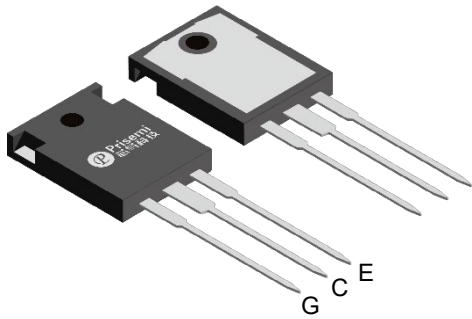
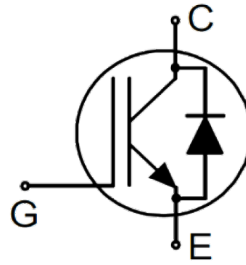
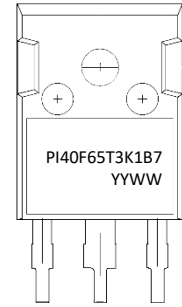


Description

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 $T_{VJmax}=175^{\circ}C$

Applications

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

Absolute maximum rating@25°C

Parameter		Symbol	Value	Units
Collector-Emitter Voltage		V_{CE}	650	V
Gate-Emitter Voltage		V_{GE}	± 20	V
Transient Gate-emitter Voltage ($t_p \leq 10\mu s, D < 0.010$)			± 30	
Collector Current	$T_c = 25^{\circ}C$	I_C	80	A
	$T_c = 100^{\circ}C$		40	
Pulsed Collector Current		I_{CM}	160	A
Diode Current	$T_c = 25^{\circ}C$	I_F	80	A
	$T_c = 100^{\circ}C$		40	
Diode Pulsed Current		I_{FM}	160	A
Power Dissipation	$T_c = 25^{\circ}C$	P_D	250	W
	$T_c = 100^{\circ}C$		125	
Operating Junction Temperature		T_{VJ}	-40~+175	$^{\circ}C$
Storage Temperature		T_{STG}	-55~+150	$^{\circ}C$

Electrical characteristics per line@25°C (unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	
Collector-Emitter Breakdown Voltage	BV_{CE}	-	650	-	-	V	
C-E Leakage Current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$	-	-	40	μA	
G-E Leakage Current	I_{GES}	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	100	nA	
Transconductance	g_{fs}	$V_{GE}=15V, I_C=40A$	-	56	-	S	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C=0.25mA, V_{CE}=V_{GE}$	3.5	4.2	5.0	V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=40A, V_{GE}=15V$	$T_{VJ}=25^\circ C$	-	1.62	2.1	V
			$T_{VJ}=125^\circ C$	-	1.86	-	
			$T_{VJ}=175^\circ C$	-	1.96	-	
Diode forward voltage	V_F	$I_C=40A, V_{GE}=0V$	$T_{VJ}=25^\circ C$	-	1.8	-	V
			$T_{VJ}=125^\circ C$	-	1.5	-	
			$T_{VJ}=175^\circ C$	-	1.35	-	
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz$	-	1550	-	pF	
Output Capacitance	C_{oes}		-	120	-		
Reverse Transfer Capacitance	C_{res}		-	10	-		
Total Gate Charge	Q_g	$V_{CE}=520V, V_{GE}=0V \text{ to } 15V, I_C=40A$	-	55	-	nC	
Gate to Emitter Charge	Q_{ge}		-	6.8	-		
Gate to Collector Charge	Q_{gc}		-	16	-		
Turn-on Delay Time	$t_{d(on)}$	$V_{CC}=400V, I_C=40A, V_{GE}=15V, R_G=15\Omega, \text{ Inductive Load}$	-	25	-	ns	
Rise Time	t_r		-	27	-		
Turn-off Delay Time	$t_{d(off)}$		-	135	-		
Fall Time	t_f		-	33	-		
Turn-on Energy Loss	E_{on}	$V_{CC}=400V, I_C=40A, V_{GE}=15V, R_G=15\Omega, \text{ Inductive Load}$	-	0.87	-	mJ	
Turn-off Energy Loss	E_{off}		-	0.40	-		
Total Switching Loss	E_{st}		-	1.27	-		
Diode Reverse Recovery Time	T_{rr}	$V_R=400V, I_F=40A, di/dt=400A/\mu S$	-	56	-	ns	
Diode Reverse Recovery Charge	Q_{rr}		-	0.27	-	μC	
Diode Reverse Recovery Current	I_{rm}		-	8.0	-	A	

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, IGBT Junction-Ambient	$R_{th(J-A)}$	-	-	40	$^{\circ}C/W$
Thermal Resistance, IGBT Junction to Case	$R_{th(J-C)}$	-	-	0.62	$^{\circ}C/W$
Thermal Resistance, FRD Junction to Case	$R_{th(J-C)}$	-	-	0.65	$^{\circ}C/W$

Typical Characteristics

Fig 1. Typical Output Characteristics (25°C)

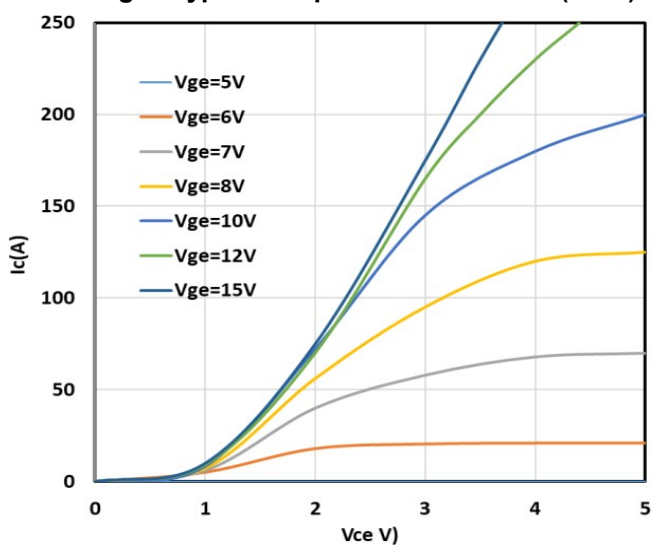


Fig 2. Typical Output characteristics (175°C)

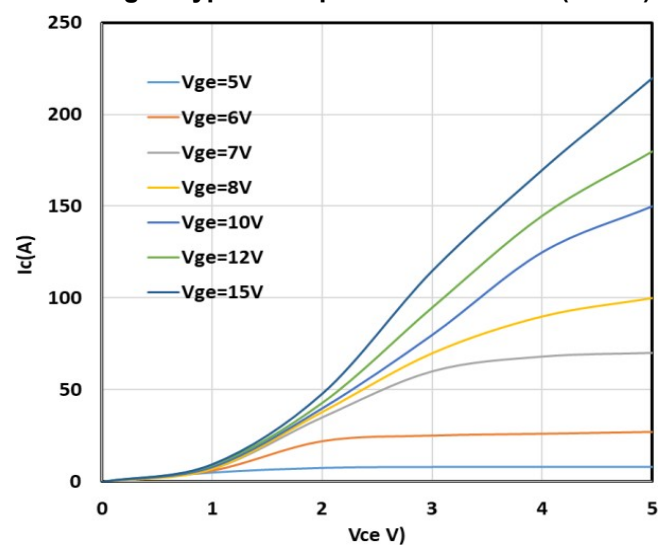


Fig 3. Forward Bias Safe Operating Area

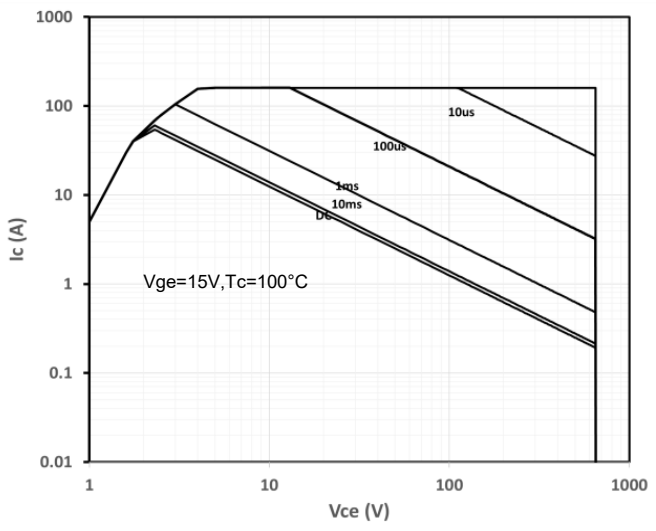
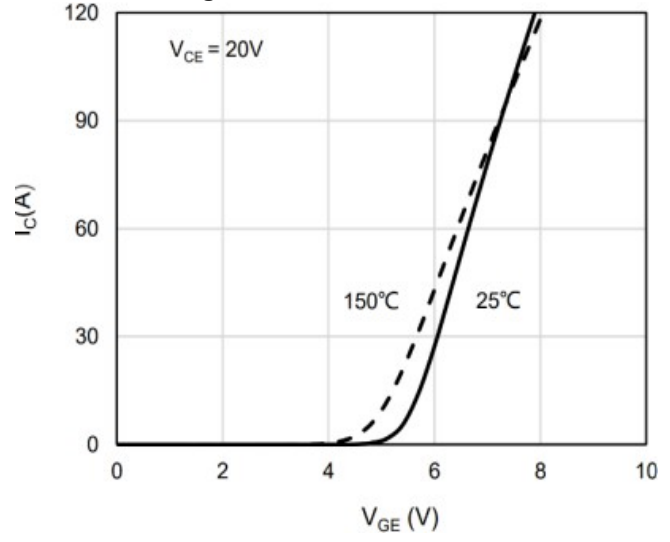


Fig 4. Transfer Characteristics



Typical Characteristics

Fig 5. Gate Charge

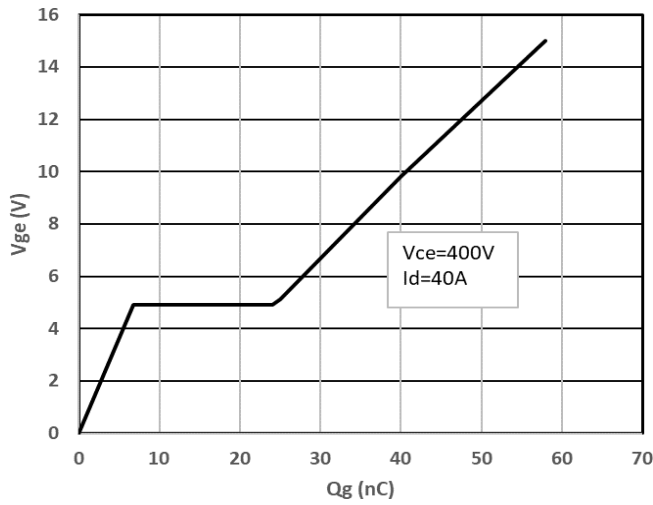


Fig 6. Typical Capacitance

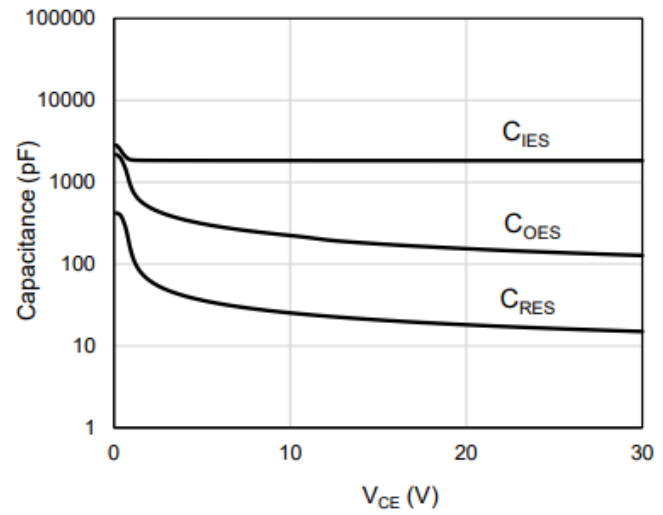


Fig 7. Vcesat vs. Junction Temperature

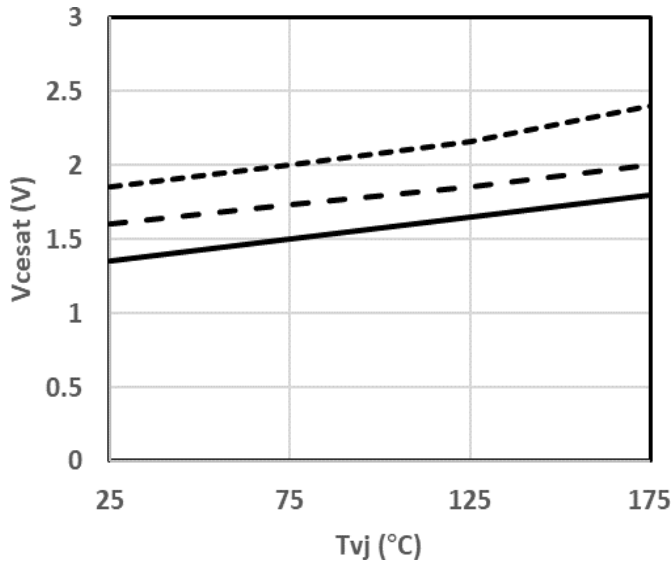


Fig 8. Typical Diode VF vs. IF Characteristic

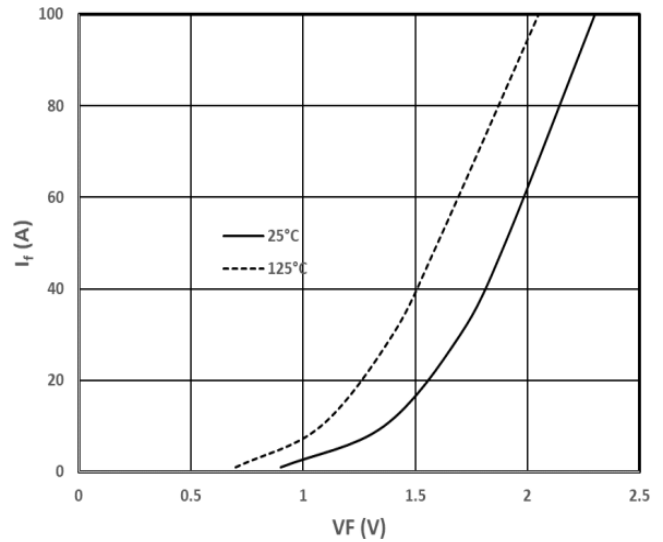


Fig 9. Threshold Voltage vs. Junction Temperature

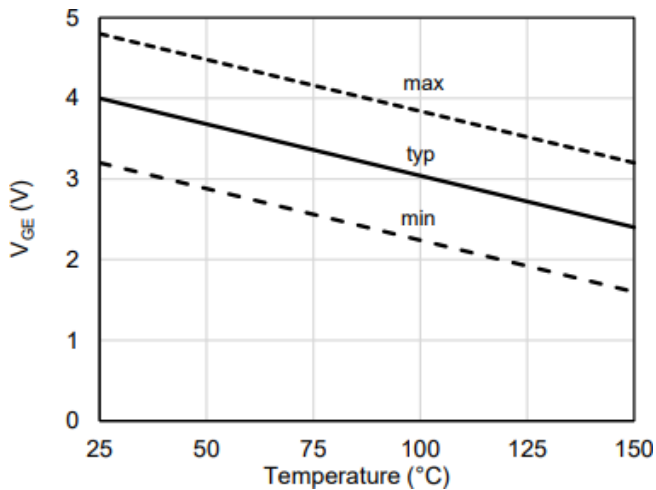


Fig 10. Transient Thermal Impedance IGBT

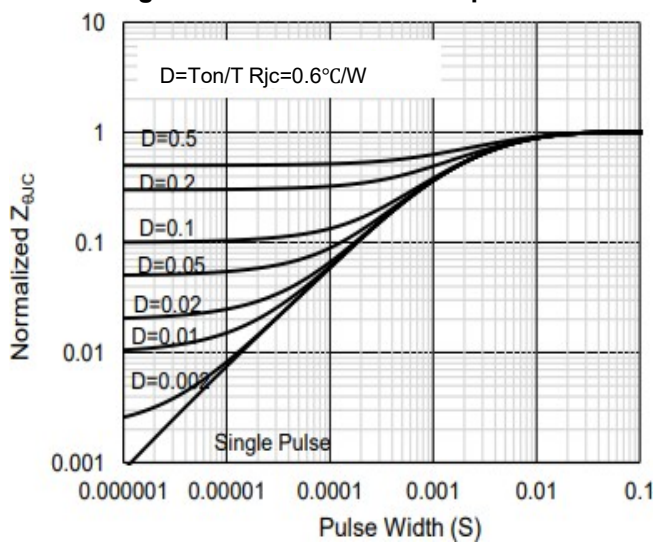


Fig 11. Transient Thermal Impedance Diode

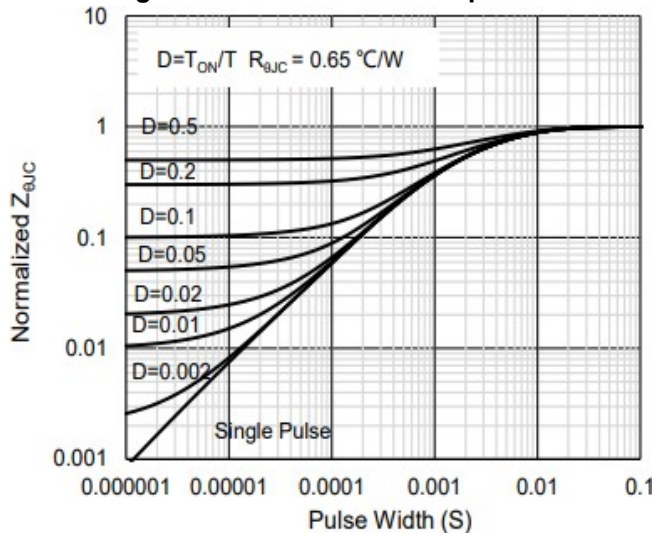


Fig 12. Switching Test Circuit & Waveforms

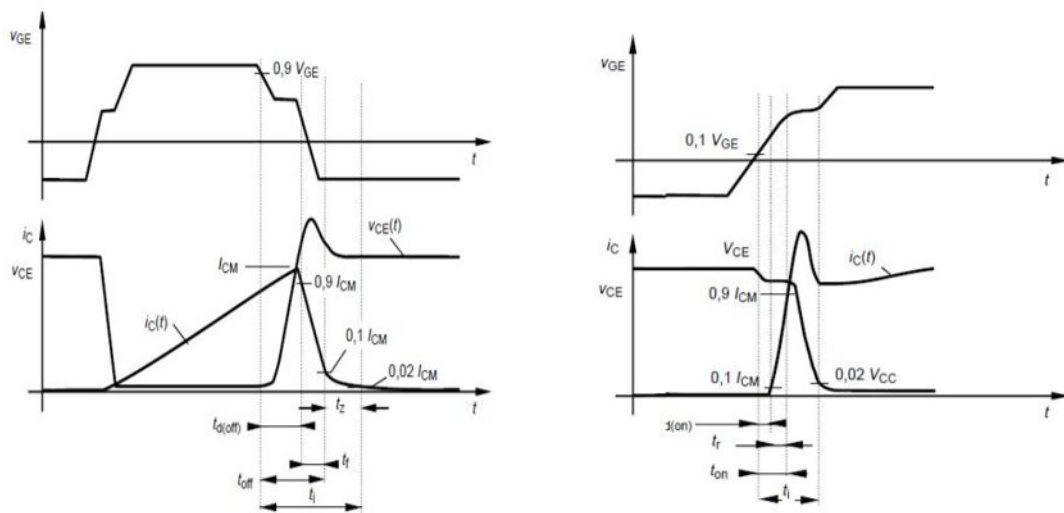
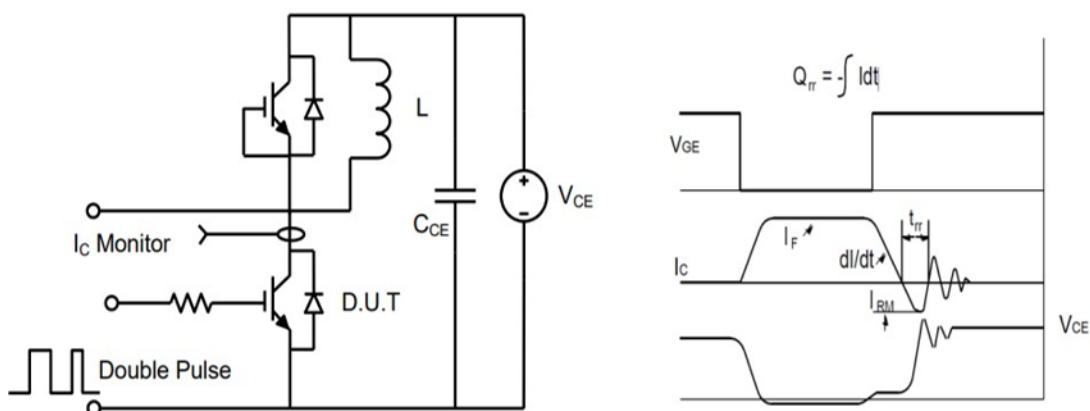
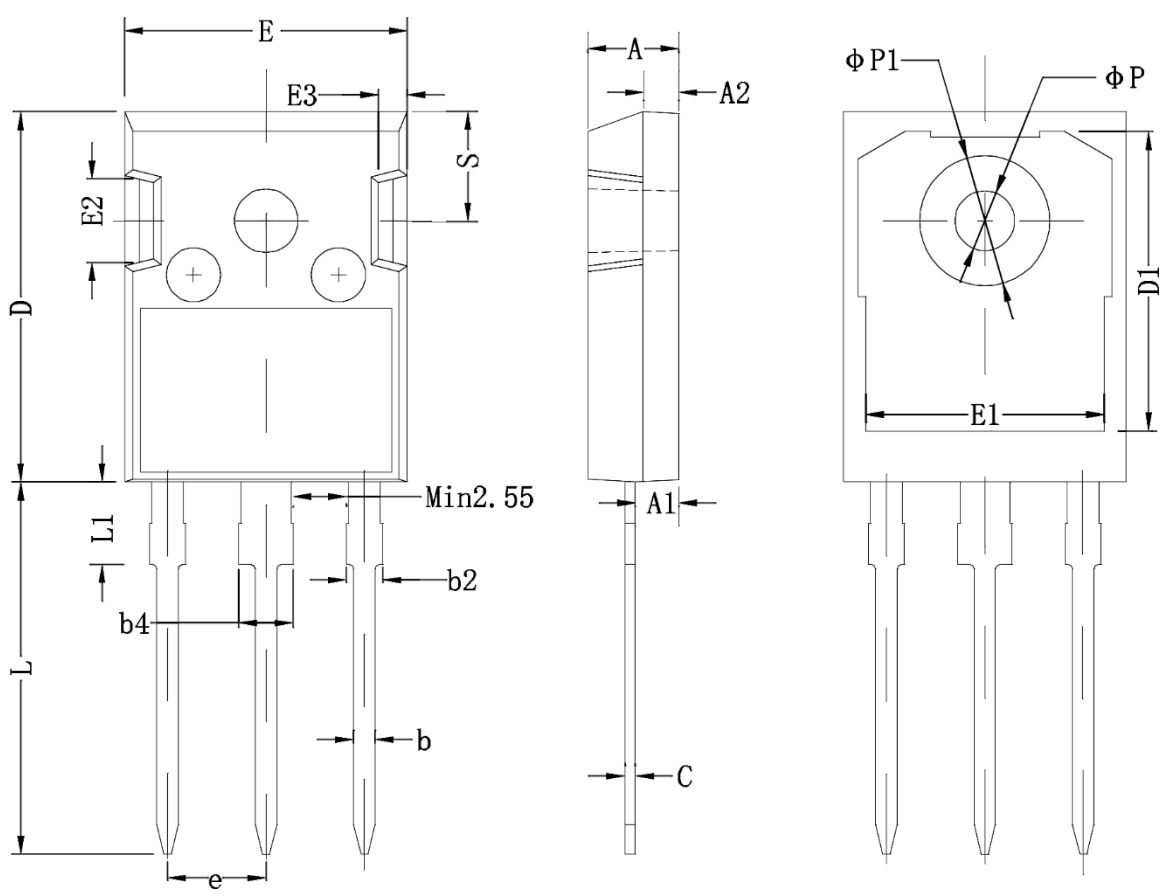


Fig 13. Diode Recovery Test Circuit & Waveforms




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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