

PSI15065HM

650V 15A Si Trench Gate Field-Stop IGBT



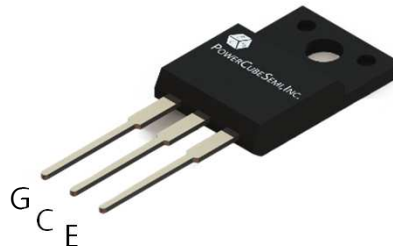
Features

Si Trench Gate Field-Stop IGBT

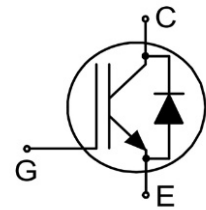
- Rated to 650V at 15Amps @ $T_j = 100^\circ\text{C}$
- High Ruggedness for Motor Control
- VCE(sat) Positive Temperature Coefficient
- Very Soft, Fast Recovery Anti-Parallel Diode
- Low EMI
- Maximum Junction Temperature 175°C

Application

- Inverter for Motor Control



PKG type : TO-220F



Description

PSI15065HM is Produced using advanced PowerCubeSemi's Field-Stop Trench IGBT Technology, which provides high performance, excellent quality and high ruggedness.

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
BV_{CES}	Collector-Emitter Breakdown Voltage	650	V
I_C	DC Collector Current	$T_C=25^\circ\text{C}$	30
		$T_C=100^\circ\text{C}$	15
$I_{C, Pulse}$	Pulsed Collector Current	60	A
I_F	Diode Forward Current	$T_C=25^\circ\text{C}$	30
		$T_C=100^\circ\text{C}$	15
$I_{F, Pulse}$	Diode Pulsed Current	60	A
V_{GE}	Gate-Emitter Voltage	± 20	V
P_D	Power Dissipation	$T_C=25^\circ\text{C}$	48
		$T_C=100^\circ\text{C}$	24
t_{SC}	Short Circuit Withstand Time	5	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
PSI15065HM	PSI15065	TO-220F	Tube	-	50

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	$I_C=15\text{A}, V_{GE}=15\text{V}$	$T_{vj}=25^{\circ}\text{C}$	-	1.65	2.00	V
			$T_{vj}=175^{\circ}\text{C}$	-	1.90	-	
V_F	Diode Forward Voltage	$V_{GE}=0\text{V}, I_F=15\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.85	2.30	V
			$T_{vj}=175^{\circ}\text{C}$	-	1.95	-	
$V_{GE(TH)}$	Gate-Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=0.5\text{mA}$	4.5	5.5	6.5	V	
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE}=650\text{V}, V_{GE}=0\text{V}, T_{vj}=25^{\circ}\text{C}$	-	-	20	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	$V_{CE}=520\text{V}, I_C=15\text{A}, V_{GE}=15\text{V}$	-	61	-	nC
Q_{GE}	Gate-Emitter Charge		-	11	-	
Q_{GC}	Gate-Collector Charge		-	35	-	
C_{IES}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	1129	-	pF
C_{OES}	Output Capacitance		-	57	-	
C_{RES}	Reverse Transfer Capacitance		-	31	-	

Thermal Characteristics

Symbol	Parameter	Numerical	Unit
$R_{\theta(J-A)}$	Thermal Resistance Junction-to-Ambient	62	$^{\circ}\text{C}/\text{W}$
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for IGBT	3.0	
$R_{\theta(J-C)}$	Thermal Resistance Junction-to-Case for Diode	5.0	



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	$V_{GE}=15\text{V}, V_{CC}=400\text{V},$ $I_C=15\text{A}, R_G=10\Omega,$ Inductive Load, $T_{vj}=25^{\circ}\text{C}$	-	19	-	ns
t_r	Turn-On Rise Time		-	27	-	
$t_{d(off)}$	Turn-Off Delay Time		-	128	-	
t_f	Turn-Off Fall Time		-	32	-	
E_{on}	Turn-On Switching Energy		-	270	-	uJ
E_{off}	Turn-Off Switching Energy		-	86	-	
E_{ts}	Total Switching Energy		-	356	-	
$t_{d(on)}$	Turn-On Delay Time	$V_{GE}=15\text{V}, V_{CC}=400\text{V},$ $I_C=15\text{A}, R_G=10\Omega,$ Inductive Load, $T_{vj}=175^{\circ}\text{C}$	-	17	-	ns
T_r	Turn-On Rise Time		-	29	-	
$t_{d(off)}$	Turn-Off Delay Time		-	150	-	
t_f	Turn-Off Fall Time		-	130	-	
E_{on}	Turn-On Switching Energy		-	342	-	uJ
E_{off}	Turn-Off Switching Energy		-	288	-	
E_{ts}	Total Switching Energy		-	630	-	
t_{rr}	Reverse Recovery Time	$I_F=15\text{A}, dI_F/dt=200\text{A}/\mu\text{s},$ $T_{vj}=25^{\circ}\text{C}$	-	150	-	ns
I_{rr}	Reverse Recovery Current		-	5.2	-	A
Q_{rr}	Reverse Recovery Charge		-	390	-	nC
t_{rr}	Reverse Recovery Time	$I_F=15\text{A}, dI_F/dt=200\text{A}/\mu\text{s},$ $T_{vj}=175^{\circ}\text{C}$	-	207	-	ns
I_{rr}	Reverse Recovery Current		-	6.1	-	A
Q_{rr}	Reverse Recovery Charge		-	631	-	nC

Typical Characteristics

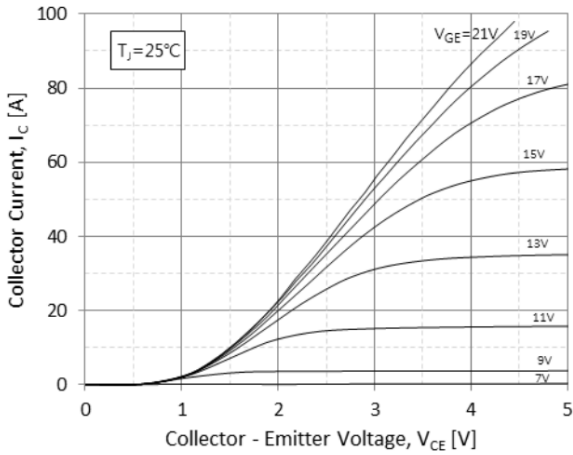


Figure 1. Output Characteristics ($T_j=25^\circ\text{C}$)

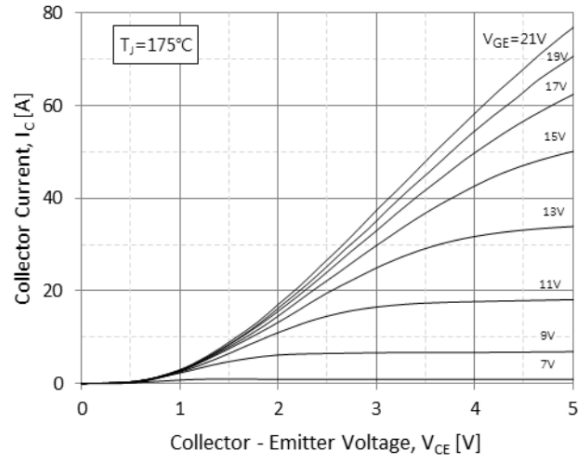


Figure 2. Output Characteristics ($T_j=175^\circ\text{C}$)

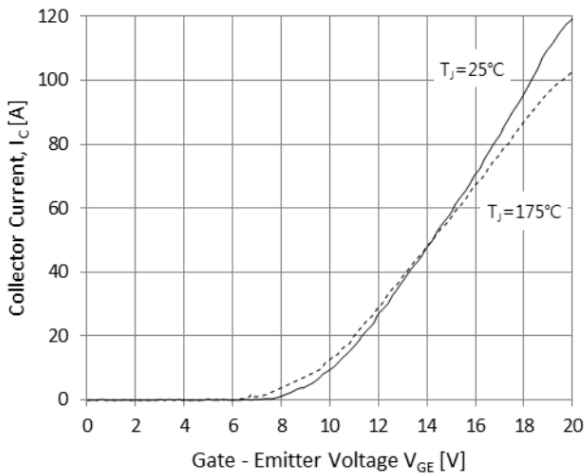


Figure 3. Typical Transfer Characteristics

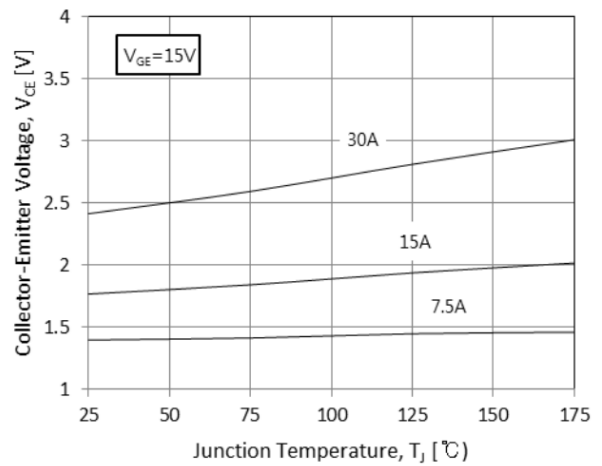


Figure 4. Typical Collector-Emitter Saturation Voltage-Junction Temperature

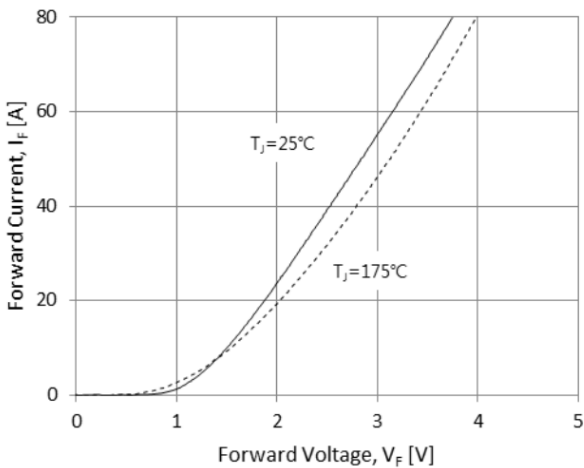


Figure 5. Diode Forward Characteristics

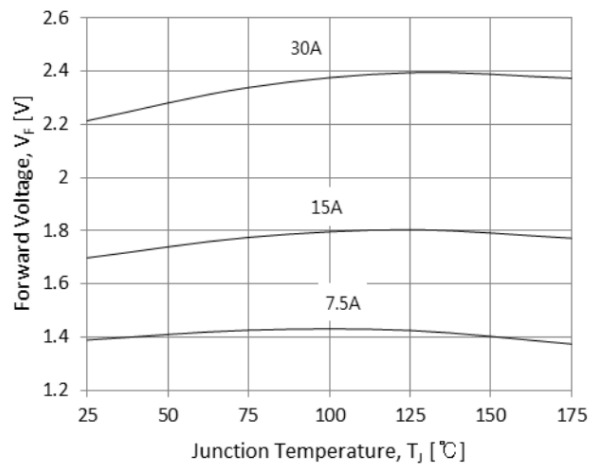


Figure 6. Diode Forward-Junction Temperature

Typical Characteristics

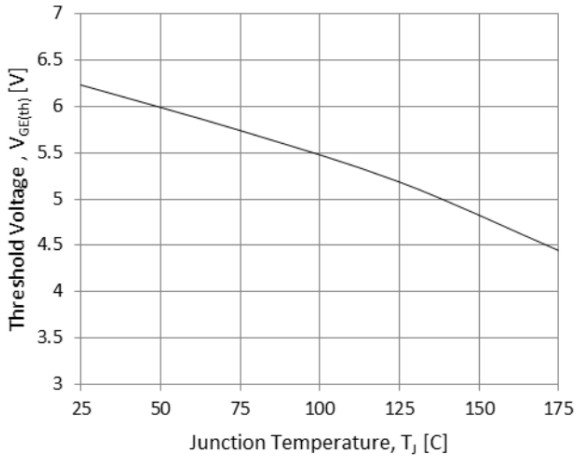


Figure 7. Threshold Voltage-Junction Temperature

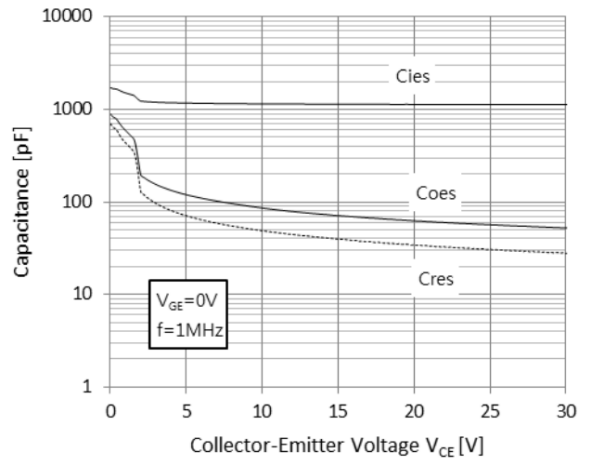


Figure 8. Typical Capacitance

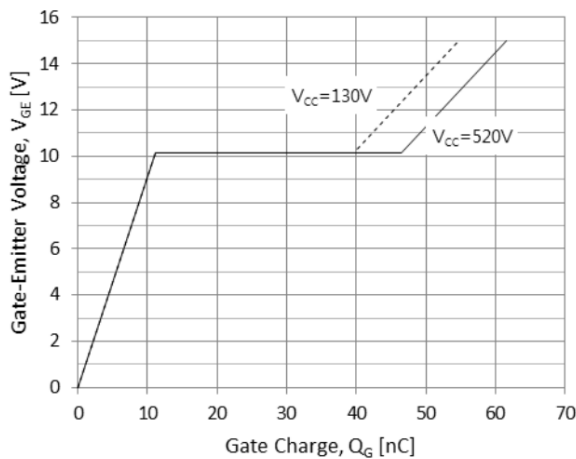


Figure 9. Typical Gate Charge

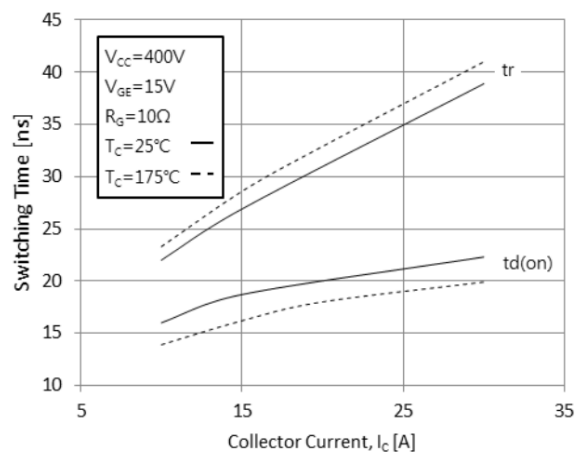


Figure 10. Typical Turn On-Time vs. Collector Current

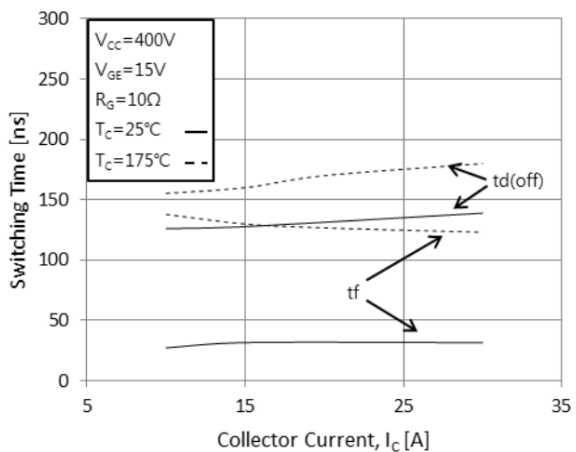


Figure 11. Typical Turn Off-Time vs. Collector Current

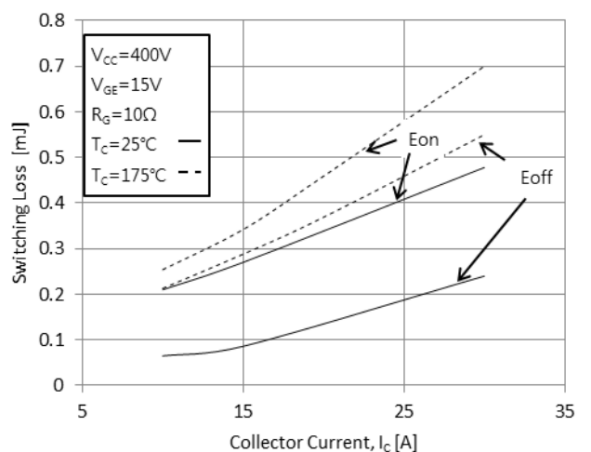


Figure 12. Switching Loss vs. Collector Current

Typical Characteristics

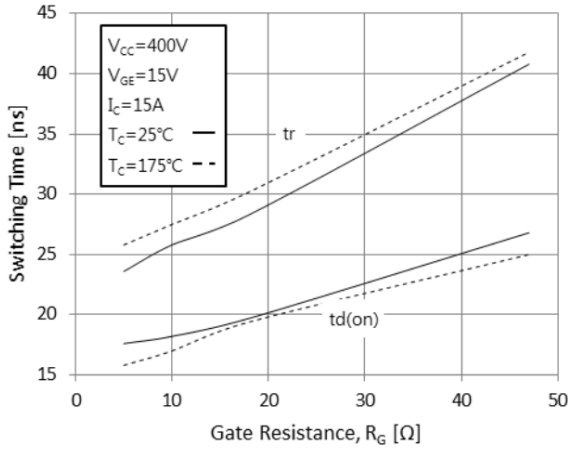


Figure 13. Turn-On Characteristics-Gate Resistance

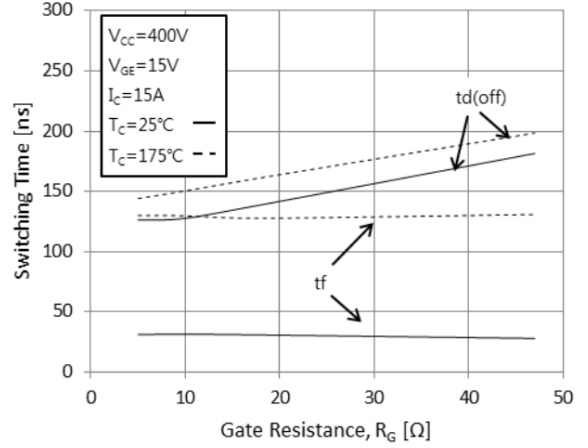


Figure 14. Turn-Off Characteristics-Gate Resistance

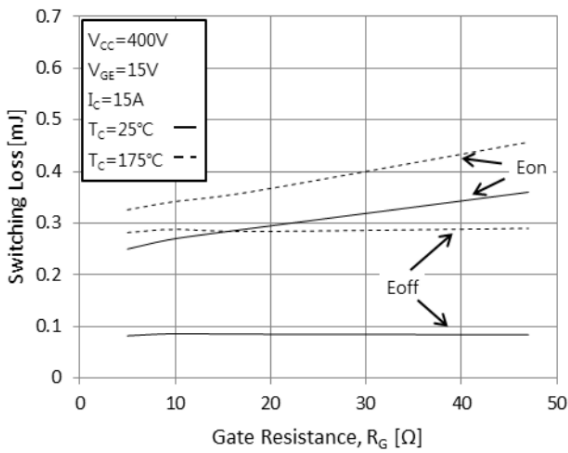


Figure 15. Switching Loss-Gate Resistance

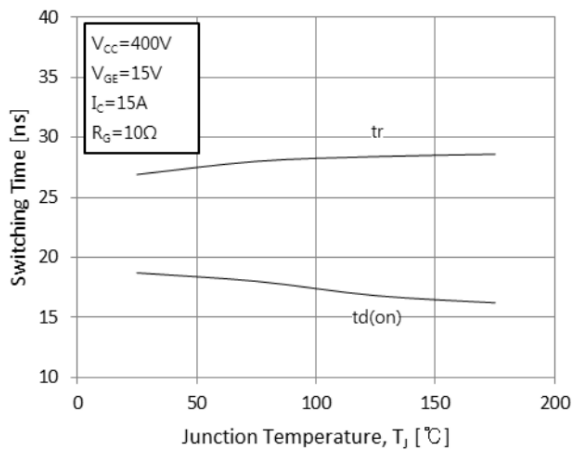


Figure 16. Turn-On Characteristics-Junction Temperature

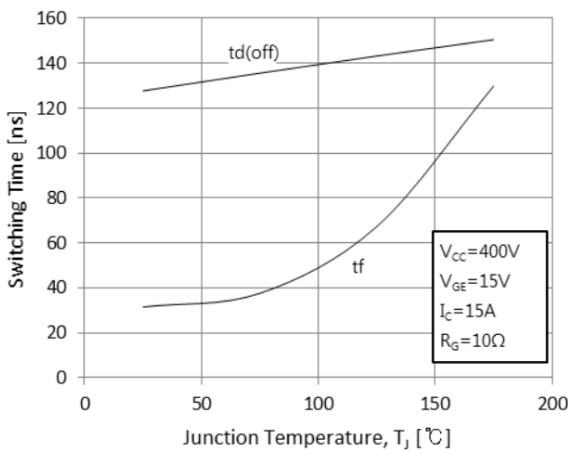


Figure 17. Turn-Off Characteristics-Junction Temperature

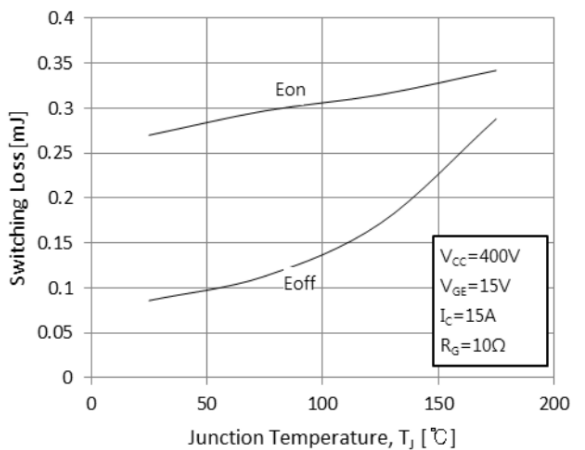


Figure 18. Switching Loss-Junction Temperature

Typical Characteristics

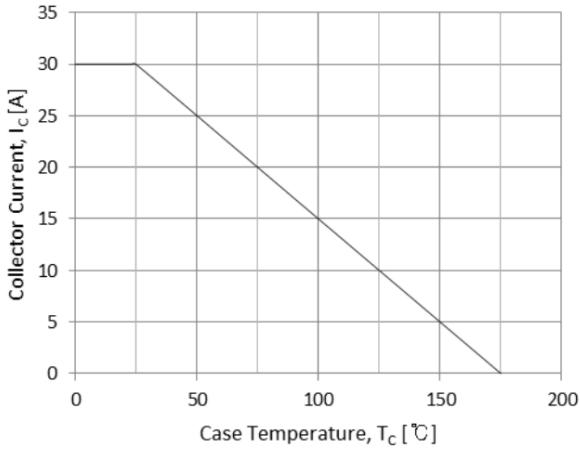


Figure 19. Case Temperature-Collector Current

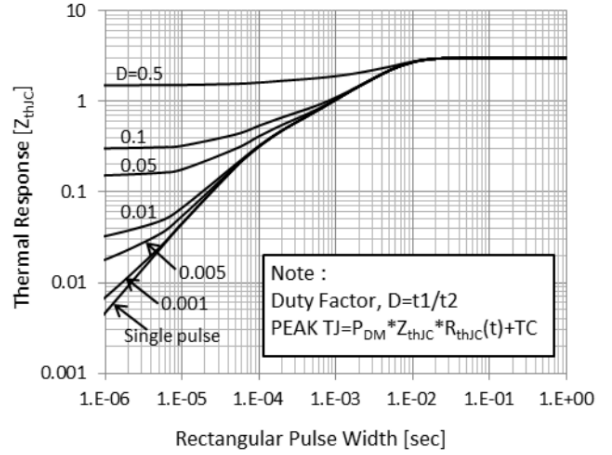


Figure 20. IGBT Transient Thermal Impedance

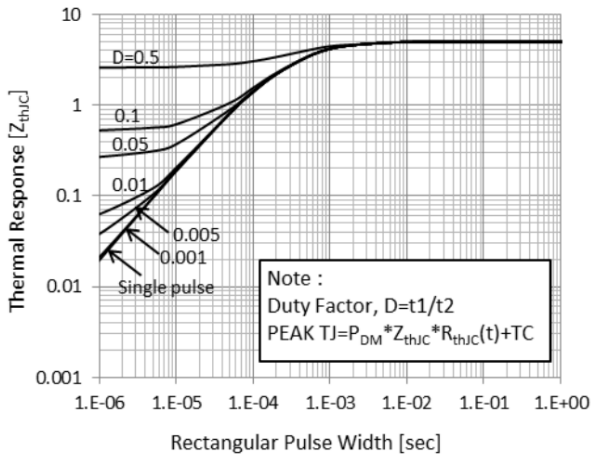
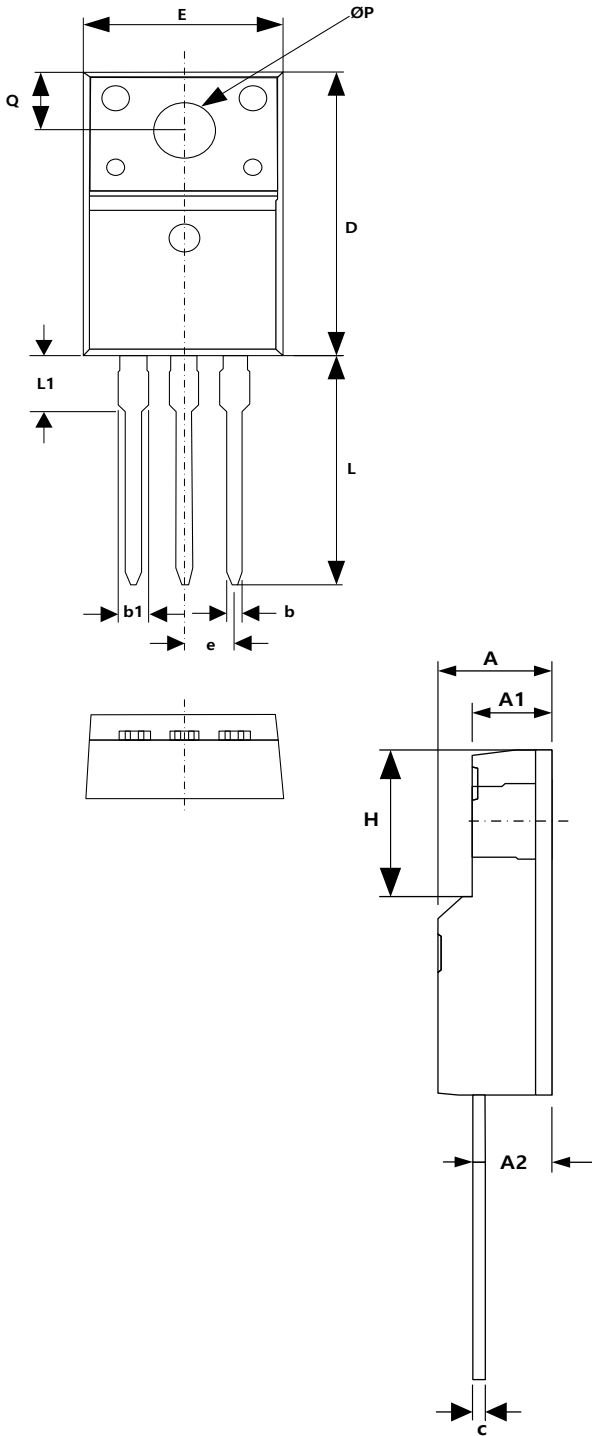


Figure 21. FRD Transient Thermal Impedance

Package Outline

Unit : mm



SYMBOL	DIMENSIONS			NOTES
	MIN	NOM	MAX	
A	4.60	4.70	4.80	
A1	2.44	2.54	2.64	
A2	2.15	2.45	2.75	
b	0.70	0.80	0.90	
b1	1.15	1.35	1.55	
c	0.50	0.60	0.70	
D	15.30	15.80	16.30	
E	9.90	10.10	10.30	
e	4.98	5.08	5.18	
H	6.40	6.60	6.80	
L	13.05	13.55	14.05	
L1	3.00	3.30	3.60	
ØP	3.00	3.20	3.40	
Q	3.10	3.30	3.50	