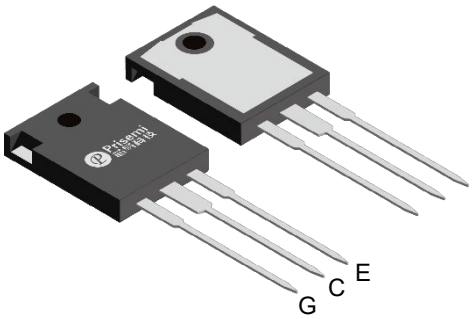
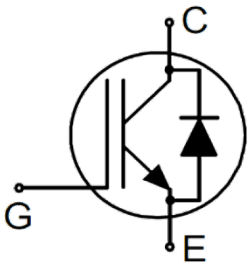
Insulate-Gate Bipolar Transistor

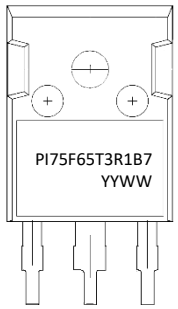
Description



TO-247-3L



Circuit Diagram



Marking (Top View)

Feature

- Easy paralleling capability due to positive temperature coefficient in $V_{CE(sat)}$
- Low EMI
- Low Gate Charge
- Low Saturation Voltage $V_{CE(sat)}$
- Maximum junction temperature T_{VJmax}=175°C

Applications

- UPS
- EV-Charger
- Solar String Inverter
- Energy Storage Inverter

Absolute maximum rating@25℃

Parameter		Symbol	Value	Units
Collector-Emitter Voltage		V_{CE}	650	V
Gate-Emitter Voltage		V_{GE}	±20	V
Transient Gate-emitter Voltage (t_p≤10μs, D<0.010)			±30	
Collector Current	T_c= 25℃	I_C	90*1	A
	T_c= 100℃		75	
Pulsed Collector Current		I_{CM}	300	A
Diode Current	T_c= 25℃	I_F	90*1	A
	T_c= 100℃		75	
Diode Pulsed Current		I_{FM}	300	A
Power Dissipation	T_c= 25℃	P_D	330	W
	T_c= 100℃		160	
Operating Junction Temperature		T_{VJ}	-40~+175	℃
Storage Temperature		T_{STG}	-55~+150	℃

Notes:

1.The max Collector current rating is package limited

2.Repetitive Rating: Pulse width limited by maximum junction temperature

Electrical characteristics per line@25℃ (unless otherwise specified)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Units
Collector-Emitter Breakdown Voltage	BV_{CE}	-		650	-	-	V
C-E Leakage Current	I_{CES}	V_{CE}=650V, V_{GE}=0V		-	-	75	μA
G-E Leakage Current	I_{GES}	V_{GE}=±20V, V_{CE}=0V		-	-	100	nA
Transconductance	g_{fs}	V_{GE}=20V, I_C=75A		-	86	-	S
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	I_C=0.25mA, V_{CE}=V_{GE}		3.2	4.0	4.8	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=75A, V_{GE}=15V	T_{VJ}=25℃	-	1.6	2.1	V
			T_{VJ}=125℃	-	1.86	-	
			T_{VJ}=175℃	-	2.0	-	
Diode forward voltage	V_F	I_C=75A, V_{GE}=0V	T_{VJ}=25℃	-	1.0	1.1	V
			T_{VJ}=125℃	-	0.95	1.0	
Input Capacitance	C_{ies}	V_{CE}=25V, V_{GE}=0V, f=1MHz		-	2810	-	pF
Output Capacitance	C_{oes}			-	215	-	
Reverse Transfer Capacitance	C_{res}			-	23	-	
Total Gate Charge	Q_g	V_{CE}=520V, V_{GE}=0V to 15V, I_C=75A		-	104	-	nC
Gate to Emitter Charge	Q_{ge}			-	15	-	
Gate to Collector Charge	Q_{gc}			-	30	-	
Turn-on Delay Time	$t_{d(on)}$	V_{CC}=400V, I_C=75A, V_{GE}=15V, R_G=8Ω, Inductive Load		-	20	-	ns
Rise Time	t_r			-	30	-	
Turn-off Delay Time	$t_{d(off)}$			-	130	-	
Fall Time	t_f			-	32	-	
Turn-on Energy Loss	E_{on}	V_{CC}=400V, I_C=75A, V_{GE}=15V, R_G=8Ω, Inductive Load		-	2.04	-	mJ
Turn-off Energy Loss	E_{off}			-	0.92	-	
Total Switching Loss	E_{st}			-	2.96	-	

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, IGBT Junction-Ambient	$R_{th(J-A)}$	-	-	40	℃/W
Thermal Resistance, IGBT Junction to Case	$R_{th(J-C)}$	-	-	0.45	℃/W
Thermal Resistance, FRD Junction to Case	$R_{th(J-C)}$	-	-	0.4	℃/W

Typical Characteristics

Fig 1. Typical Output Characteristics (25°C)

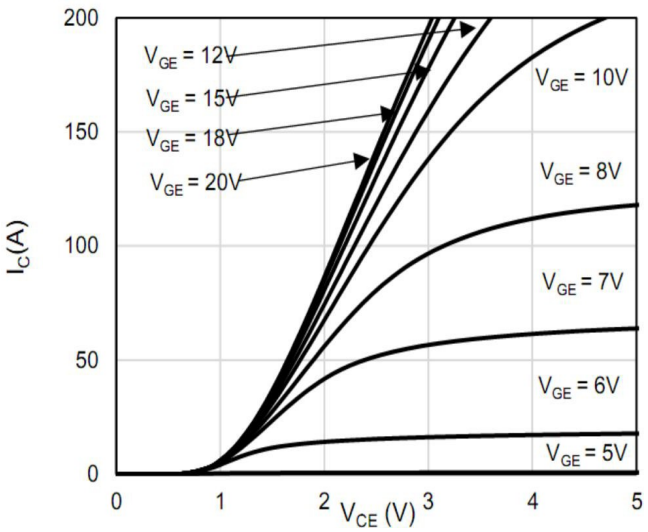


Fig 2. Typical Output characteristics (150°C)

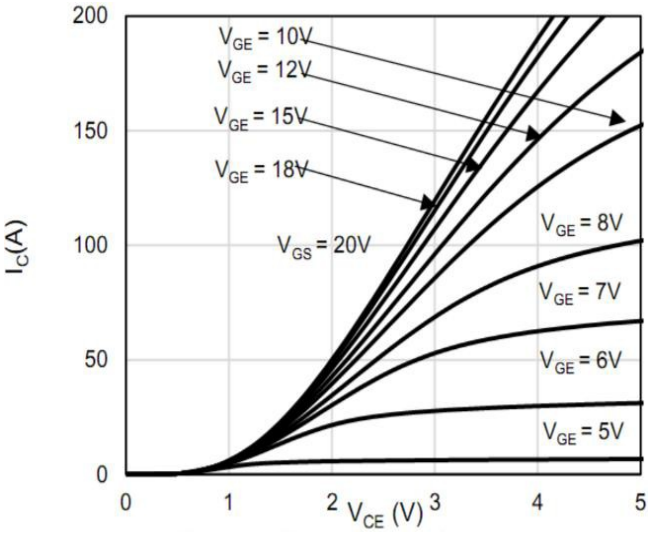


Fig 3. Forward Bias Safe Operating Area

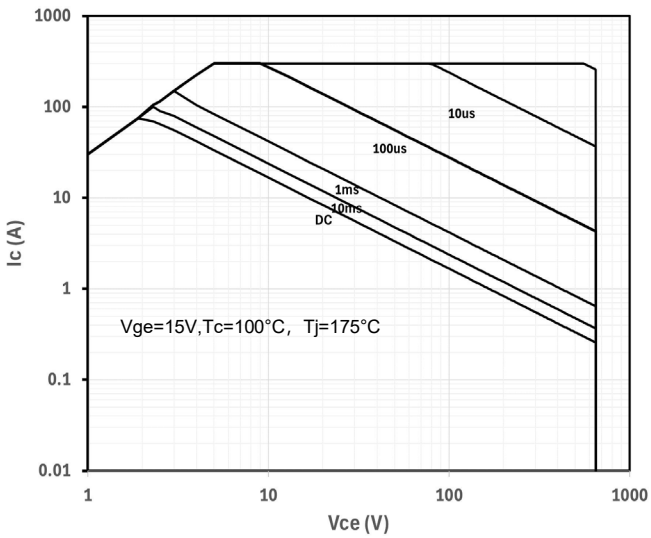


Fig 4. Transfer Characteristics

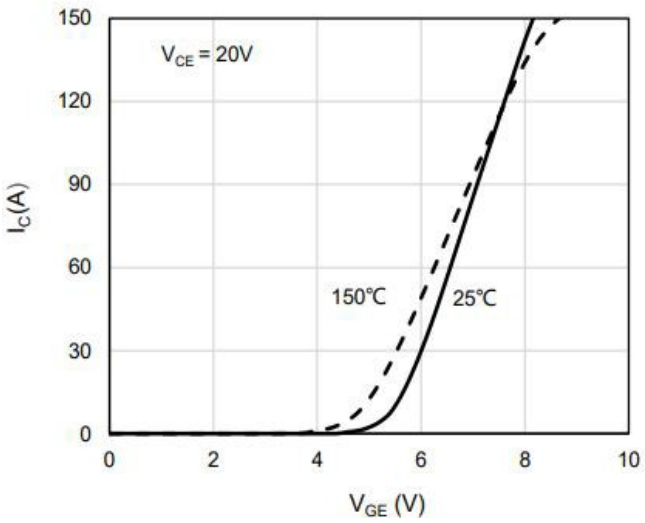


Fig 5. Gate Charge

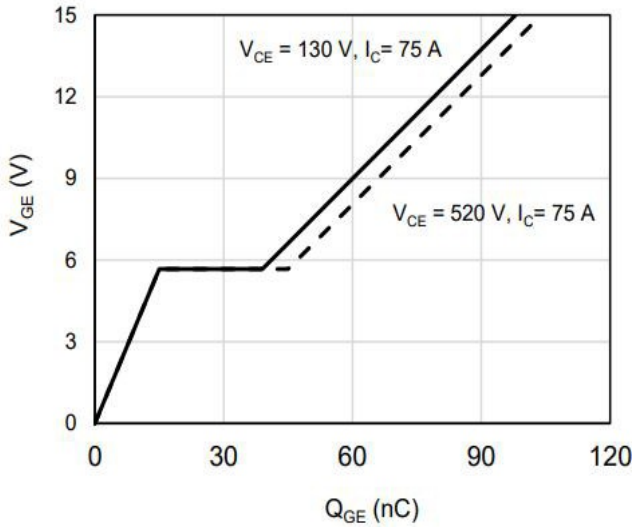


Fig 6. Typical Capacitance

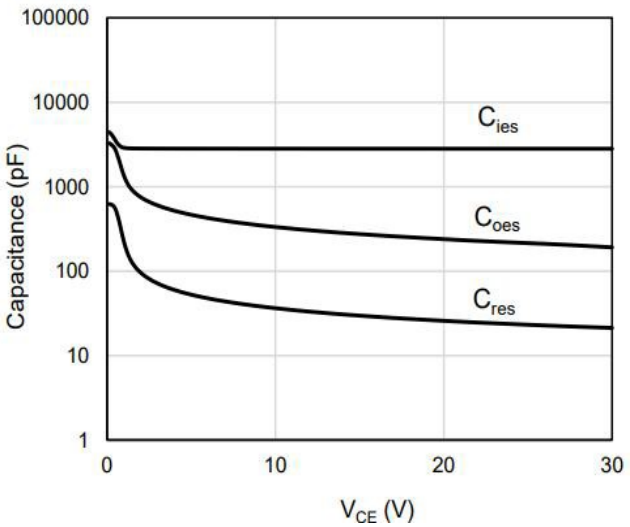


Fig 7. Vcesat vs. Junction Temperature

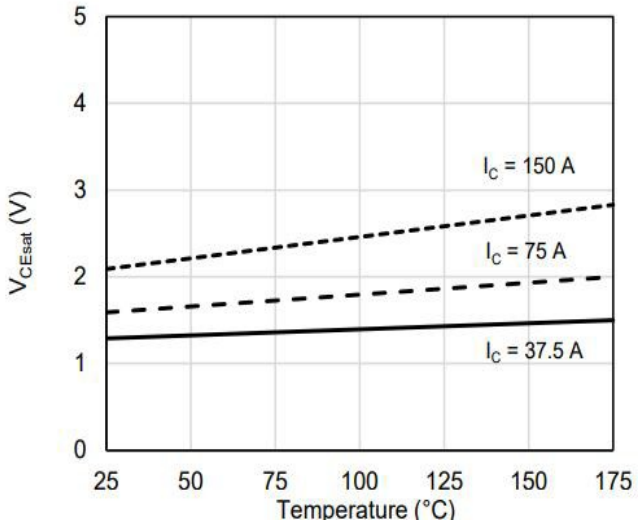


Fig 8. Typical Diode VF vs. IF Characteristic

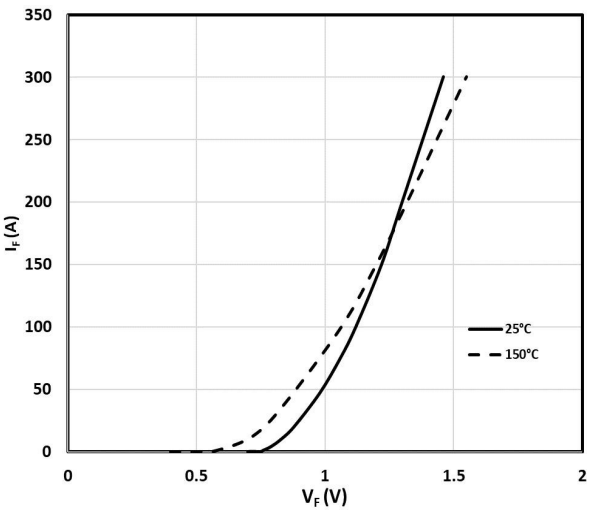


Fig 9. Threshold Voltage vs. Junction Temperature

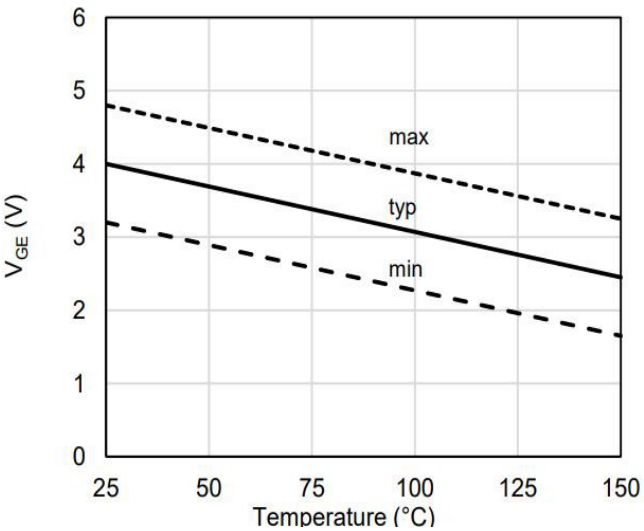


Fig 10. Switching Energy Loss vs. Collector Current

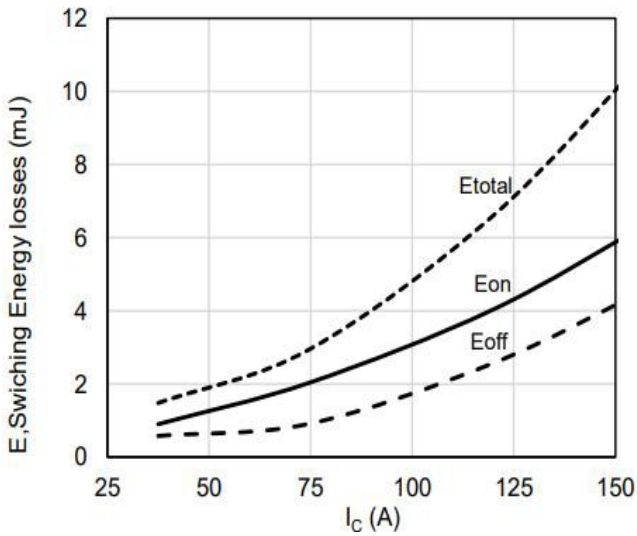


Fig 11. Switching Energy Loss vs. Rg

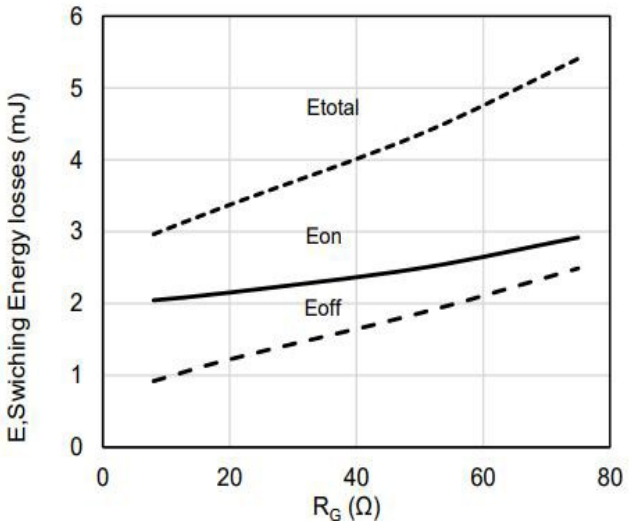


Fig 12. Transient Thermal Impedance IGBT

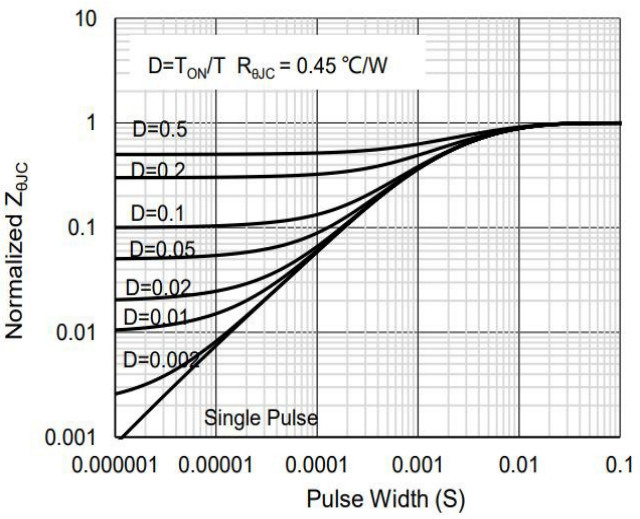


Fig 13. Transient Thermal Impedance Diode

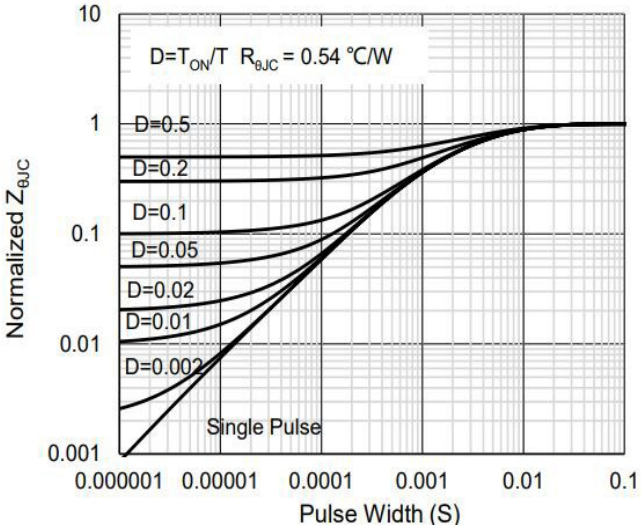


Fig 14. Switching Test Circuit & Waveforms

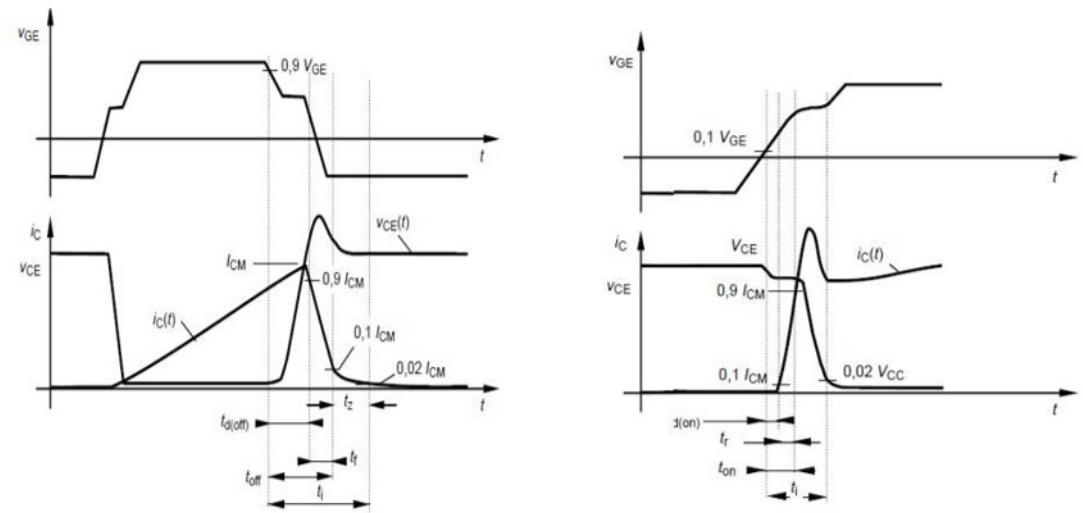
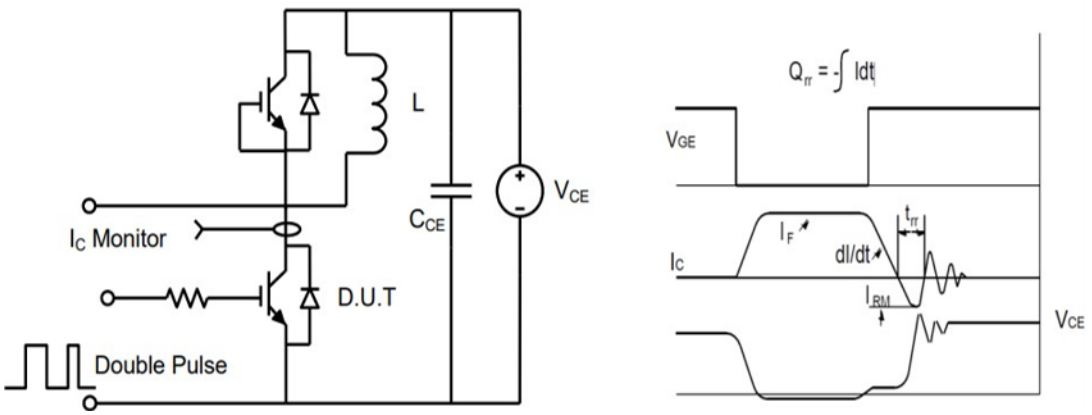
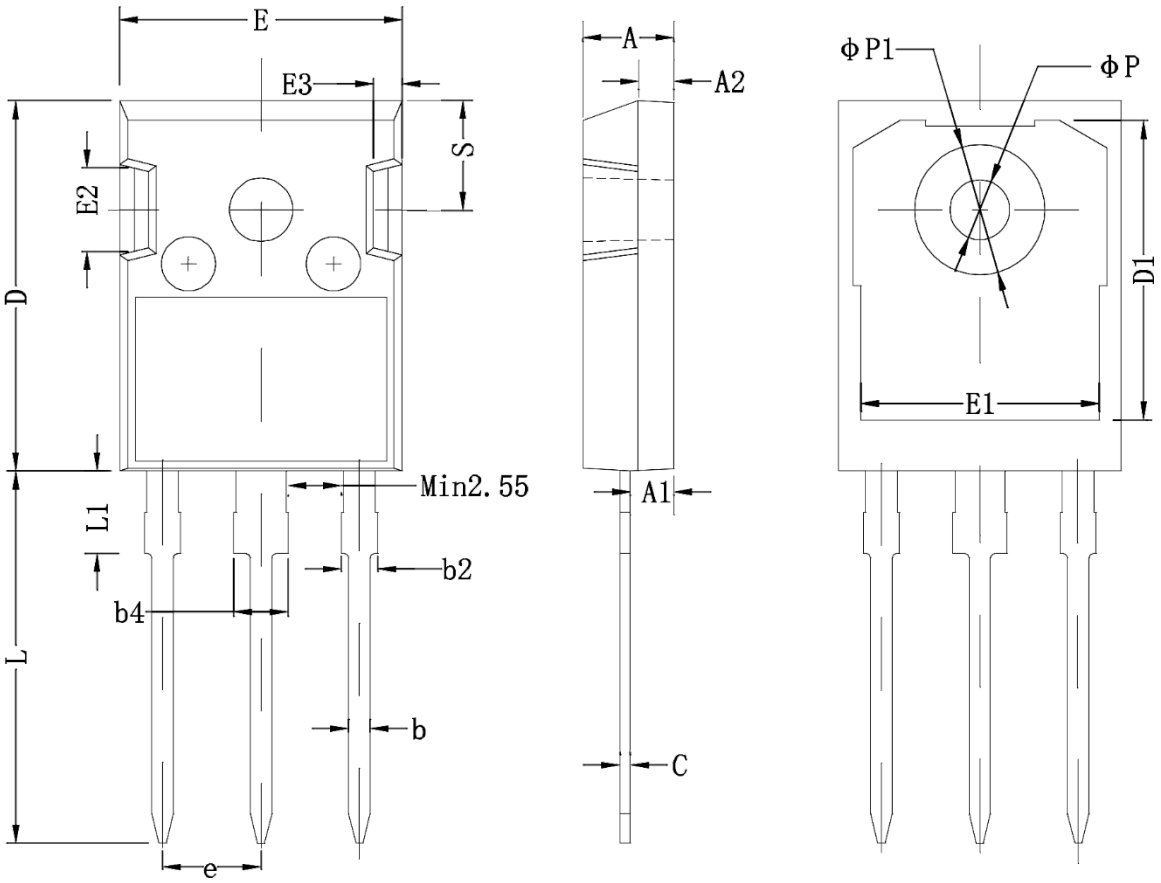


Fig 15. Diode Recovery Test Circuit & Waveforms



Product Dimension (TO-247-3L)



Dim	Millimeters			Dim	Millimeters		
	Min	Nom	Max		Min	Nom	Max
A	4.80	5.00	5.20	E1	13.00	13.30	13.60
A1	2.21	2.41	2.59	E2	4.80	5.00	5.20
A2	1.85	2.00	2.15	E3	2.30	2.50	2.70
b	1.11	1.21	1.36	e	5.44 BSC.		
b2	1.91	2.01	2.21	L	19.62	19.92	20.22
b4	2.91	3.01	3.21	L1	-		4.30
c	0.51	0.61	0.75	φP	3.40	3.60	3.80
D	20.70	21.00	21.30	φP1	-		7.30
D1	16.25	16.55	16.85	S	6.15 BSC.		
E	15.50	15.80	16.10				

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