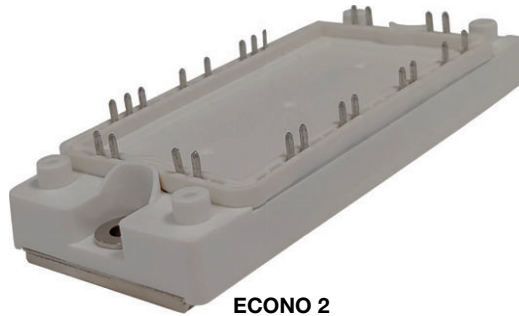


IGBT 4 Pack Module, 75 A



ECONO 2
(Package example)

FEATURES

- Trench gate field stop
- Square RBSOA
- HEXFRED® low Q_{rr} , low switching energy
- Positive $V_{CE(on)}$ temperature coefficient
- Copper baseplate
- Low stray inductance design
- UL approved file E78996 
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT

PRIMARY CHARACTERISTICS

V_{CES}	1200 V
I_C at $T_C = 87\text{ °C}$	75 A
$V_{CE(on)}$ (typical)	2.20 V
Speed	8 kHz to 30 kHz
Package	ECONO 2
Circuit configuration	4 pack with thermistor

BENEFITS

- Benchmark efficiency for SMPS appreciation in particular HF welding
- Rugged transient performance
- Low EMI, requires less snubbing
- Direct mounting to heatsink space saving
- PCB solderable terminals
- Low junction to case thermal resistance

ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		1200	V
Continuous collector current	I_C	$T_C = 25\text{ °C}$	118	A
		$T_C = 80\text{ °C}$	81	
Pulsed collector current (See fig. C.T.5)	I_{CM}	$T_J = 150\text{ °C}$, $t_p = 6\text{ ms}$, $V_{GE} = 15\text{ V}$	270	
Clamped inductive load current	I_{LM}		250	
Diode continuous forward current	I_F	$T_C = 25\text{ °C}$	60	
		$T_C = 80\text{ °C}$	40	
Diode maximum forward current	I_{FM}		150	
Gate to emitter voltage	V_{GE}		± 20	V
Maximum power dissipation (IGBT)	P_D	$T_C = 25\text{ °C}$	431	W
		$T_C = 80\text{ °C}$	241	
Isolation voltage	V_{ISOL}		AC 2500 (min)	V



ELECTRICAL SPECIFICATIONS (T _J = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	V _{BR(CES)}	V _{GE} = 0 V, I _C = 4 mA	1200	-	-	V
Collector to emitter voltage	V _{CE(on)}	I _C = 75 A, V _{GE} = 15 V	-	2.20	2.60	
		I _C = 75 A, V _{GE} = 15 V, T _J = 125 °C	-	2.44	-	
Gate threshold voltage	V _{GE(th)}	V _{CE} = V _{GE} , I _C = 4 mA	4.6	5.9	7.6	
Threshold voltage temperature coefficient	ΔV _{GE(th)} /ΔT _J	V _{CE} = V _{GE} , I _C = 4 mA (25 °C to 125 °C)	-	-13	-	mV/°C
Zero gate voltage collector current	I _{CES}	V _{GE} = 0 V, V _{CE} = 1200 V	-	1.4	100	μA
		V _{GE} = 0 V, V _{CE} = 1200 V, T _J = 125 °C	-	1130	-	
Diode forward voltage drop	V _{FM}	I _F = 75 A	-	3.7	4.9	V
		I _F = 75 A, T _J = 125 °C	-	3.7	-	
Gate to emitter leakage current	I _{GES}	V _{GE} = ± 20 V	-	-	± 200	nA

SWITCHING CHARACTERISTICS (T _J = 25 °C unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Total gate charge (turn-on)	Q _G	I _C = 75 A V _{CC} = 960 V V _{GE} = 15 V	-	333	-	nC
Gate to emitter charge (turn-on)	Q _{GE}		-	36	-	
Gate to collector charge (turn-on)	Q _{GC}		-	173	-	
Turn-on switching loss	E _{on}	I _C = 75 A, V _{CC} = 600 V V _{GE} = 15 V, R _g = 5 Ω, L = 500 μH T _J = 25 °C ⁽¹⁾	-	1.85	-	mJ
Turn-off switching loss	E _{off}		-	2.51	-	
Total switching loss	E _{tot}		-	4.36	-	
Turn-on switching loss	E _{on}	I _C = 75 A, V _{CC} = 600 V V _{GE} = 15 V, R _g = 5 Ω, L = 500 μH T _J = 125 °C ⁽¹⁾	-	3.17	-	
Turn-off switching loss	E _{off}		-	4.23	-	
Total switching loss	E _{tot}		-	7.40	-	
Turn-on delay time	t _{d(on)}	I _C = 75 A, V _{CC} = 600 V V _{GE} = 15 V, R _g = 5 Ω, L = 500 μH T _J = 125 °C	-	92	-	ns
Rise time	t _r		-	20	-	
Turn-off delay time	t _{d(off)}		-	153	-	
Fall time	t _f		-	178	-	
Reverse bias safe operating area	RBSOA	T _J = 150 °C, I _C = 250 A, V _{CC} = 700 V, V _P = 1200 V, R _g = 10 Ω, V _{GE} = 15 V to 0 V	Fullsquare			
Short circuit safe operating area	SCSOA	T _J = 150 °C, V _{CC} = 600 V, V _P = 1200 V R _g = 10 Ω, V _{GE} = 15 V to 0 V	10	-	-	μs
Diode peak reverse recovery current	I _{rr}	T _J = 25 °C	-	13	-	A
		T _J = 125 °C	-	19	-	
Diode reverse recovery time	t _{rr}	T _J = 25 °C	-	132	-	ns
		T _J = 125 °C	-	200	-	
Total reverse recovery charge	Q _{rr}	T _J = 25 °C	-	858	-	nC
		T _J = 125 °C	-	1900	-	

Note

⁽¹⁾ Energy losses include “tail” and diode reverse recovery

INTERNAL NTC - THERMISTOR SPECIFICATIONS				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUE	UNITS
Resistance	R25	T _C = 25 °C	5000	Ω
	R100	T _C = 100 °C	493 ± 5 %	
B-value	B _{25/50}	R ₂ = R ₂₅ exp. [B _{25/50} (1/T ₂ - 1/(298.15 K))]	3375 ± 5 %	K
Maximum operating temperature			220	°C
Dissipation constant			2	mW/°C
Thermal time constant			8	s

THERMAL AND MECHANICAL SPECIFICATIONS

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Junction and storage temperature range	T_J, T_{Stg}	-40	-	150	$^{\circ}\text{C}$
Junction-to-case IGBT	R_{thJC}	-	-	0.29	$^{\circ}\text{C/W}$
Junction-to-case diode	R_{thJC}	-	-	0.56	
Case to sink per module	R_{thCS}	-	0.02	-	
Mounting torque (M5)		2.7	-	3.3	Nm
Weight		-	170	-	g

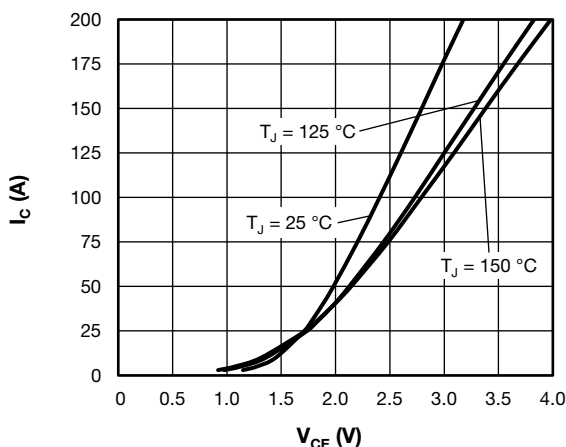


Fig. 1 - Typical Trench IGBT Output Characteristics, $V_{GE} = 15 \text{ V}$

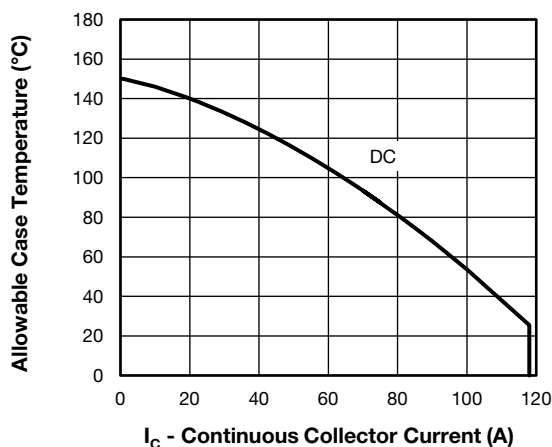


Fig. 3 - Maximum Trench IGBT Continuous Collector Current vs. Case Temperature

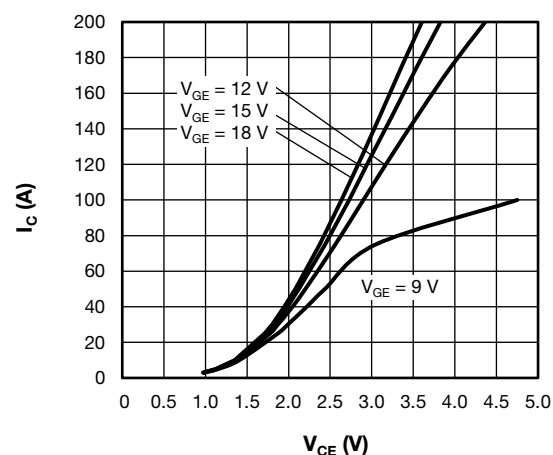


Fig. 2 - Typical Trench IGBT Output Characteristics, $T_J = 125 \text{ }^{\circ}\text{C}$

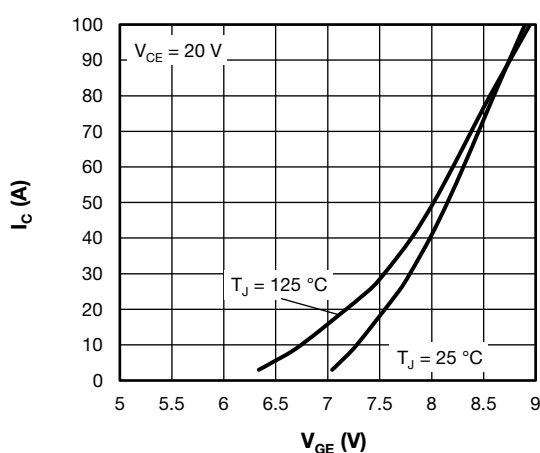


Fig. 4 - Typical Trench IGBT Transfer Characteristics

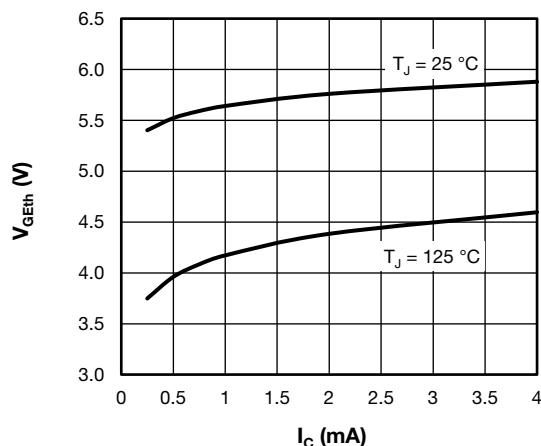
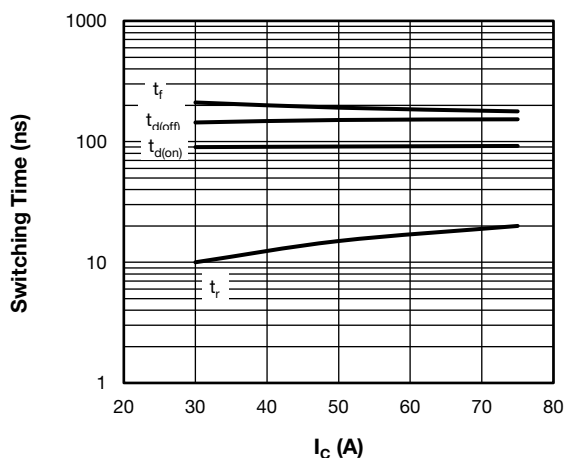


Fig. 5 - Typical Trench IGBT Gate Threshold Voltage


Fig. 8 - Typical Trench IGBT Switching Time vs. I_C
(with Antiparallel Diode)

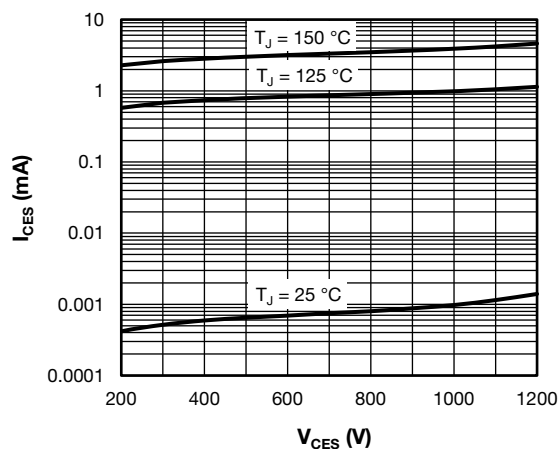
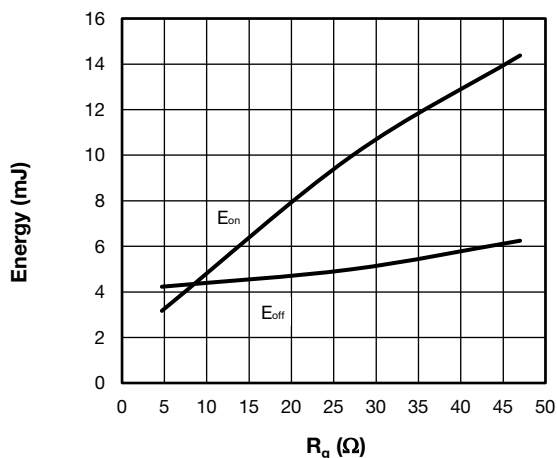
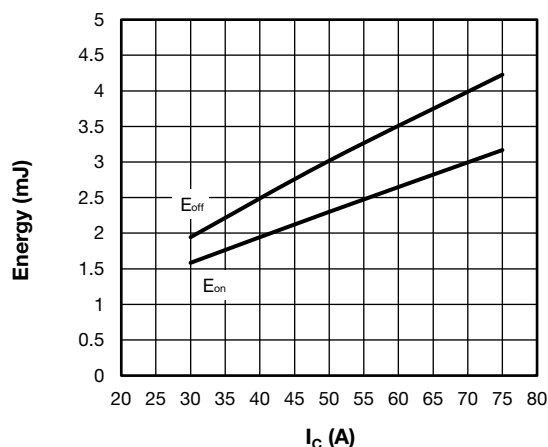
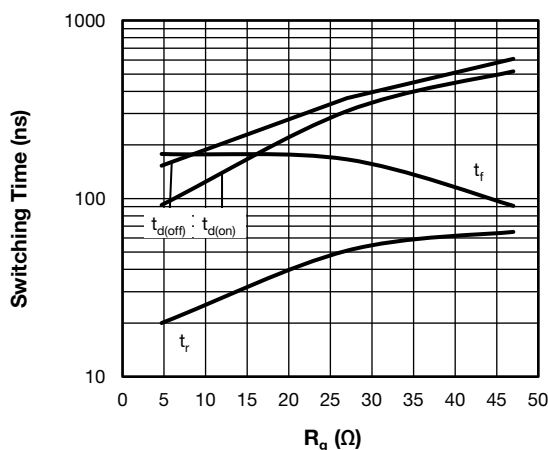
 $T_J = 125^\circ\text{C}$, $V_{CC} = 600\text{ V}$, $R_g = 4.7\ \Omega$, $V_{GE} = +15\text{V}/-15\text{V}$, $L = 500\ \mu\text{H}$


Fig. 6 - Typical Trench IGBT Zero Gate Voltage Collector Current


Fig. 9 - Typical Trench IGBT Energy Loss vs. R_g
(with Antiparallel Diode)

 $T_J = 125^\circ\text{C}$, $V_{CC} = 600\text{ V}$, $I_C = 75\text{ A}$, $V_{GE} = +15\text{V}/-15\text{V}$, $L = 500\ \mu\text{H}$

Fig. 7 - Typical Trench IGBT Energy Loss vs. I_C
(with Antiparallel Diode)

 $T_J = 125^\circ\text{C}$, $V_{CC} = 600\text{ V}$, $R_g = 4.7\ \Omega$, $V_{GE} = +15\text{V}/-15\text{V}$, $L = 500\ \mu\text{H}$

Fig. 10 - Typical Trench IGBT Switching Time vs. R_g
(with Antiparallel Diode)

 $T_J = 125^\circ\text{C}$, $V_{CC} = 600\text{ V}$, $I_C = 75\text{ A}$, $V_{GE} = +15\text{V}/-15\text{V}$, $L = 500\ \mu\text{H}$

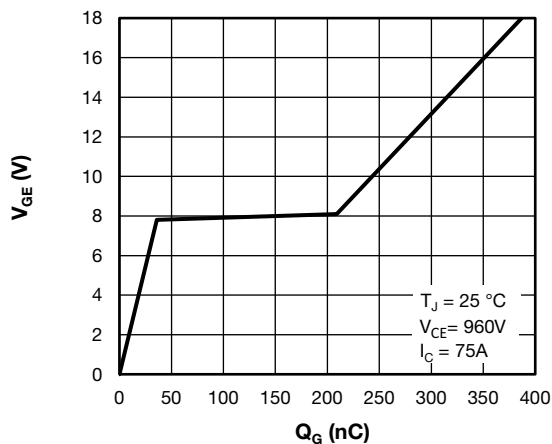


Fig. 11 - Typical Trench IGBT Gate charge vs. Gate to Emitter Voltage

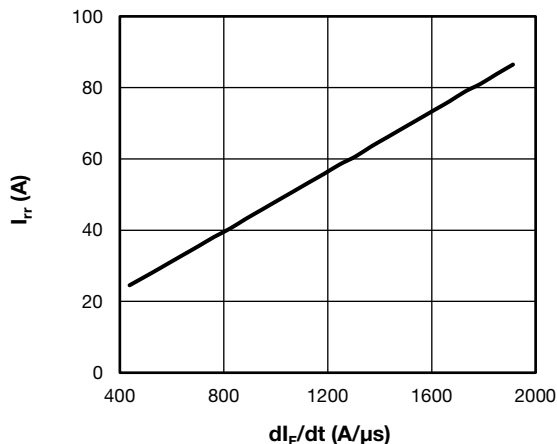


Fig. 14 - Typical Diode I_{rr} vs. di_F/dt
 $V_{CC} = 400 \text{ V}$; $V_{GE} = 15 \text{ V}$; $I_{CE} = 5.0 \text{ A}$; $T_J = 150 \text{ °C}$

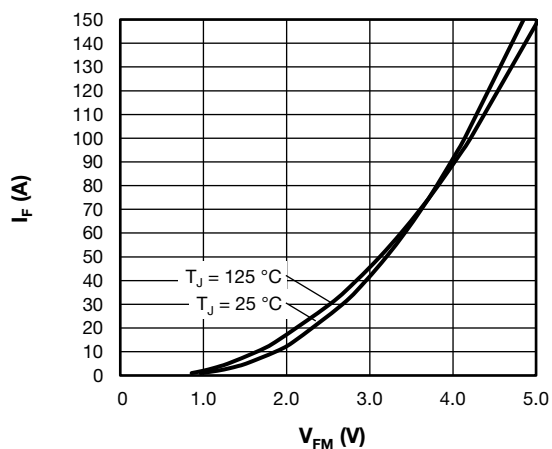


Fig. 12 - Typical Diode Forward Characteristics
 $t_p = 80 \text{ μs}$

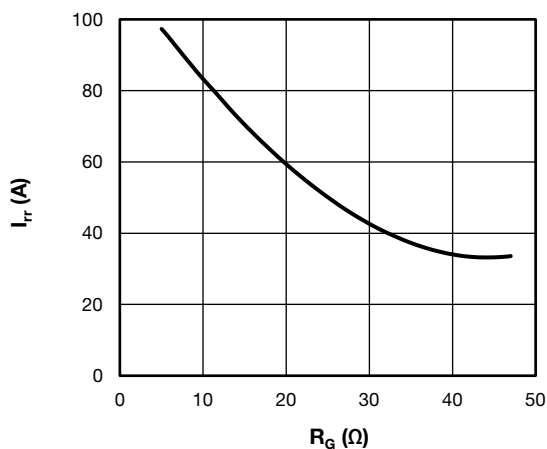


Fig. 15 - Typical Diode I_{rr} vs. R_g
 $T_J = 150 \text{ °C}$; $I_F = 5.0 \text{ A}$

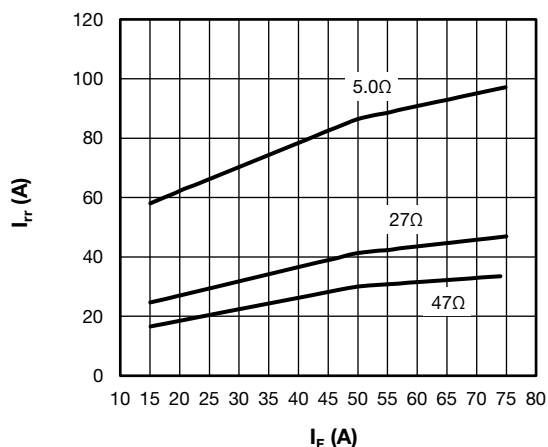


Fig. 13 - Typical Diode I_{rr} vs. I_F ,
 $T_J = 150 \text{ °C}$

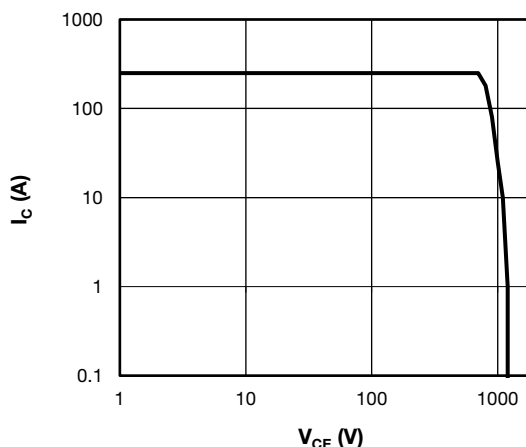


Fig. 16 - Trench IGBT Reverse BIAS SOA
 $T_J = 150 \text{ °C}$, $I_C = 250 \text{ A}$, $R_g = 10 \text{ Ω}$, $V_{GE} = +15 \text{ V/0 V}$, $V_{CC} = 700 \text{ V}$,
 $V_p = 1200 \text{ V}$

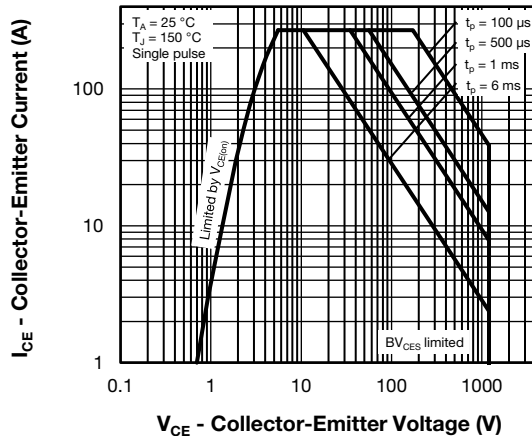
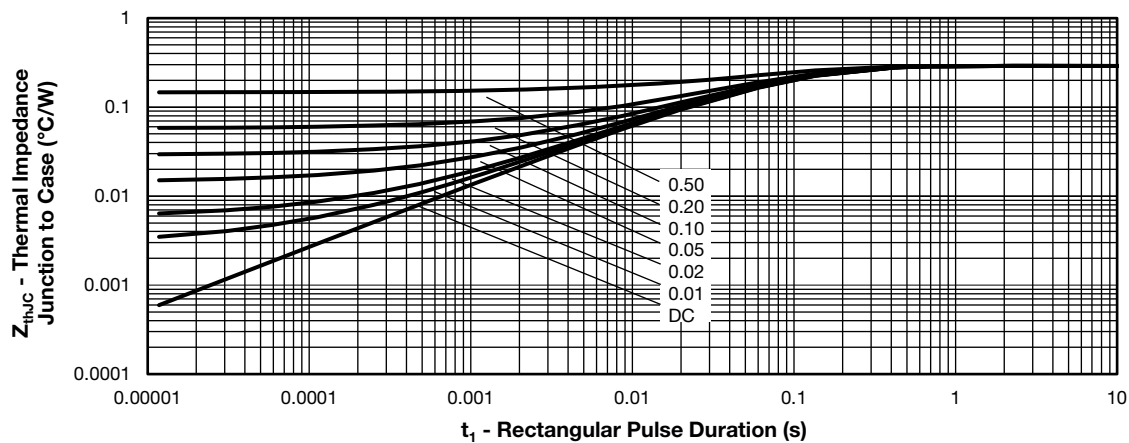


Fig. 17 - Trench IGBT Safe Operating Area


Fig. 18 - Maximum Trench IGBT Thermal Impedance Z_{thJC} Characteristics

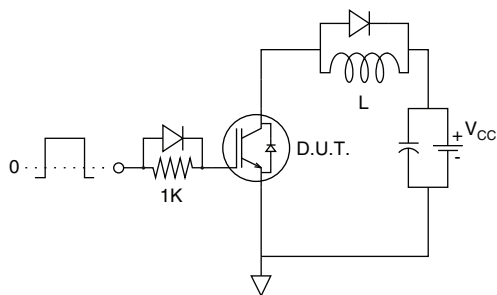


Fig. 19 - Gate Charge Circuit (Turn-Off)

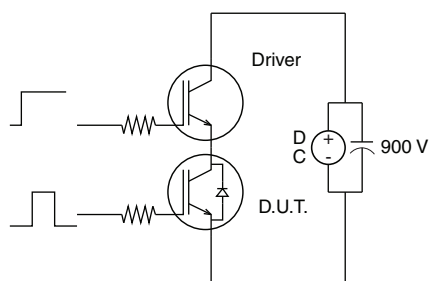


Fig. 21 - S.C. SOA Circuit

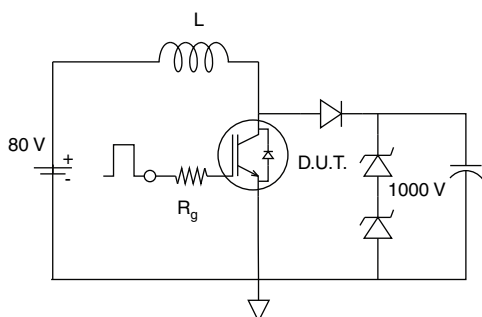


Fig. 20 - RBSOA Circuit

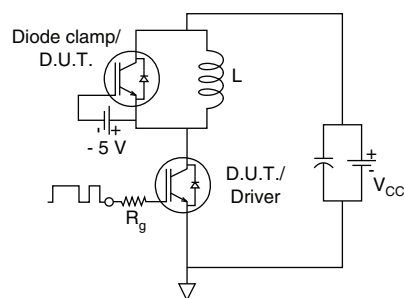


Fig. 22 - Switching Loss Circuit

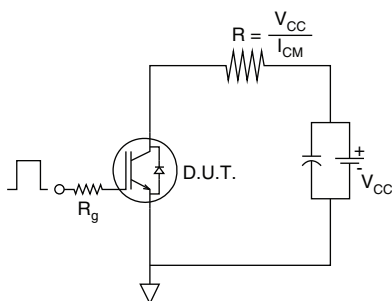


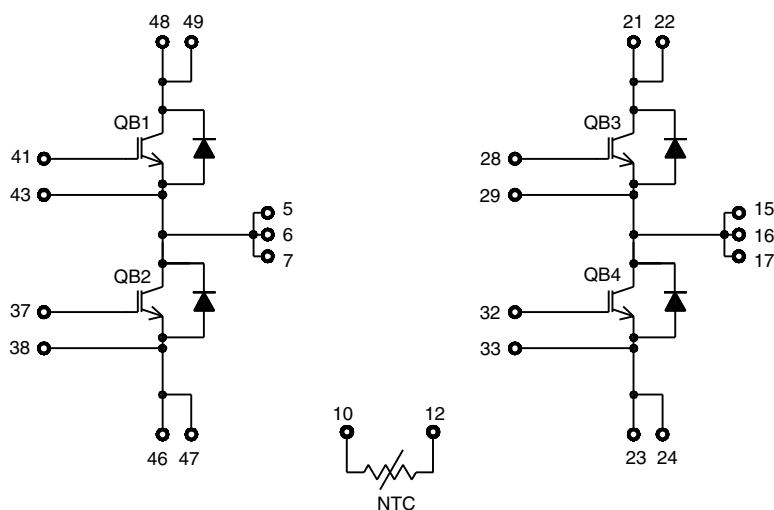
Fig. 23 - Resistive Load Circuit



ORDERING INFORMATION TABLE

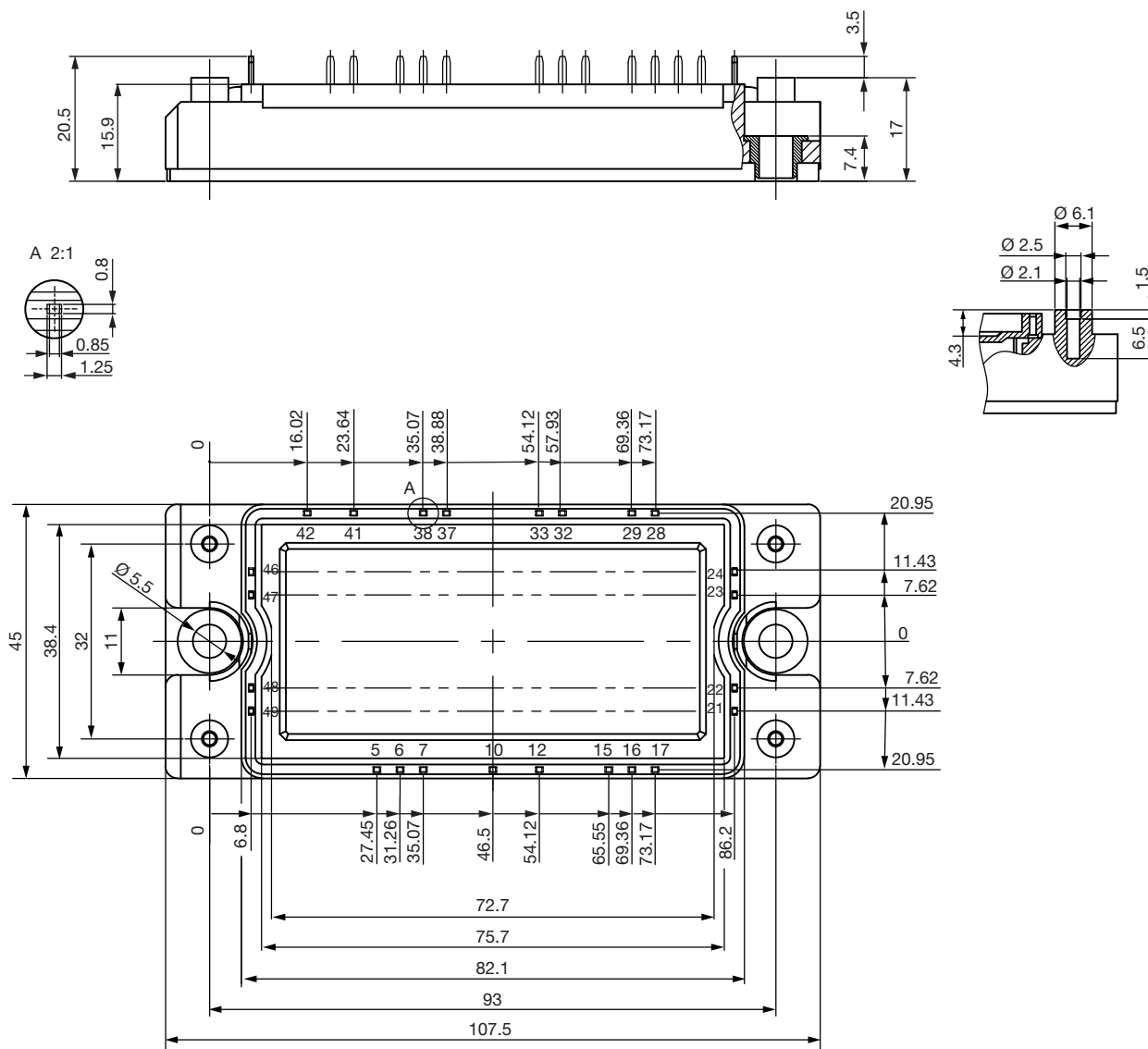
Device code	VS-	G	T	75	Y	F	120	U	T
	1	2	3	4	5	6	7	8	9
1	Vishay Semiconductors product								
2	Insulated gate bipolar transistor (IGBT)								
3	T = Trench gate field stop IGBT								
4	Current rating (75 = 75 A)								
5	Circuit configuration (Y = 4 pack)								
6	Package indicator (F = ECONO 2)								
7	Voltage rating (120 = 1200 V)								
8	Speed/type (U = ultrafast IGBT)								
9	T = NTC thermistor								

CIRCUIT CONFIGURATION





DIMENSIONS in millimeters





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