FAIRCHILD SEMICONDUCTOR®

July 2008

Power-SPM™

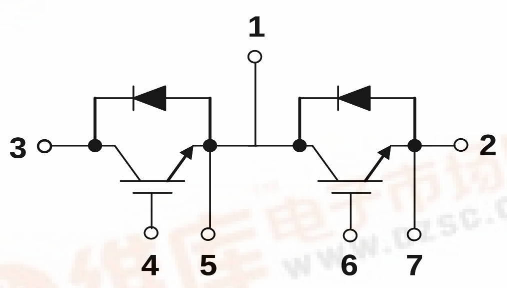
FP7G100US60

Transfer Molded Type IGBT Module

General Description

Fairchild's New IGBT Modules (Transfer Molded Type) provide low conduction and switching losses as well as short circuit ruggedness. They are designed for applications such as Motor control, Uninterrupted Power Supplies (UPS) and general Inverters where short circuit ruggedness is a required feature.

Package Code : EPM7



Internal Circuit Diagram

Features

- Short Circuit rated 10us @Tc=100°C, Vge=15V
- High Speed Switching
- Low Saturation Voltage : Vce(sat) =2.2V @Ic=100A
- High Input Impedance
- Fast & Soft Anti-Parallel FWD

Application

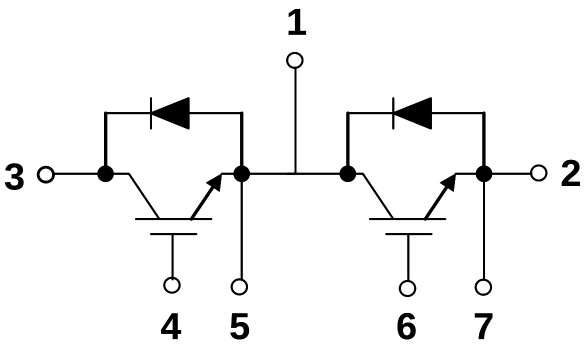
- Welders
- AC & DC Motor Controls
- General Purpose Inverters
- Robotics
- Servo Controls
- UPS

Absolute Maximum Ratings

Symbol	Description		Rating	Units
V_{CES}	Collector-Emitter Voltage		600	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Collector Current	@ T_C = 25°C	100	A
$I_{CM\ (1)}$	Pulsed Collector Current		200	A
I_F	Diode Continuous Forward Current	@ T_C = 100°C	100	A
I_{FM}	Diode Maximum Forward Current		200	A
T_{SC}	Short Circuit Withstand Time	@ T_C = 100°C	10	us
P_D	Maximum Power Dissipation	@ T_C = 25°C	400	W
T_J	Operating Junction Temperature		-40 to +125	°C
T_{stg}	Storage Temperature Range		-40 to +125	°C
V_{iso}	Isolation Voltage	@ AC 1minute	2500	V
Mounting	Power Terminals Screw : M5		2.0	N.m
Torque	Mounting Screw : M5		2.0	N.m

Pin Configuration and Pin Description

Top View



Internal Circuit Diagram

Pin Description

Pin Number	Pin Description
1	Emitter of Q1, IGBT, Collector of Q2, IGBT
2	Emitter of Q2, IGBT
3	Collector of Q1, IGBT
4	Gate of Q1, IGBT
5	Emitter of Q1, IGBT
6	Gate of Q2, IGBT
7	Emitter of Q2, IGBT

Electrical Characteristics (T_J = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE}= 0V, I_C = 250μA	600	-	-	V
$\Delta BV_{CES}/\Delta T_J$	Temperature Coeff. of Breakdown Voltage	V_{GE}= 0V, I_C = 1mA	-	0.6	-	V
I_{CES}	Collector Cut-off Current	V_{CE}= V_{CES}, V_{GE}= 0V	-	-	250	uA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}= V_{GES}, V_{CE}= 0V	-	-	± 100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	V_{GE} = 0V, I_C=100mA	5.0	6.0	8.5	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	I_C = 100A, V_{GE} = 15V	-	2.2	2.8	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{CE} = 30V, V_{GE} = 0V, f = 1MHz		6085		pF
C_{oes}	Output Capacitance			725		pF
C_{res}	Reverse Capacitance			135		pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 100A, R_G = 2.4Ω, V_{GE} = 15V Inductive Load, T_C = 25°C	-	34	-	ns
t_r	Rise Time		-	24	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	98	-	ns
t_f	Fall Time		-	45	-	ns
E_{on}	Turn-On Switching Loss		-	0.54	-	mJ
E_{off}	Turn-Off Switching Loss		-	1.26	-	mJ
E_{ts}	Total Switching Loss		-	1.8	-	mJ
$t_{d(on)}$	Turn-On Delay Time	V_{CC} = 300 V, I_C = 100A, R_G = 2.4Ω, V_{GE} = 15V Inductive Load, T_C = 125°C	-	33	-	ns
t_r	Rise Time		-	28	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	101	-	ns
t_f	Fall Time		-	171	-	ns
E_{on}	Turn-On Switching Loss		-	1.12	-	mJ
E_{off}	Turn-Off Switching Loss		-	3.18	-	mJ
E_{ts}	Total Switching Loss		-	4.3	-	mJ
T_{sc}	Short Circuit Withstand Time	V_{CC} = 300 V, V_{GE} = 15V @ T_C = 100°C	10	-	-	us
Q_g	Total Gate Charge	V_{CE} = 300 V, I_C = 100A, V_{GE} = 15V	-	283	-	nC
Q_{ge}	Gate-Emitter Charge		-	50	-	nC
Q_{gc}	Gate-Collector Charge		-	155	-	nC

Electrical Characteristics of DIODE (T_J = 25°C, Unless Otherwise Specified)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
V_{FM}	Diode Forward Voltage	I_F = 100A	T_C = 25°C	-	1.9	2.8	V
			T_C = 100°C	-	1.8	-	
t_{rr}	Diode Reverse Recovery Time	I_F = 100A di / dt = 200 A/us	T_C = 25°C	-	85	125	ns
			T_C = 100°C	-	150	-	
I_{rr}	Diode Peak Reverse Recovery Current		T_C = 25°C	-	8	11	A
			T_C = 100°C	-	13	-	
Q_{rr}	Diode Reverse Recovery Charge		T_C = 25°C	-	325	635	nC
			T_C = 100°C	-	965	-	

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case (IGBT Part, per 1/2 Module)	-	0.25	°C/W
$R_{\theta JC}$	Junction-to-Case (DIODE Part, per 1/2 Module)	-	0.7	°C/W
$R_{\theta CS}$	Case-to-Sink (Conductive grease applied)	0.05	-	°C/W
Weight	Weight of Module	-	90	g

Typical Performance Characteristics

Fig 1. Typical Output Characteristics

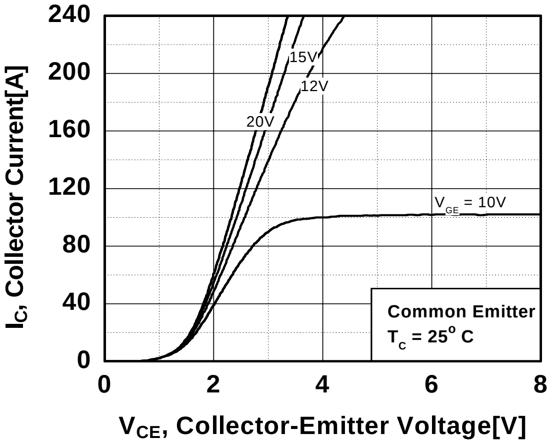


Fig 2. Typical Saturation Voltage Characteristics

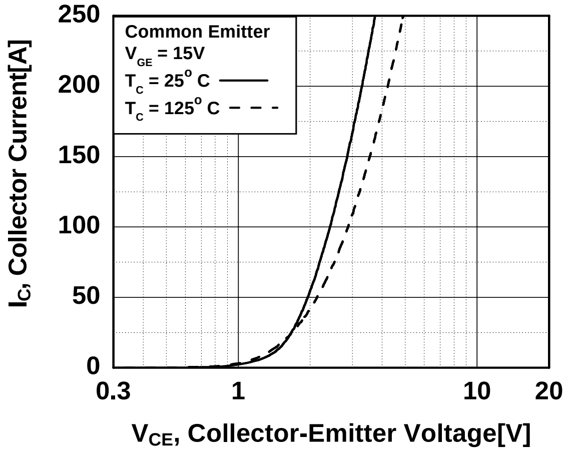


Fig 3. Saturation Voltage vs. Case Temperature at Variant Current Level

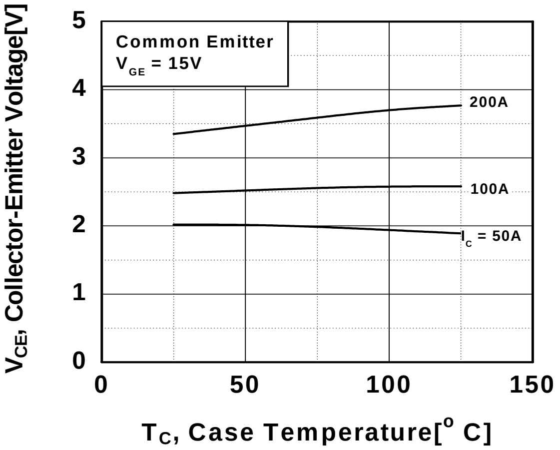


Fig 4. Load Current vs. Frequency

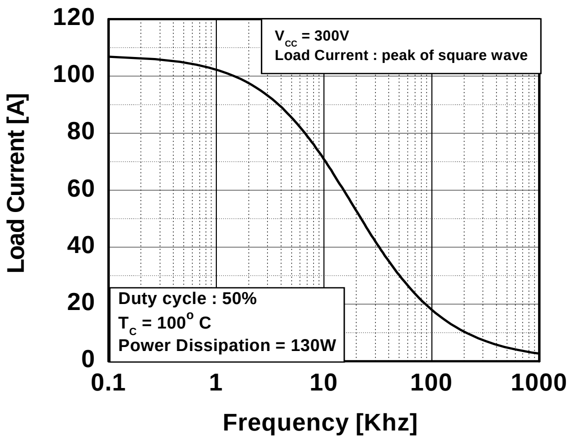


Fig 5. Saturation Voltage vs. V_{GE}

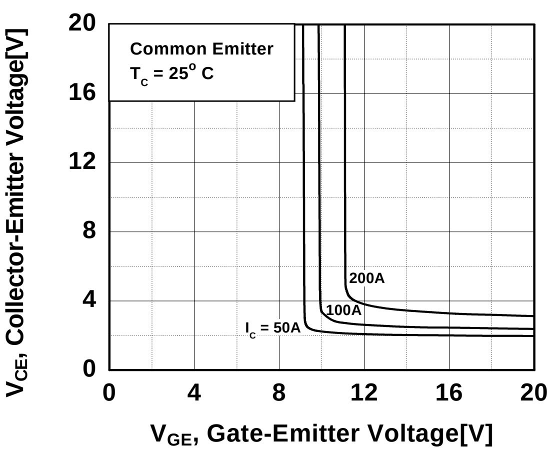


Fig 6. Saturation Voltage vs. V_{GE}

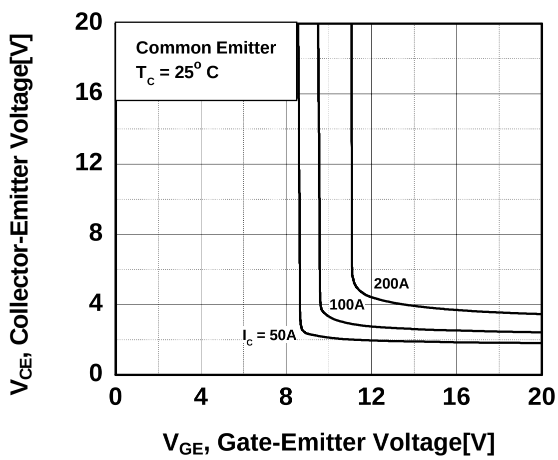


Fig 7. Capacitance Characteristics

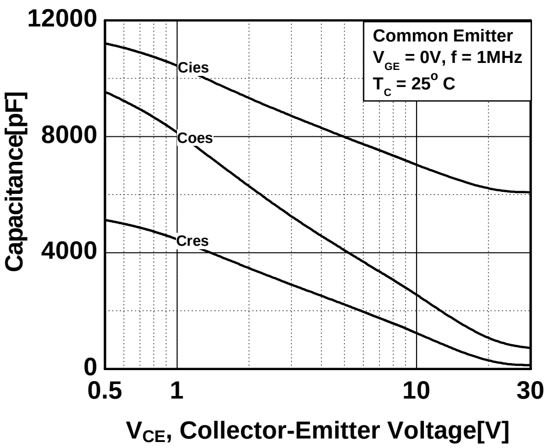


Fig 8. Turn-On Characteristics vs. Gate Resistance

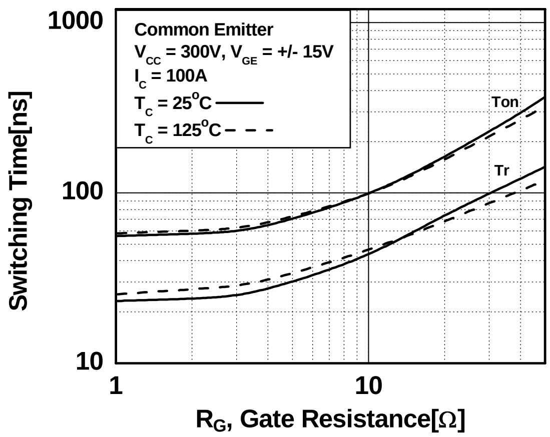


Fig 9. Turn-Off Characteristics vs. Gate Resistance

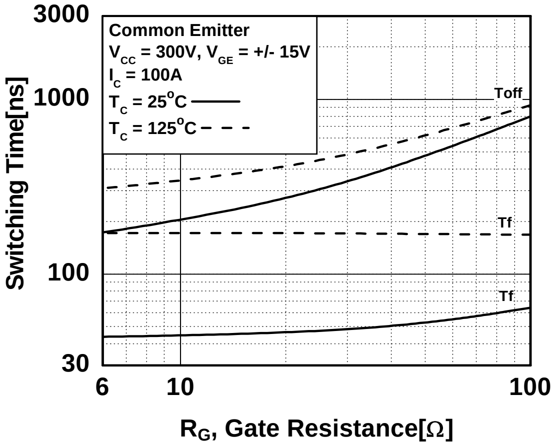


Fig 10. Switching Loss vs. Gate Resistance

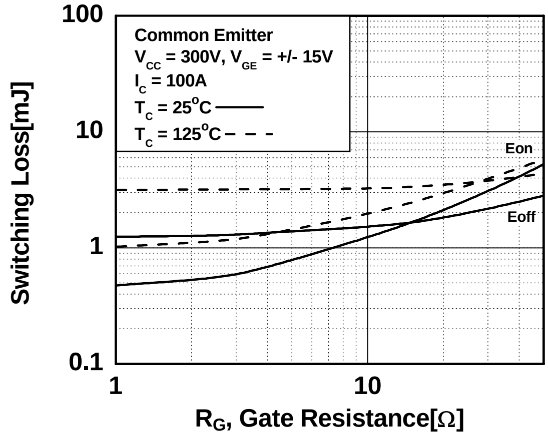


Fig 11. Turn-On Characteristics vs. Collector Current

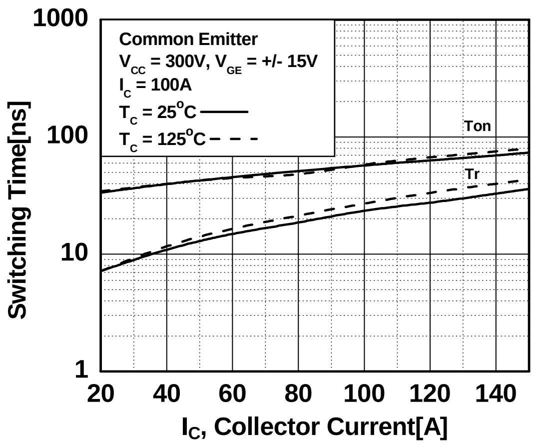


Fig 12. Turn-Off Characteristics vs. Collector Current

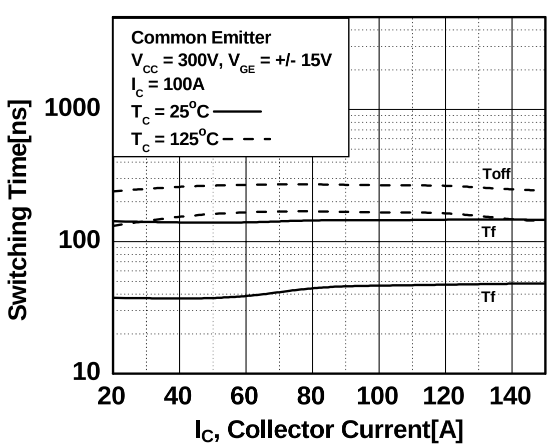


Fig 13. Switching Loss vs. Collector

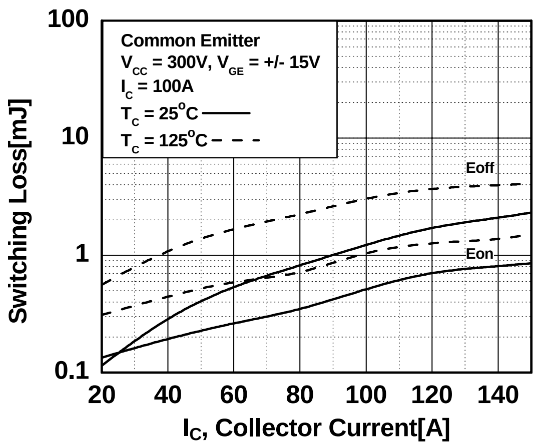


Fig 14. Gate Charge Characteristics

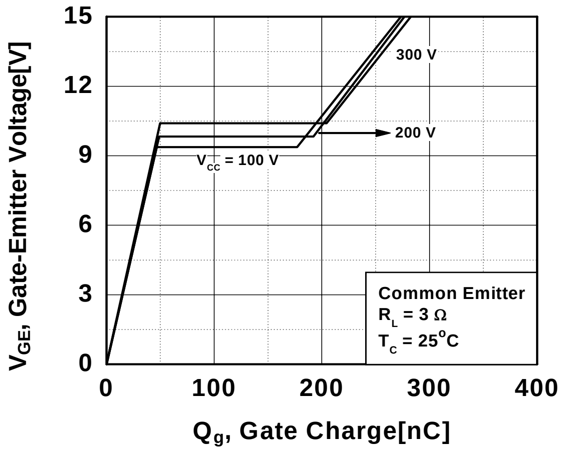


Fig 15. SOA Characteristics

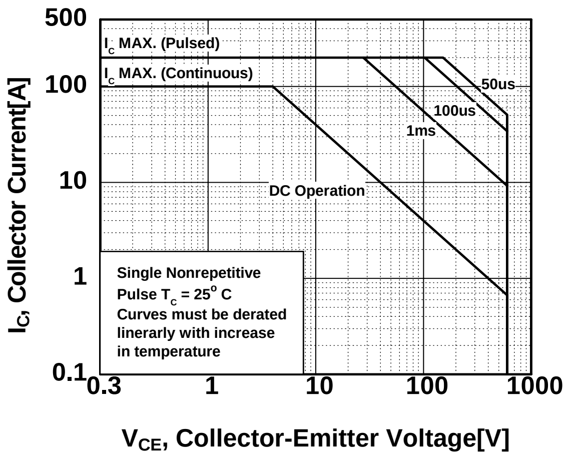


Fig 16. Turn-Off SOA Characteristics

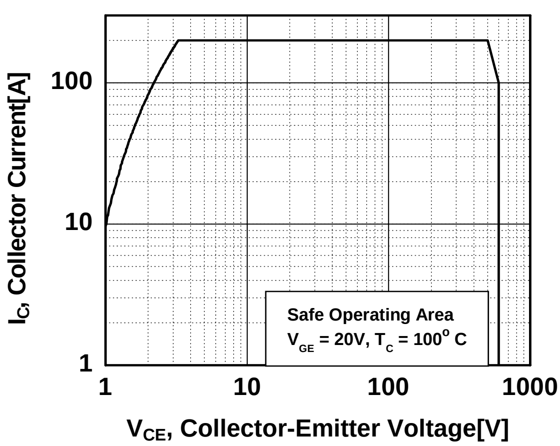


Fig 17. RBSOA Characteristics

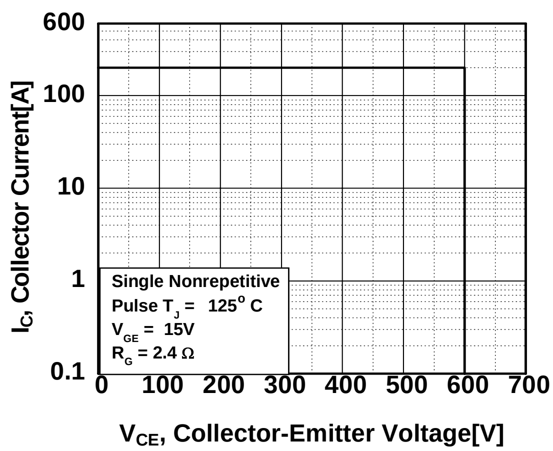


Fig 18. Transient Thermal Impedance

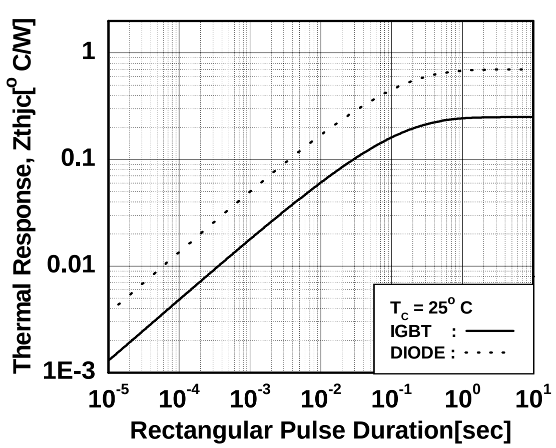


Fig 19. Forward Characteristics

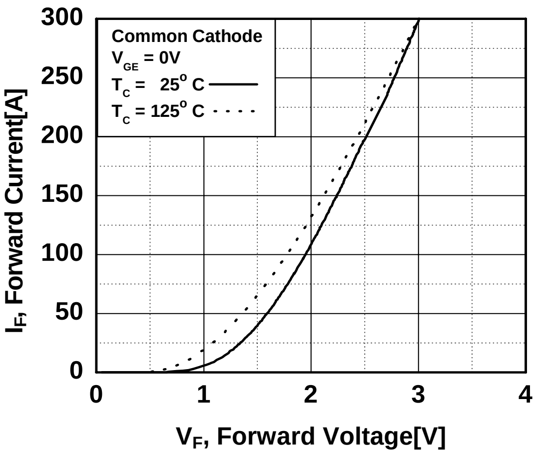
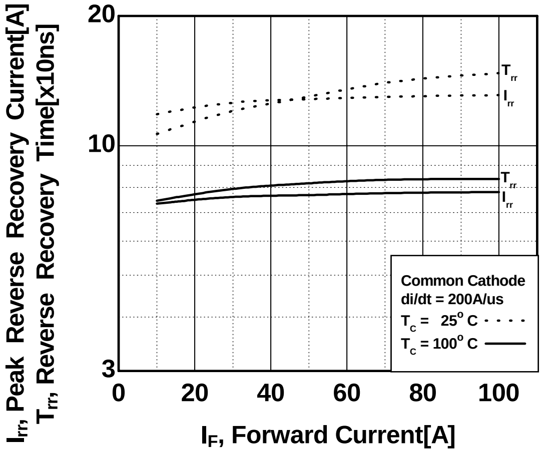
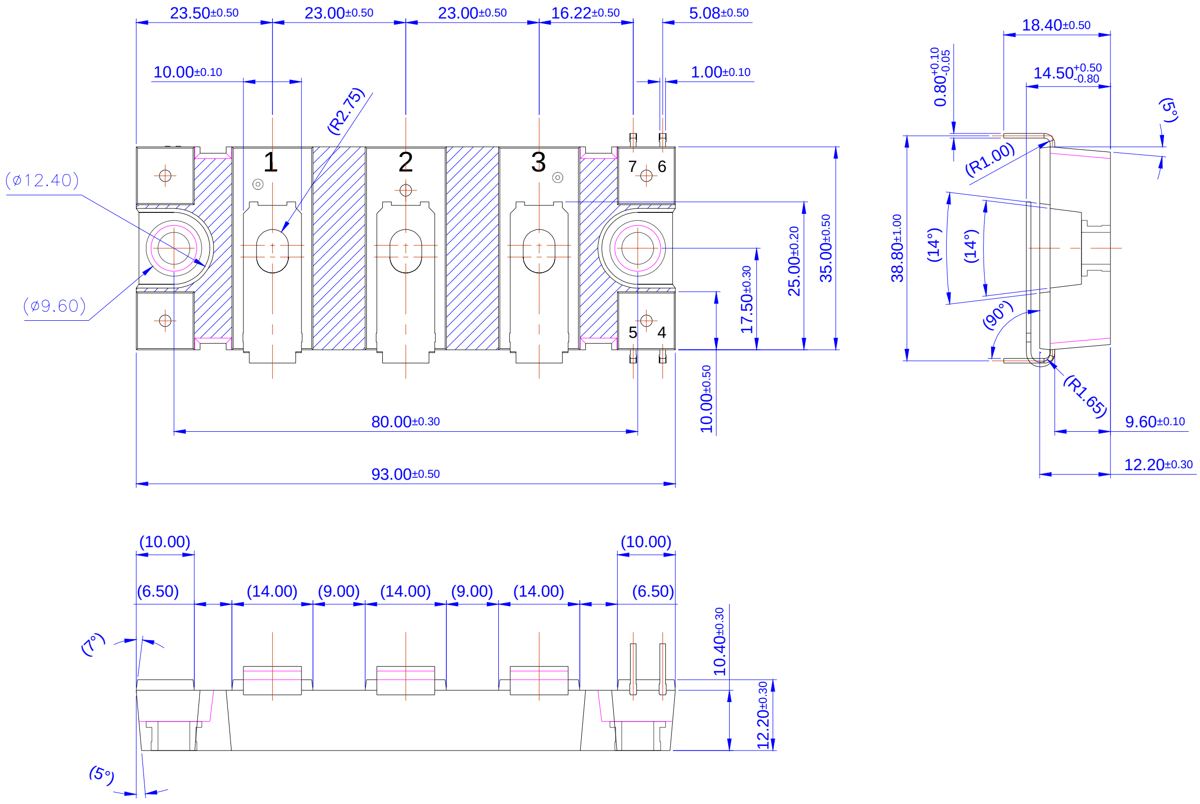


Fig 20. Reverse Recovery Characteristics



Detailed Package Outline Drawings



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