

Features

- Trench & Field Stop technology
 - Low saturation voltage
 - Low turn-off losses
 - Positive temperature coefficient
- Free wheeling diodes with fast and soft reverse recovery
- Industrial standard package with copper base plate

Applications

- Welder / Power supply
- UPS / Inverter
- Industrial motor driver

Preliminary data

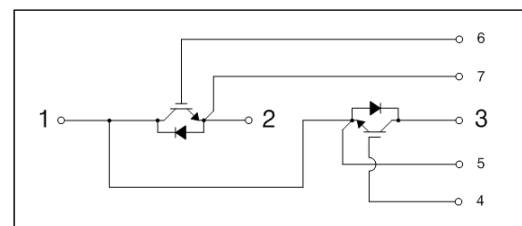


Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Item	Symbol	Conditions	Value	Units
IGBT	V_{CES}		600	V
	V_{GES}		± 20	V
	I_C	@ $T_j = 175^\circ\text{C}$, $T_C = 25^\circ\text{C}$, Continuous	400	A
		@ $T_j = 175^\circ\text{C}$, $T_C = 80^\circ\text{C}$, Continuous	300	A
	I_{CM}	@ $T_C = 80^\circ\text{C}$, $t_p = 1\text{ ms}$	600	A
	T_j	Operating Junction Temperature ⁽¹⁾	-40~125	$^\circ\text{C}$
	P_D	@ $T_j = 175^\circ\text{C}$, $T_C = 25^\circ\text{C}$	1200	W
Diode		@ $T_j = 175^\circ\text{C}$, $T_C = 80^\circ\text{C}$	700	W
	V_{RRM}		600	V
	I_F		400	A
	I_{FRM}	$t_p = 1\text{ ms}$	800	A
Module	T_j	Operating Junction Temperature ⁽¹⁾	-40~125	$^\circ\text{C}$
	T_{stg}	Storage Temperature	-40~125	$^\circ\text{C}$
	V_{iso}	@ AC 1 minute	2500	V
	M_t	Main Terminal Mounting Torque (M6)	2.5~6.0	Nm
	M_S	Heat Sink Mounting Torque (M6)	3.0~6.0	Nm
	W	Weight	260	g

Internal Circuit & Pin Description

Pin Number	Pin Name	Pin Description
1	C2E1	Output
2	E2	Negative DC Link Output
3	C1	Positive DC Link Output
4	G1	Gate Input for High-side
5	E1	Emitter Input for High-side
6	G2	Gate Input for Low-side
7	E2	Emitter Input for Low-side



(Note *1) The Maximum junction temperature of chip is 175°C .

Electrical Characteristics of IGBT and Diode $T_C = 25^\circ\text{C}$ unless otherwise noted

Static Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{CES}	C-E Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 250\mu\text{A}$	600	-	-	V
I_{CES}	C-E Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	-	-	250	μA
I_{GES}	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$	-	-	-	nA
$V_{GE(th)}$	G-E Threshold Voltage	$V_{GE} = V_{CE}, I_C = 400\text{ mA}$	-	7.1	-	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 400\text{ A}, V_{GE} = 15\text{ V}, T_C = 25^\circ\text{C}$	-	2.0	-	V
		$I_C = 400\text{ A}, V_{GE} = 15\text{ V}, T_C = 125^\circ\text{C}$	-	2.3	-	V

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_{SC}	Short Current	$V_{GE} \leq 15\text{ V}, V_{CC} = 400\text{ V}$ $V_{CE} \leq V_{CES}, T_J = 125, T_P \leq 5.5\mu\text{s}$		1400		A
C_{ies}	Input Capacitance	$V_{CE} = 30\text{ V}, V_{GE} = 0\text{ V}$ $f = 1\text{ MHz}, T_C = 25^\circ\text{C}$	-	26	-	nF
C_{oes}	Output Capacitance		-	1.5	-	nF
C_{res}	Reverse Transfer Capacitance		-	0.7	-	nF
$t_{d(on)}$	Turn-On Delay Time	$T_C = 125^\circ\text{C}, R_G = 15\ \Omega$ $L = 50\ \mu\text{H}, V_{DC} = 300\text{ V}$ $V_{GE} = 15\text{ V} \sim -15\text{ V}$ $I_C = 400\text{ A}$	-	409	-	ns
t_r	Rise Time		-	256	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	563	-	ns
t_f	Fall Time		-	76	-	ns
E_{on}	Turn-On Switching Loss		-	32.9	-	mJ
E_{off}	Turn-Off Switching Loss		-	14.8	-	mJ
E_{ts}	Total Switching Loss		-	47.7	-	mJ
Q_g	Total Gate Charge	$V_{GE} = 0\text{ V} \sim +15\text{ V}$	-	830	-	nC
Q_{ge}	Gate-Emitter Charge		-	310	-	nC
Q_{gc}	Gate-Collector Charge		-	330	-	nC

Electrical Characteristics of Diode

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units	
V _F	Diode Forward Voltage	I _F = 400 A V _{GE} = 0 V	T _C = 25 °C	-	1.6	-	V	
			T _C = 125 °C	-	1.6	-		
t _{rr}	Diode Reverse Recovery Time	R _G = 15 Ω L = 50 μH V _{DC} = 300 V V _{GE} = 15 V ~ -15 V I _C = 400 A	T _C = 25 °C	-	304	-	ns	
			T _C = 125 °C	-	460	-		
I _{RRM}	Diode Peak Reverse Recovery Current		T _C = 25 °C	-	88	-	A	
			T _C = 125 °C	-	125	-		
Q _{rr}	Diode Reverse Recovery Charge		T _C = 25 °C	-	10.2	-	μC	
			T _C = 125 °C	-	26.6	-		
E _{rr}	Diode Reverse Recovery Energy		T _C = 25 °C	-	1.1	-	mJ	
			T _C = 125 °C	-	3.3	-		

Thermal Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$R_{th(J-C)}$	Thermal Resistance (IGBT Part)	Junction-to-Case	-	0.12	-	$^\circ\text{C/W}$
$R_{th(J-C)D}$	Thermal Resistance (Diode Part)	Junction-to-Case	-	0.20	-	$^\circ\text{C/W}$
$R_{th(C-H)}$	Thermal Resistance (IGBT Part)	Case-to-Heatsink	-		-	$^\circ\text{C/W}$
$R_{th(C-H)D}$	Thermal Resistance (Diode Part)	Case-to-Heatsink	-		-	$^\circ\text{C/W}$

* This specifications may not be considered as an assurance of characteristics and may not have same characteristics in case of using different test systems from @ LSIS. We therefore strongly recommend prior consultation of our engineers.

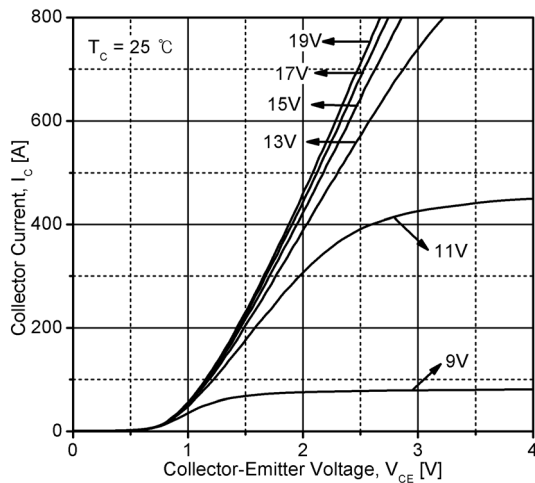


Fig 1. Typical IGBT Output Characteristics

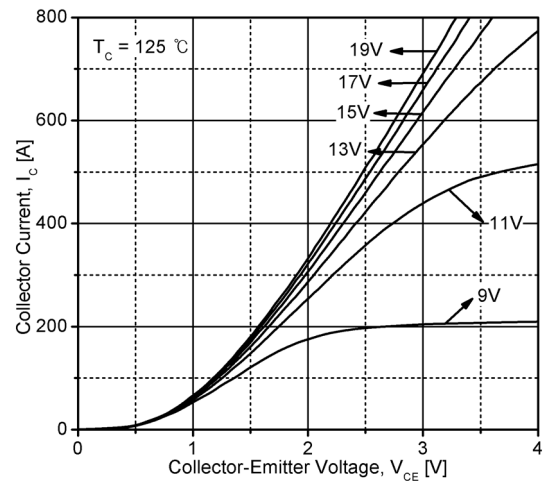


Fig 2. Typical IGBT Output Characteristics

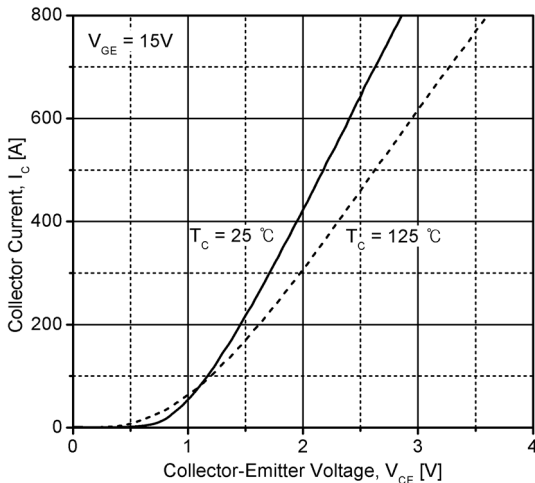


Fig 3. Typical IGBT Output Characteristics

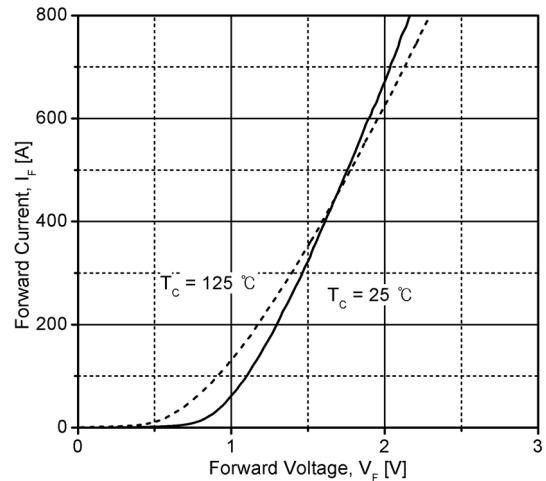


Fig 4. Typical Diode Forward Characteristics

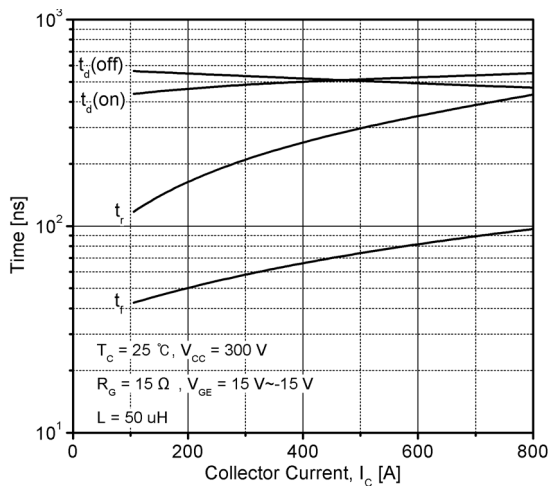


Fig 5. Typical Switching Time vs. Collector Current

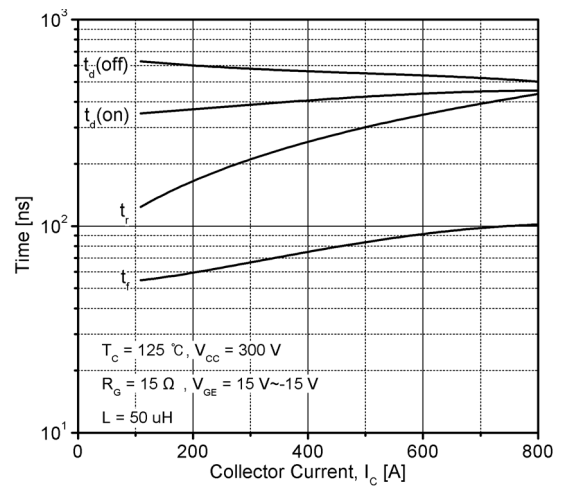


Fig 6. Typical Switching Time vs. Collector Current

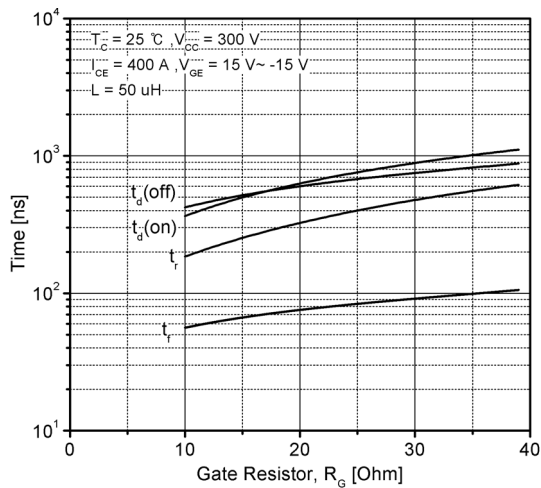


Fig 7. Typical Switching Time vs. Gate Resistor

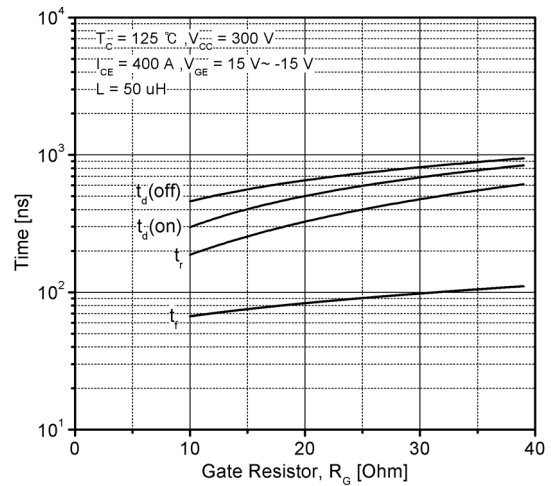


Fig 8. Typical Switching Time vs. Gate Resistor

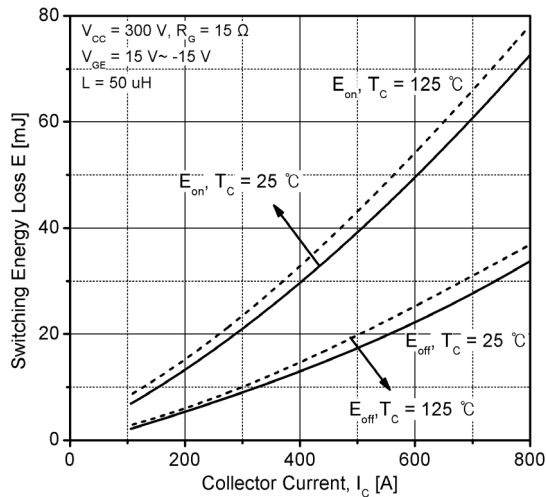


Fig 9. Typical IGBT Switching Loss

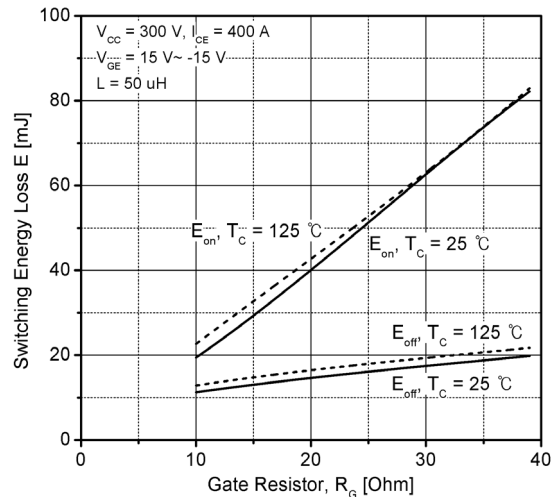


Fig 10. Typical IGBT Switching Loss

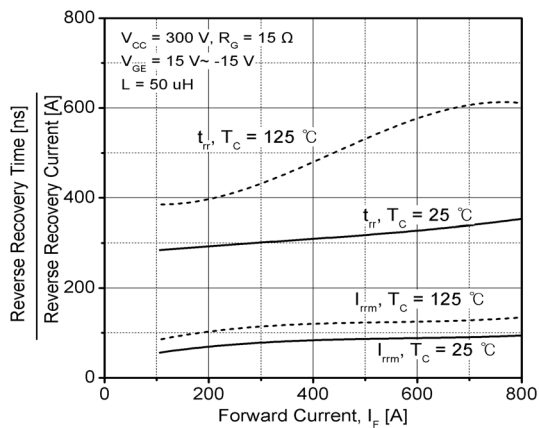


Fig 11. Typical Recovery Characteristics of Diode

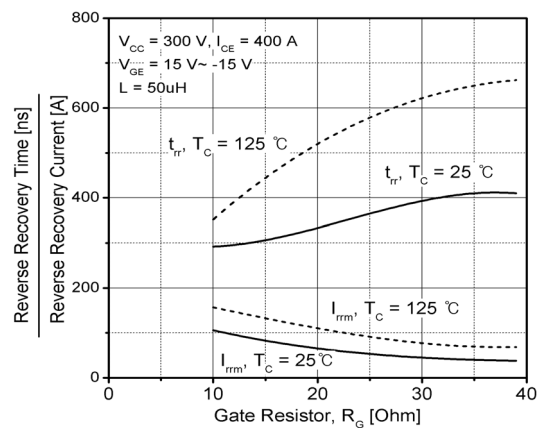


Fig 12. Typical Recovery Characteristics of Diode

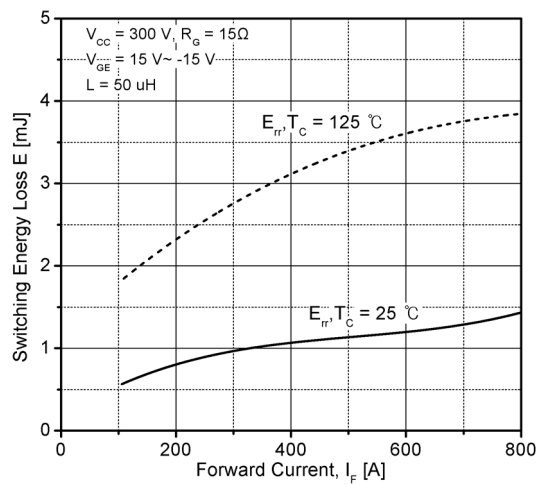


Fig 13. Typical Diode Switching Loss

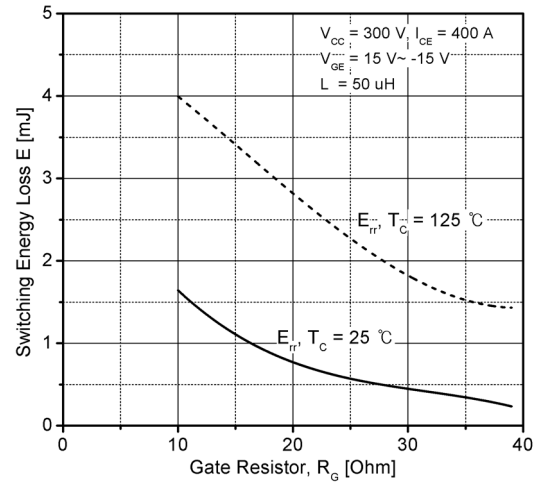


Fig 14. Typical Diode Switching Loss

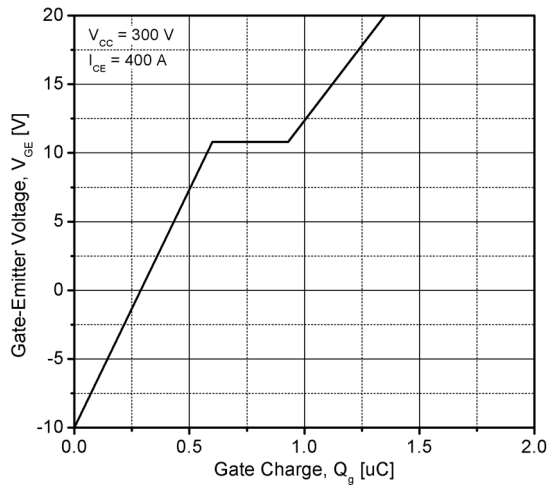


Fig 15. Typical Gate Charge Characteristics

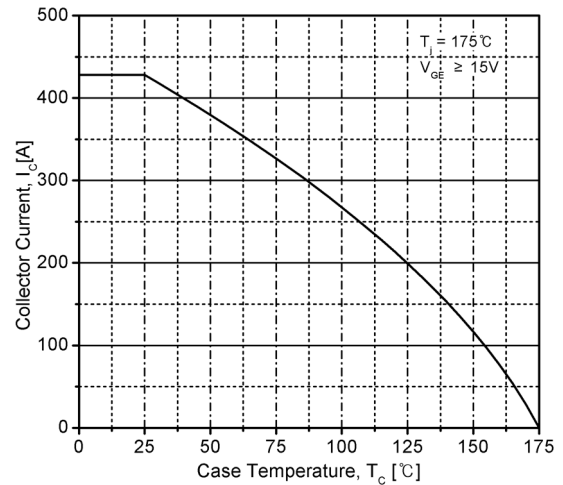


Fig 16. Case Temperature vs. Collector Current

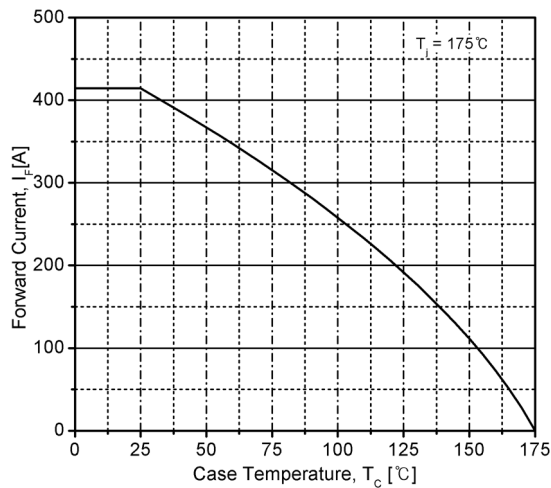


Fig 17. Case Temperature vs. Diode Current

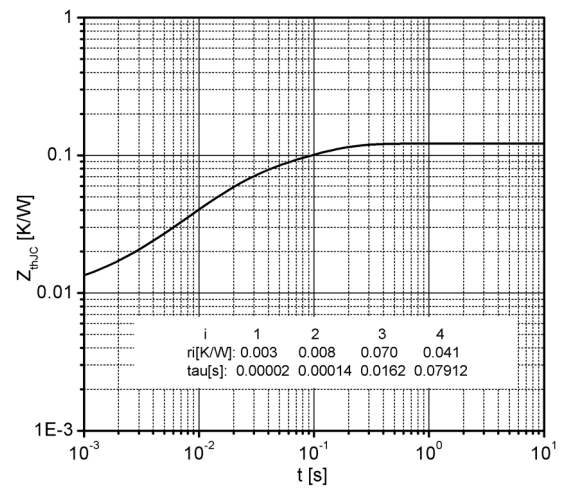


Fig 18. Typical IGBT Thermal Impedance

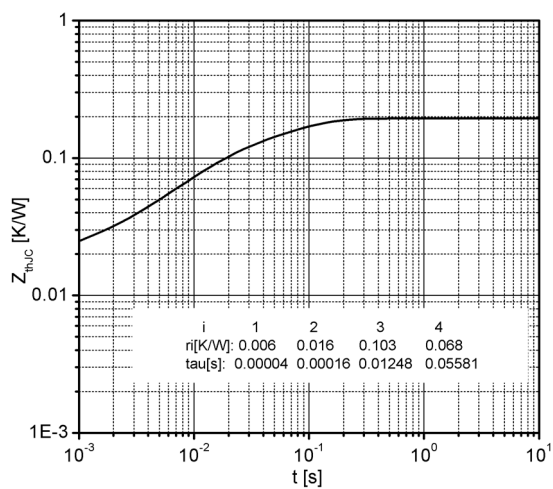
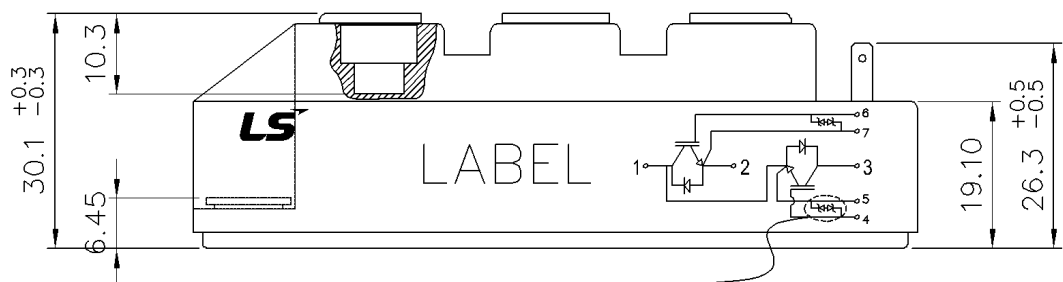
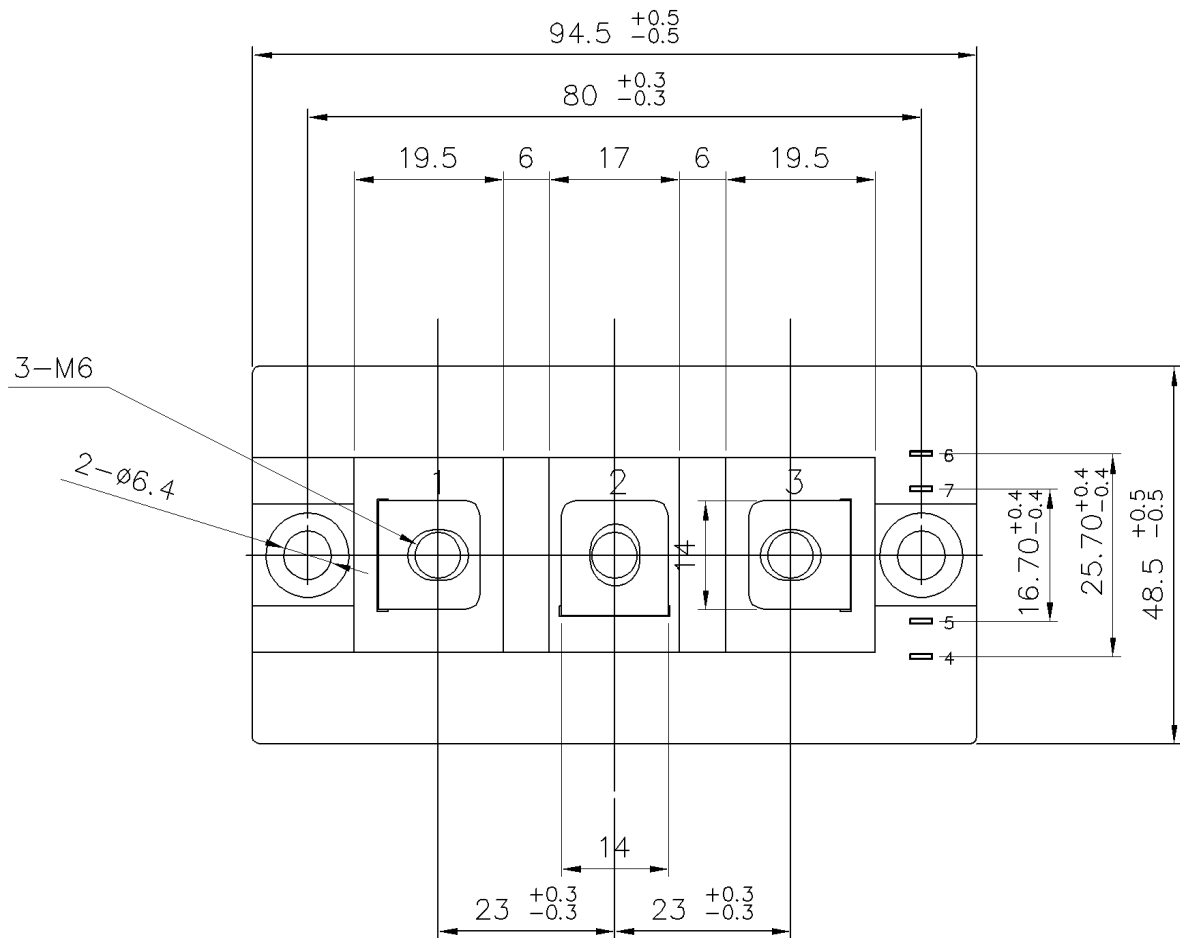


Fig 19. Typical Diode Thermal Impedance

LVH400G604

Package Dimension (Dimension in mm)



*Zener Diode for ESD Protection.