

PSI40065BM

650V 40A Si Trench Gate Field-Stop IGBT

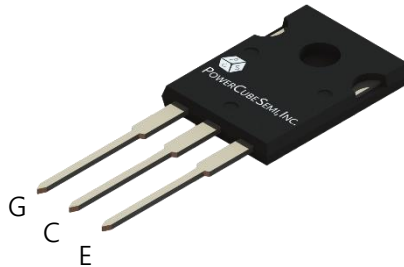
Features

Si Trench Gate Field-Stop IGBT

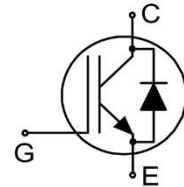
- Rated to 650V at 40Amps @ $T_j = 100^\circ\text{C}$
- $V_{CE(sat)}=1.8\text{V}$ @ $I_C=40\text{A}$
- Maximum Junction Temperature 175°C

Application

- Inverters
- Welding Converters
- High-Range Switching Frequency Converters



PKG type : TO-247



Description

PSI40065BM is Produced using advanced PowerCubeSemi's Field-Stop Trench IGBT Technology, which provides high Switching Speed and Excellent quality.

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit	
BV_{CES}	Collector-Emitter Breakdown Voltage	650	V	
I_C	DC Collector Current	$T_C=25^\circ\text{C}$	80	A
		$T_C=100^\circ\text{C}$	40	
$I_{C, Pulse}$	Pulsed Collector Current	120	A	
I_F	Diode Forward Current	$T_C=25^\circ\text{C}$	40	A
		$T_C=100^\circ\text{C}$	20	
$I_{F, Pulse}$	Diode Pulsed Current	120	A	
V_{GE}	Gate-Emitter Voltage	± 20	V	
P_D	Power Dissipation	$T_C=25^\circ\text{C}$	230	W
		$T_C=100^\circ\text{C}$	115	
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
PSI40065BM	PSI40065	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	$I_C=2\text{mA}, V_{GE}=0\text{V}$	650	-	-	V	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=40\text{A}, V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	-	1.8	2.3	V
			$T_{vj}=175^{\circ}\text{C}$	-	2.3	-	
V_F	Diode Forward Voltage	$V_{GE}=0\text{V}, I_F=20\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.5	1.95	V
			$T_{vj}=175^{\circ}\text{C}$	-	1.5	-	
$V_{GE(TH)}$	Gate-Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=40\text{mA}$	3.5	5.0	6.5	V	
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE}=650\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$	-	-	40	μA	
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20\text{V}, V_{CE}=0\text{V}$	-	-	± 100	nA	

Dynamic Characteristics

Symbol	Parameter	Test Condition	Numerical			Unit
			Min	Typ	Max	
Q_G	Total Gate Charge	$V_{CE}=520\text{V}, I_C=40\text{A}, V_{GE}=15\text{V}$	-	60	-	nC
Q_{GE}	Gate-Emitter Charge		-	13	-	
Q_{GC}	Gate-Collector Charge		-	25	-	
C_{IES}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	1565	-	pF
C_{OES}	Output Capacitance		-	37	-	
C_{RES}	Reverse Transfer Capacitance		-	120	-	

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	0.65	
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for Diode	1.75	



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	$V_{GE}=15\text{V}, V_{CC}=400\text{V},$ $I_C=40\text{A}, R_G=10\Omega,$ Inductive Load, $T_{vj}=25^{\circ}\text{C}$	-	6	-	ns
t_r	Turn-On Rise Time		-	36	-	
$t_{d(off)}$	Turn-Off Delay Time		-	55	-	
t_f	Turn-Off Fall Time		-	64	-	
E_{on}	Turn-On Switching Energy		-	0.5	-	mJ
E_{off}	Turn-Off Switching Energy		-	0.4	-	
E_{ts}	Total Switching Energy	-	0.9	-		
$t_{d(on)}$	Turn-On Delay Time	$V_{GE}=15\text{V}, V_{CC}=400\text{V},$ $I_C=40\text{A}, R_G=10\Omega,$ Inductive Load, $T_{vj}=175^{\circ}\text{C}$	-	7	-	ns
T_r	Turn-On Rise Time		-	41	-	
$t_{d(off)}$	Turn-Off Delay Time		-	60	-	
t_f	Turn-Off Fall Time		-	102	-	
E_{on}	Turn-On Switching Energy		-	1.04	-	mJ
E_{off}	Turn-Off Switching Energy		-	0.57	-	
E_{ts}	Total Switching Energy	-	1.61	-		
t_{rr}	Reverse Recovery Time	$I_F=20\text{A}, dI_F/dt=820\text{A}/\mu\text{s},$ $T_{vj}=25^{\circ}\text{C}$	-	60	-	ns
I_{rr}	Reverse Recovery Current		-	18	-	A
Q_{rr}	Reverse Recovery Charge		-	696	-	nC
t_{rr}	Reverse Recovery Time	$I_F=20\text{A}, dI_F/dt=820\text{A}/\mu\text{s},$ $T_{vj}=175^{\circ}\text{C}$	-	72	-	ns
I_{rr}	Reverse Recovery Current		-	22	-	A
Q_{rr}	Reverse Recovery Charge		-	864	-	nC

Typical Characteristics

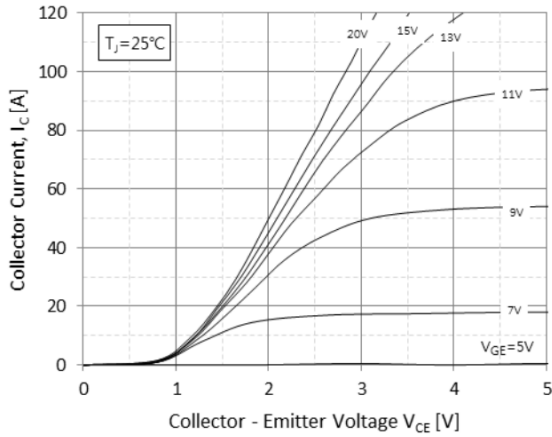


Figure 1. Output Characteristics ($T_J=25^\circ\text{C}$)

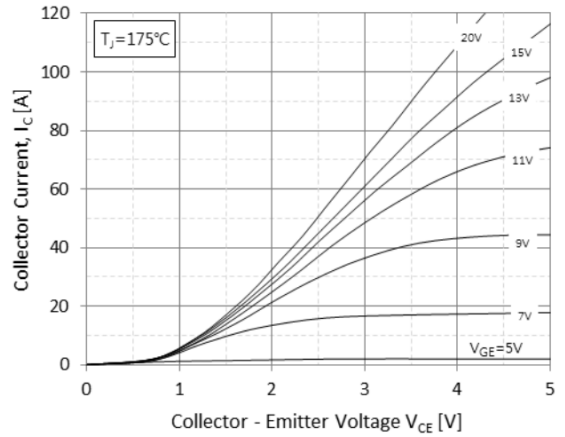


Figure 2. Output Characteristics ($T_J=175^\circ\text{C}$)

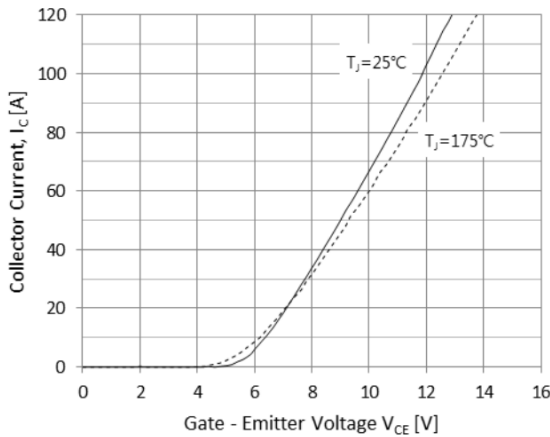


Figure 3. Typical Transfer Characteristics

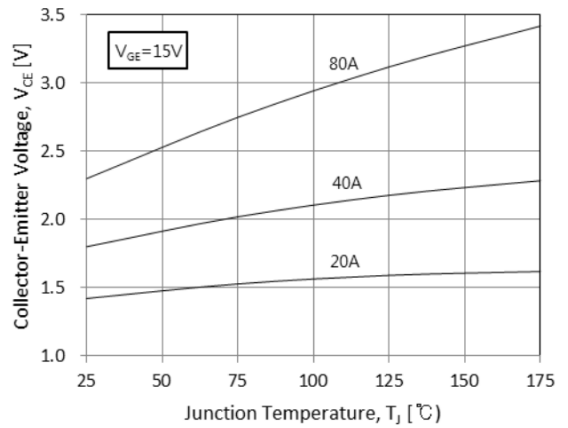


Figure 4. Typical Collector-Emitter Saturation Voltage-Junction Temperature

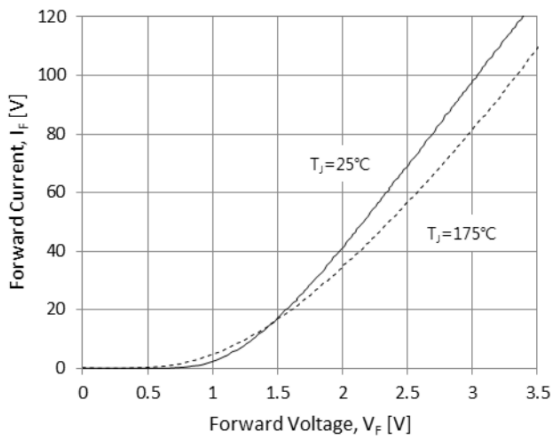


Figure 5. Diode Forward Characteristics

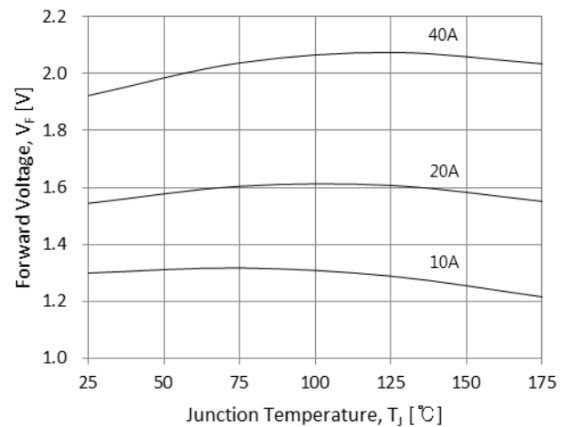


Figure 6. Diode Forward-Junction Temperature

Typical Characteristics

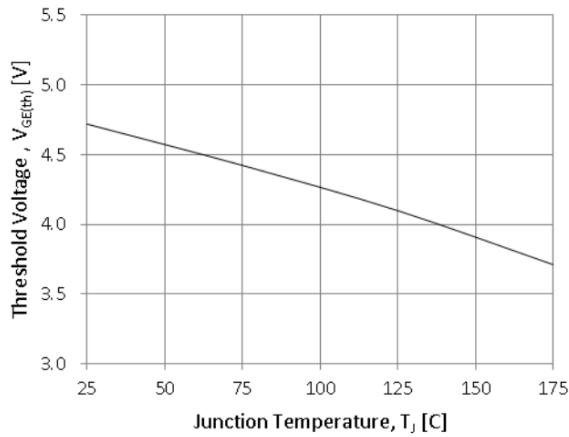


Figure 7. Threshold Voltage-Junction Temperature

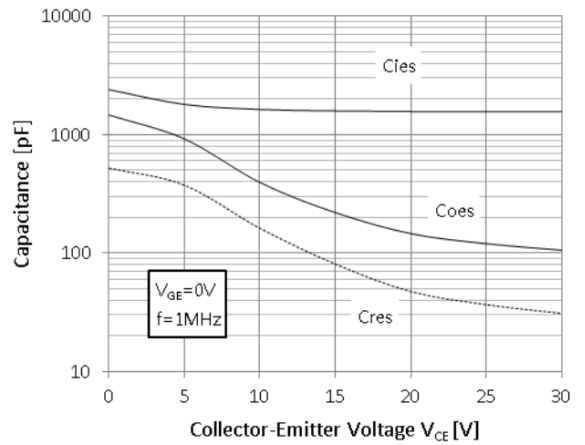


Figure 8. Typical Capacitance

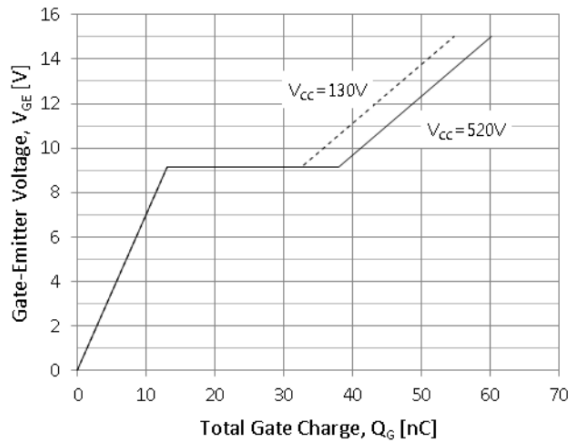


Figure 9. Typical Gate Charge

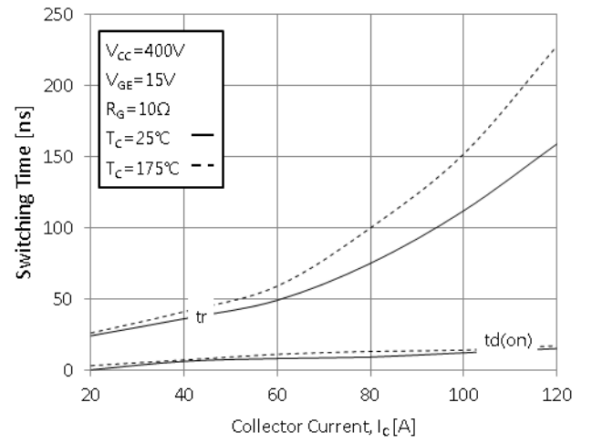


Figure 10. Typical Turn On-Collector Current

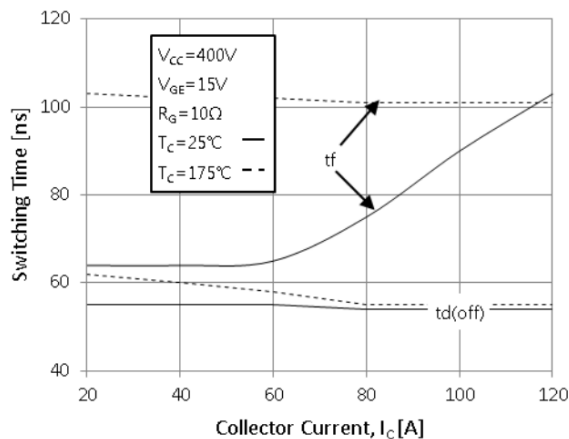


Figure 11. Typical Turn Off-Collector Current

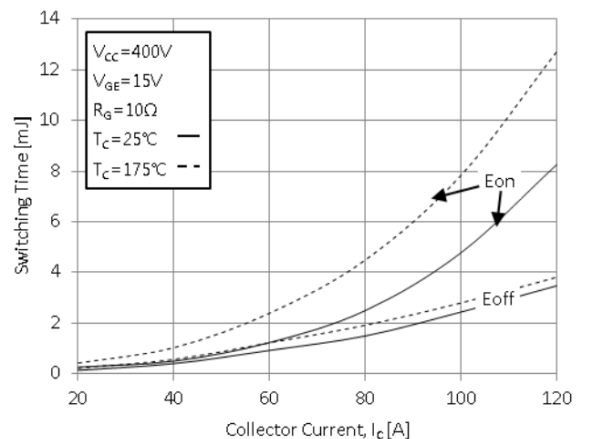


Figure 12. Switching Loss-Collector Current

Typical Characteristics

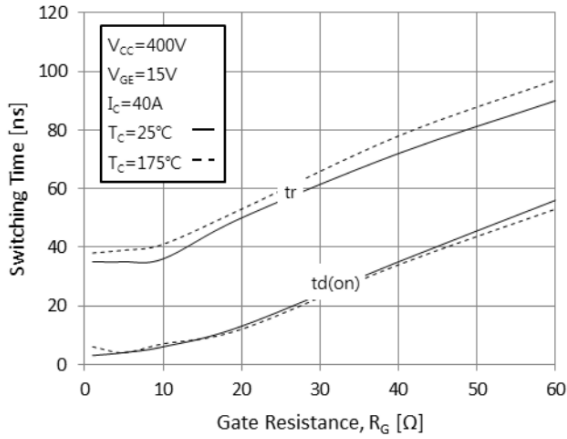


Figure 13. Turn-On Characteristics-Gate Resistance

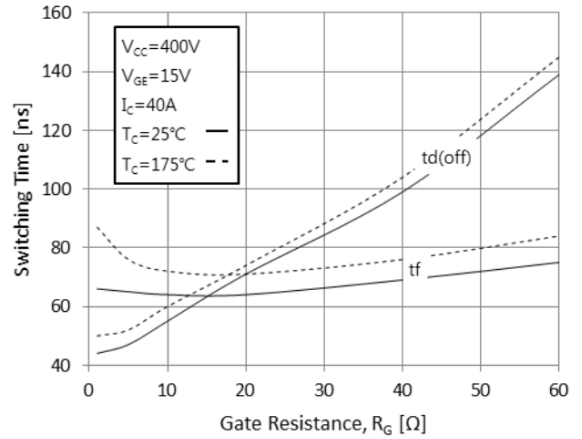


Figure 14. Turn-Off Characteristics-Gate Resistance

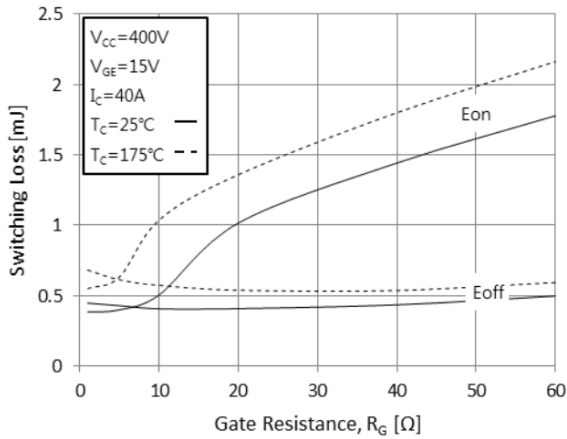


Figure 15. Switching Loss-Gate Resistance

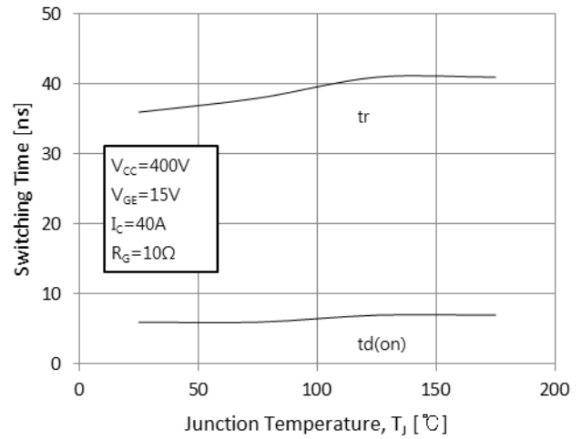


Figure 16. Turn-On Characteristics-Junction Temperature

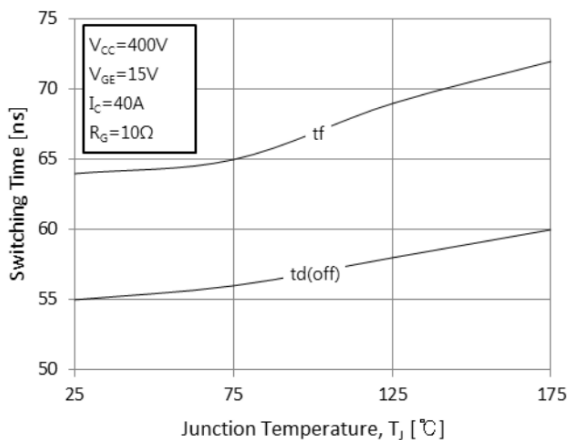


Figure 17. Turn-Off Characteristics-Junction Temperature

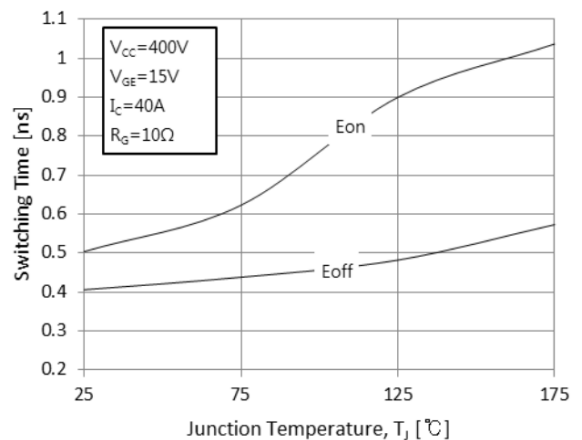


Figure 18. Switching Loss-Junction Temperature

Typical Characteristics

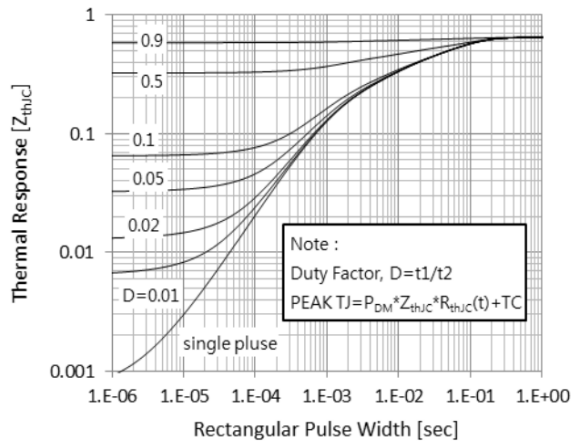


Figure 20. IGBT Transient Thermal Impedance

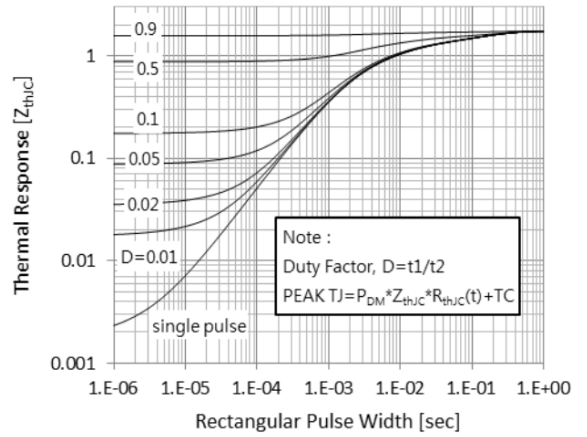
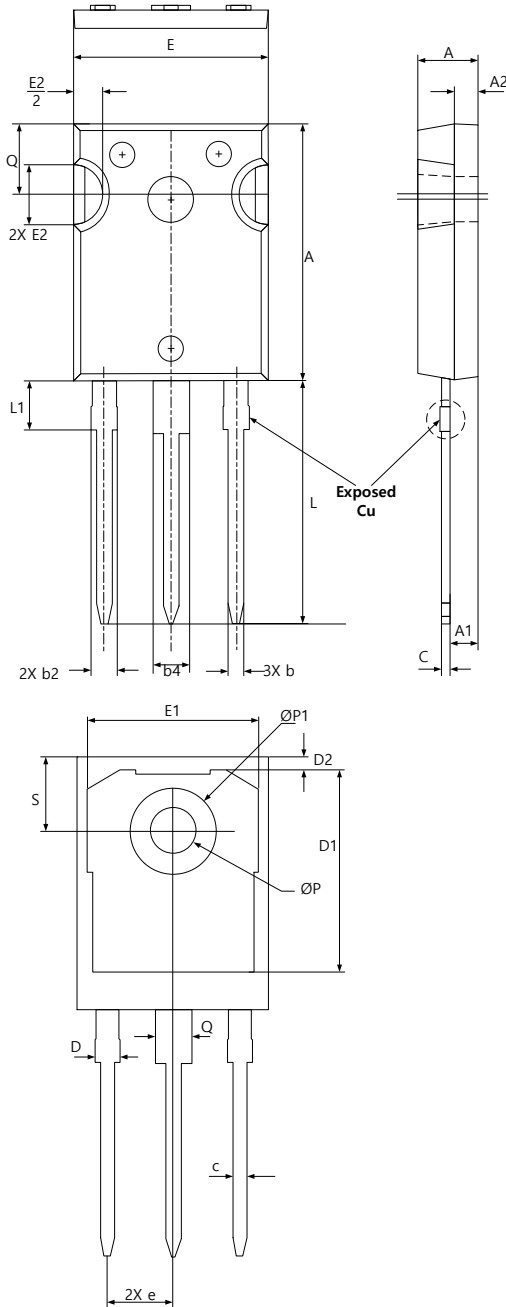


Figure 21. FRD Transient Thermal Impedance

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	