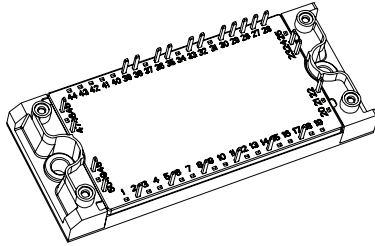


## IGBT PIM Module, 12 A


**ECONO2 PIM**
**FEATURES**

- Low  $V_{CE(on)}$  non punch through IGBT technology
- Low diode  $V_F$
- 10  $\mu$ s short circuit capability
- Square RBSOA
- HEXFRED® antiparallel diode with ultrasoft reverse recovery characteristics
- Positive  $V_{CE(on)}$  temperature coefficient
- Ceramic DBC substrate
- Low stray inductance design
- Speed 8 to 60 kHz
- Totally lead (Pb)-free
- Designed and qualified for industrial market


**RoHS**  
COMPLIANT

PRODUCT SUMMARY	
$V_{CES}$	600 V
$V_{CE(on)}$ (typical)	1.61 V
$t_{sc}$ at $T_J = 150\text{ }^\circ\text{C}$	> 10 $\mu$ s
$I_C$ at $T_C = 80\text{ }^\circ\text{C}$	12 A

**BENEFITS**

- Benchmark efficiency for motor control
- Rugged transient performance
- Low EMI, requires less snubbing
- Direct mounting to heatsink
- PCB solderable terminals
- Low junction to case thermal resistance
- UL approved E78996

ABSOLUTE MAXIMUM RATINGS						
	PARAMETER	SYMBOL	TEST CONDITIONS		MAX.	UNITS
Inverter	Collector to emitter voltage	$V_{CES}$			600	V
	Gate to emitter voltage	$V_{GES}$			$\pm 20$	
	Continuous collector current	$I_C$	$T_C = 25\text{ }^\circ\text{C}$		20	A
			$T_C = 80\text{ }^\circ\text{C}$		12	
	Pulsed collector current See fig. C.T.5	$I_{CM}$			40	A
	Diode maximum forward current	$I_{FM}$	Pulsed		40	A
Power dissipation	$P_D$	One IGBT	25 $^\circ\text{C}$	100	W	
Input rectifier	Repetitive peak reverse voltage	$V_{RRM}$			800	V
	Average output current	$I_{F(AV)}$	50/60 Hz sine pulse	80 $^\circ\text{C}$	10	A
	Surge current (non-repetitive)	$I_{FSM}$	Rated $V_{RRM}$ applied, 10 ms, sine pulse		310	
	$I^2t$ (non-repetitive)	$I^2t$			525	$\text{A}^2\text{s}$
Brake	Collector to emitter voltage	$V_{CES}$			600	V
	Gate to emitter voltage	$V_{GES}$			$\pm 20$	
	Continuous collector current	$I_C$	$T_C = 25\text{ }^\circ\text{C}$		10	A
			$T_C = 80\text{ }^\circ\text{C}$		6	
	Pulsed collector current See fig. C.T.5	$I_{CM}$			20	A
	Power dissipation	$P_D$	One IGBT	25 $^\circ\text{C}$	100	W
	Repetitive peak reverse voltage	$V_{RRM}$			600	V
	Maximum operating junction temperature	$T_J$			150	$^\circ\text{C}$
	Storage temperature range	$T_{Stg}$			- 40 to + 125	
	Isolation voltage	$V_{ISOL}$	AC (1 min)		2500	V

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)							
	PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Inverter IGBT	Collector to emitter breakdown voltage	$BV_{(CES)}$	$V_{GE} = 0\text{ V}, I_C = 500\text{ }\mu\text{A}$	600	-	-	V
	Temperature coefficient of breakdown voltage	$\Delta V_{(BR)CES}/\Delta T_J$	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$ ( $25\text{ }^\circ\text{C}$ to $125\text{ }^\circ\text{C}$ )	-	0.25	-	$V/^\circ\text{C}$
	Collector to emitter voltage	$V_{CE(on)}$	$I_C = 10\text{ A}, V_{GE} = 15\text{ V}$	-	1.61	1.86	V
			$I_C = 20\text{ A}, V_{GE} = 15\text{ V}$	-	2.10	2.49	
			$I_C = 10\text{ A}, V_{GE} = 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	1.79	1.97	
			$I_C = 20\text{ A}, V_{GE} = 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	2.45	2.72	
	Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$	4	-	6	
	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 $125\text{ }^\circ\text{C}$ )	-	-9.1	-	$\text{mV}/^\circ\text{C}$
	Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$	-	-	100	$\mu\text{A}$
			$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$ $T_J = 125\text{ }^\circ\text{C}$	-	250	-	
	Gate to emitter leakage current	$I_{GES}$	$V_{GE} = \pm 20\text{ V}$	-	-	$\pm 200$	nA
	Total gate charge (turn-on)	$Q_G$	$I_C = 10\text{ A}$	-	51	76	nC
	Gate to emitter charge (turn-on)	$Q_{GE}$	$V_{CC} = 300\text{ V}$	-	12	18	
	Gate to collector charge (turn-on)	$Q_{GC}$	$V_{GE} = 15\text{ V}$	-	19	28	
	Turn-on switching loss	$E_{on}$	$I_C = 10\text{ A}, V_{CC} = 300\text{ V}$ $V_{GE} = 15\text{ V}, R_G = 22\text{ }\Omega$ $L = 500\text{ }\mu\text{H}, T_J = 25\text{ }^\circ\text{C}^{(1)}$	-	0.19	0.29	mJ
	Turn-off switching loss	$E_{off}$		-	0.11	0.17	
	Total switching loss	$E_{tot}$		-	0.30	0.45	
	Turn-on switching loss	$E_{on}$	$I_C = 10\text{ A}, V_{CC} = 300\text{ V}$ $V_{GE} = 15\text{ V}, R_G = 22\text{ }\Omega$ $L = 500\text{ }\mu\text{H}, T_J = 125\text{ }^\circ\text{C}^{(1)}$	-	0.24	0.36	mJ
	Turn-off switching loss	$E_{off}$		-	0.18	0.28	
	Total switching loss	$E_{tot}$		-	0.42	0.63	
Turn-on delay time	$t_{d(on)}$	$I_C = 10\text{ A}, V_{CC} = 300\text{ V}$ $V_{GE} = 15\text{ V}, R_G = 22\text{ }\Omega$ $L = 500\text{ }\mu\text{H}, T_J = 125\text{ }^\circ\text{C}$	-	87	131	ns	
Rise time	$t_r$		-	17	26		
Turn-off delay time	$t_{d(off)}$		-	116	174		
Fall time	$t_f$		-	161	242		
Input capacitance	$C_{ies}$	$V_{GE} = 0\text{ V}$	-	900	1350	pF	
Output capacitance	$C_{oes}$	$V_{CC} = 30\text{ V}$	-	263	395		
Reverse transfer capacitance	$C_{res}$	$f = 1\text{ MHz}$	-	30	45		
Inverter IGBT	Reverse bias safe operating area	RBSOA	$T_J = 125\text{ }^\circ\text{C}, I_C = 40\text{ A}$ $R_G = 22\text{ }\Omega, V_{GE} = 15\text{ V to }0$	Fullsquare			
	Short circuit safe operating area	SCSOA	$T_J = 150\text{ }^\circ\text{C}$ $V_{CC} = 300\text{ V}, V_P = 600\text{ V}$ $R_G = 22\text{ }\Omega, V_{GE} = 15\text{ V to }0\text{ V}$	10	-	-	$\mu\text{s}$
Inverter Diode	Diode peak reverse recovery current	$I_{rr}$	$T_J = 125\text{ }^\circ\text{C}$ $V_{CC} = 300\text{ V}, I_F = 10\text{ A}, L = 500\text{ }\mu\text{H}$ $R_G = 22\text{ }\Omega, V_{GE} = 15\text{ V}$	-	23	-	A
	Diode forward voltage drop	$V_{FM}$	$I_F = 10\text{ A}$	-	1.23	1.49	V
			$I_F = 20\text{ A}$	-	1.43	1.84	
			$I_F = 10\text{ A}, T_J = 125\text{ }^\circ\text{C}$	-	1.18	1.44	
$I_F = 20\text{ A}, T_J = 125\text{ }^\circ\text{C}$			-	1.44	1.79		

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)							
	PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Rectifier	Maximum forward voltage drop	$V_{FM}$	$I_F = 10\text{ A}$	-	-	1.04	V
	Maximum reverse leakage current	$I_{RM}$	$T_J = 25\text{ }^\circ\text{C}, V_R = 800\text{ V}$	-	-	0.2	mA
			$T_J = 150\text{ }^\circ\text{C}, V_R = 800\text{ V}$	-	-	1	
	Forward slope resistance	$r_T$	$T_J = 150\text{ }^\circ\text{C}$	-	12.7	-	m $\Omega$
Conduction threshold voltage	$V_{F(TO)}$	-		0.70	-	V	
Brake IGBT	Collector to emitter breakdown voltage	$BV_{(CES)}$	$V_{GE} = 0\text{ V}, I_C = 500\text{ }\mu\text{A}$	600	-	-	
	Temperature coefficient of breakdown voltage	$\Delta V_{(BR)CES}/\Delta T_J$	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$ ( $25\text{ }^\circ\text{C}$ to $125\text{ }^\circ\text{C}$ )	-	0.25	-	V/ $^\circ\text{C}$
	Collector to emitter voltage	$V_{CE(on)}$	$I_C = 5\text{ A}, V_{GE} = 15\text{ V}$	-	1.29	1.43	V
			$I_C = 10\text{ A}, V_{GE} = 15\text{ V}$	-	1.61	1.80	
			$I_C = 5\text{ A}, V_{GE} = 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	1.37	1.49	
			$I_C = 10\text{ A}, V_{GE} = 15\text{ V}, T_J = 125\text{ }^\circ\text{C}$	-	1.80	2.0	
	Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}, I_C = 250\text{ }\mu\text{A}$	4	-	6	
	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 $125\text{ }^\circ\text{C}$ )	-	-9.1	-	mV/ $^\circ\text{C}$
	Zero gate voltage collector current	$I_{CES}$	$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$	-	-	100	$\mu\text{A}$
			$V_{GE} = 0\text{ V}, V_{CE} = 600\text{ V}$ $T_J = 125\text{ }^\circ\text{C}$	-	150	-	
	Gate to emitter leakage current	$I_{GES}$	$V_{GE} = \pm 20\text{ V}$	-	-	$\pm 200$	nA
	Total gate charge (turn-on)	$Q_G$	$I_C = 5\text{ A}$ $V_{CC} = 300\text{ V}$ $V_{GE} = 15\text{ V}$	-	53	79	nC
	Gate to emitter charge (turn-on)	$Q_{GE}$		-	11	17	
	Gate to collector charge (turn-on)	$Q_{GC}$		-	18	27	
	Turn-on switching loss	$E_{on}$	$I_C = 5\text{ A}, V_{CC} = 300\text{ V}$ $V_{GE} = 15\text{ V}, R_G = 22\text{ }\Omega$ $L = 500\text{ }\mu\text{H}, T_J = 25\text{ }^\circ\text{C}^{(1)}$	-	0.11	0.16	mJ
	Turn-off switching loss	$E_{off}$		-	0.10	0.14	
	Total switching loss	$E_{tot}$		-	0.20	0.30	
	Turn-on switching loss	$E_{on}$	$I_C = 5\text{ A}, V_{CC} = 300\text{ V}$ $V_{GE} = 15\text{ V}, R_G = 22\text{ }\Omega$ $L = 500\text{ }\mu\text{H}, T_J = 125\text{ }^\circ\text{C}^{(1)}$	-	0.13	0.20	mJ
	Turn-off switching loss	$E_{off}$		-	0.17	0.25	
Total switching loss	$E_{tot}$	-		0.30	0.45		
Turn-on delay time	$t_{d(on)}$	$I_C = 5\text{ A}, V_{CC} = 300\text{ V}$ $V_{GE} = 15\text{ V}, R_G = 22\text{ }\Omega$ $L = 500\text{ }\mu\text{H}, T_J = 125\text{ }^\circ\text{C}$	-	86	129	ns	
Rise time	$t_r$		-	12	18		
Turn-off delay time	$t_{d(off)}$		-	117	176		
Fall time	$t_f$		-	184	276		
Brake IGBT	Input capacitance	$C_{ies}$	$V_{GE} = 0\text{ V}$ $V_{CC} = 30\text{ V}$ $f = 1\text{ MHz}$	-	900	1350	pF
	Output capacitance	$C_{oes}$		-	263	395	
	Reverse transfer capacitance	$C_{res}$		-	30	45	
	Reverse bias safe operating area	RBSOA	$T_J = 150\text{ }^\circ\text{C}, I_C = 20\text{ A}$ $R_G = 22\text{ }\Omega, V_{GE} = 15\text{ V to }0$	Fullsquare			
	Short circuit safe operating area	SCSOA	$T_J = 150\text{ }^\circ\text{C}$ $V_{CC} = 300\text{ V}, V_P = 600\text{ V}$ $R_G = 22\text{ }\Omega, V_{GE} = 15\text{ V to }0$	10	-	-	$\mu\text{s}$

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)							
	PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Brake Diode	Diode peak reverse recovery current	$I_{rr}$	$V_{CC} = 300\text{ V}$ , $I_F = 5\text{ A}$ , $L = 500\text{ }\mu\text{H}$ $V_{GE} = 15\text{ V}$ to 0, $R_G = 22\text{ }\Omega$	-	18	-	A
	Diode forward voltage drop	$V_{FM}$	$I_F = 5\text{ A}$	-	1.22	1.46	V
			$I_F = 10\text{ A}$	-	1.41	1.70	
			$I_F = 5\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$	-	1.16	1.43	
			$I_F = 10\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$	-	1.41	1.74	
NTC	Resistance	R	$T_J = 25\text{ }^\circ\text{C}$	-	5000	-	$\Omega$
			$T_J = 100\text{ }^\circ\text{C}$	-	4933	-	
	B value	B	$T_J = 25\text{ }^\circ\text{C}/50\text{ }^\circ\text{C}$	-	3375	-	K

**Note**

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

<b>THERMAL AND MECHANICAL SPECIFICATIONS</b>					
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNITS
Junction to case inverter IGBT thermal resistance	$R_{thJC}$	-	-	1.25	$^\circ\text{C}/\text{W}$
Junction to case inverter FRED thermal resistance		-	-	2.44	
Junction to case brake DIODE thermal resistance		-	-	3.08	
Junction to case brake IGBT thermal resistance		-	-	1.25	
Junction to case input rectifier thermal resistance		-	-	1.03	
Case to sink, flat, greased surface	$R_{thCS}$	-	0.05	-	
Mounting torque (M5)		2.7	-	3.3	Nm
Weight		-	170	-	g

**INVERTER**

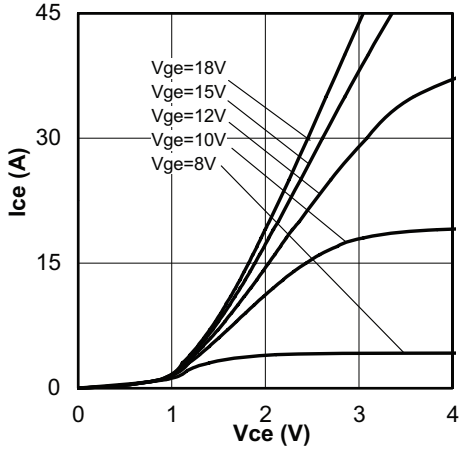


Fig. 1 - Typical IGBT Output Characteristics  
 $T_J = 25^\circ\text{C}$ ;  $t_p = 80 \mu\text{s}$

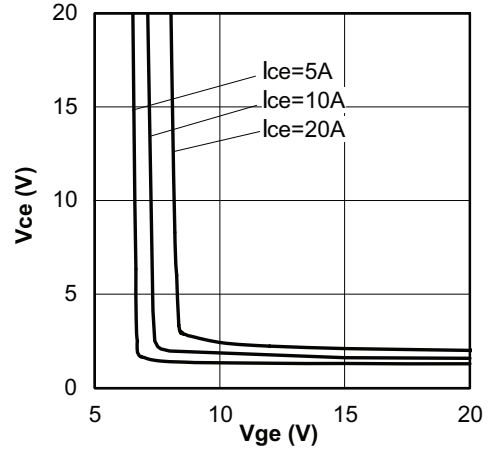


Fig. 4 - Typical  $V_{CE}$  vs.  $V_{GE}$   
 $T_J = 25^\circ\text{C}$

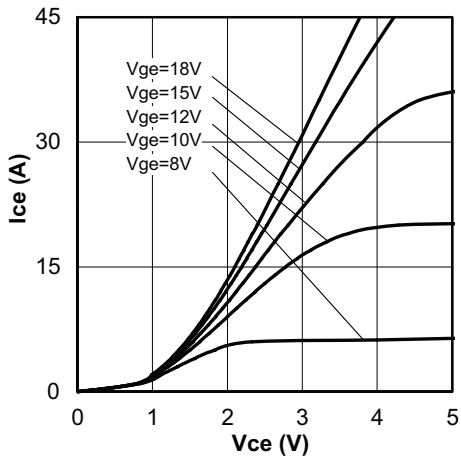


Fig. 2 - Typical IGBT Output Characteristics  
 $T_J = 125^\circ\text{C}$ ;  $t_p = 80 \mu\text{s}$

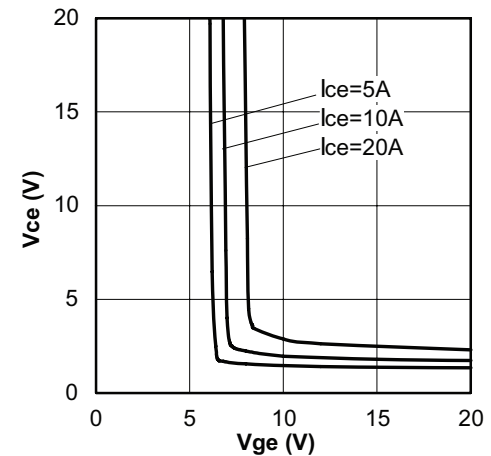


Fig. 5 - Typical  $V_{CE}$  vs.  $V_{GE}$   
 $T_J = 125^\circ\text{C}$

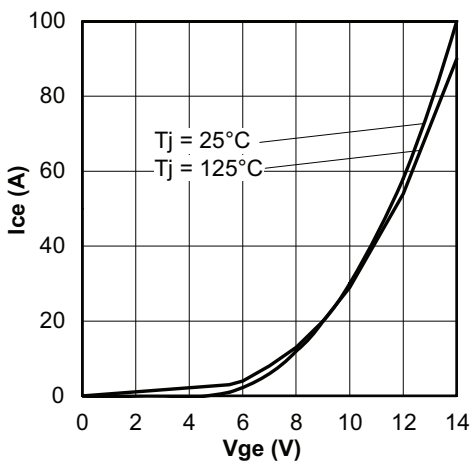


Fig. 3 - Typical Transfer Characteristics  
 $V_{CE} = 50 \text{ V}$ ;  $t_p = 10 \mu\text{s}$

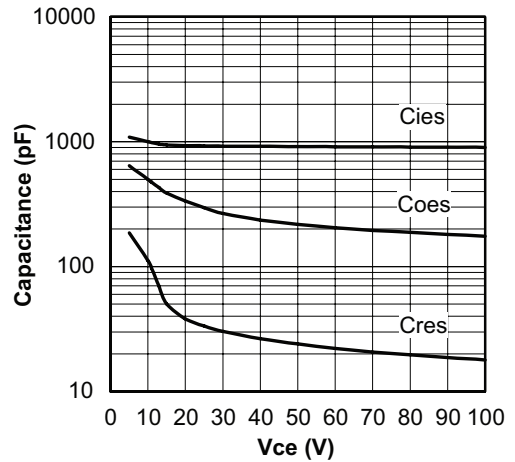


Fig. 6 - Typical Capacitance vs.  $V_{CE}$   
 $V_{GE} = 0 \text{ V}$ ;  $f = 1 \text{ MHz}$

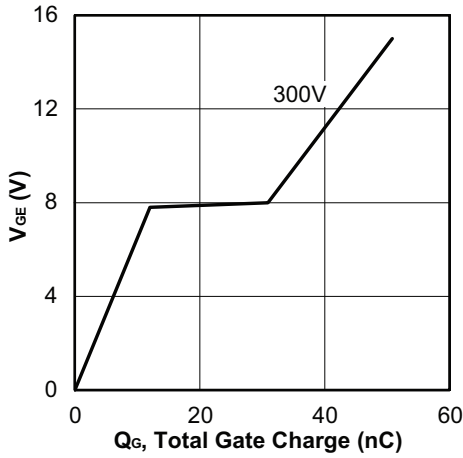


Fig. 7 - Typical Gate Charge vs.  $V_{GE}$   
 $I_{CE} = 10\text{ A}$

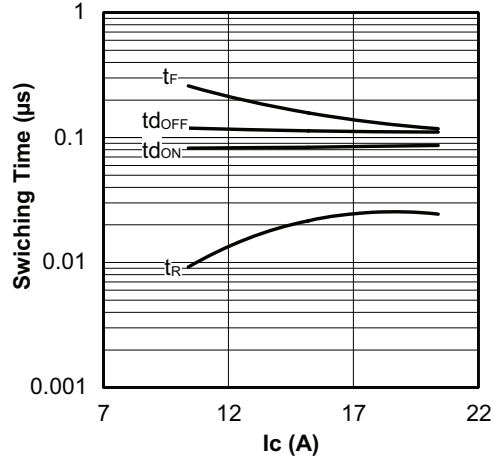


Fig. 10 - Typical Switching Time vs.  $I_C$   
 $T_J = 125\text{ }^\circ\text{C}$ ;  $L = 500\text{ }\mu\text{H}$ ;  $V_{CE} = 300\text{ V}$ ;  $R_G = 22\text{ }\Omega$ ;  $V_{GE} = 15\text{ V}$

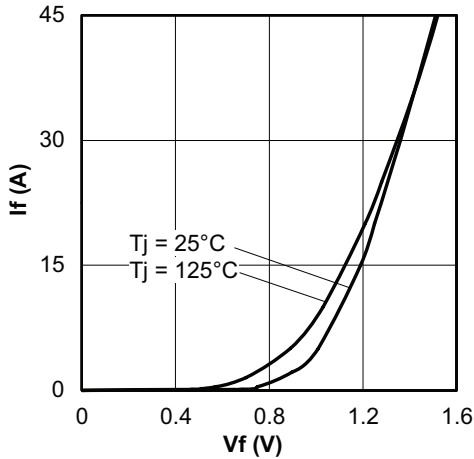


Fig. 8 - Typical Diode Forward Characteristics  
 $t_p = 80\text{ }\mu\text{s}$

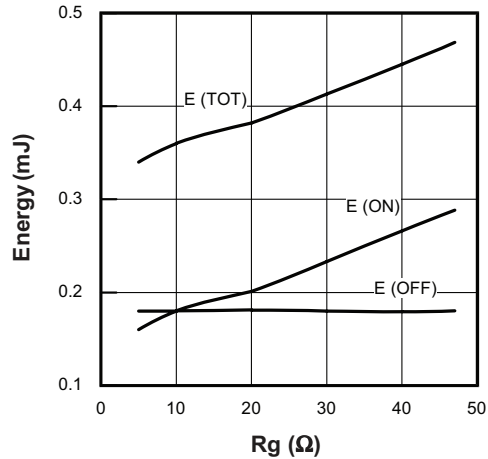


Fig. 11 - Typical Energy Loss vs.  $R_G$   
 $T_J = 125\text{ }^\circ\text{C}$ ;  $L = 500\text{ }\mu\text{H}$ ;  $V_{CE} = 300\text{ V}$ ;  $I_{CE} = 10\text{ A}$ ;  $V_{GE} = 15\text{ V}$

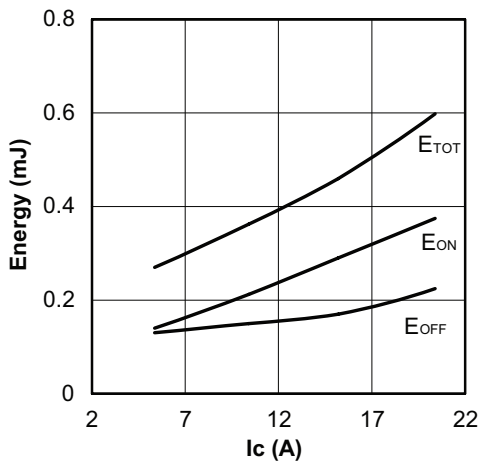


Fig. 9 - Typical Energy Loss vs.  $I_C$   
 $T_J = 125\text{ }^\circ\text{C}$ ;  $L = 500\text{ }\mu\text{H}$ ;  $V_{CE} = 300\text{ V}$ ;  $R_G = 22\text{ }\Omega$ ;  $V_{GE} = 15\text{ V}$

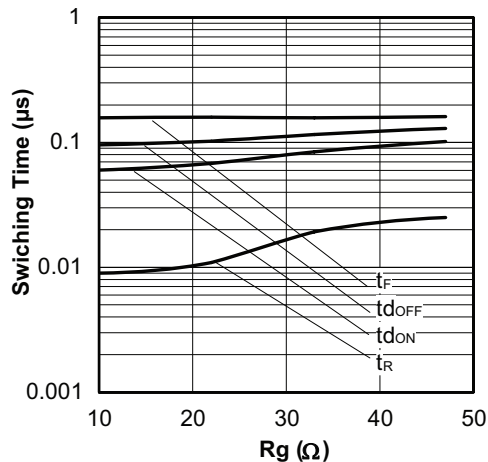


Fig. 12 - Typical Switching Time vs.  $R_G$   
 $T_J = 125\text{ }^\circ\text{C}$ ;  $L = 500\text{ }\mu\text{H}$ ;  $V_{CE} = 300\text{ V}$ ;  $I_{CE} = 10\text{ A}$ ;  $V_{GE} = 15\text{ V}$

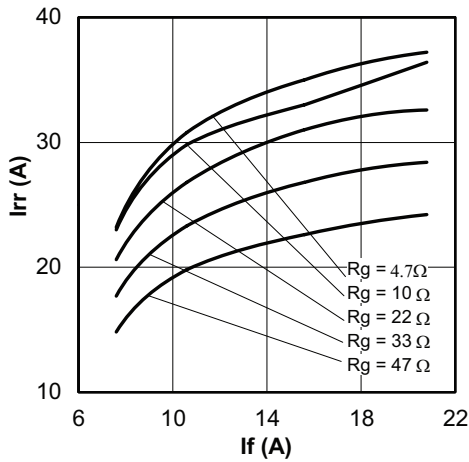
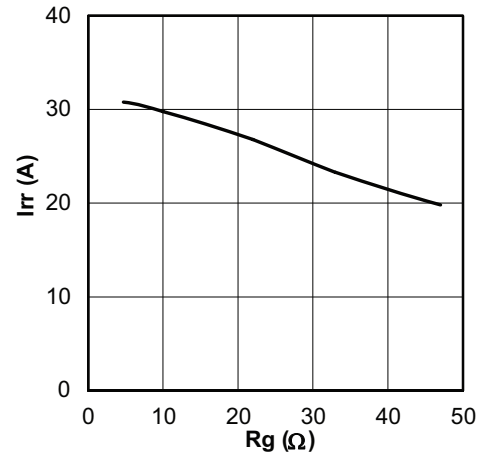
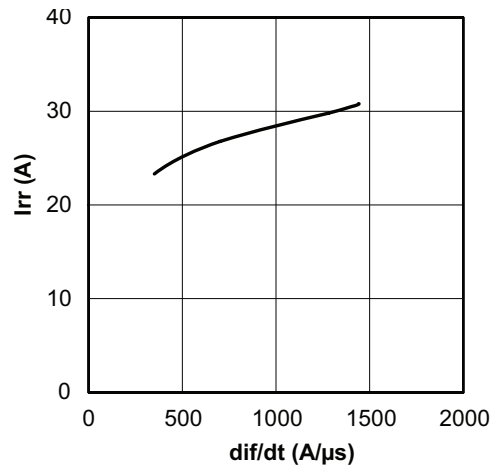
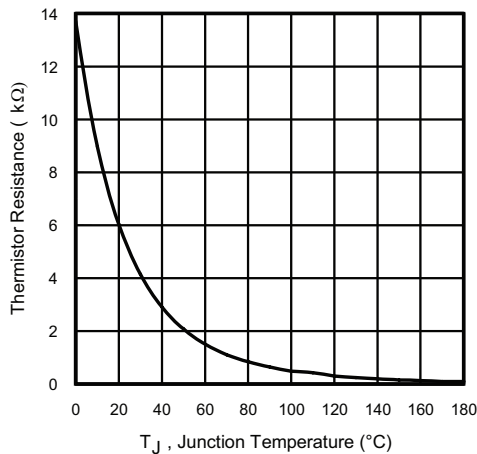
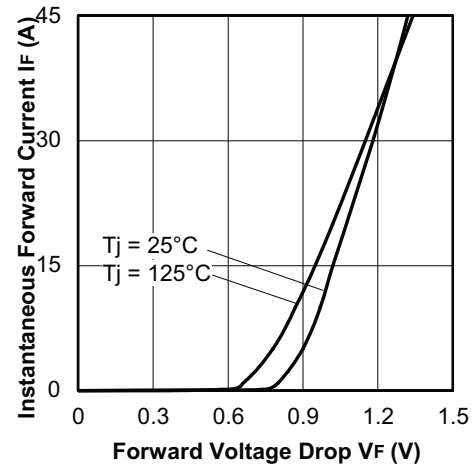

 Fig. 13 - Typical Diode  $I_{RR}$  vs.  $I_F$   
 $T_J = 125^\circ\text{C}$ 

 Fig. 14 - Typical Diode  $I_{RR}$  vs.  $R_G$   
 $T_J = 125^\circ\text{C}$ ;  $I_F = 10\text{ A}$ 

 Fig. 15 - Typical Diode  $I_{RR}$  vs.  $df/dt$   
 $V_{CC} = 300\text{ V}$ ;  $V_{GE} = 15\text{ V}$ ;  $I_F = 10\text{ A}$ ;  $T_J = 125^\circ\text{C}$ 
**THERMISTOR**


Fig. 16 - Thermistor Resistance vs. Temperature

**INPUT RECTIFIER**

 Fig. 17 - Typical Diode Forward Characteristics  
 $t_p = 80\ \mu\text{s}$

## INVERTER

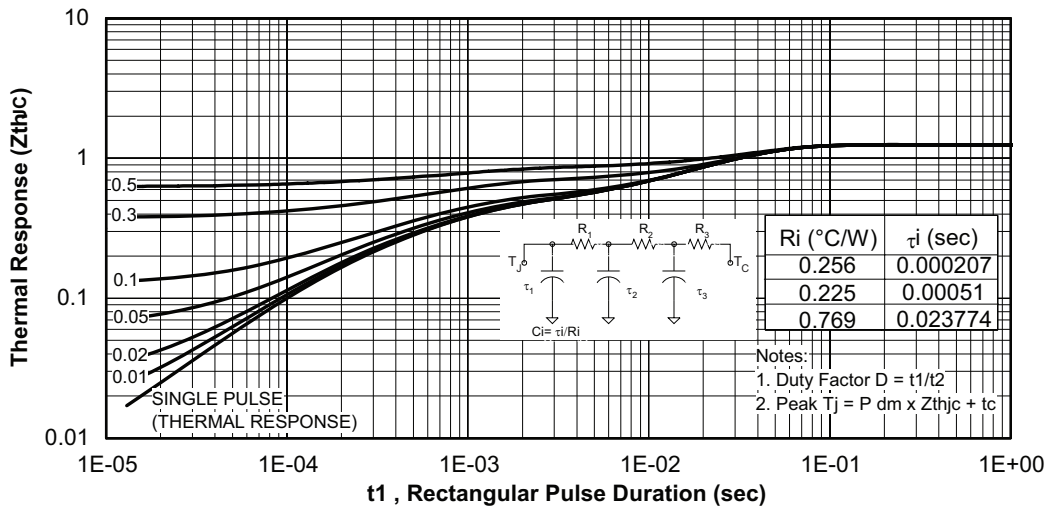


Fig. 18 - Maximum Transient Thermal Impedance, Junction to Case (Inverter IGBT)

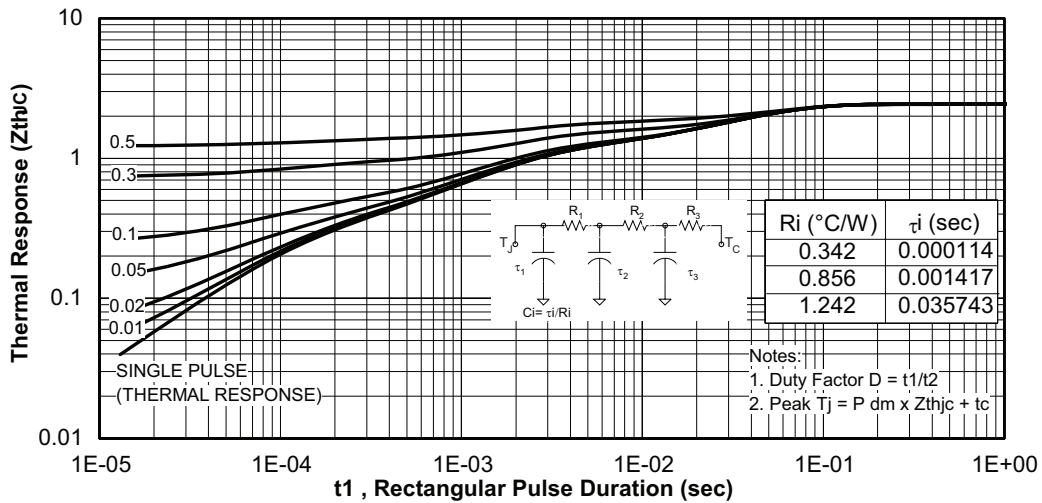


Fig. 19 - Maximum Transient Thermal Impedance, Junction to Case (Inverter FRED)



**BRAKE**

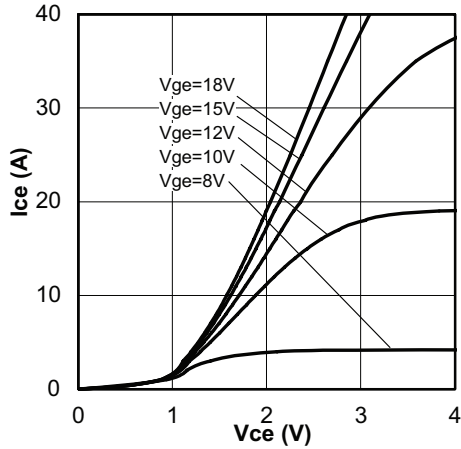


Fig. 20 - Typical IGBT Output Characteristics  
 $T_J = 25^\circ\text{C}$ ;  $t_p = 80 \mu\text{s}$

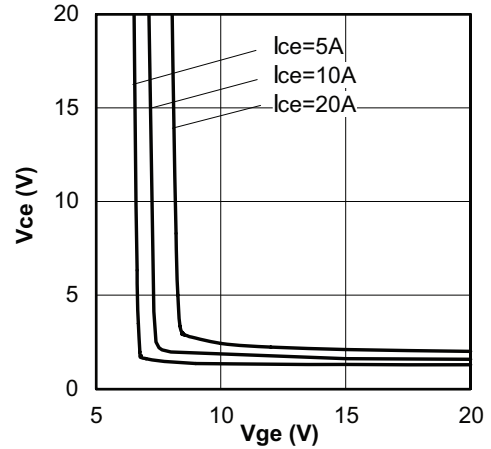


Fig. 23 - Typical  $V_{CE}$  vs.  $V_{GE}$   
 $T_J = 25^\circ\text{C}$

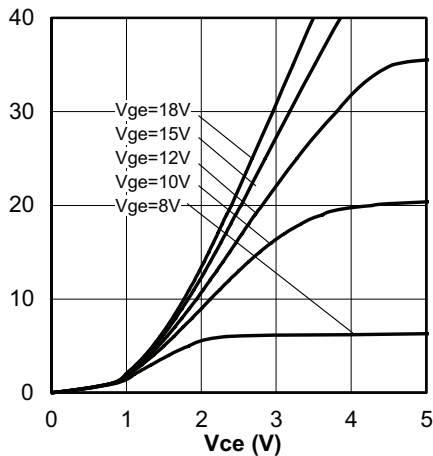


Fig. 21 - Typical IGBT Output Characteristics  
 $T_J = 125^\circ\text{C}$ ;  $t_p = 80 \mu\text{s}$

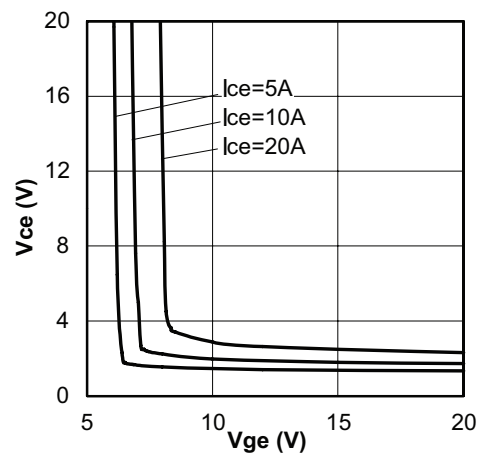


Fig. 24 - Typical  $V_{CE}$  vs.  $V_{GE}$   
 $T_J = 125^\circ\text{C}$

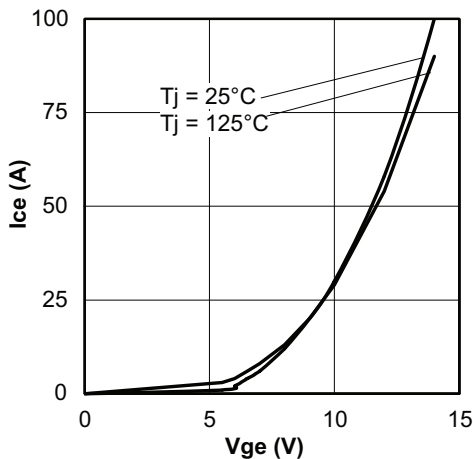


Fig. 22 - Typical Transfer Characteristics  
 $V_{CE} = 50 \text{ V}$ ;  $t_p = 10 \mu\text{s}$

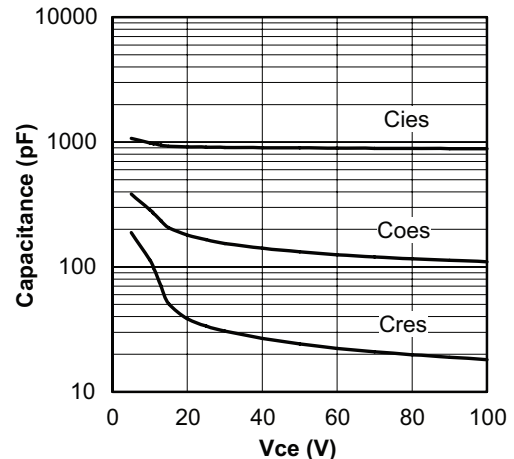


Fig. 25 - Typical Capacitance vs.  $V_{CE}$   
 $V_{GE} = 0 \text{ V}$ ;  $f = 1 \text{ MHz}$

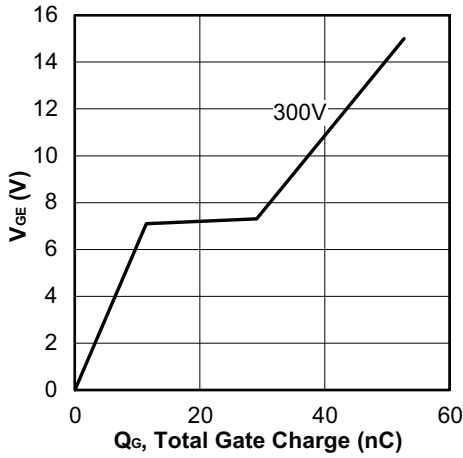


Fig. 26 - Typical Gate Charge vs.  $V_{GE}$   
 $I_{CE} = 5 \text{ A}$

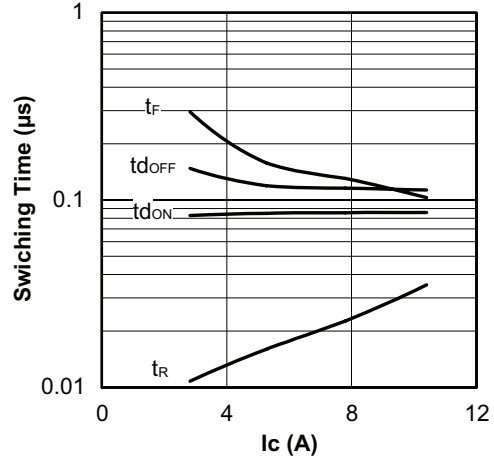


Fig. 29 - Typical Switching Time vs.  $I_C$   
 $T_J = 125 \text{ }^\circ\text{C}$ ;  $L = 500 \text{ } \mu\text{H}$ ;  $V_{CE} = 300 \text{ V}$ ;  $R_G = 22 \text{ } \Omega$ ;  $V_{GE} = 15 \text{ V}$

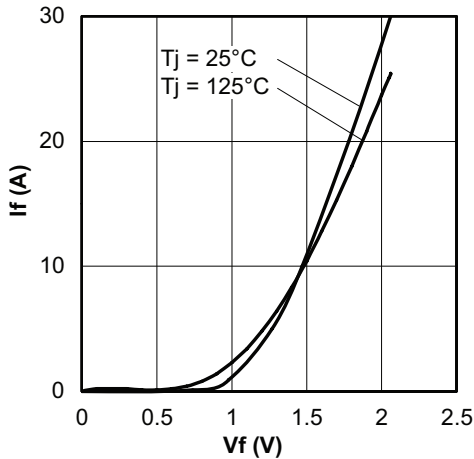


Fig. 27 - Typical Diode Forward Characteristics  
 $t_p = 80 \text{ } \mu\text{s}$

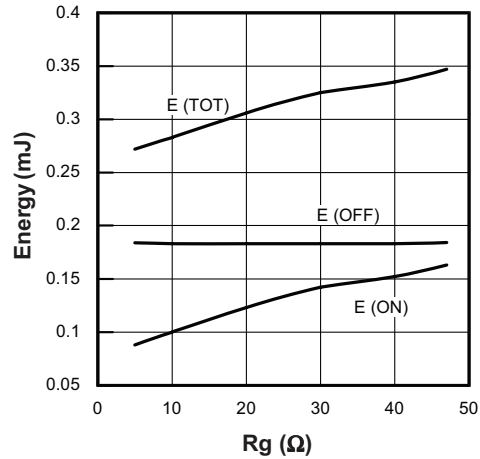


Fig. 30 - Typical Energy Loss vs.  $R_G$   
 $T_J = 125 \text{ }^\circ\text{C}$ ;  $L = 500 \text{ } \mu\text{H}$ ;  $V_{CE} = 300 \text{ V}$ ;  $I_{CE} = 5 \text{ A}$ ;  $V_{GE} = 15 \text{ V}$

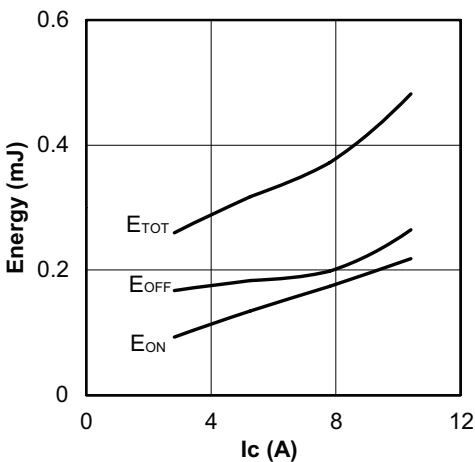


Fig. 28 - Typical Energy Loss vs.  $I_C$   
 $T_J = 125 \text{ }^\circ\text{C}$ ;  $L = 500 \text{ } \mu\text{H}$ ;  $V_{CE} = 300 \text{ V}$ ;  $R_G = 22 \text{ } \Omega$ ;  $V_{GE} = 15 \text{ V}$

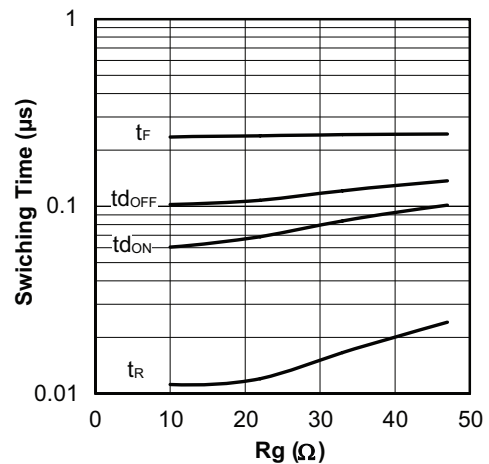


Fig. 31 - Typical Switching Time vs.  $R_G$   
 $T_J = 125 \text{ }^\circ\text{C}$ ;  $L = 500 \text{ } \mu\text{H}$ ;  $V_{CE} = 300 \text{ V}$ ;  $I_{CE} = 5 \text{ A}$ ;  $V_{GE} = 15 \text{ V}$

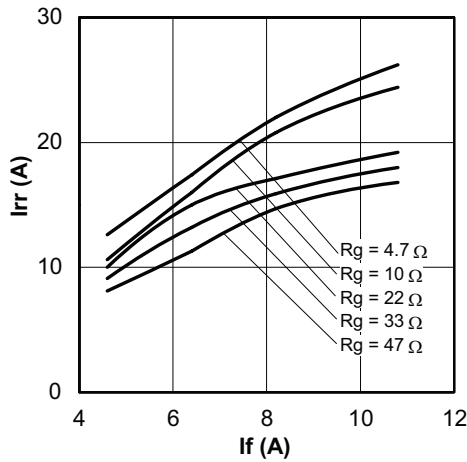


Fig. 32 - Typical Diode  $I_{RR}$  vs.  $I_F$   
 $T_J = 125^\circ\text{C}$

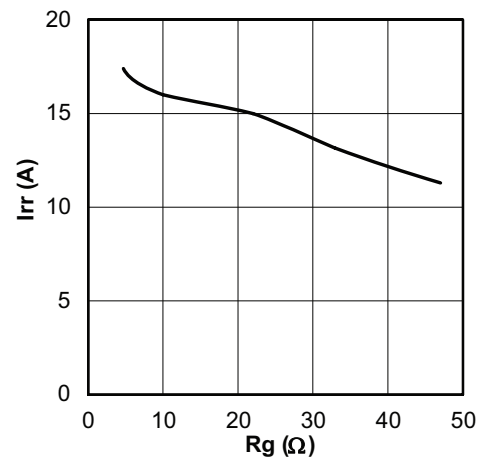


Fig. 33 - Typical Diode  $I_{RR}$  vs.  $R_G$   
 $T_J = 125^\circ\text{C}$ ;  $I_F = 5\text{ A}$

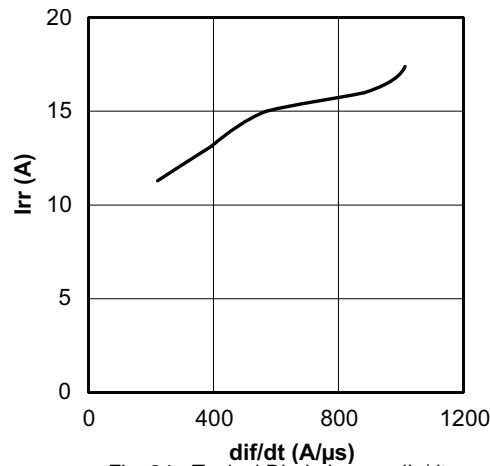


Fig. 34 - Typical Diode  $I_{RR}$  vs.  $\text{di}/\text{dt}$   
 $V_{CC} = 300\text{ V}$ ;  $V_{GE} = 15\text{ V}$ ;  $I_{CE} = 5\text{ A}$ ;  $T_J = 125^\circ\text{C}$

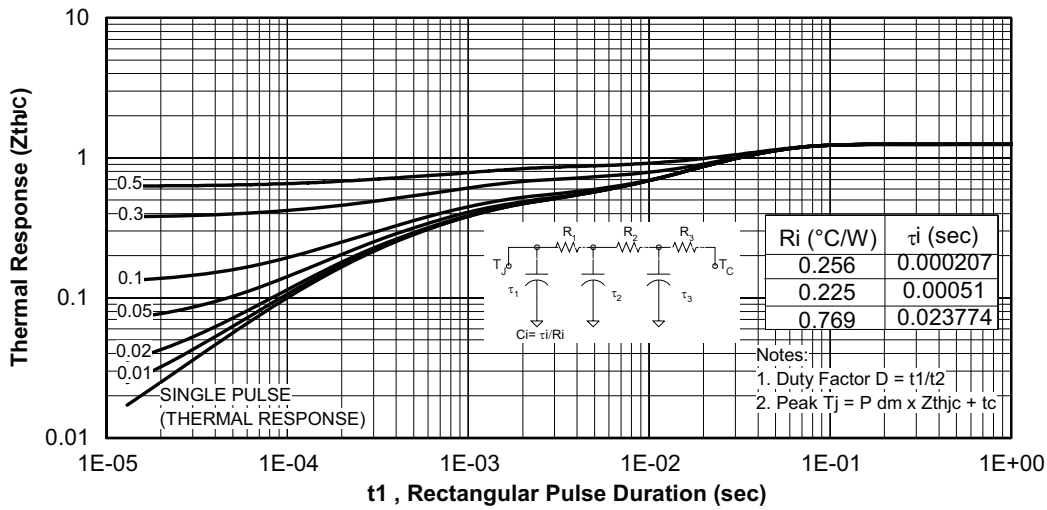


Fig. 35 - Maximum Transient Thermal Impedance, Junction to Case (Brake IGBT)

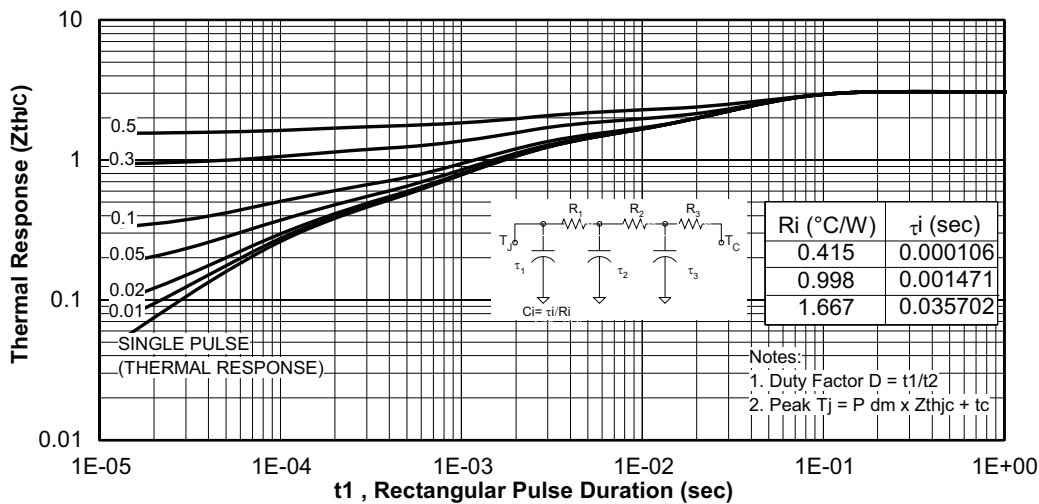


Fig. 36 - Maximum Transient Thermal Impedance, Junction to Case (Brake Diode)

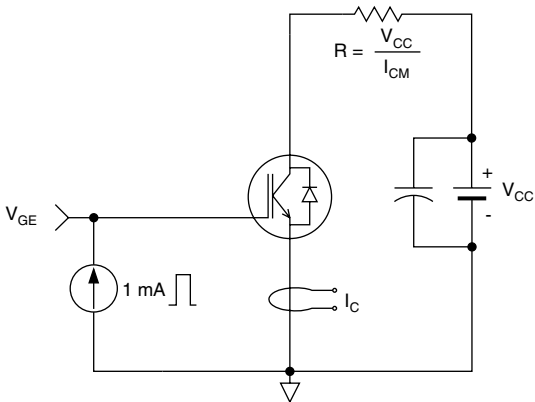


Fig. C.T.1 - Gate Charge Circuit (turn-off)

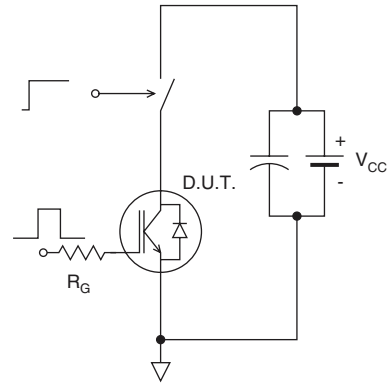


Fig. C.T.3 - S.C. SOA Circuit

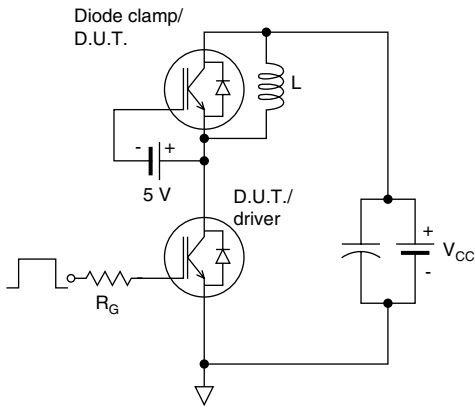


Fig. C.T.2 - RBSOA Circuit

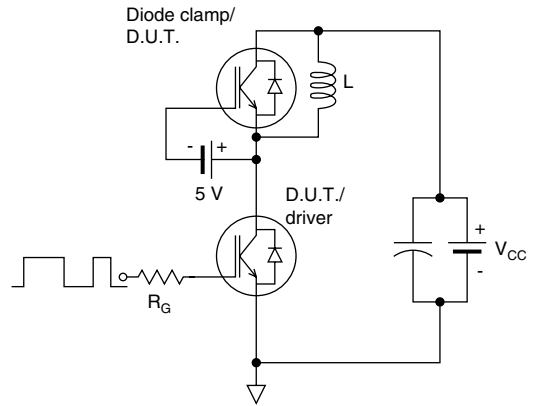


Fig. C.T.4 - Switching Loss Circuit

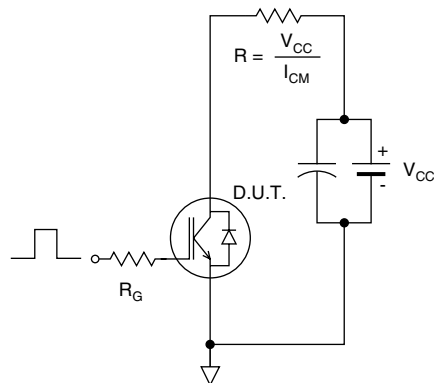
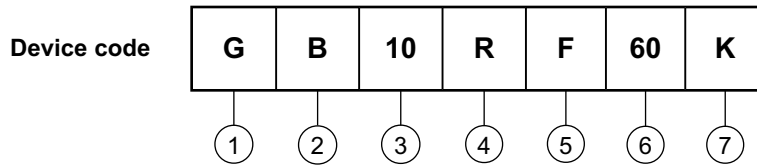


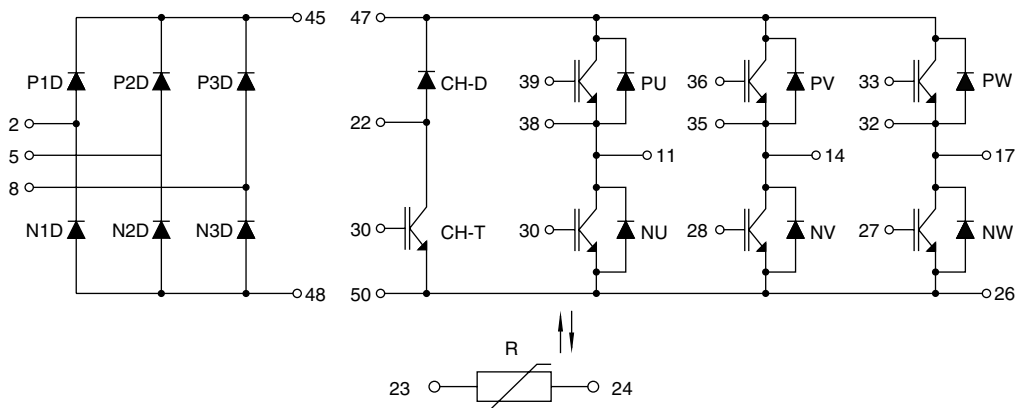
Fig. C.T.5 - Resistive Load Circuit

## ORDERING INFORMATION TABLE



- 1** - Insulated Gate Bipolar Transistor (IGBT)
- 2** - B = IGBT Generation 5 NPT
- 3** - Current rating (10 = 10 A)
- 4** - Circuit configuration  
(R = Three phase bridge-brake-inverter with thermistor)
- 5** - Package indicator (F = ECONO2)
- 6** - Voltage rating (60 = 600 V)
- 7** - Speed/type (K = Ultrafast IGBT/Speed 8 to 60 kHz)

## CIRCUIT CONFIGURATION



### LINKS TO RELATED DOCUMENTS

Dimensions	<a href="http://www.vishay.com/doc?95083">http://www.vishay.com/doc?95083</a>
Part marking information	<a href="http://www.vishay.com/doc?95071">http://www.vishay.com/doc?95071</a>



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