

PSI25120BM

1200V 25A Si Trench Gate Field-Stop IGBT

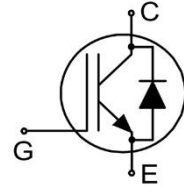
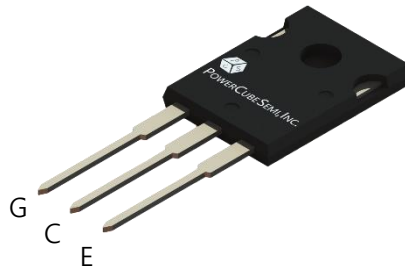
Features

Si Trench Gate Field-Stop IGBT

- Rated to 1200V at 25Amps @ $T_j = 100^\circ\text{C}$
- High Speed Switching & Low $V_{CE(sat)}$ Loss
- High Input Impedance
- Maximum Junction Temperature 175°C
- Ultra Soft, fast recovery anti-parallel diode
- Ultra narrowed VF distribution control
- Positive Temperature coefficient for easy paralleling

Application

- PFC
- Welder
- UPS
- PV Inverter



PKG type : TO-247

Description

PSI25120BM is Produced using advanced PowerCubeSemi's Field-Stop Trench IGBT Technology, which provides low $V_{CE(sat)}$ high switching performance and excellent quality.

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit	
BV_{CES}	Collector-Emitter Breakdown Voltage	1200	V	
I_C	DC Collector Current	$T_C=25^\circ\text{C}$	50	A
		$T_C=100^\circ\text{C}$	25	
$I_{C, Pulse}$	Pulsed Collector Current	100	A	
I_F	Diode Forward Current	$T_C=25^\circ\text{C}$	25	A
		$T_C=100^\circ\text{C}$	12.5	
$I_{F, Pulse}$	Diode Pulsed Current	100	A	
V_{GE}	Gate-Emitter Voltage	± 20	V	
P_D	Power Dissipation	$T_C=25^\circ\text{C}$	348	W
		$T_C=100^\circ\text{C}$	174	
t_{SC}	Short circuit withstand time	10	μs	
T_{vj}	Operating Junction Temperature Range	-40 to 175	$^\circ\text{C}$	
T_{stg}	Storage Temperature Range	-55 to 150		



Package Marking and Ordering Information

Device Marking	Device	Package	Packing Method	Tape width	Quantity
PSI25120BM	PSI25120	TO-247	Tube	-	30

Electrical Characteristics

 $T_{vj}=25^{\circ}\text{C}$ Unless Otherwise Specified

Static Characteristics

Symbol	Parameter	Test Condition	Numerical			Unit	
			Min	Typ	Max		
BV_{CES}	Collector-Emitter Breakdown Voltage	$I_C=500\mu\text{A}$, $V_{GE}=0\text{V}$	1200	-	-	V	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=25\text{A}$, $V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	-	2.0	2.4	V
			$T_{vj}=175^{\circ}\text{C}$	-	2.5	-	
V_F	Diode Forward Voltage	$V_{GE}=0\text{V}$, $I_F=12.5\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	2.1	2.6	V
			$T_{vj}=175^{\circ}\text{C}$	-	1.9	-	
$V_{GE(TH)}$	Gate-Emitter Threshold Voltage	$V_{CE}=V_{GE}$, $I_C=0.85\text{mA}$	5.0	6.0	7.0	V	
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE}=1200\text{V}$, $V_{GE}=0\text{V}$, $T_{vj}=25^{\circ}\text{C}$	-	-	250	μA	
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$	-	-	± 250	nA	

Dynamic Characteristics

Symbol	Parameter	Test Condition	Numerical			Unit
			Min	Typ	Max	
Q_G	Total Gate Charge	$V_{CE}=960\text{V}$, $I_C=25\text{A}$, $V_{GE}=15\text{V}$	-	204	-	nC
Q_{GE}	Gate-Emitter Charge		-	34	-	
Q_{GC}	Gate-Collector Charge		-	94	-	
C_{IES}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=1\text{MHz}$	-	3942	-	pF
C_{OES}	Output Capacitance		-	72	-	
C_{RES}	Reverse Transfer Capacitance		-	142	-	
L_E	Internal Emitter Inductance measured 5mm (0.197 in.) from Case		-	13.0	-	nH
$I_{C(SC)}$	Short Circuit Collector Current Max. 1000 short circuits Time between short circuits $\geq 1.0\text{s}$	$V_{GE}=15\text{V}$, $V_{CC}=600\text{V}$, $t_{SC} \leq 10\mu\text{s}$, $T_{vj}=175^{\circ}\text{C}$	-	121	-	A



Electrical Characteristics

$T_{vj}=25^{\circ}\text{C}$ Unless Otherwise Specified

Switching Characteristics

Symbol	Parameter	Test Condition	Numerical			Unit
			Min	Typ	Max	
$t_{d(on)}$	Turn-On Delay Time	$V_{GE}=15\text{V}, V_{CC}=600\text{V},$ $I_C=25\text{A}, R_G=23\Omega,$ Inductive Load, $T_{vj}=25^{\circ}\text{C}$	-	73	-	ns
t_r	Turn-On Rise Time		-	41	-	
$t_{d(off)}$	Turn-Off Delay Time		-	269	-	
t_f	Turn-Off Fall Time		-	39	-	
E_{on}	Turn-On Switching Energy		-	1.44	-	mJ
E_{off}	Turn-Off Switching Energy		-	0.55	-	
E_{ts}	Total Switching Energy		-	1.99	-	
$t_{d(on)}$	Turn-On Delay Time	$V_{GE}=15\text{V}, V_{CC}=600\text{V},$ $I_C=25\text{A}, R_G=23\Omega,$ Inductive Load, $T_{vj}=175^{\circ}\text{C}$	-	65	-	ns
T_r	Turn-On Rise Time		-	45	-	
$t_{d(off)}$	Turn-Off Delay Time		-	292	-	
t_f	Turn-Off Fall Time		-	75	-	
E_{on}	Turn-On Switching Energy		-	2.43	-	mJ
E_{off}	Turn-Off Switching Energy		-	1.09	-	
E_{ts}	Total Switching Energy		-	3.52	-	
t_{rr}	Reverse Recovery Time	$I_F=25\text{A}, di_F/dt=500\text{A}/\mu\text{s},$ $T_{vj}=25^{\circ}\text{C}$	-	100	-	ns
I_{rr}	Reverse Recovery Current		-	17	-	A
Q_{rr}	Reverse Recovery Charge		-	0.85	-	nC
di_{rr}/dt	Rate of fall of reverse recovery current during t_b		-	-376	-	A/ μs
T_{rr}	Reverse Recovery Time	$I_F=25\text{A}, di_F/dt=500\text{A}/\mu\text{s},$ $T_{vj}=175^{\circ}\text{C}$	-	150	-	Ns
I_{rr}	Reverse Recovery Current		-	25	-	A
Q_{rr}	Reverse Recovery Charge		-	1.85	-	nC
di_{rr}/dt	Rate of fall of reverse recovery current during t_b		-	-374	-	A/ μs

Thermal Characteristics

Symbol	Parameter	Numerical	Unit
$R_{\theta(J-A)}$	Thermal Resistance Junction-to-Ambient	40	$^{\circ}\text{C}/\text{W}$
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for IGBT	0.43	
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for Diode	1.55	

Typical Characteristics

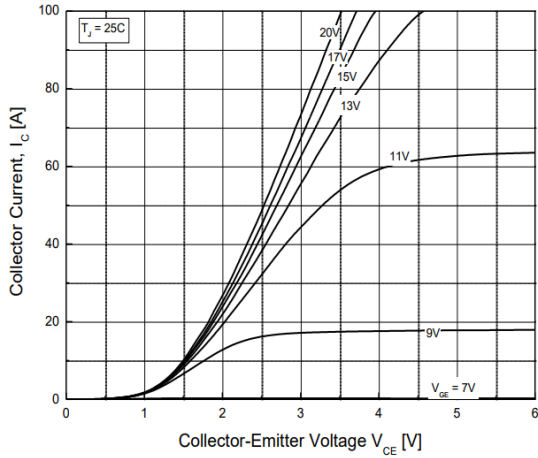


Figure 1. Typical Output Characteristics ($T_J=25^\circ\text{C}$)

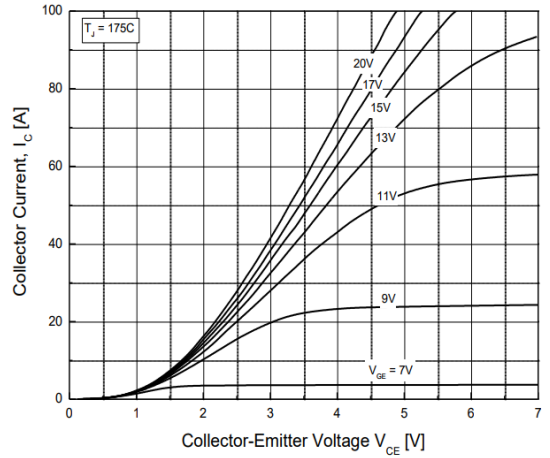


Figure 2. Typical Output Characteristics ($T_J=175^\circ\text{C}$)

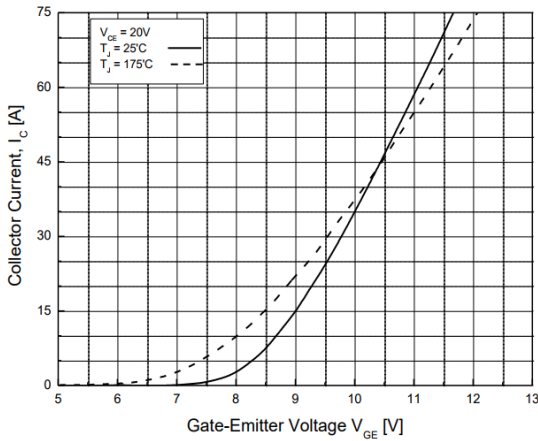


Figure 3. Typical Transfer Characteristics

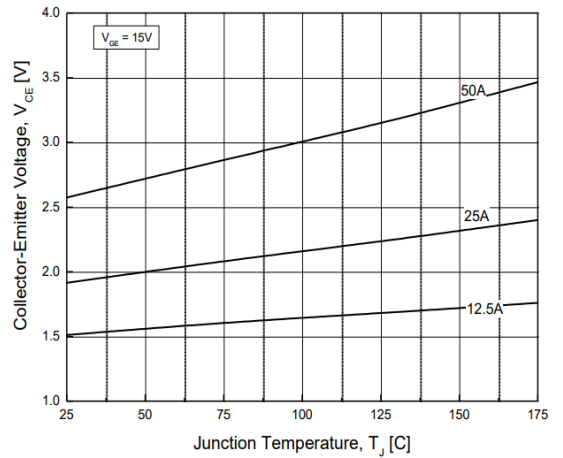


Figure 4. Typical Collector-Emitter Saturation Voltage-Junction Temperature

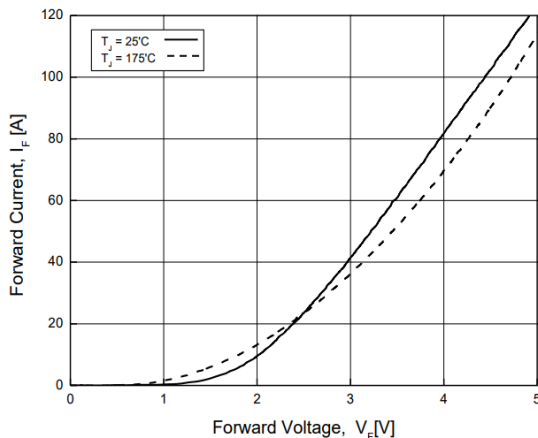


Figure 5. Diode Forward Characteristics

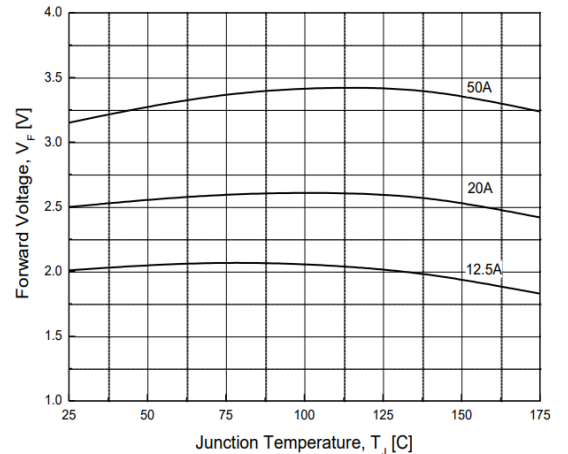


Figure 6. Diode Forward-Junction Temperature

Typical Characteristics

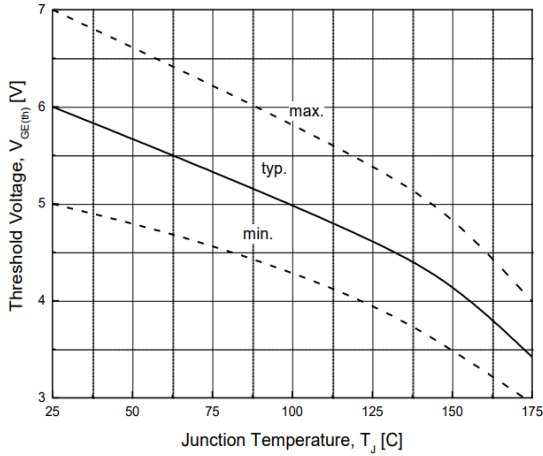


Figure 7. Threshold Voltage-Junction Temperature

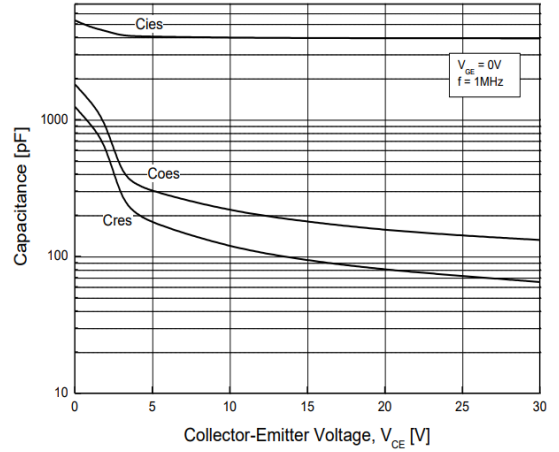


Figure 8. Typical Capacitance

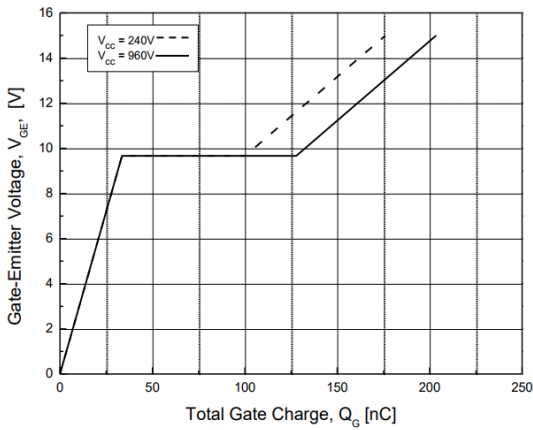


Figure 9. Typical Gate Charge

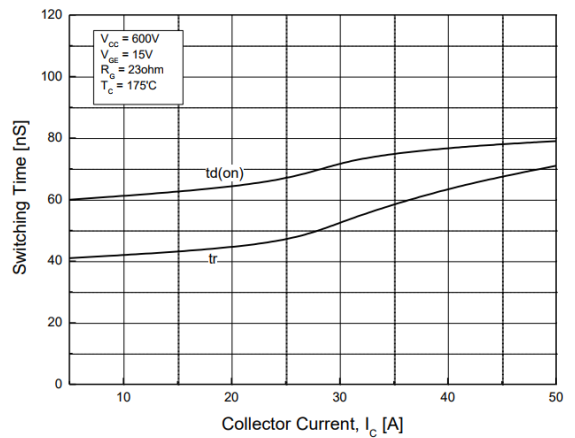


Figure 10. Typical Turn On-Collector Current

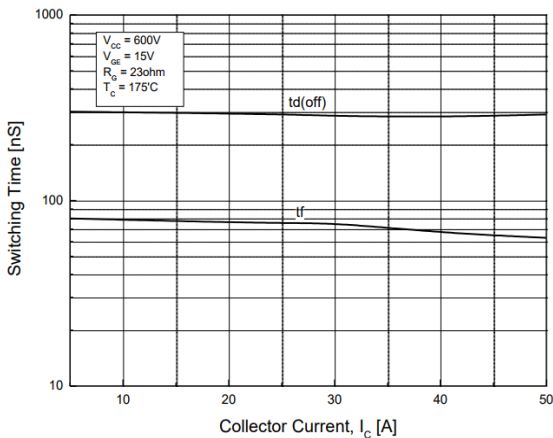


Figure 11. Typical Turn off-Collector Current

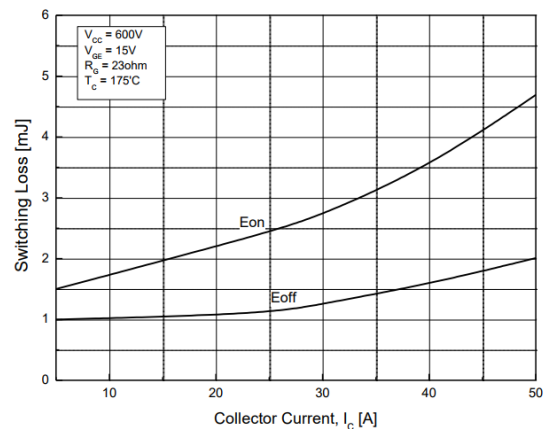


Figure 12. Switching Loss-Collector Current

Typical Characteristics

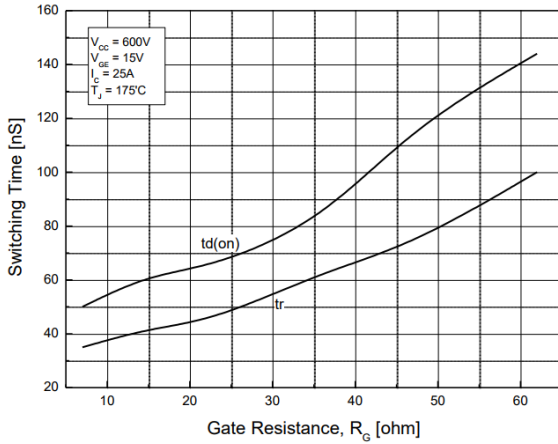


Figure 13. Turn-On Characteristics-Gate Resistance

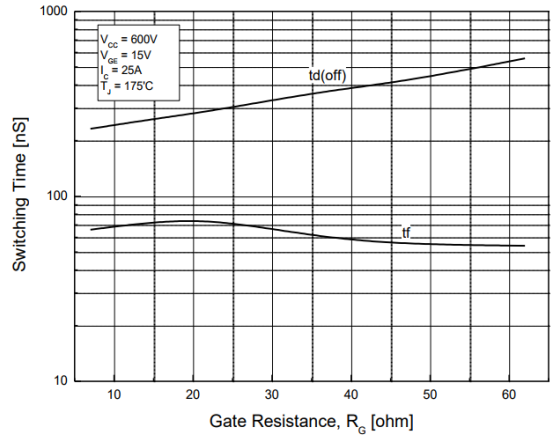


Figure 14. Turn-Off Characteristics-Gate Resistance

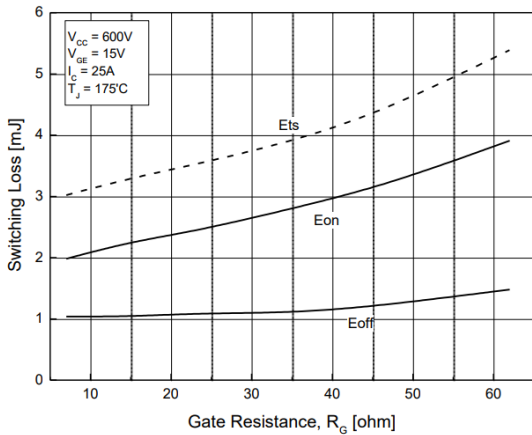


Figure 15. Switching Loss-Gate Resistance

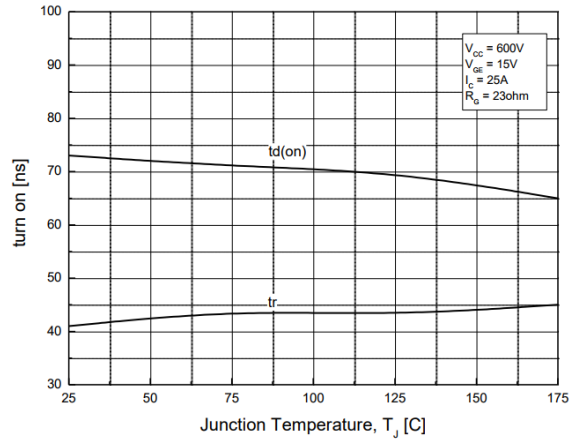


Figure 16. Turn On Characteristic-Junction Temperature

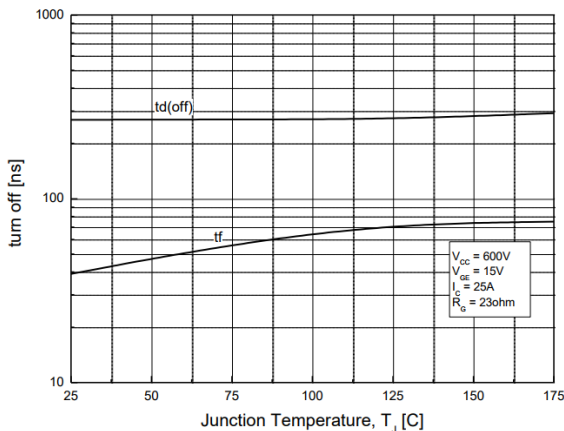


Figure 17. Turn off Characteristics-Junction Temperature

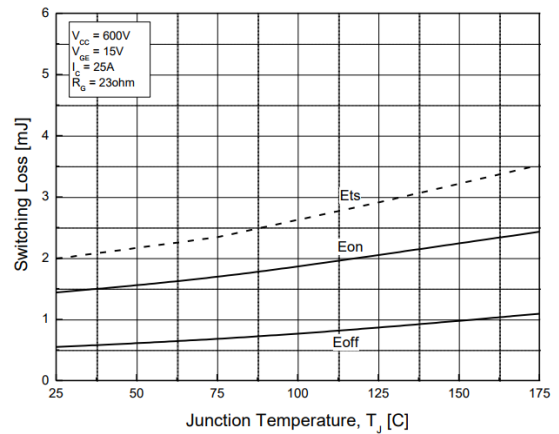


Figure 18. Switching Loss-Junction Temperature

Typical Characteristics

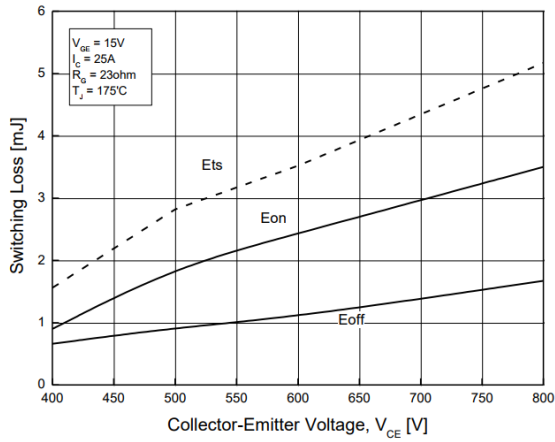


Figure 19. Switching Loss-Collector Emitter Voltage

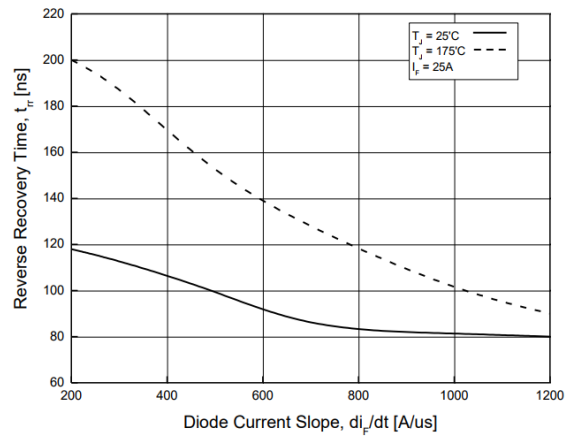


Figure 20. Reverse Recovery Time-Diode Current Slope

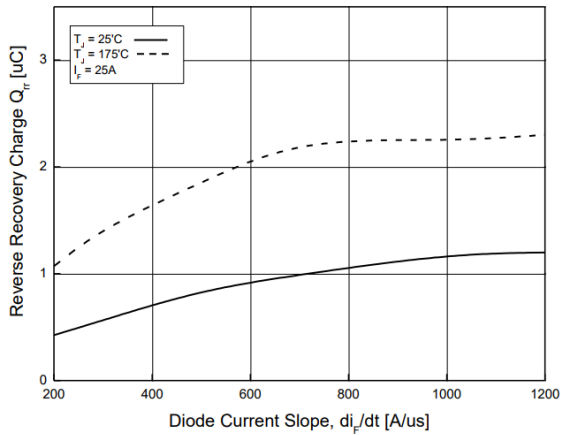


Figure 21. Reverse Recovery Charge-Diode Current Slope

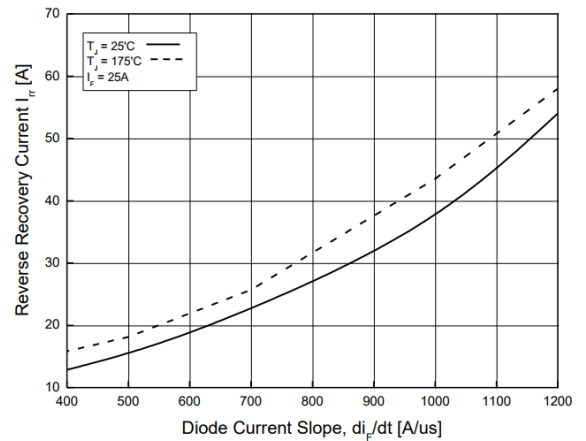


Figure 22. Reverse Recovery Current-Diode Current Slope

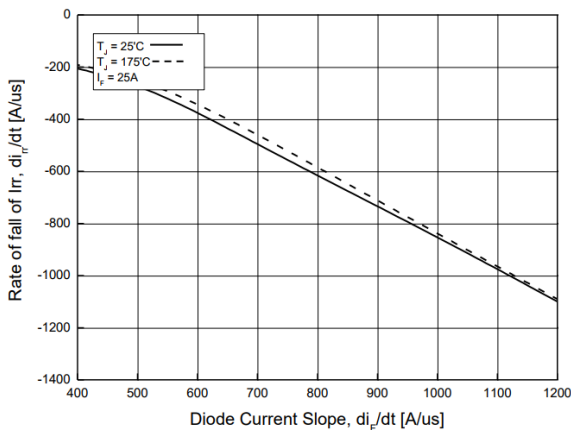


Figure 23. Rate of fall of Reverse Recovery Current-Diode Current Slope

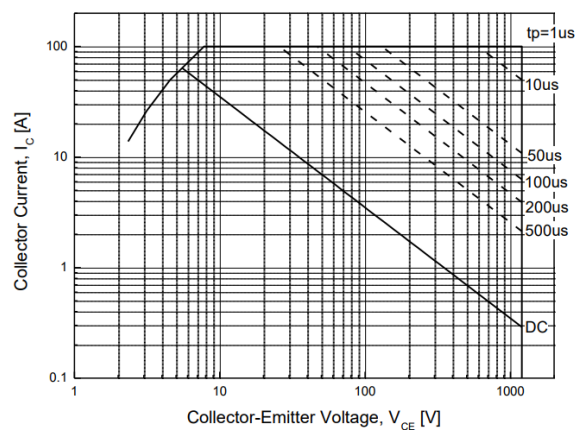


Figure 24. Forward Bias Safe Operating Area

Typical Characteristics

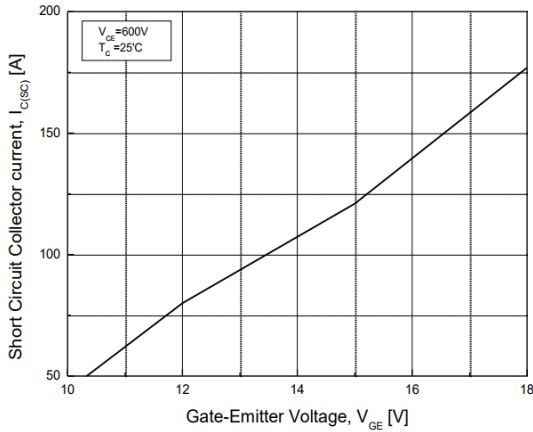


Figure 25. Typical Short Circuit Collector Current

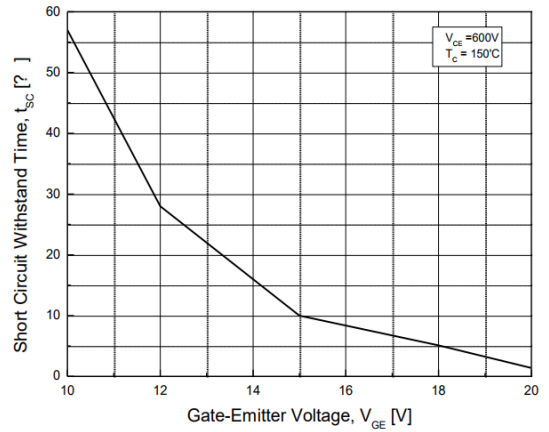


Figure 26. Typical Short Circuit Withstand Time

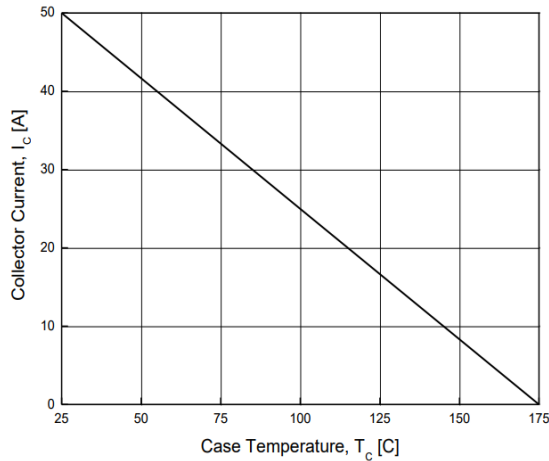


Figure 27. Case Temperature-Collector Current

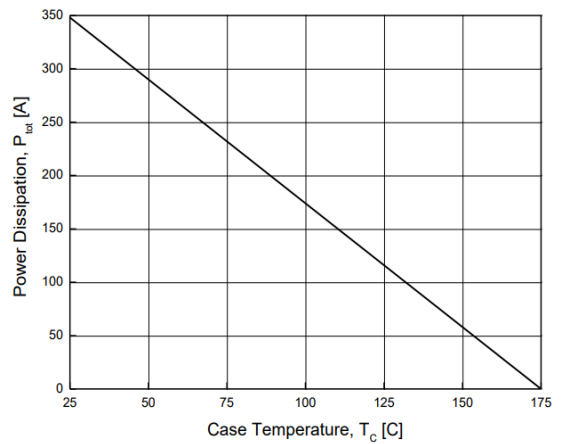


Figure 28. Power Dissipation-Case Temperature

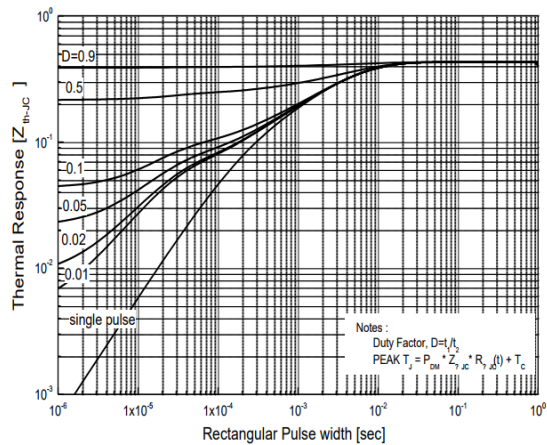


Figure 29. IGBT Transient Thermal Impedance

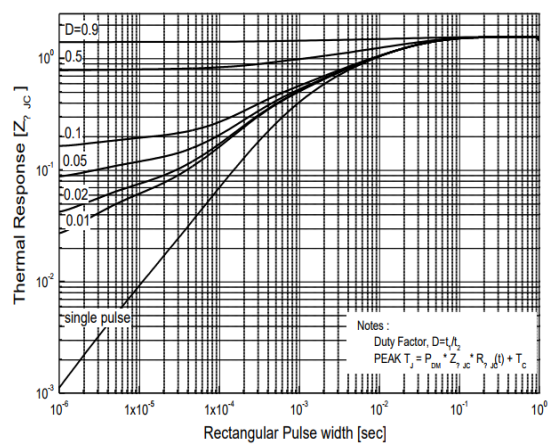
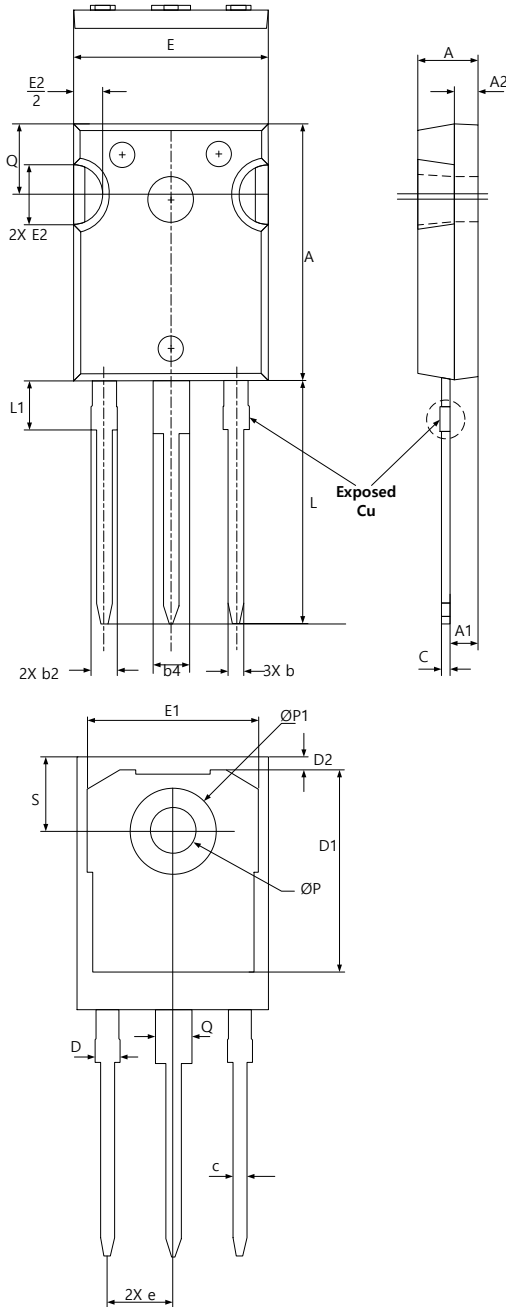


Figure 30. FRD Transient Thermal Impedance

Package Outline

Unit : mm



SYMBOL	DIMENSIONS			NOTES
	MIN	NOM	MAX	
A	4.83	5.02	5.21	
A1	2.29	2.41	2.55	
A2	1.50	2.00	2.49	
b	1.12	1.20	1.33	
b1	1.12	1.20	1.28	
b2	1.91	2.00	2.39	6
b3	1.91	2.00	2.34	
b4	2.87	3.00	3.22	6, 8
b5	2.87	3.00	3.18	
c	0.55	0.60	0.69	6
c1	0.55	6.00	0.65	
D	20.80	20.95	21.10	4
D1	16.25	16.55	17.65	5
D2	0.51	1.19	1.35	
E	15.75	15.94	16.13	4
E1	13.46	14.02	14.16	5
E2	4.32	4.91	5.49	3
e	5.44 BSC			
L	19.81	20.07	20.32	
L1	4.10	4.19	4.40	6
ϕP	3.56	3.61	3.65	7
$\phi P1$	7.19 REF			
Q	5.39	5.79	6.20	
S	6.04	6.17	6.30	