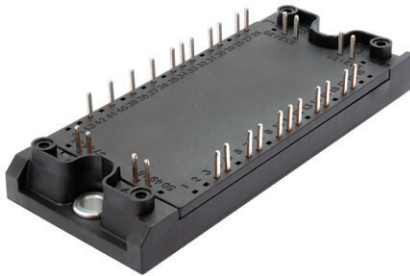


IGBT Fourpack Module, 50 A


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


RoHS
COMPLIANT

PRIMARY CHARACTERISTICS

V_{CES}	1200 V
I_C at $T_C = 66^\circ\text{C}$	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	$T_C = 25^\circ\text{C}$	66	A
		$T_C = 80^\circ\text{C}$	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	$T_C = 25^\circ\text{C}$	40	
		$T_C = 80^\circ\text{C}$	25	
Diode maximum forward current	I_{FM}		150	
Gate to emitter voltage	V_{GE}		± 20	V
Maximum power dissipation (IGBT)	P_D	$T_C = 25^\circ\text{C}$	330	W
		$T_C = 80^\circ\text{C}$	180	
Maximum operating junction temperature	T_J		150	$^\circ\text{C}$
Storage temperature range	T_{Stg}		-40 to +125	
Isolation voltage	V_{ISOL}		AC 2500 (min)	V



ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Collector to emitter breakdown voltage	$BV_{(CES)}$	$V_{GE} = 0\text{ V}$, $I_C = 500\text{ }\mu\text{A}$	1200	-	-	V
Collector to emitter voltage	$V_{CE(ON)}$	$I_C = 50\text{ A}$, $V_{GE} = 15\text{ V}$	-	3.49	3.9	
		$I_C = 75\text{ A}$, $V_{GE} = 15\text{ V}$	-	4.15	4.5	
		$I_C = 50\text{ A}$, $V_{GE} = 15\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	4.16	4.5	
		$I_C = 75\text{ A}$, $V_{GE} = 15\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	4.97	5.4	
Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$, $I_C = 250\text{ }\mu\text{A}$	4.0	4.9	6.0	mV/ $^{\circ}\text{C}$
Threshold voltage temperature coefficient	$\Delta V_{GE(th)}/\Delta T_J$	$V_{CE} = V_{GE}$, $I_C = 1\text{ mA}$ ($25\text{ }^{\circ}\text{C}$ to $125\text{ }^{\circ}\text{C}$)	-	-10	-	
Zero gate voltage collector current	I_{CES}	$V_{GE} = 0\text{ V}$, $V_{CE} = 1200\text{ V}$	-	11	250	μA
		$V_{GE} = 0\text{ V}$, $V_{CE} = 1200\text{ V}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	600	1000	
Diode forward voltage drop	V_{FM}	$I_F = 50\text{ A}$	-	3.30	4.5	V
		$I_F = 75\text{ A}$	-	3.90	5.0	
		$I_F = 50\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	3.6	4.8	
		$I_F = 75\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$	-	4.37	5.5	
Gate to emitter leakage current	I_{GES}	$V_{GE} = \pm 20\text{ V}$	-	-	± 200	nA

SWITCHING CHARACTERISTICS ($T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise noted)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Total gate charge (turn-on)	Q_G	$I_C = 50\text{ A}$ $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$	-	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}	$I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$, $R_G = 4.7\text{ }\Omega$, $L = 500\text{ }\mu\text{H}$ $T_J = 25\text{ }^{\circ}\text{C}$ ⁽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}	$I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$, $R_G = 4.7\text{ }\Omega$, $L = 500\text{ }\mu\text{H}$ $T_J = 125\text{ }^{\circ}\text{C}$ ⁽¹⁾	-	1.68	-	mJ
Turn-off switching loss	E_{off}		-	1.77	-	
Total switching loss	E_{tot}		-	3.46	-	
Turn-on delay time	$t_{d(on)}$	$I_C = 50\text{ A}$, $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$, $R_G = 4.7\text{ }\Omega$, $L = 500\text{ }\mu\text{H}$ $T_J = 125\text{ }^{\circ}\text{C}$	-	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	$T_J = 150\text{ }^{\circ}\text{C}$, $I_C = 150\text{ A}$ $R_G = 10\text{ }\Omega$, $V_{GE} = 15\text{ V}$ to 0 V	Fullsquare			
Short circuit safe operating area	SCSOA	$T_J = 150\text{ }^{\circ}\text{C}$ $V_{CC} = 900\text{ V}$, $V_P = 1200\text{ V}$ $R_G = 10\text{ }\Omega$, $V_{GE} = 15\text{ V}$ to 0 V	10	-	-	μs
Diode peak reverse recovery current	I_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	-	1.3	2.3	A
		$T_J = 125\text{ }^{\circ}\text{C}$	-	2.0	3	
Diode reverse recovery time	t_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	-	0.453	0.49	μs
		$T_J = 125\text{ }^{\circ}\text{C}$	-	0.74	0.82	
Total reverse recovery charge	Q_{rr}	$T_J = 25\text{ }^{\circ}\text{C}$	-	0.12	0.3	μC
		$T_J = 125\text{ }^{\circ}\text{C}$	-	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

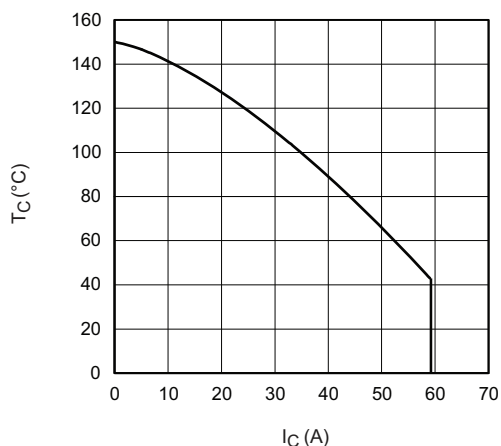


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

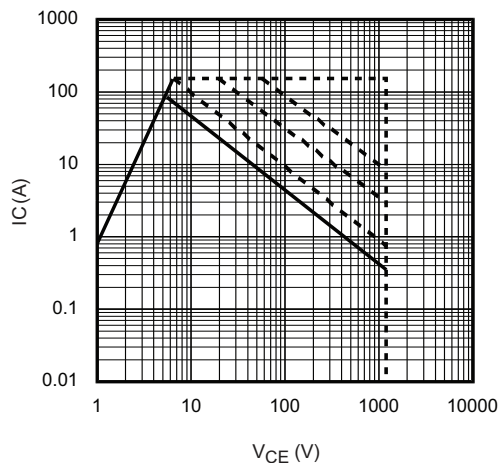


Fig. 3 - Forward SOA
 $T_C = 25^\circ\text{C}$; $T_J \leq 150^\circ\text{C}$

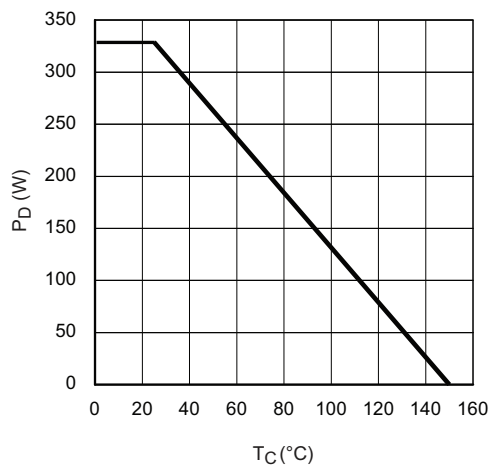


Fig. 2 - Power Dissipation vs. Case Temperature

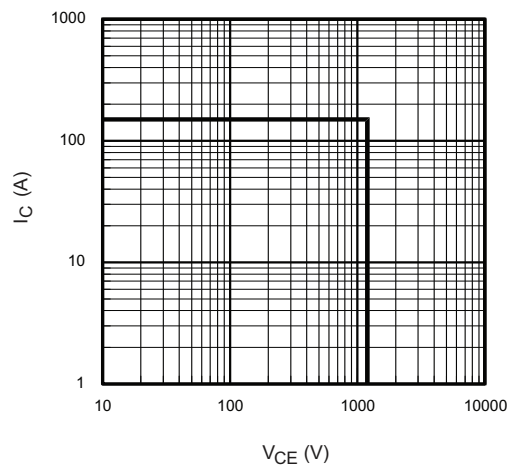


Fig. 4 - Reverse Bias SOA
 $T_J = 150^\circ\text{C}$; $V_{GE} = 15\text{ V}$

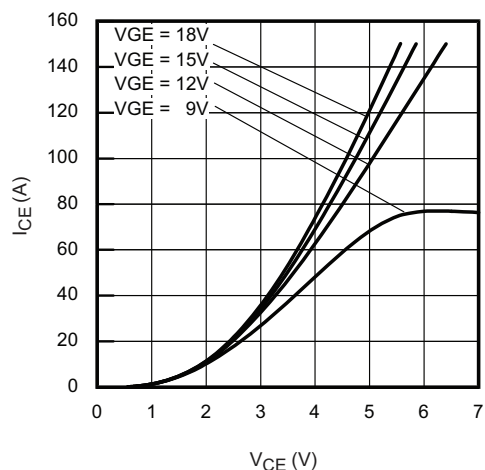


Fig. 5 - Typical IGBT Output Characteristics
 $T_J = 25^\circ\text{C}$; $t_p = 500\ \mu\text{s}$

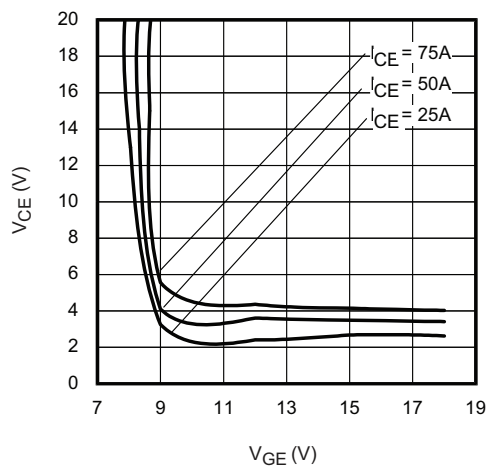


Fig. 8 - Typical V_{CE} vs. V_{GE}
 $T_J = 25^\circ\text{C}$

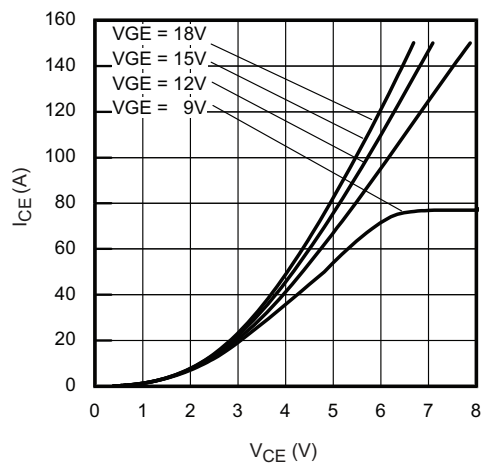


Fig. 6 - Typical IGBT Output Characteristics
 $T_J = 125^\circ\text{C}$; $t_p = 500\ \mu\text{s}$

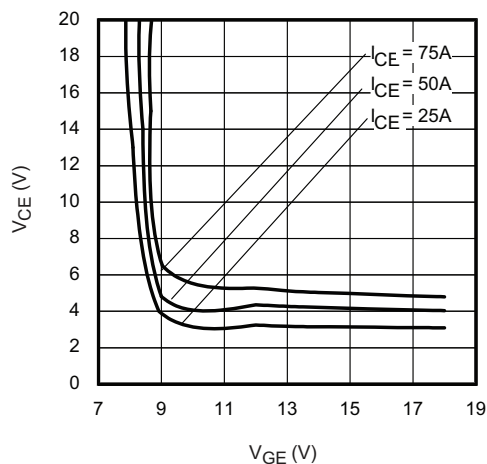


Fig. 9 - Typical V_{CE} vs. V_{GE}
 $T_J = 125^\circ\text{C}$

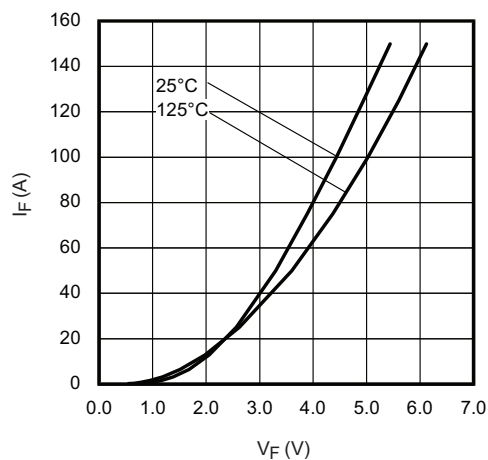


Fig. 7 - Typical Diode Forward Characteristics
 $t_p = 500\ \mu\text{s}$

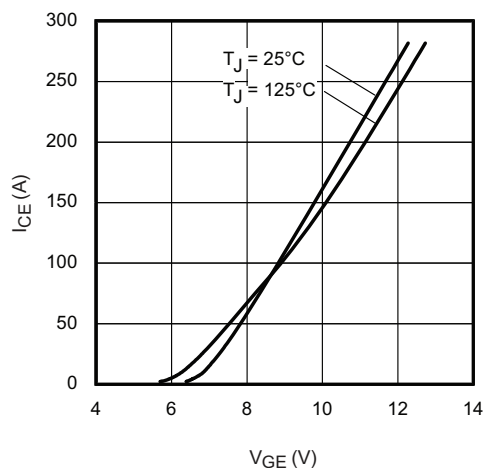


Fig. 10 - Typical Transfer Characteristics
 $V_{CE} = 20\ \text{V}$; $t_p = 500\ \mu\text{s}$

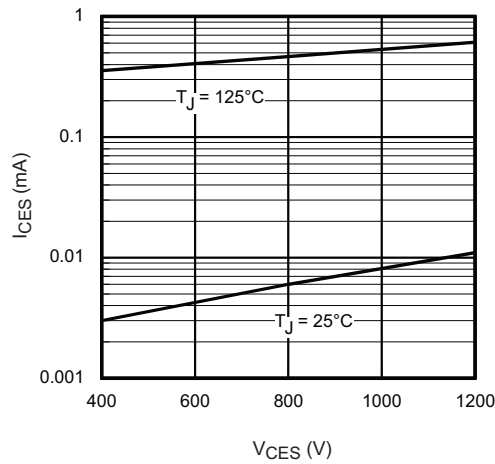


Fig. 11 - Typical Zero Gate Voltage Collector Current

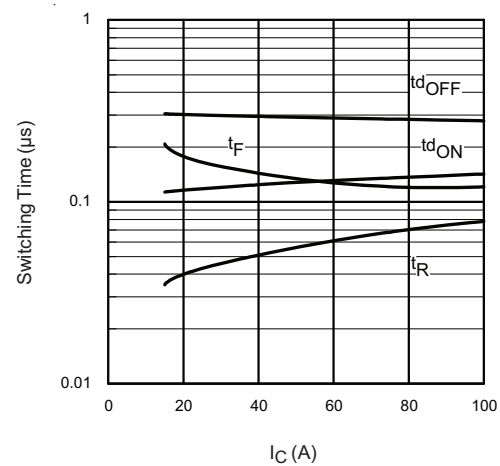
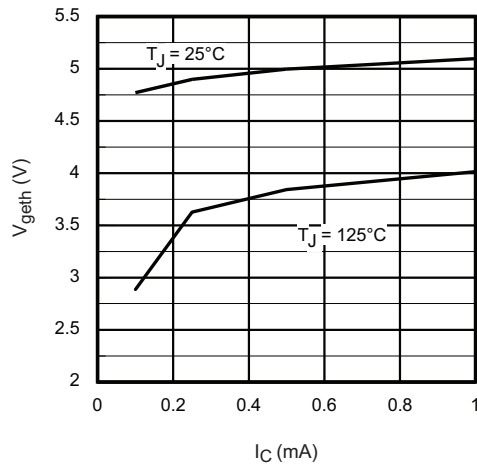
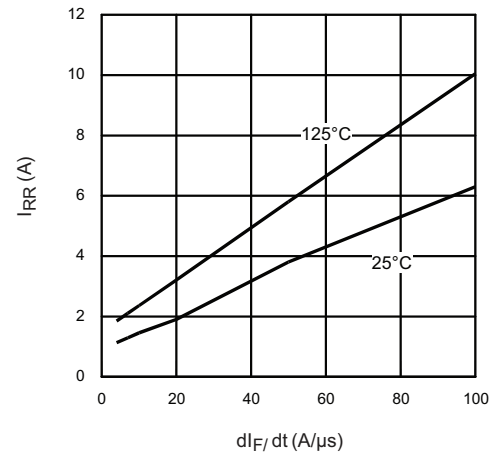
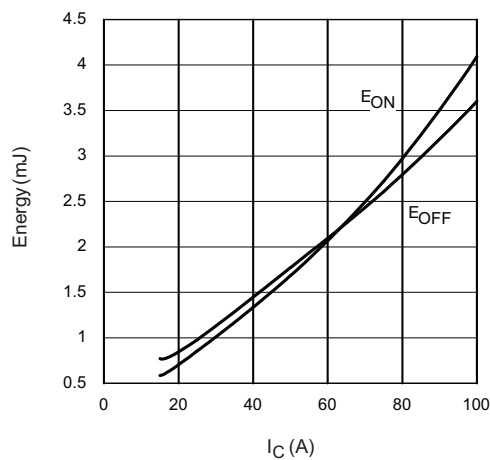
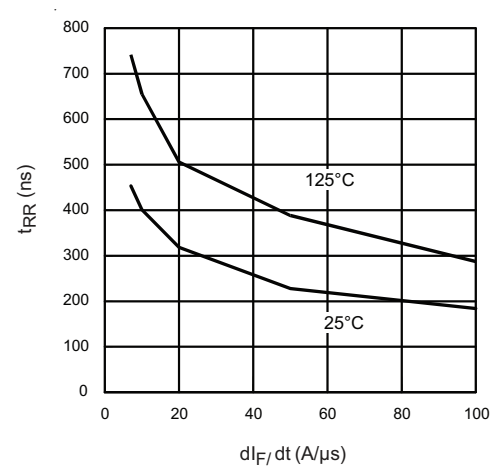

Fig. 14 - Typical Switching Time vs. I_C
 $T_J = 125^\circ\text{C}$; $L = 200\ \mu\text{H}$; $V_{CE} = 600\ \text{V}$; $R_G = 5\ \Omega$; $V_{GE} = 15\ \text{V}$


Fig. 12 - Typical Threshold Voltage


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

Fig. 13 - Typical Energy Loss vs. I_C
 $T_J = 125^\circ\text{C}$; $L = 200\ \mu\text{H}$; $V_{CE} = 600\ \text{V}$; $R_G = 5\ \Omega$; $V_{GE} = 15\ \text{V}$

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

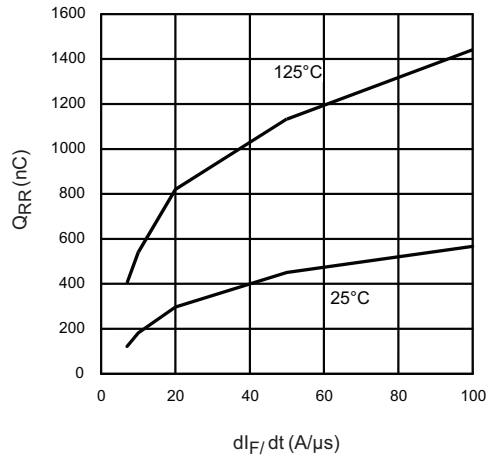


Fig. 17 - Typical Diode Q_{rr} vs. dI_F/dt
 $V_{CC} = 600\text{ V}$; $I_F = 50\text{ A}$

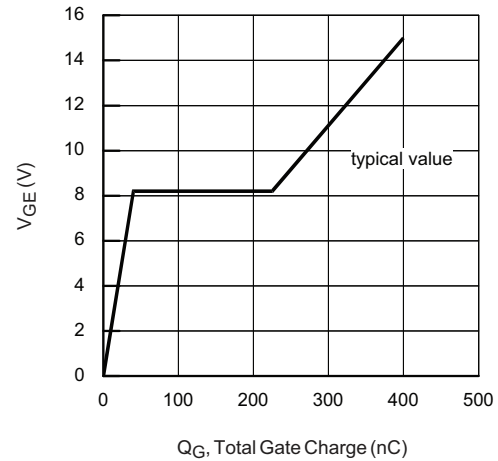


Fig. 18 - Typical Gate Charge vs. V_{GE}
 $I_{CE} = 5.0\text{ A}$; $L = 600\text{ μH}$

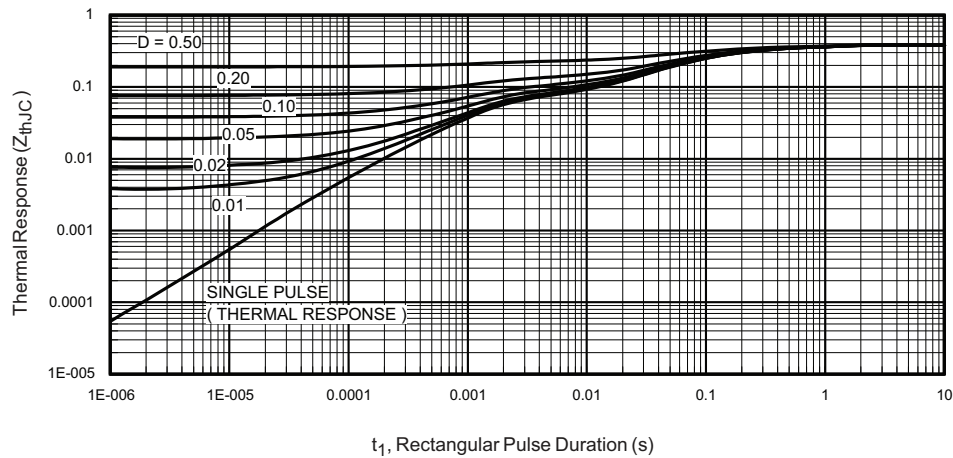


Fig. 19 - Maximum Transient Thermal Impedance, Junction to Case (IGBT)

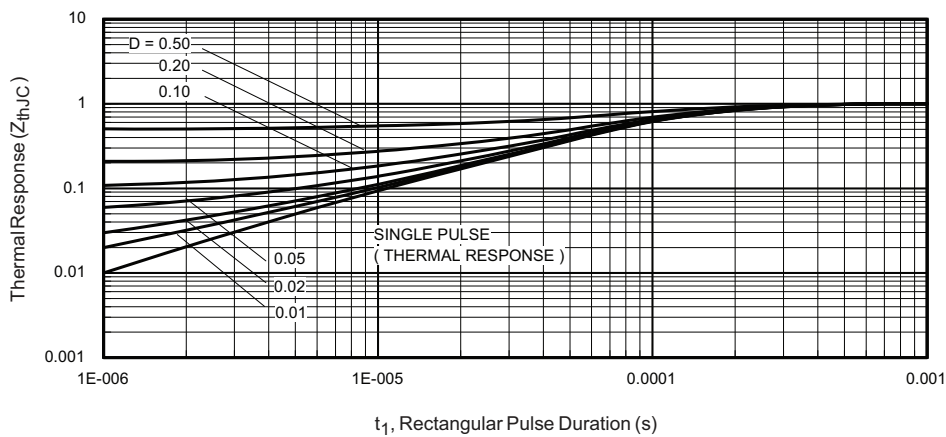


Fig. 20 - Maximum Transient Thermal Impedance, Junction to Case (DIODE)

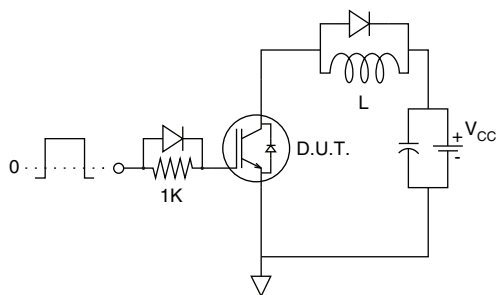


Fig. 21 - Gate Charge Circuit (Turn-Off)

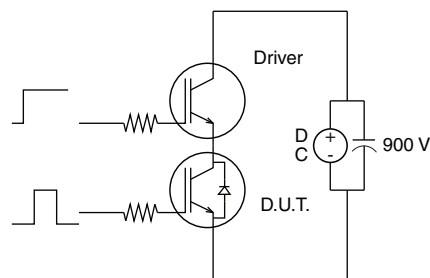


Fig. 23 - S.C. SOA Circuit

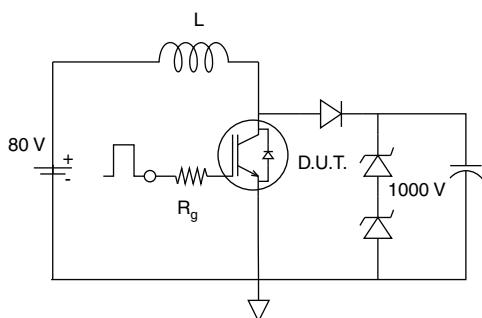


Fig. 22 - RBSOA Circuit

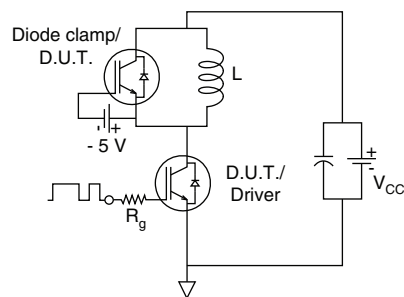


Fig. 24 - Switching Loss Circuit

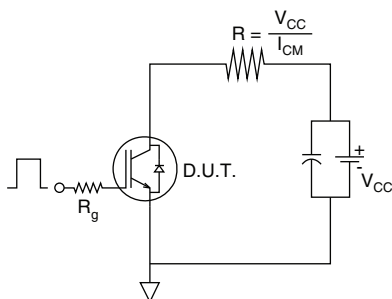
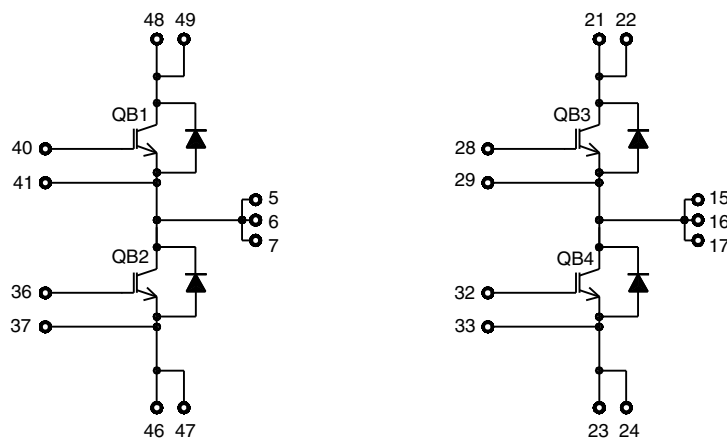


Fig. 25 - Resistive Load Circuit

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)

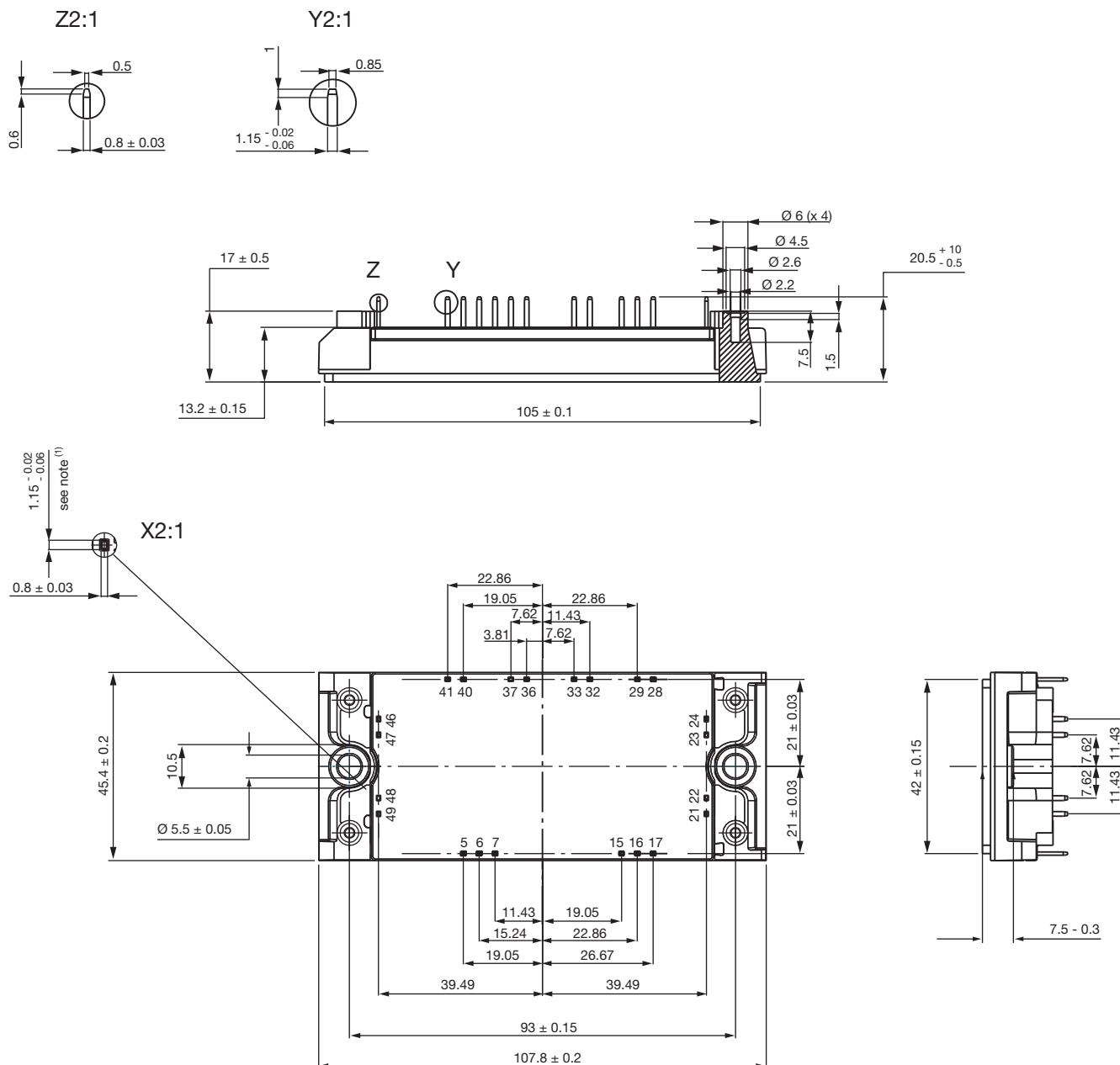
CIRCUIT CONFIGURATION

LINKS TO RELATED DOCUMENTS

Dimensions

www.vishay.com/doc?95539

ECONO2 4PACK N Series

DIMENSIONS in millimeters





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