

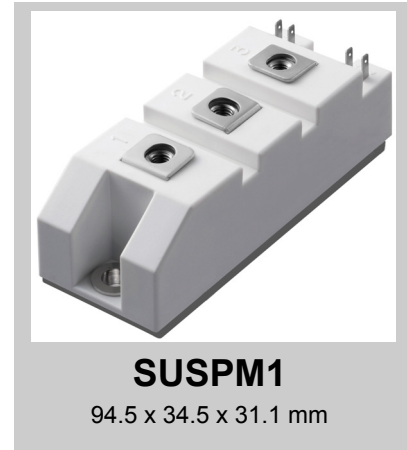
**Features**

- Non Punch Through (NPT) technology
  - Ultra-fast
  - 10 $\mu$ s short circuit current
  - Positive  $V_{CE(on)}$  temperature coefficient
  - Square RBSOA
- Free wheeling diodes with fast and soft reverse recovery
- Industrial standard package with copper base plate
- Included ESD protection function <sup>\*(1)</sup>

**Applications**

- Welder / Power Supply
- UPS / Inverter
- Industrial Motor Driver

**Preliminary data**

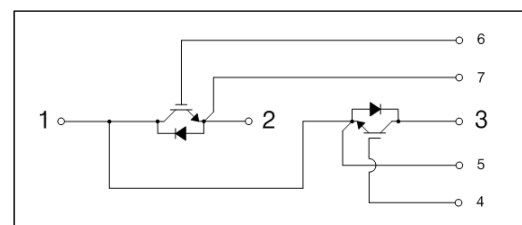


**Absolute Maximum Ratings**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Item	Symbol	Conditions	Value	Units
IGBT	$V_{CES}$		1200	V
	$V_{GES}$		$\pm 20$	V
	$I_C$	@ $T_j = 150^\circ\text{C}$ , $T_C = 25^\circ\text{C}$ , Continuous	-	A
		@ $T_j = 150^\circ\text{C}$ , $T_C = 80^\circ\text{C}$ , Continuous	50	A
	$I_{CM}$	@ $T_C = 80^\circ\text{C}$ , $t_p = 1\text{ ms}$	100	A
	$T_{SC}$	Chip Level, @ $T_j = 150^\circ\text{C}$ , $V_{GE} = 15\text{ V}$ , $V_{CES} < 1200\text{ V}$	10	$\mu\text{s}$
	$T_j$	Operating Junction Temperature <sup>*(2)</sup>	-40~125	$^\circ\text{C}$
$P_D$	@ $T_j = 150^\circ\text{C}$ , $T_C = 25^\circ\text{C}$	350	W	
	@ $T_j = 150^\circ\text{C}$ , $T_C = 80^\circ\text{C}$	200	W	
Diode	$V_{RRM}$		1200	V
	$I_F$		50	A
	$I_{FRM}$	$t_p = 1\text{ ms}$	100	A
	$T_j$	Operating Junction Temperature <sup>*(2)</sup>	-40~125	$^\circ\text{C}$
Module	$T_{stg}$	Storage Junction Temperature	-40~125	$^\circ\text{C}$
	$V_{iso}$	@ AC 1minute	2500	V
	$M_t$	Main Terminal Mounting torque (M5)	2.5~5	Nm
	$M_S$	Heat sink Mounting torque (M6)	3.0~5	Nm
	$W$	Weight	180	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) Option : Included  $\pm 28\text{ V}$  Zener Diode between Gate and Emitter.  
 (Note \*2) The Maximum junction temperature of chip is  $150^\circ\text{C}$ .

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

### Static Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$BV_{CES}$	C-E Breakdown Voltage	$V_{GE} = 0\text{ V}, I_C = 1\text{ mA}$	1200	-	-	V
$I_{CES}$	C-E Cut-Off Current	$V_{CE} = V_{CES}, V_{GE} = 0\text{ V}$	-	-	1	mA
$I_{GES}$	G-E Leakage Current	$V_{GE} = V_{GES}, V_{CE} = 0\text{ V}$	-	-	-	nA
$V_{GE(th)}$	G-E Threshold Voltage	$V_{GE} = V_{CE}, I_C = 50\text{ mA}$	-	5.9	-	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C = 50\text{ A}, V_{GE} = 15\text{ V}, T_C = 25^\circ\text{C}$	-	3.4	-	V
		$I_C = 50\text{ A}, V_{GE} = 15\text{ V}, T_C = 125^\circ\text{C}$	-	3.8	-	V

### Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$C_{ies}$	Input Capacitance	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}$ $f = 1\text{ MHz}, T_C = 25^\circ\text{C}$	-	5.60	-	nF
$C_{oes}$	Output Capacitance		-	0.35	-	nF
$C_{res}$	Reverse Transfer Capacitance		-	0.50	-	nF
$t_d(on)$	Turn-On Delay Time	$T_C = 125^\circ\text{C}, R_G = 15\ \Omega$ $L = 200\ \mu\text{H}, V_{DC} = 600\text{ V}$ $V_{GE} = 15\text{ V} \sim -15\text{ V}$ $I_C = 50\text{ A}$	-	60	-	ns
$t_r$	Rise Time		-	40	-	ns
$t_d(off)$	Turn-Off Delay Time		-	548	-	ns
$t_f$	Fall Time		-	32	-	ns
$E_{on}$	Turn-On Switching Loss		-	5.6	-	mJ
$E_{off}$	Turn-Off Switching Loss		-	1.6	-	mJ
$E_{is}$	Total Switching Loss		-	7.2	-	mJ
$Q_g$	Total Gate Charge	$V_{GE} = 0\text{ V} \sim +15\text{ V}$	-	410	-	nC
$Q_{ge}$	Gate-Emitter Charge		-	45	-	nC
$Q_{gc}$	Gate-Collector Charge		-	206	-	nC

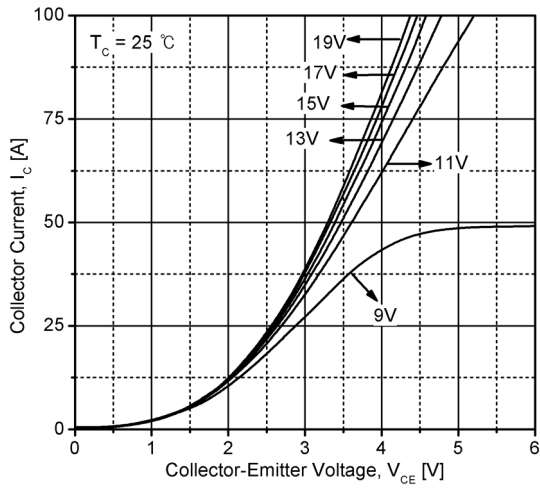
## Electrical Characteristics of Diode $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units	
$V_F$	Diode Forward Voltage	$I_F = 50\text{ A}$ $V_{GE} = 0\text{ V}$	$T_C = 25^\circ\text{C}$	-	1.8	-	V
			$T_C = 125^\circ\text{C}$	-	1.7	-	
$t_{rr}$	Diode Reverse Recovery Time	$R_G = 15\ \Omega$ $L = 200\ \mu\text{H}$ $V_{DC} = 600\text{ V}$ $V_{GE} = 15\text{ V} \sim -15\text{ V}$ $I_C = 50\text{ A}$	$T_C = 25^\circ\text{C}$	-	236	-	ns
			$T_C = 125^\circ\text{C}$	-	610	-	
$I_{RRM}$	Diode Peak Reverse Recovery Current		$T_C = 25^\circ\text{C}$	-	55	-	A
			$T_C = 125^\circ\text{C}$	-	66	-	
$Q_{rr}$	Diode Reverse Recovery Charge		$T_C = 25^\circ\text{C}$	-	4.5	-	$\mu\text{C}$
			$T_C = 125^\circ\text{C}$	-	11.0	-	
$E_{rr}$	Diode Reverse Recovery Energy	$T_C = 25^\circ\text{C}$	-	1.1	-	mJ	
		$T_C = 125^\circ\text{C}$	-	4.0	-		

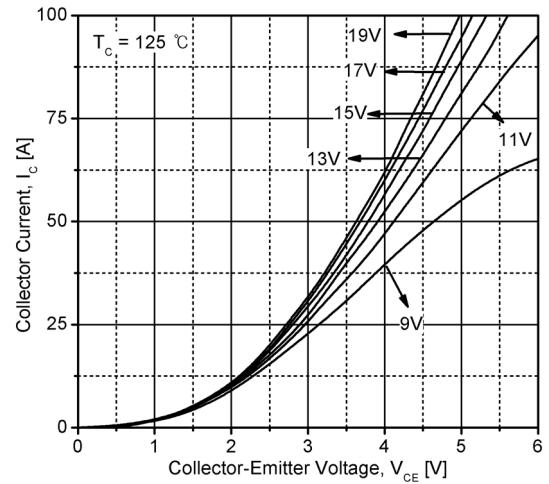
### Thermal Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$R_{th(J-C)}$	Thermal Resistance (IGBT Part)	Junction-to-Case	-	0.32	-	$^\circ\text{C/W}$
$R_{th(J-C)D}$	Thermal Resistance (Diode Part)	Junction-to-Case	-	-	-	$^\circ\text{C/W}$

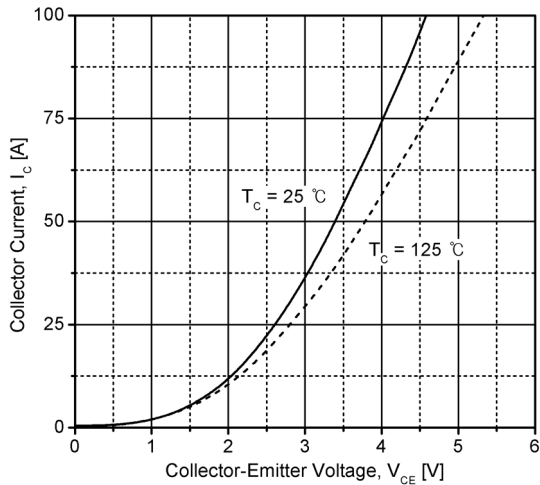
\* This specifications may not be considered as an assurance of characteristics and may not have same characteristics in case of using different test systems from @LSIS. We therefore strongly recommend prior consultation of our engineers.



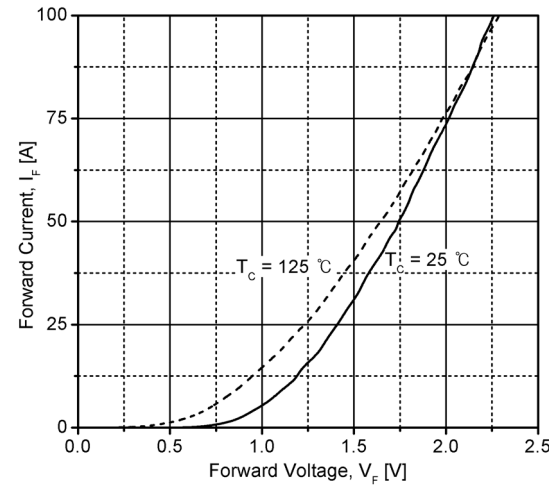
**Fig 1. Typical IGBT Output Characteristics**



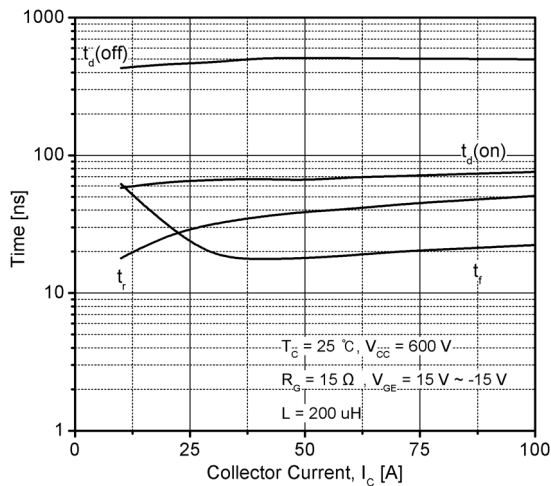
**Fig 2. Typical IGBT Output Characteristics**



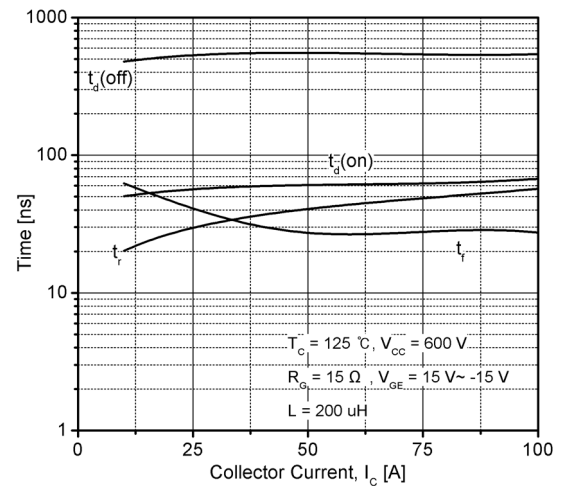
**Fig 3. Typical IGBT Output Characteristics**



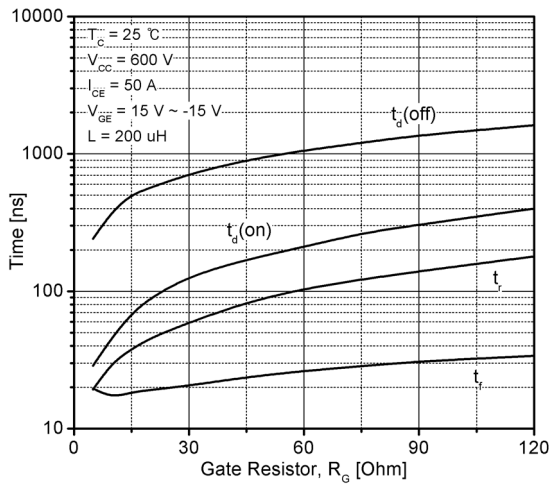
**Fig 4. Typical Diode Forward Characteristics**



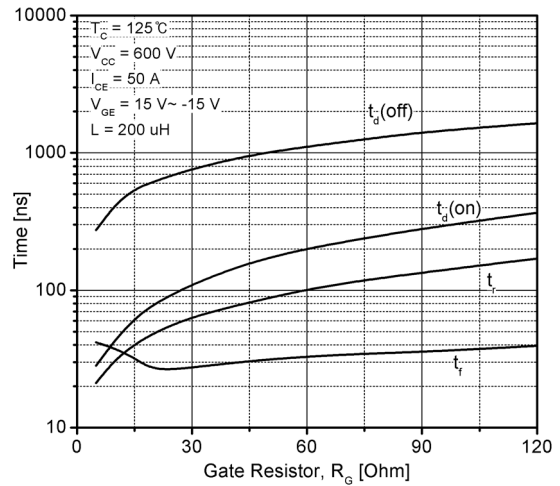
**Fig 5. Typical Switching Time vs. Collector Current**



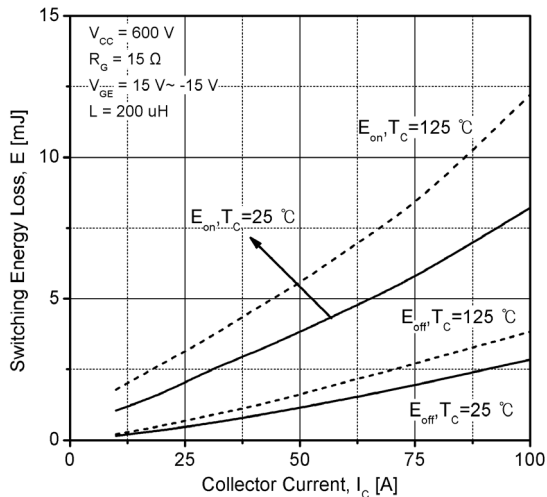
**Fig 6. Typical Switching Time vs. Collector Current**



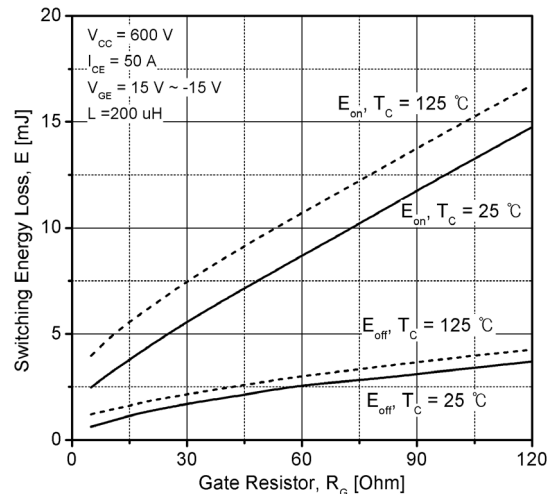
**Fig 7. Typical Switching Time vs. Gate Resistor**



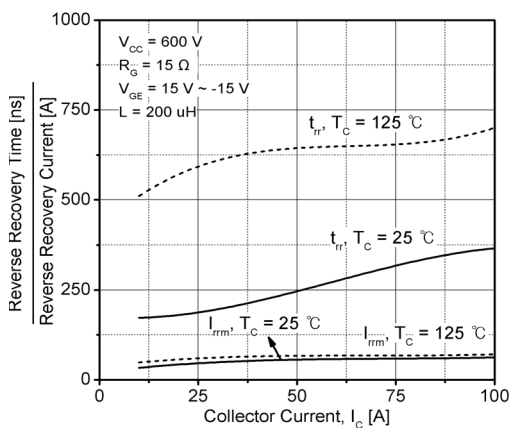
**Fig 8. Typical Switching Time vs. Gate Resistor**



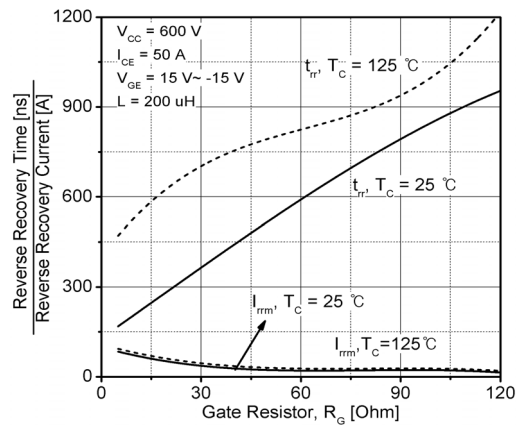
**Fig 9. Typical IGBT Switching Loss**



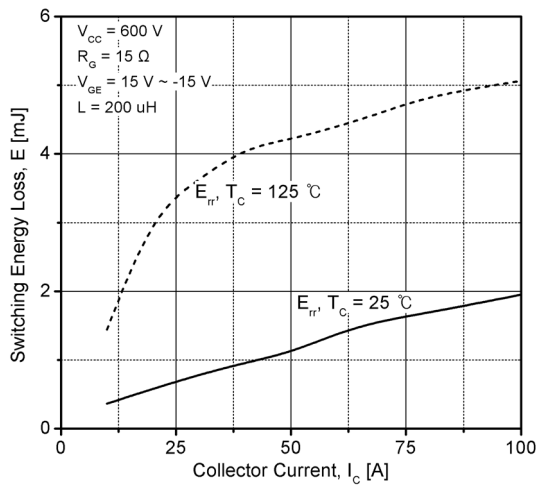
**Fig 10. Typical IGBT Switching Loss**



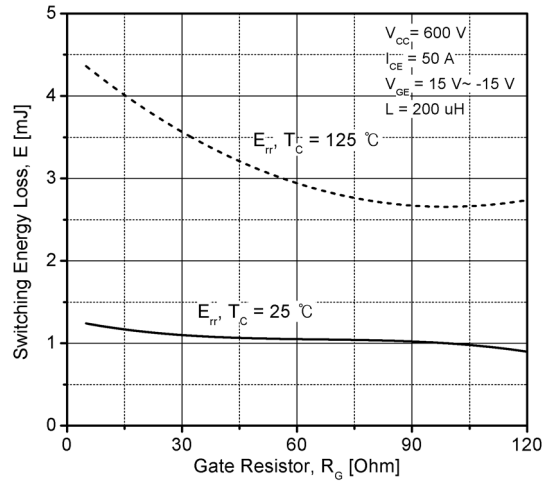
**Fig 11. Typical Recovery Characteristics of Diode**



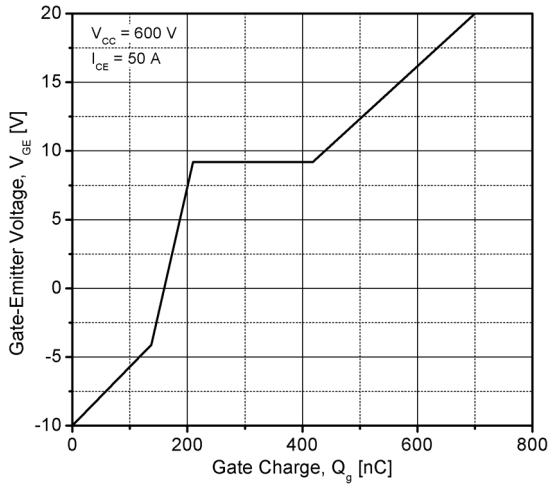
**Fig 12. Typical Recovery Characteristics of Diode**



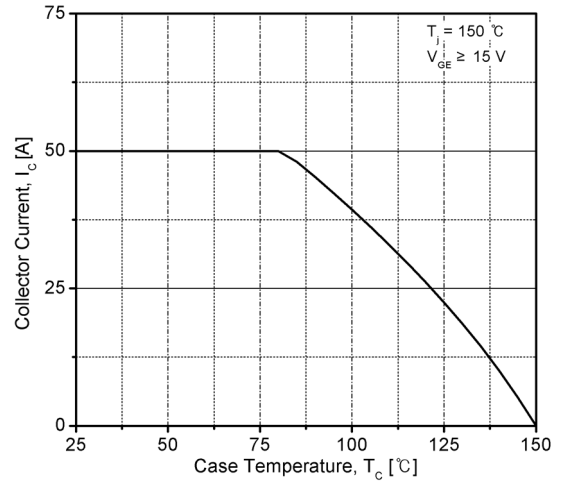
**Fig 13. Typical Diode Switching Loss**



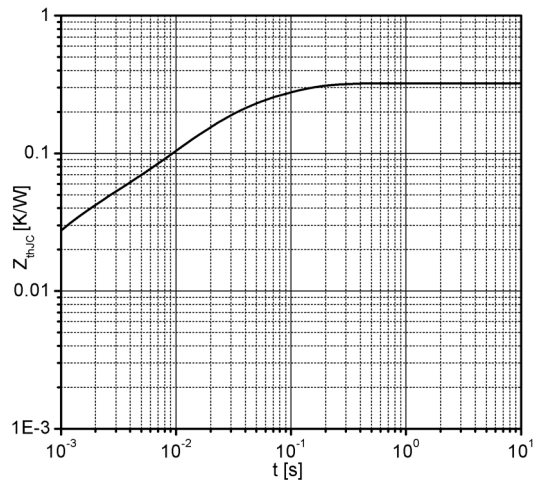
**Fig 14. Typical Diode Switching Loss**



**Fig 15. Typical Gate Charge Characteristics**

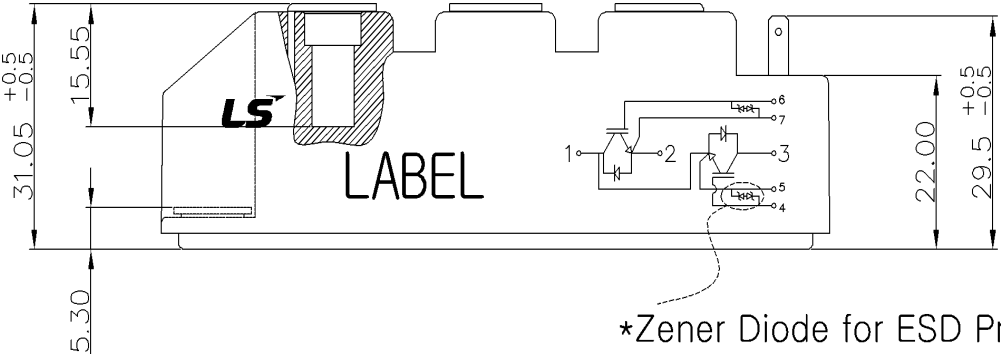
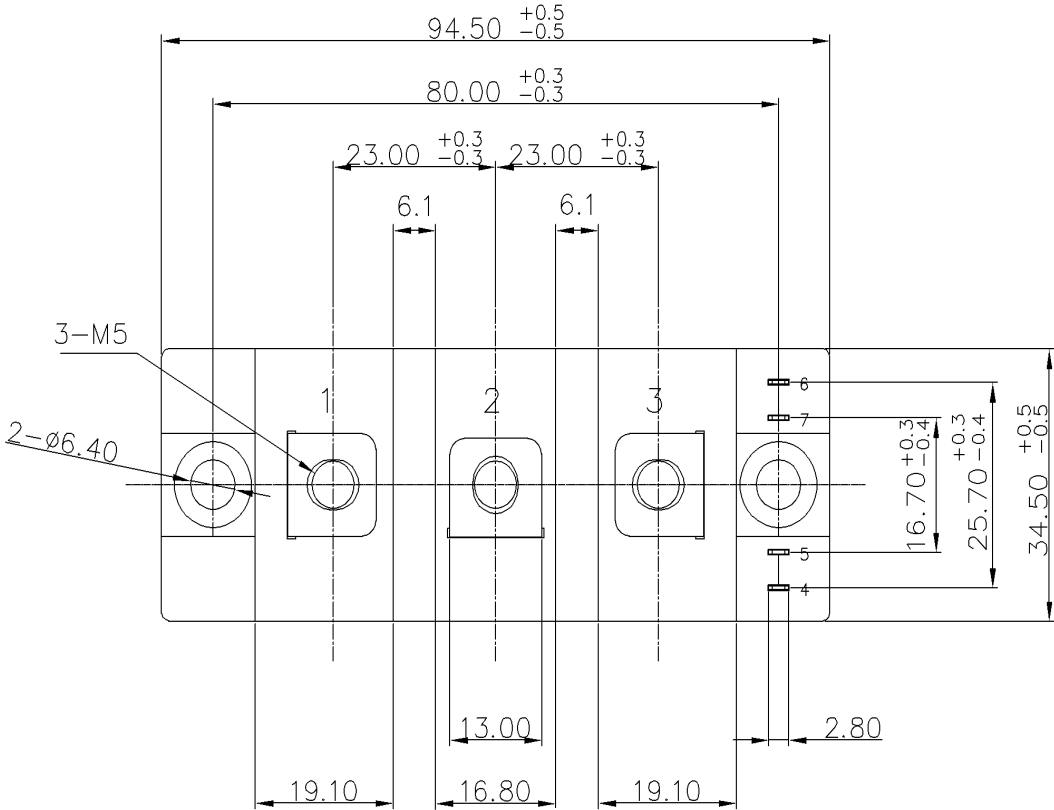


**Fig 16. Case Temperature vs. Collector Current**



**Fig 17. Typical Transient Thermal Impedance**

Package Dimension(Dimension in mm)



\*Zener Diode for ESD Protection.