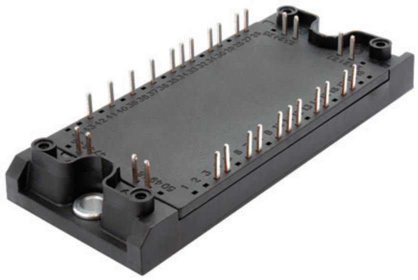
IGBT Fourpack Module, 50 A



ECONO 2

FEATURES

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

Pb-free
RoHS
COMPLIANT

PRIMARY CHARACTERISTICS	
V_{CES}	1200 V
I_C at T_C = 66 °C	50 A
$V_{CE(on)}$ (typical)	3.49 V
Speed	8 kHz to 30 kHz
Package	ECONO 2
Circuit configuration	4 pack

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 °C	66	A
		T_C = 80 °C	44	
Pulsed collector current See fig. C.T.5	I_{CM}		150	
Clamped inductive load current	I_{LM}		150	
Diode continuous forward current	I_F	T_C = 25 °C	40	
		T_C = 80 °C	25	
Diode maximum forward current	I_{FM}		150	
Gate to emitter voltage	V_{GE}		± 20	V
Maximum power dissipation (IGBT)	P_D	T_C = 25 °C	330	W
		T_C = 80 °C	180	
Maximum operating junction temperature	T_J		150	°C
Storage temperature range	T_{Stg}		-40 to +125	
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	$BV_{(CES)}$	V_{GE} = 0 V, I_C = 500 μA	1200	-	-	V
Collector to emitter voltage	$V_{CE(ON)}$	I_C = 50 A, V_{GE} = 15 V	-	3.49	3.9	
		I_C = 75 A, V_{GE} = 15 V	-	4.15	4.5	
		I_C = 50 A, V_{GE} = 15 V, T_J = 125 °C	-	4.16	4.5	
		I_C = 75 A, V_{GE} = 15 V, T_J = 125 °C	-	4.97	5.4	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250 μA	4.0	4.9	6.0	
Threshold voltage temperature coefficient	$\Delta V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 1 mA (25 °C to 125 °C)	-	-10	-	mV/°C
Zero gate voltage collector current	I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V	-	11	250	μA
		V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 125 °C	-	600	1000	
Diode forward voltage drop	V_{FM}	I_F = 50 A	-	3.30	4.5	V
		I_F = 75 A	-	3.90	5.0	
		I_F = 50 A, T_J = 125 °C	-	3.6	4.8	
		I_F = 75 A, T_J = 125 °C	-	4.37	5.5	
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 = 50 A V_{CC} = 600 V V_{GE} = 15 V		-	400	-	nC
Gate to emitter charge (turn-on)	Q_{GE}			-	43	-	
Gate to collector charge (turn-on)	Q_{GC}			-	187	-	
Turn-on switching loss	E_{on}	I_C = 50 A, V_{CC} = 600 V V_{GE} = 15 V, R_G = 4.7 Ω, L = 500 μH T_J = 25 °C [1]		-	0.93	-	mJ
Turn-off switching loss	E_{off}			-	1.20	-	
Total switching loss	E_{tot}			-	2.13	-	
Turn-on switching loss	E_{on}	I_C = 50 A, V_{CC} = 600 V V_{GE} = 15 V, R_G = 4.7 Ω, L = 500 μH T_J = 125 °C [1]		-	1.68	-	
Turn-off switching loss	E_{off}			-	1.77	-	
Total switching loss	E_{tot}			-	3.46	-	
Turn-on delay time	$t_{d(on)}$	I_C = 50 A, V_{CC} = 600 V V_{GE} = 15 V, R_G = 4.7 Ω, L = 500 μH T_J = 125 °C		-	128	-	ns
Rise time	t_r			-	56	-	
Turn-off delay time	$t_{d(off)}$			-	292	-	
Fall time	t_f			-	134	-	
Reverse bias safe operating area	RBSOA	T_J = 150 °C, I_C = 150 A R_G = 10 Ω, V_{GE} = 15 V to 0 V		Fullsquare			
Short circuit safe operating area	SCSOA	T_J = 150 °C V_{CC} = 900 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	V_{CC} = 600 V I_F = 50 A dI/dt = 7 A/μs	-	1.3	2.3	A
		T_J = 125 °C		-	2.0	3	
Diode reverse recovery time	t_{rr}	T_J = 25 °C		-	0.453	0.49	μs
		T_J = 125 °C		-	0.74	0.82	
Total reverse recovery charge	Q_{rr}	T_J = 25 °C		-	0.12	0.3	μC
		T_J = 125 °C		-	0.4	1.5	

Note

(1) Energy losses include "tail" and diode reverse recovery

THERMAL AND MECHANICAL SPECIFICATIONS					
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Junction to case IGBT	R_{thJC} (IGBT)	-	-	0.38	°C/W
Junction to case DIODE	R_{thJC} (DIODE)	-	-	1.00	
Case to sink, flat, greased surface	R_{thCS} (MODULE)	-	0.05	-	
Mounting torque (M5)		2.7	-	3.3	Nm
Weight		-	170	-	g

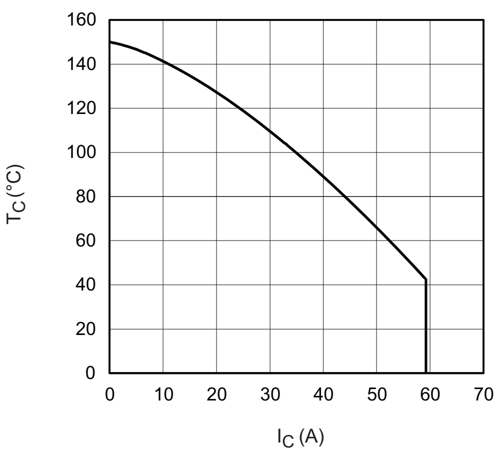


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

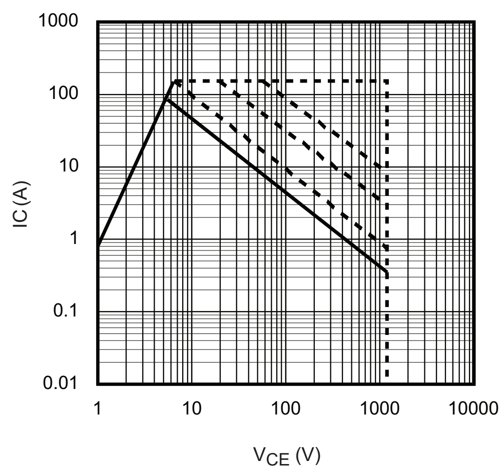


Fig. 3 - Forward SOA
T_C = 25 °C; $T_J \leq$ 150 °C

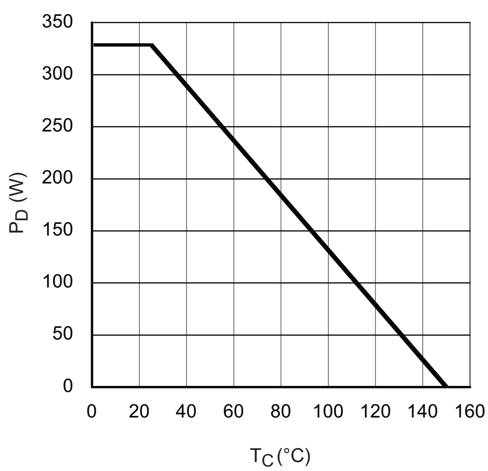


Fig. 2 - Power Dissipation vs. Case Temperature

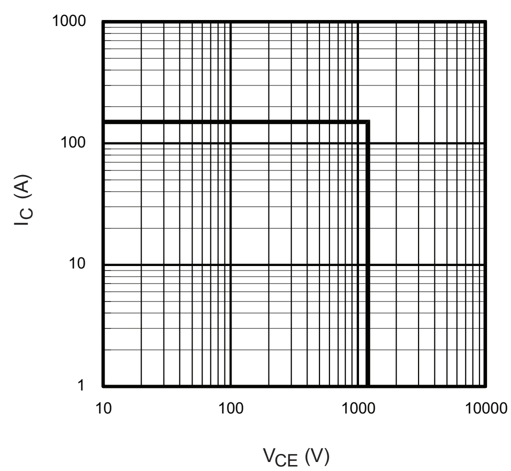


Fig. 4 - Reverse Bias SOA
T_J = 150 °C; V_{GE} = 15 V

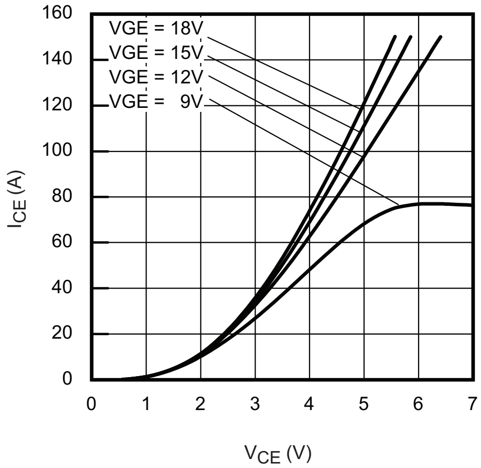


Fig. 5 - Typical IGBT Output Characteristics
T_J = 25 °C; t_p = 500 μs

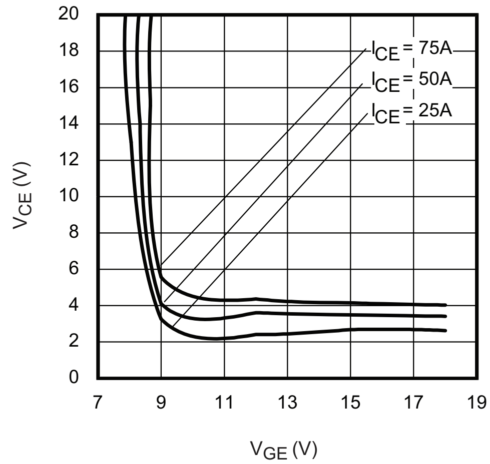


Fig. 8 - Typical V_{CE} vs. V_{GE}
T_J = 25 °C

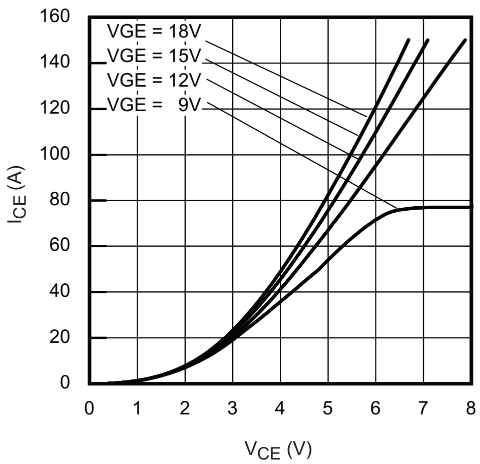


Fig. 6 - Typical IGBT Output Characteristics
T_J = 125 °C; t_p = 500 μs

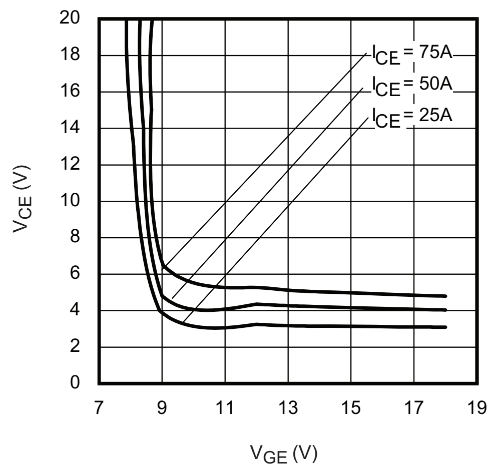


Fig. 9 - Typical V_{CE} vs. V_{GE}
T_J = 125 °C

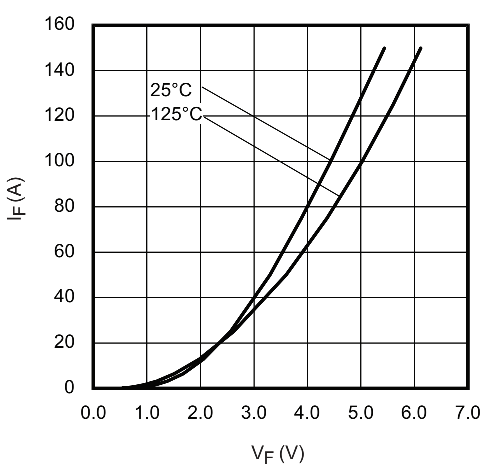


Fig. 7 - Typical Diode Forward Characteristics
t_p = 500 μs

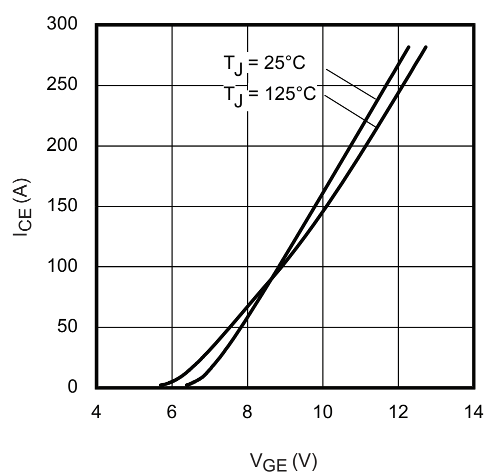


Fig. 10 - Typical Transfer Characteristics
V_{CE} = 20 V; t_p = 500 μs

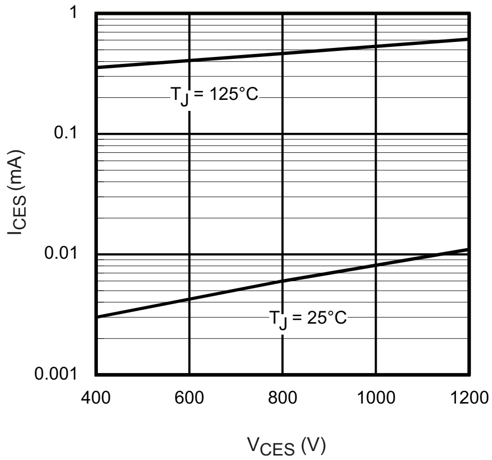


Fig. 11 - Typical Zero Gate Voltage Collector Current

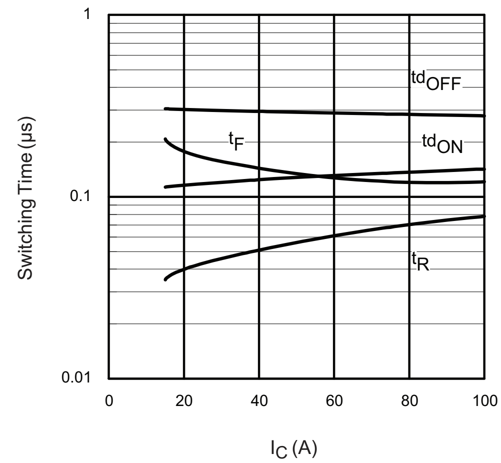


Fig. 14 - Typical Switching Time vs. I_C
T_J = 125 °C; L = 200 µH; V_{CE} = 600 V, R_G = 5 Ω; V_{GE} = 15 V

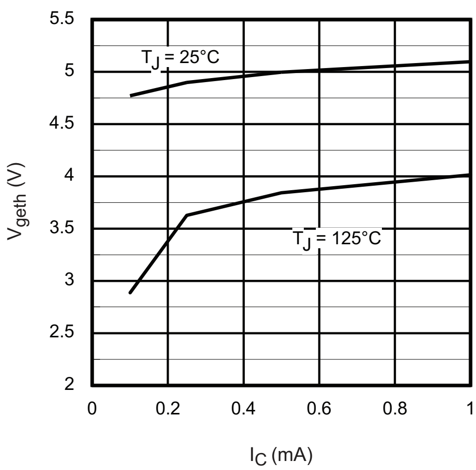


Fig. 12 - Typical Threshold Voltage

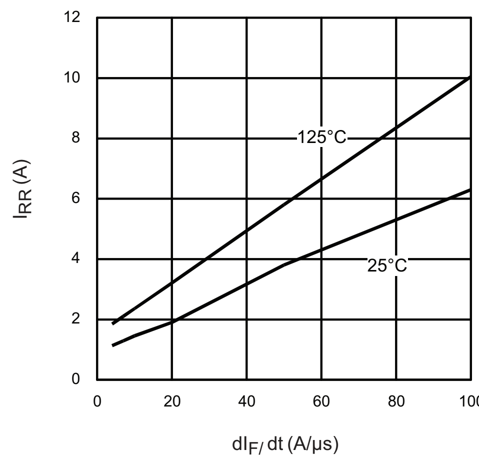


Fig. 15 - Typical Diode I_{REC} vs. dI_F/dt
V_{CC} = 600 V; I_F = 50 A

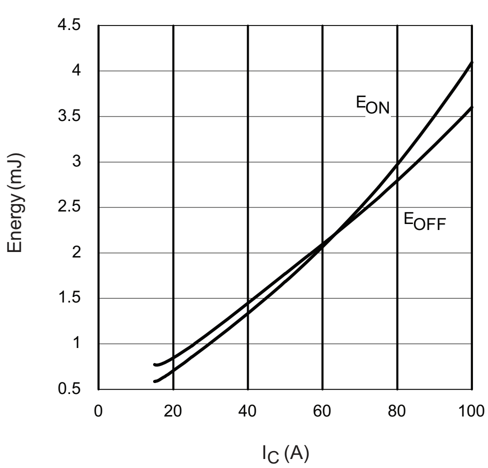


Fig. 13 - Typical Energy Loss vs. I_C
T_J = 125 °C; L = 200 µH; V_{CE} = 600 V, R_G= 5 Ω; V_{GE} = 15 V

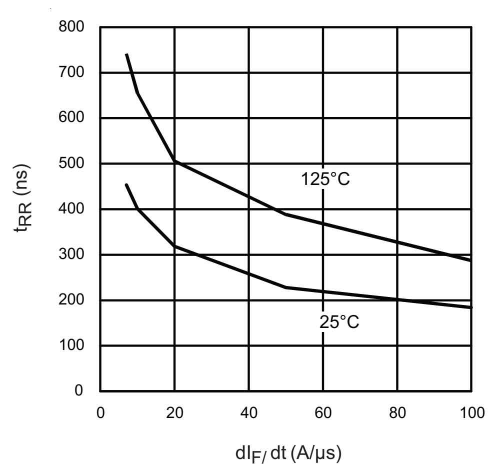


Fig. 16 - Typical Diode t_{rr} vs. dI_F/dt
V_{CC} = 600 V; I_F = 50 A

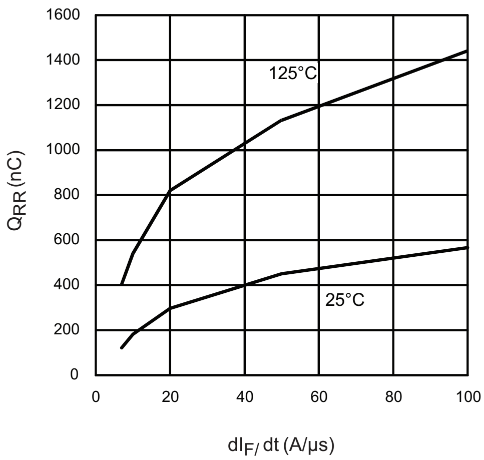


Fig. 17 - Typical Diode Q_{rr} vs. dI_F/dt
V_{CC} = 600 V; I_F = 50 A

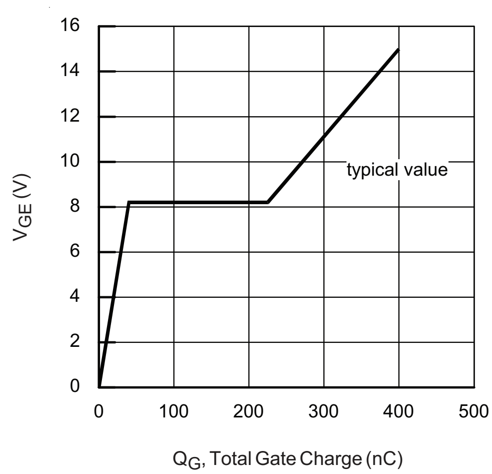


Fig. 18 - Typical Gate Charge vs. V_{GE}
I_{CE} = 5.0 A; L = 600 µH

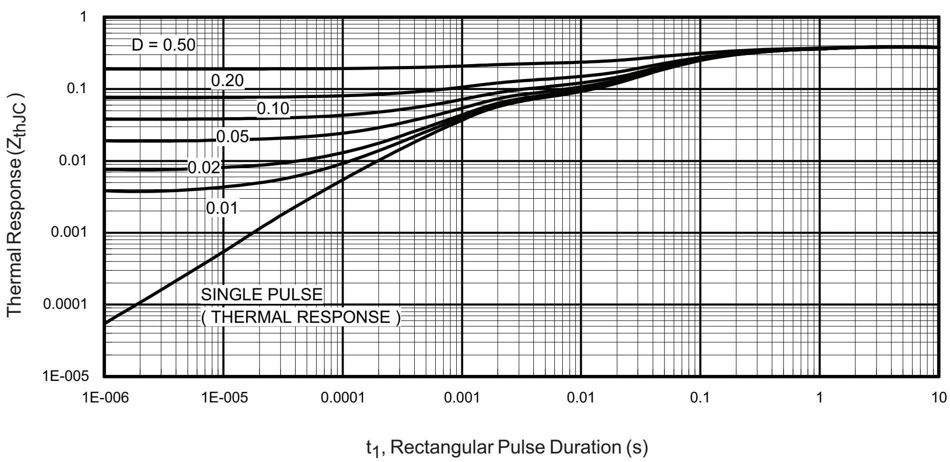


Fig. 19 - Maximum Transient Thermal Impedance, Junction to Case (IGBT)

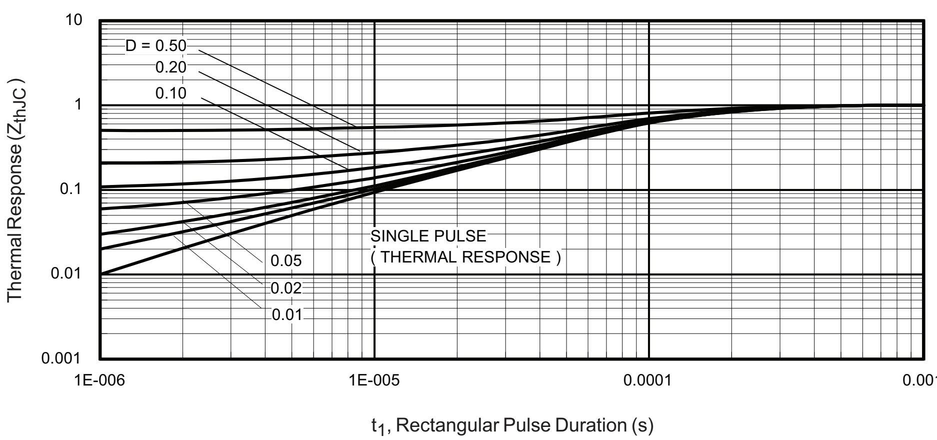


Fig. 20 - Maximum Transient Thermal Impedance, Junction to Case (DIODE)

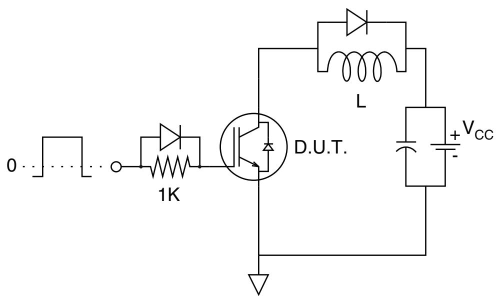


Fig. 21 - Gate Charge Circuit (Turn-Off)

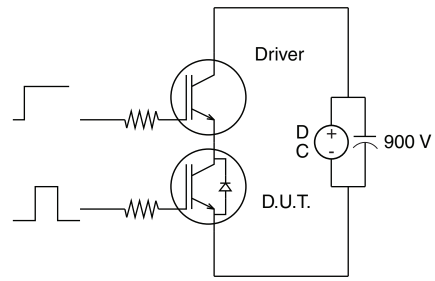


Fig. 23 - S.C. SOA Circuit

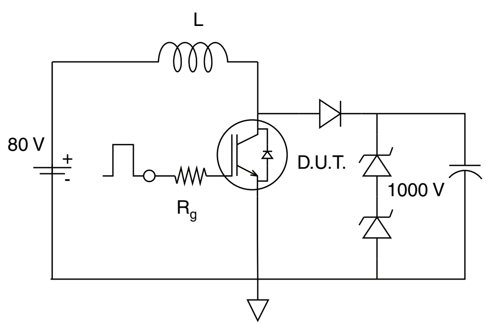


Fig. 22 - RBSOA Circuit

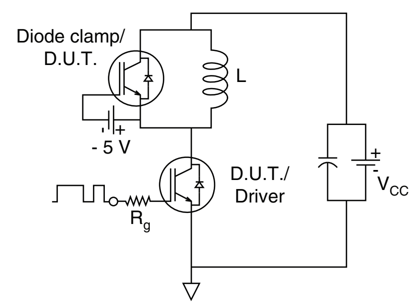


Fig. 24 - Switching Loss Circuit

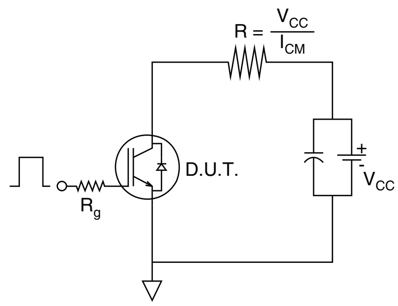


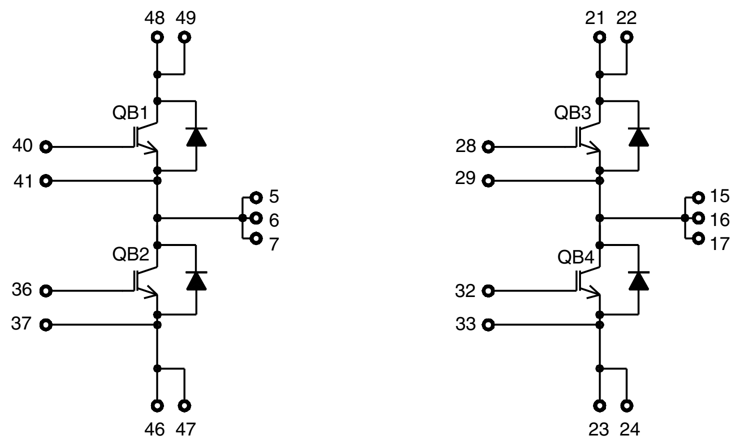
Fig. 25 - Resistive Load Circuit

ORDERING INFORMATION TABLE

Device code	VS-	G	B	50	Y	F	120	N
	1	2	3	4	5	6	7	8

1 - Vishay Semiconductors product
2 - Insulated gate bipolar transistor (IGBT)
3 - B = IGBT Gen 5 NPT
4 - Current rating (50 = 50 A)
5 - Circuit configuration (Y = 4 pack)
6 - Package indicator (F = ECONO 2)
7 - Voltage rating (120 = 1200 V)
8 - Speed/type (N = ultrafast with reduced diode, speed 8 kHz to 60 kHz)

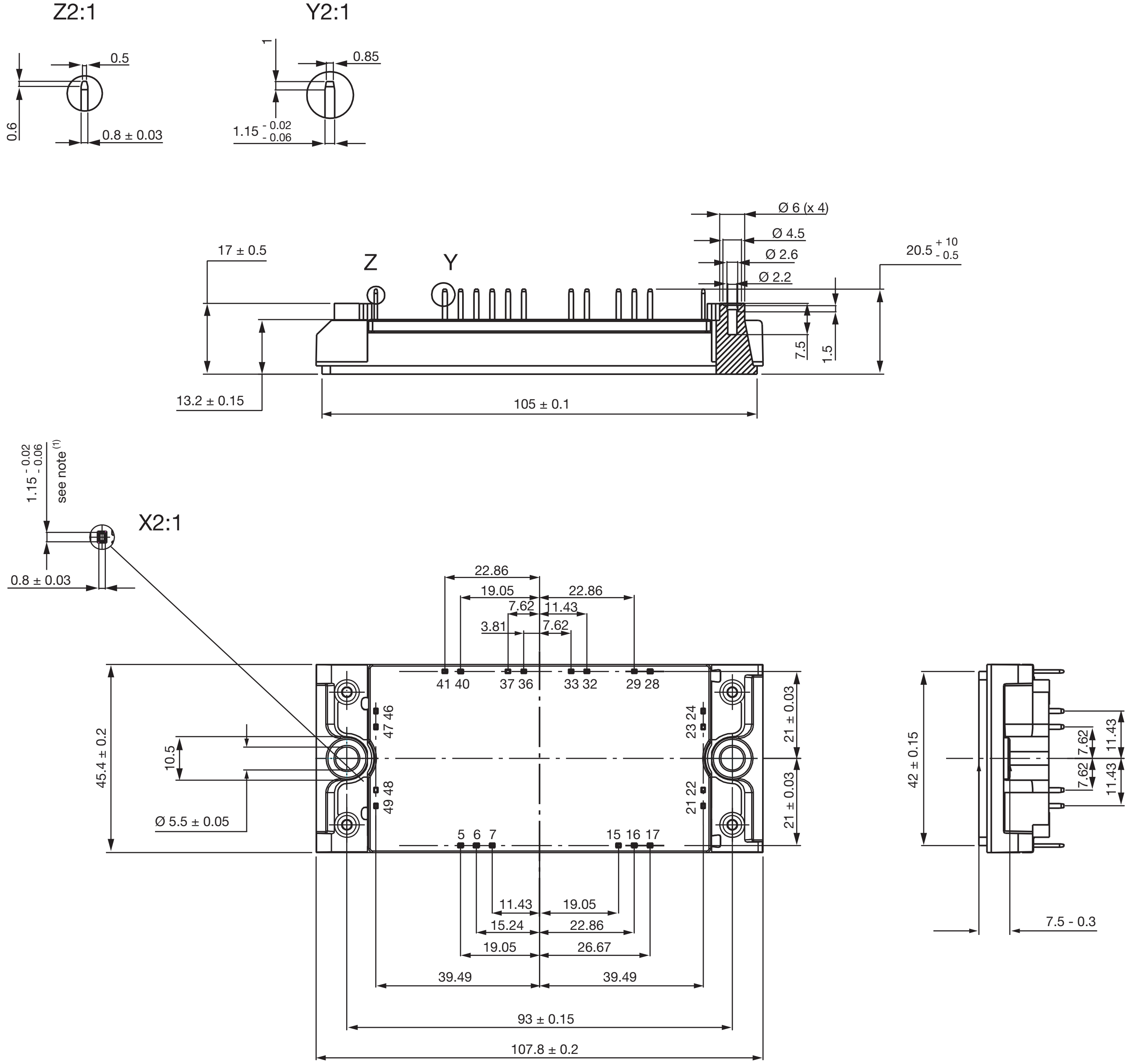
CIRCUIT CONFIGURATION



LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95539

ECONO2 4PACK N Series

DIMENSIONS in millimeters



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