode Thermal Resistance，Junction-to-Case	R_{thJC}	-	-	0.62	
Thermal Resistance，Junction-to-Ambient	R_{thJA}	-	-	40	

75A 650V Trench Fieldstop IGBT with anti-parallel diode SRE75N065FSU2DH

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	715			V
Gate Threshold Voltage		$V_{GE(th)}$	V_{CE}=V_{GE}, I_C=250μA	4.4	5.1	5.8	V
Collector-emitter saturation voltage		V_{CEsat}	V_{GE}=15V, I_C=75A, T_J=25ºC		1.49	2.0	V
			T_J=125ºC		1.8		V
			T_J=175ºC		2.0		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		3234		pF
Output Capacitance		C_{OES}			241		
Reverse Transfer Capacitance		C_{RES}			45		
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=75A R_G=10Ω, V_{GE}=0/15V Energy losses include "tail" and diode reverse recovery		29		ns
Rise Time		t_r			71		ns
Turn-off Delay Time		$t_{d(off)}$			172		ns
Fall Time		t_f			53		ns
Turn-on energy		E_{on}			2.1		mJ
Turn-off energy		E_{off}			0.85		mJ
Total switching energy		E_{ts}			2.95		mJ
Turn-on Delay Time		$t_{d(on)}$	T_J=175ºC V_{CC}=400V, I_C=75A R_G=10Ω,V_{GE}=0/15V Energy losses include "tail" and diode reverse recovery		28		ns
Rise Time		t_r			69		ns
Turn-off Delay Time		$t_{d(off)}$			172		ns
Fall Time		t_f			203		ns
Turn-on energy		E_{on}			2.57		mJ
Turn-off energy		E_{off}			1.16		mJ
Total switching energy		E_{ts}			3.73		mJ
Gate to Emitter Charge		Q_{GE}	V_{CC}=400V, I_C=75A V_{GE}=0 to 15V		26		nC
Gate to Collector Charge		Q_{GC}			28		
Gate Charge Total		Q_G			150		

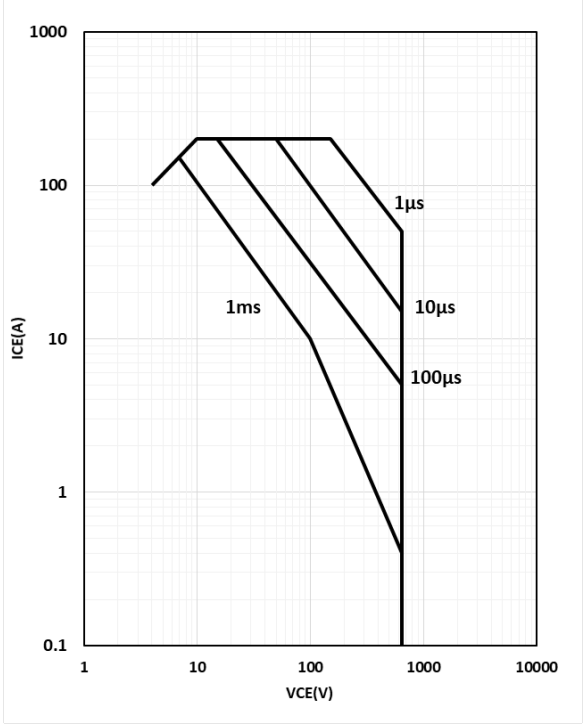
75A 650V Trench Fieldstop IGBT with anti-parallel diode SRE75N065FSU2DH

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Reverse Diode Characteristics						
Diode Forward Voltage	V_F	I_F=37A T_J=25ºC		1.48	1.8	V
		I_F=37A T_J=125ºC		1.31		
		I_F=37A T_J=175ºC		1.20		
		I_F=75A T_J=25ºC		1.74	2.1	
		I_F=75A T_J=125ºC		1.6		
		I_F=75A T_J=175ºC		1.52		
Reverse Recovery Time	t_{rr}	T_J=25ºC V_R=400V, I_F=75A dI_F/dt=840A/us		117		ns
Reverse Recovery Charge	Q_{rr}			1.02		uC
Peak Reverse Recovery Current	I_{rrm}			17		A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt			-180		A/μs
Reverse recovery energy	Erec			0.14		mJ
Reverse Recovery Time	t_{rr}	T_J=175ºC V_R=400V, I_F=75A dI_F/dt=840A/us		228		ns
Reverse Recovery Charge	Q_{rr}			4.64		uC
Peak Reverse Recovery Current	I_{rrm}			39		A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt			-240		A/μs
Reverse recovery energy	Erec			0.92		mJ

75A 650V Trench Fieldstop IGBT with anti-parallel diode SRE75N065FSU2DH

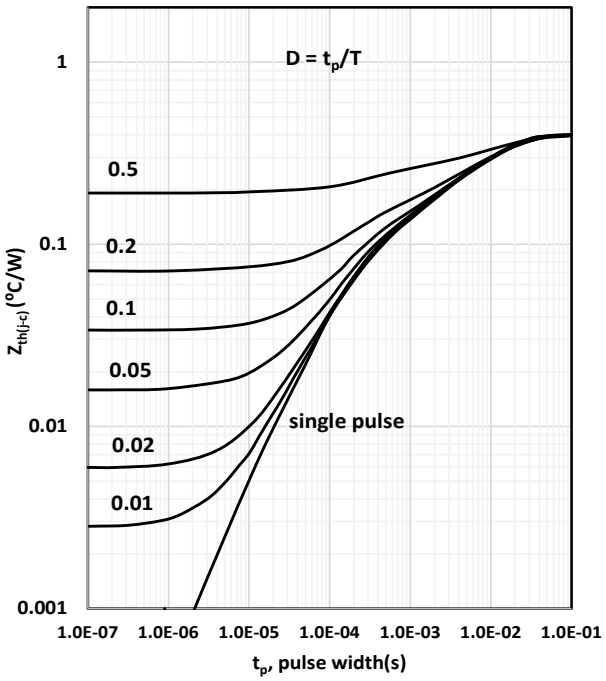
Typical Performance Characteristics

Figure 3: IGBT FBSOA



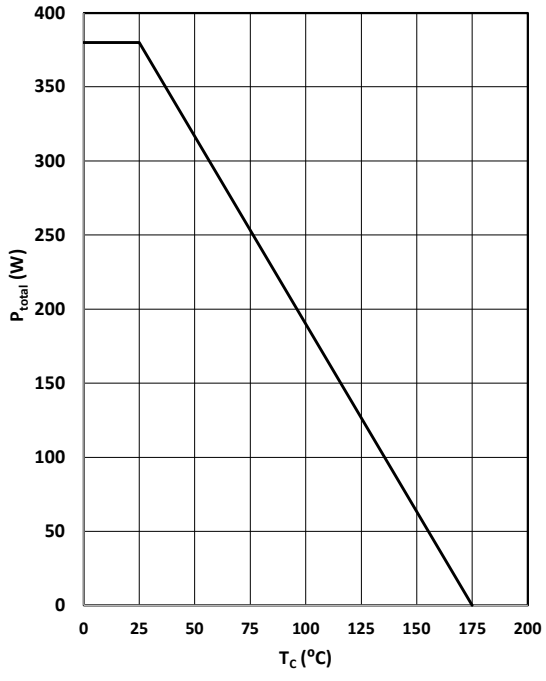
$I_C = f(V_{CE})$; $V_{GE} \geq 15/0V$; $Tj \leq 175°C$

Figure 4: IGBT transient thermal impedance



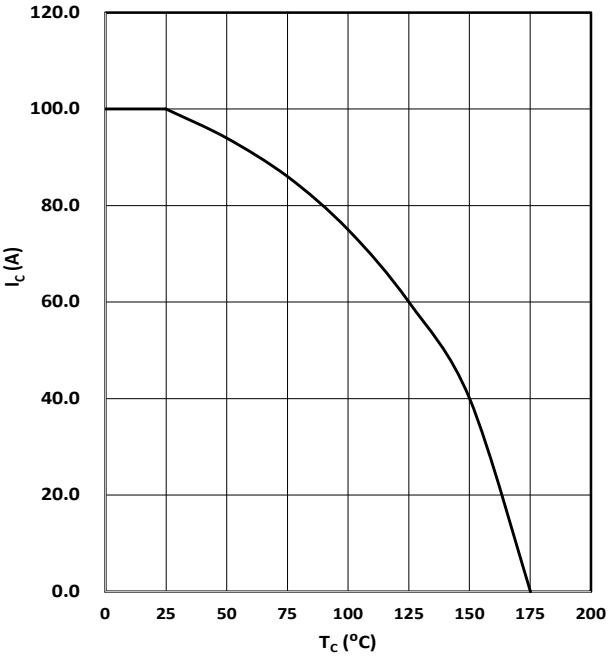
$R_{th(J-C)} = f(t_p)$; duty cycle: $D = t_p/T$

Figure 5: Power dissipation



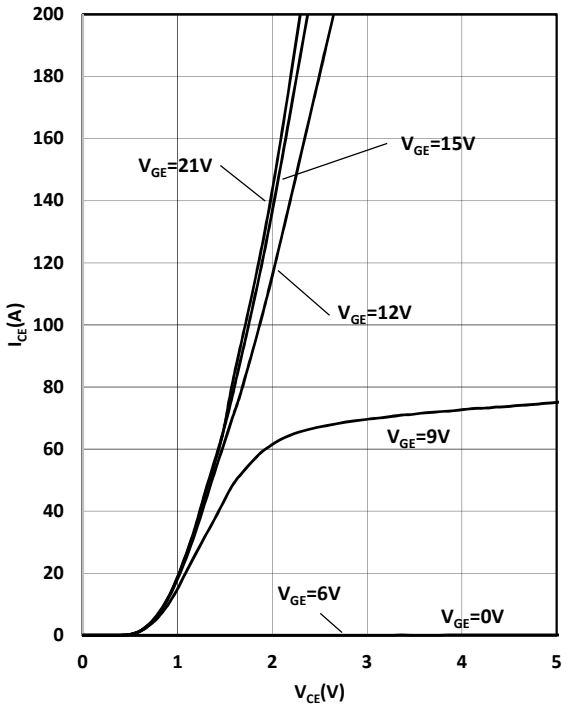
Ptot= f(Tc);

Figure 6: Collector current vs. temperature



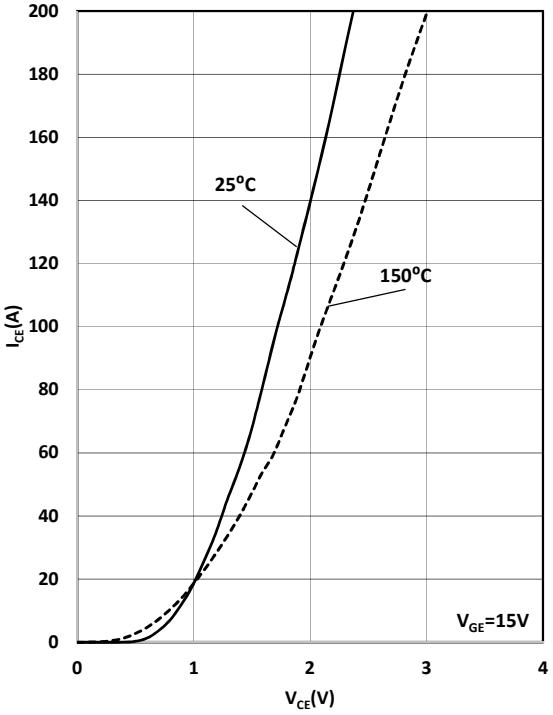
Ic= f(Tj); $V_{GE} \geq 15V$; $Tj \leq 175°C$

Figure 7: Typical Output Characteristics



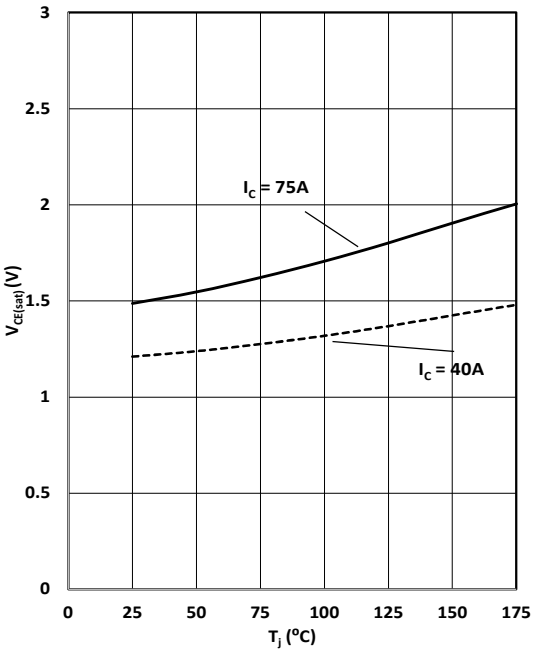
$I_C = f(V_{CE})$; Tj= 25ºC; parameter: V_{CE}

Figure 8: Typical output characteristic



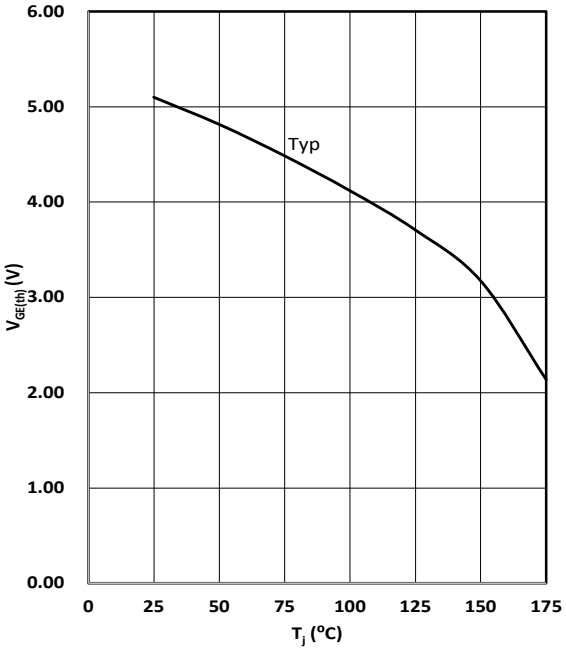
$I_C = f(V_{CE})$; Tj= 25ºC vs 150ºC

Figure 9: Typical collector-emitter saturation voltage as a function of junction temperature



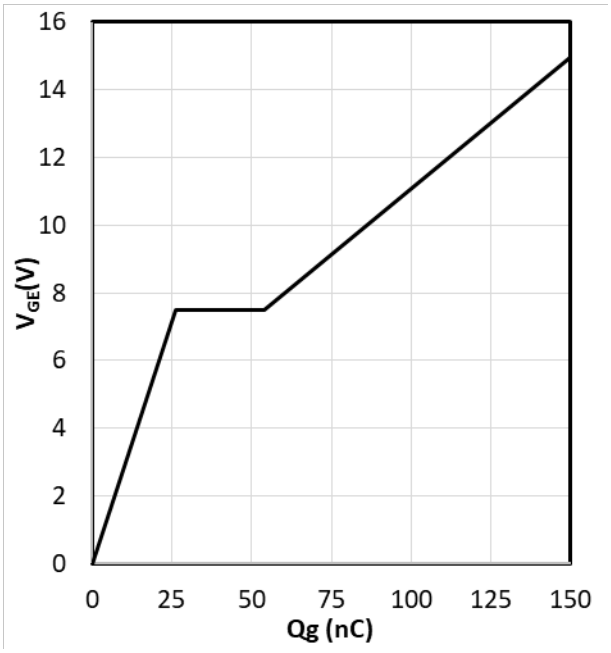
$V_{CE} = f(T_j)$; V_{GE}=15V

Figure 10: Gate-emitter threshold voltage as a function of junction temperature



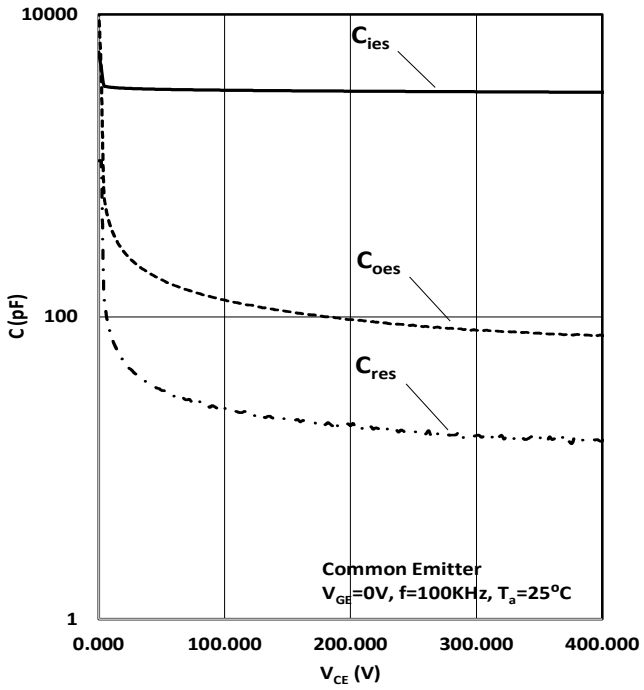
$V_{GE} = f(T_j)$; I_{CE} = 250µA

Figure 11: Typical Gate Charge



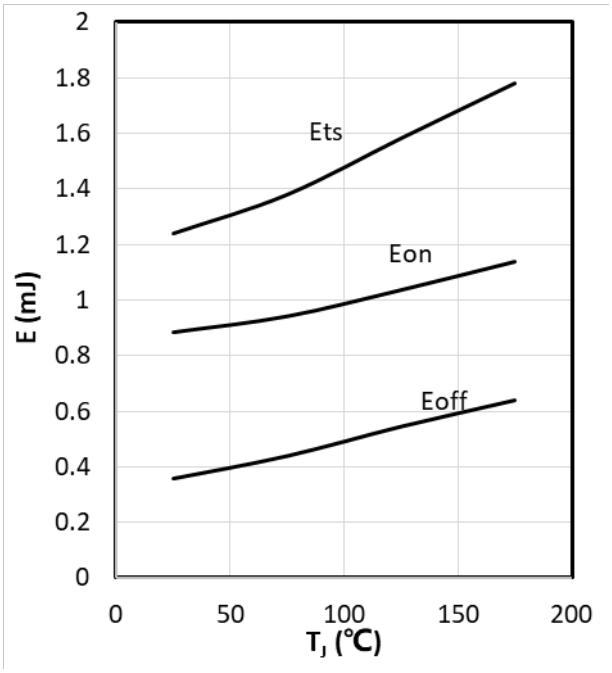
V_{GE}= f(Q_{gate}); I_C= 75A

Figure 12: Typical Capacitances



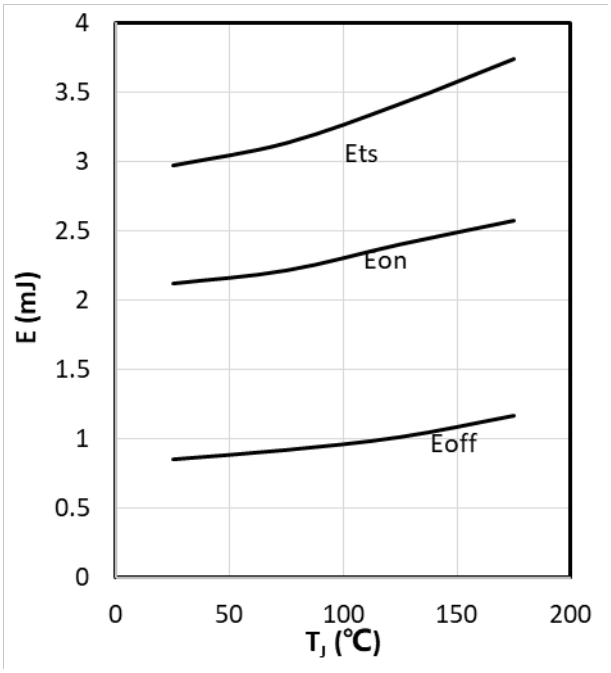
C=f(V_{CE}); V_{GE}=0; f=100KHz

Figure 13: Typical switching energy losses as a function of junction temperature



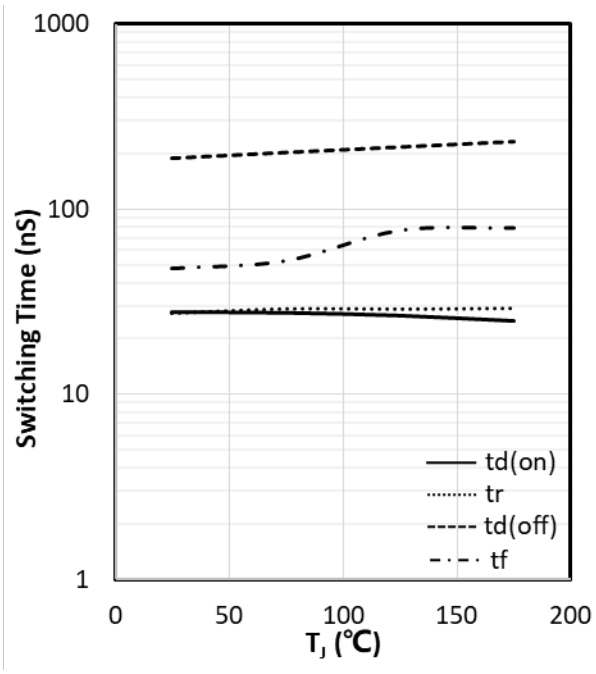
E=f(Tj); V_{CE}=400V; Ic=37A; R_G=10Ω

Figure14: Typical switching energy losses as a function of junction temperature



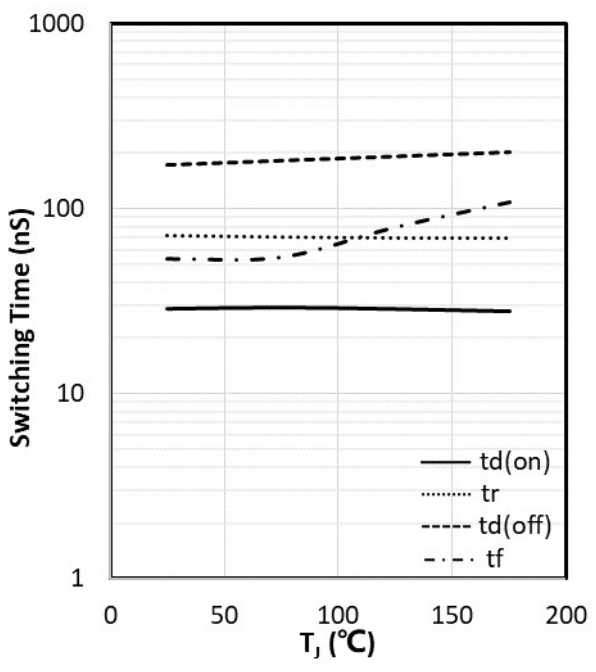
E=f(Tj); V_{CE}=400V; Ic=75A; R_G=10Ω

Figure 15: Typical Switching time as a function of junction temperature



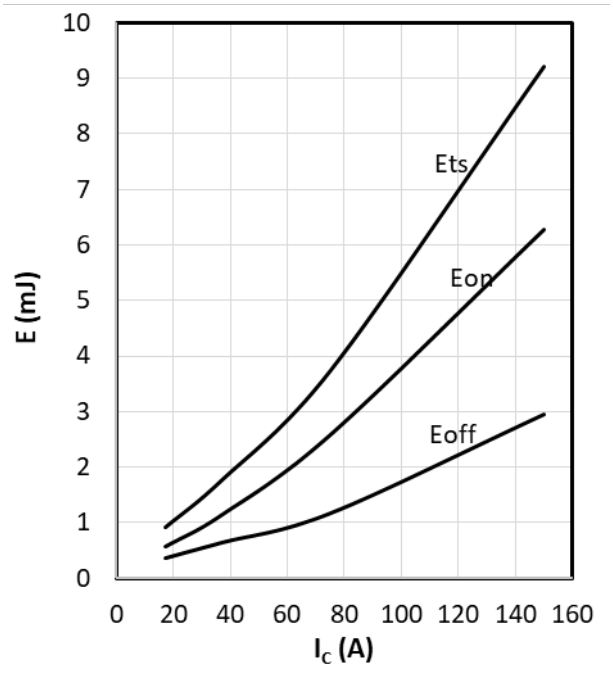
t=f(Tj); V_{CE}=400V; Ic=37A; R_G=10Ω

Figure 16: Typical Switching time as a function of junction temperature



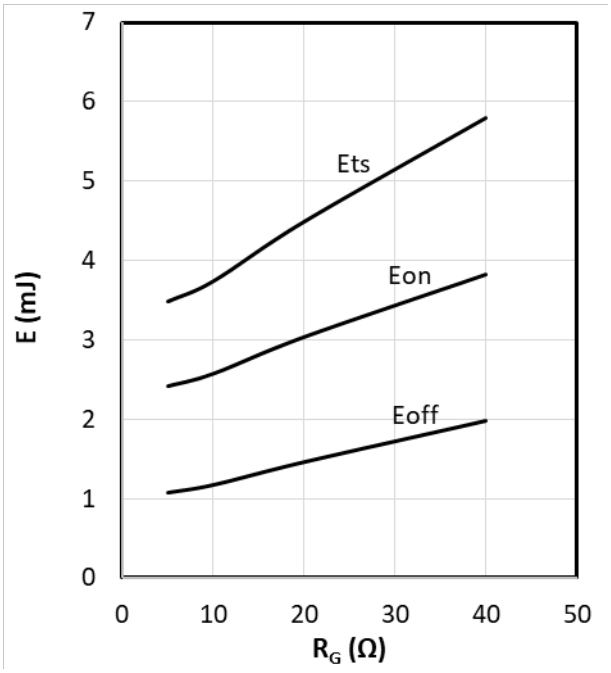
t=f(Tj); V_{CE}=400V; Ic=75A; R_G=10Ω

Figure 17: Typical switching energy losses as a function of collector current



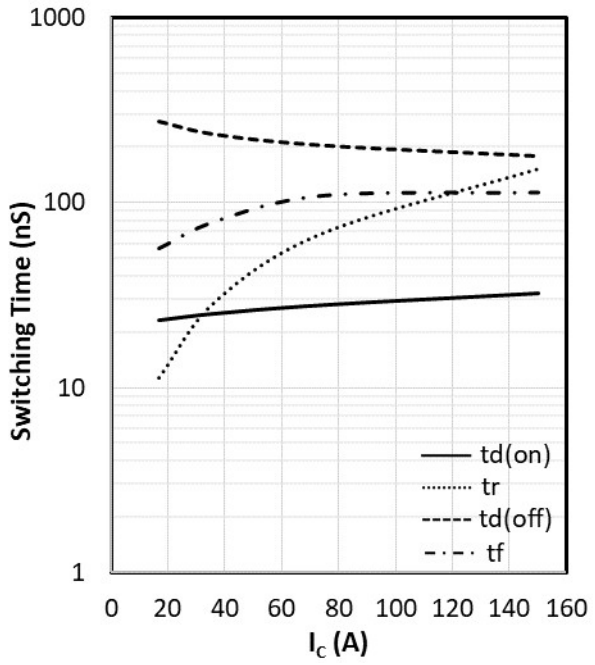
E=f(Ic); V_{CE}=400V; Tj=175ºC; R_G=10Ω

Figure 18: Typical switching energy losses as a function of gate resistor



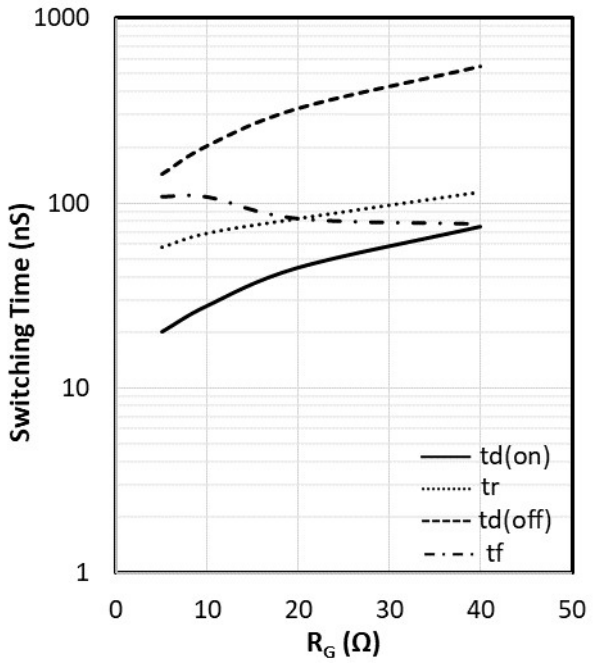
E=f(R_G); V_{CE}=400V; Tj=175ºC; Ic=75A

Figure 19: Typical Switching time as a function of collector current



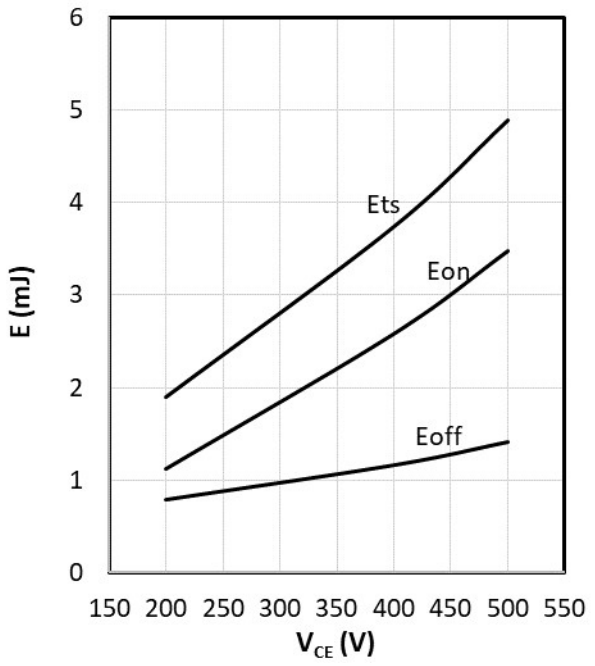
t=f(Ic); V_{CE}=400V; Tj=175ºC; R_G=10Ω

Figure 20: Typical Switching time as a function of gate resistor



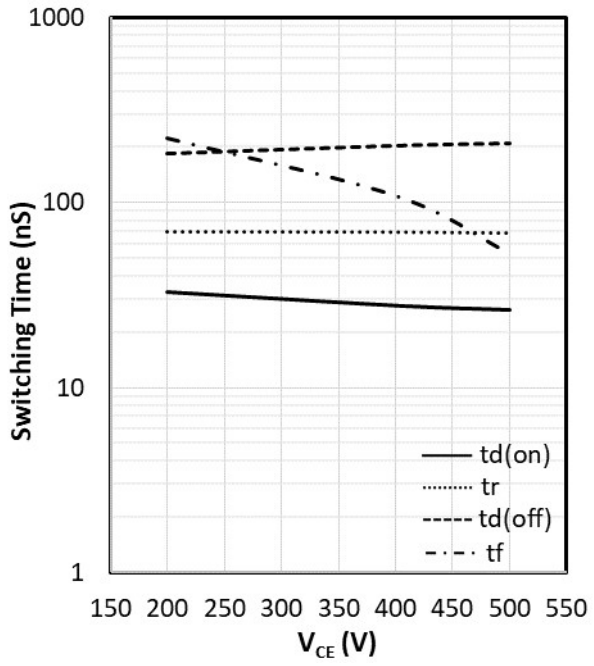
t=f(R_G); V_{CE}=400V; Tj=175ºC; Ic=75A

Figure 21: Typical switching energy losses as a function of collector voltage



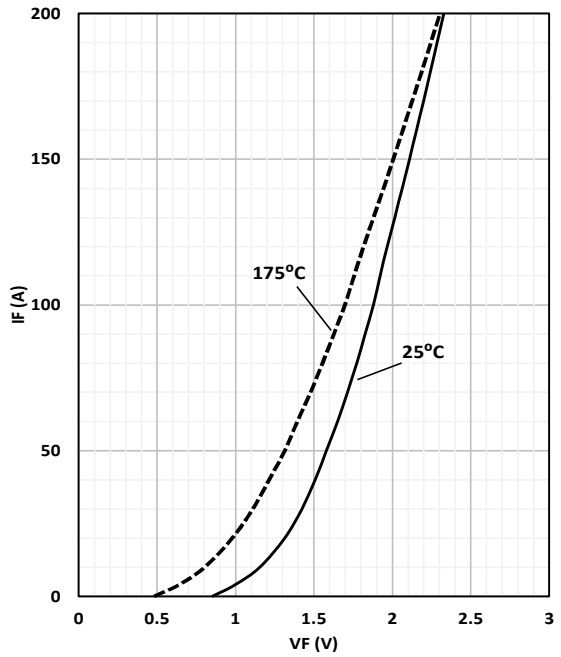
E=f(Vce); Ic=75A; Tj=175ºC; R_G=10Ω

Figure 22: Typical Switching time as a function of collector voltage



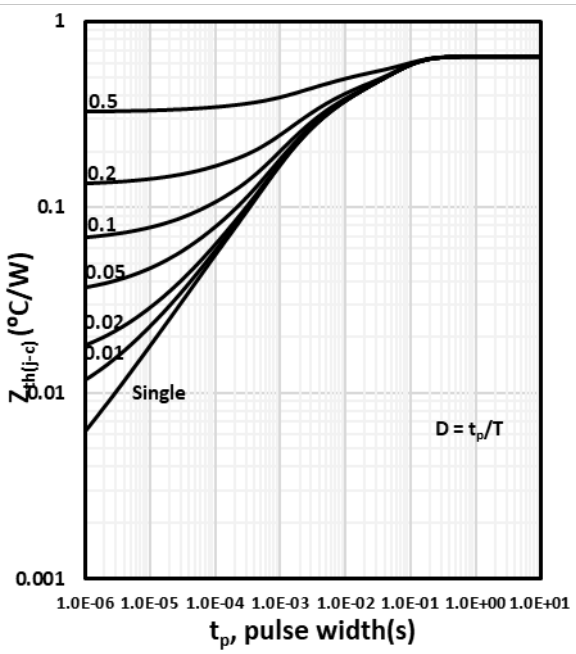
t=f(Vce); Ic=75A; Tj=175ºC; R_G=10Ω

Figure 23: Typical diode forward current as a function of forward voltage



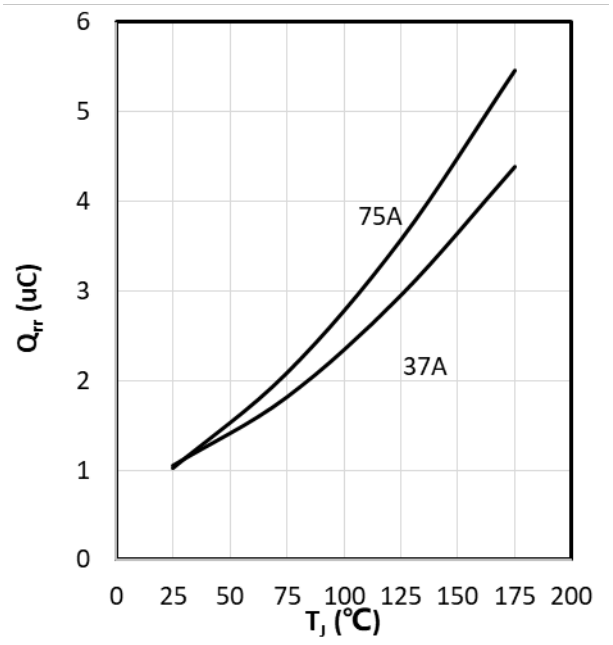
I_F= f(V_F);

Figure 24: Diode transient thermal impedance



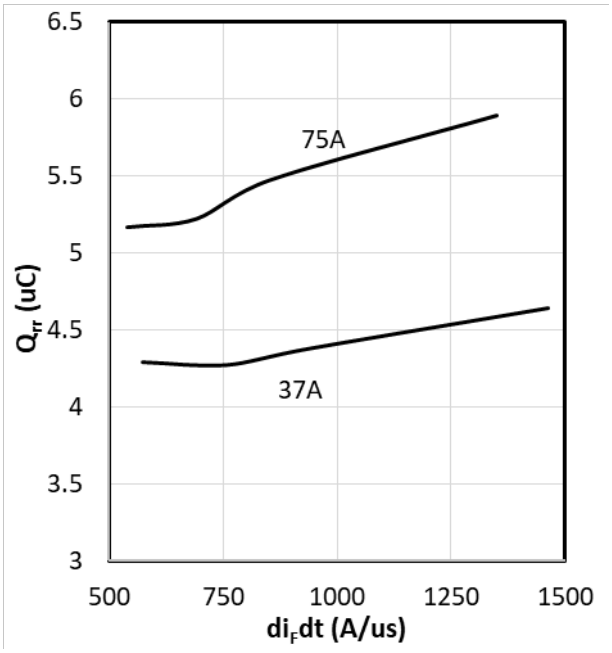
$R_{th(J-C)}$= f(t_p); duty cycle: D= t_p/T

Figure 25: Typical reverse recovery charge as a function of junction temperature

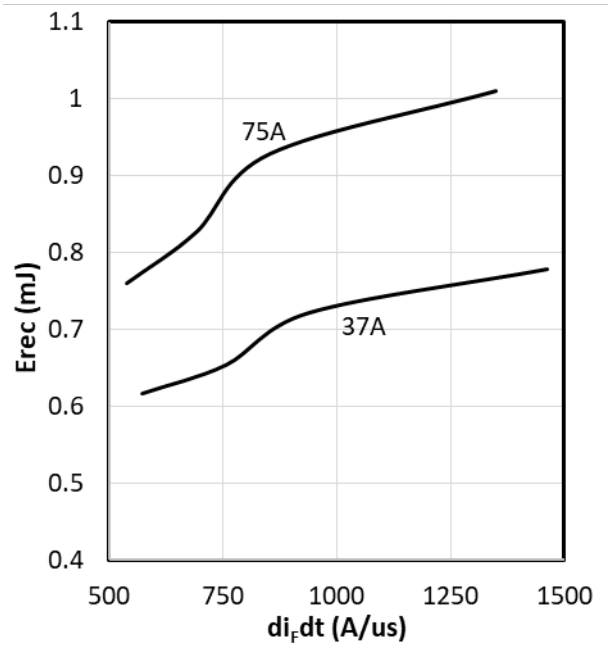
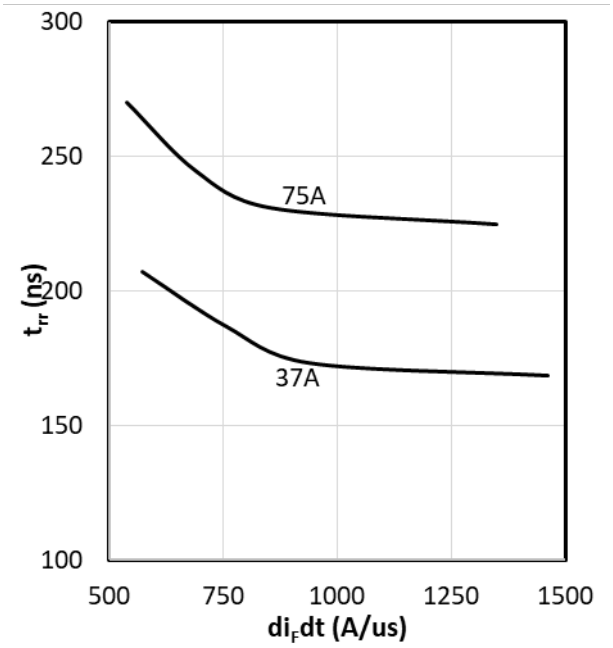


Qrr=f(Tj); V_{CE}=400V; Tj=175ºC; di_F/dt=0.9A/ns

Figure 26: Typical reverse recovery charge as a function of diode current slope

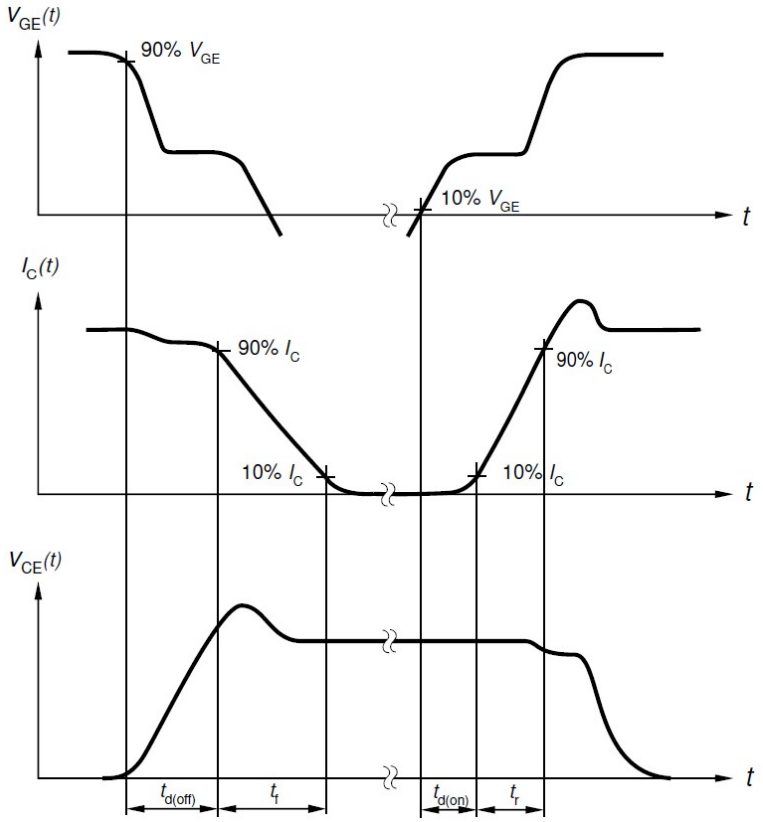


Qrr=f(di_F/dt); V_{CE}=400V; Tj=175ºC

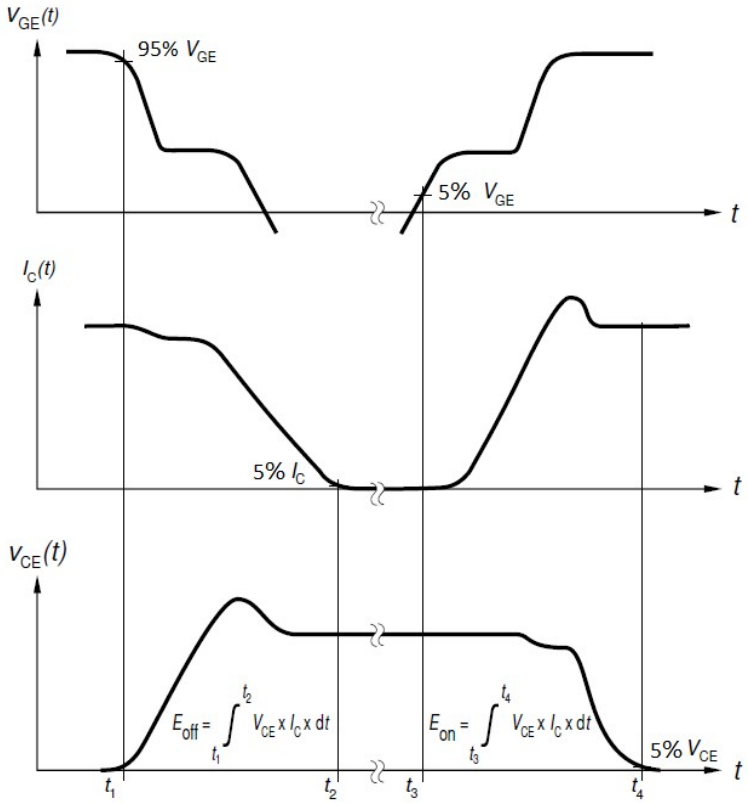
Figure 27: Typical reverse recovery energy as a function of diode current slope	Figure 28: Typical reverse recovery time as a function of diode current slope
	
Erec= f(diF/dt); VCE=400V; Tj=175ºC	trr=f(diF/dt); VCE=400V; Tj=175ºC

Test Circuits

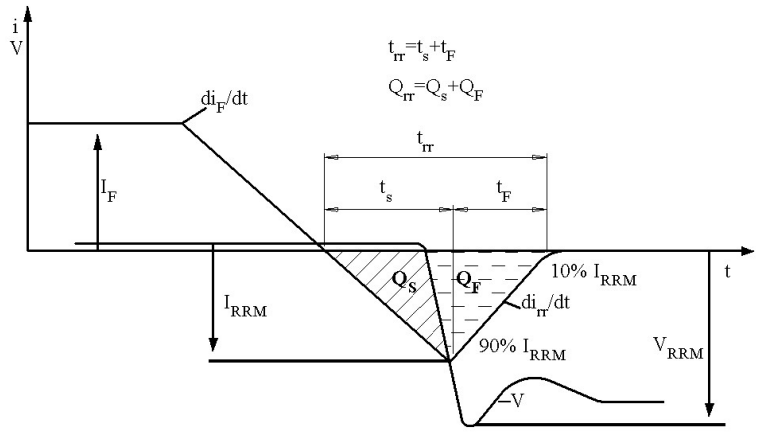
1. Definition Switching times



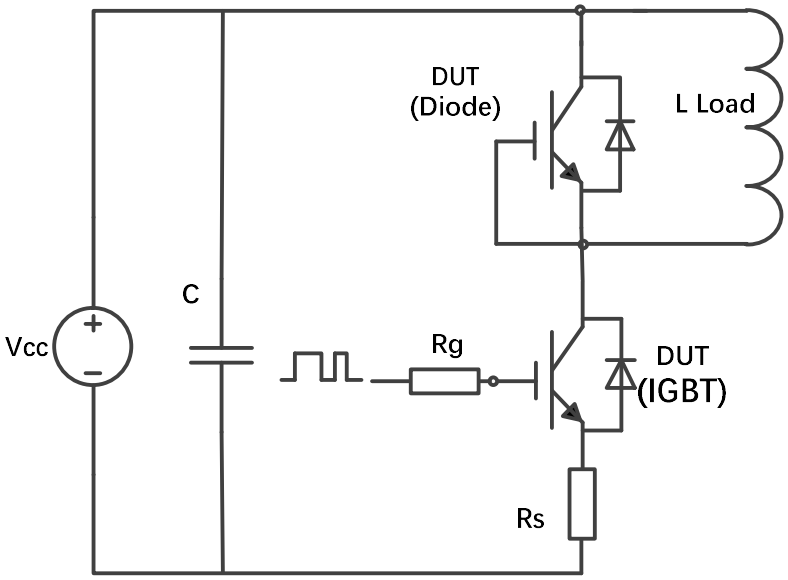
2. Definition Switching losses



3. Definition Diode Switching Characteristics



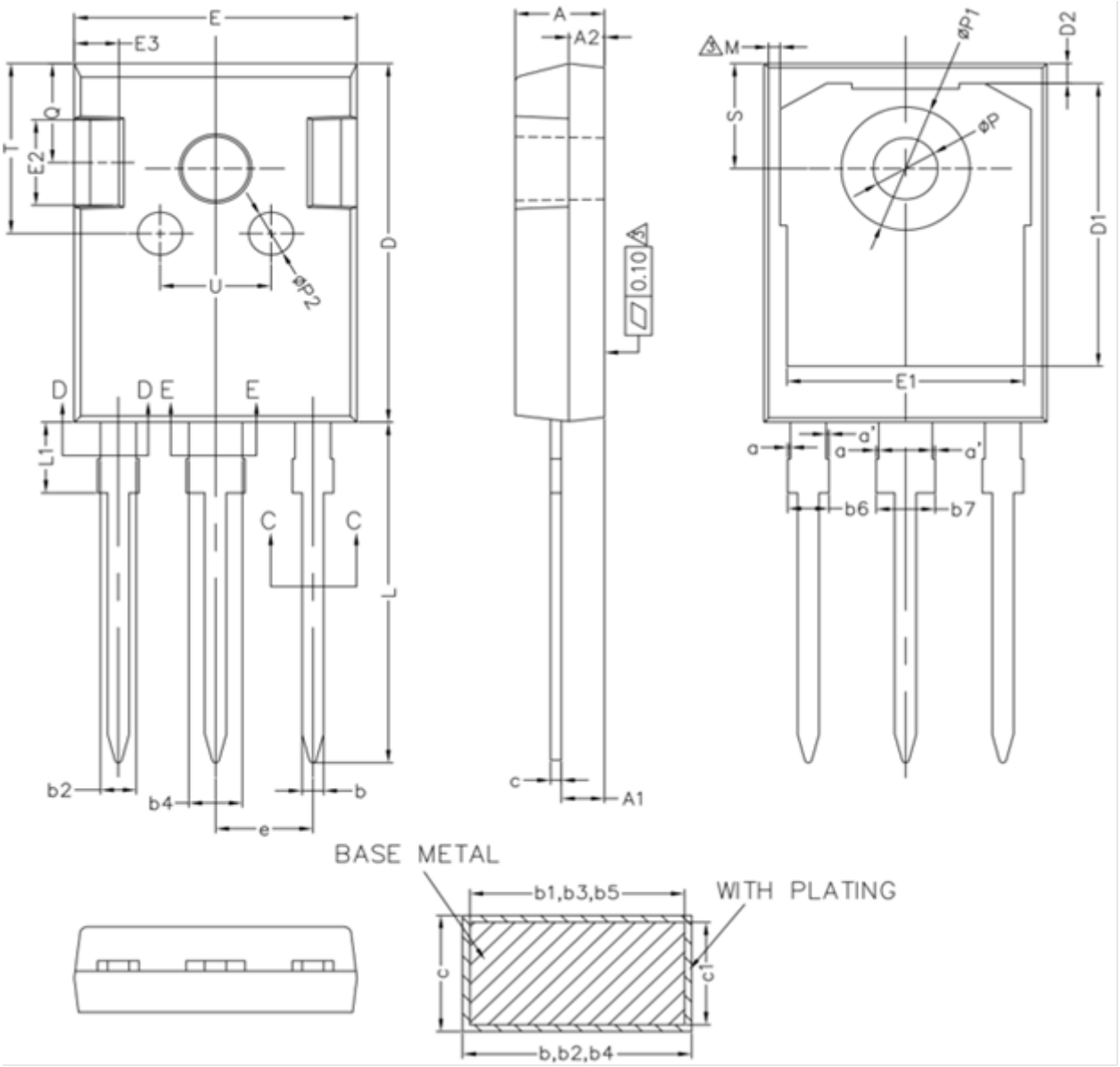
4. Dynamic test circuit



75A 650V Trench Fieldstop IGBT with anti-parallel diode SRE75N065FSU2DH

Mechanical Dimensions

TO-247 **Unit: mm**



75A 650V Trench Fieldstop IGBT with anti-parallel diode SRE75N065FSU2DH

Symbol	Dimensions(mm)			Symbol	Dimensions(mm)		
	Min.	Typ.	Max.		Min.	Typ.	Max.
A	4.90	5.00	5.10	D2	1.05	1.20	1.35
A1	2.31	2.41	2.51	E	15.70	15.80	15.90
A2	1.90	2.00	2.10	E1	13.10	13.30	13.50
a	0	-	0.15	E2	4.90	5.00	5.10
a’	0	-	0.15	E3	2.40	2.50	2.60
b	1.16	-	1.26	e	5.34	5.44	5.54
b1	1.15	1.2	1.22	L	19.80	19.92	20.10
b2	1.96	-	2.06	L1	-	-	4.30
b3	1.95	2.00	2.02	M	0.35	-	0.95
b4	2.96	-	3.06	P	3.50	3.60	3.70
b5	2.95	3.00	3.02	P1	7.00	-	7.40
b6	-	-	2.25	P2	2.40	2.50	2.60
b7	-	-	3.25	Q	5.60	-	6.00
c	0.59	-	0.66	S	6.05	6.15	6.25
c1	0.58	0.60	0.62	T	9.80	-	10.20
D	20.90	21.00	21.10	U	6.00	-	6.40
D1	16.25	16.55	16.85	-	-	-	-

75A 650V Trench Fieldstop IGBT with anti-parallel diode SRE75N065FSU2DH

Sanrise Technology Co., LTD

http://www.sanrise-tech.com

IMPORTANT NOTICE

Shenzhen Sanrise Technology Co., LTD. reserves the right to make changes without further notice to any products or specifications herein. Shenzhen Sanrise Technology Co., LTD. does not assume any responsibility for use of any its products for any particular purpose, nor does Shenzhen Sanrise Technology Co., LTD. assume any liability arising out of the application or use of any its products or circuits. Shenzhen Sanrise Technology Co., LTD. does not convey any license under its patent rights or other rights nor the rights of others.

Main Site:

- Headquarter

Shenzhen Sanrise Technology Co., LTD.

A1206, Skyworth building, No. 008, gaoxinnan 1st Road, Gaoxin District, Yuehai street, Nanshan District, ShenZhen, P.R. China

Tel: +86-755-22953335

Fax: +86-755-22916878

- Shanghai Office

Shenzhen Sanrise Technology Co., LTD.

Rm.401, Building B, No. 666, Zhangheng Road, Zhangjiang Hi-Tech Park, Shanghai, P.R.China

Tel: +86-21-68825918