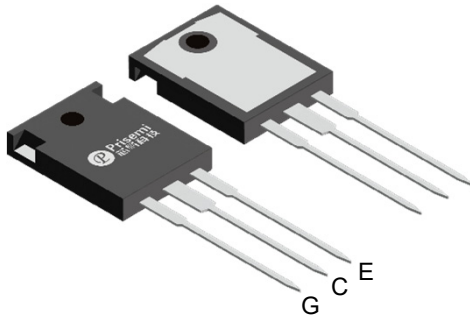
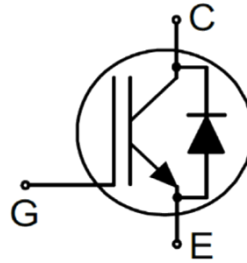
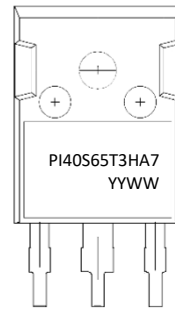


Insulate-Gate Bipolar Transistor
Description

TO-247-3L

Circuit Diagram

Marking (Top View)
Feature

- Low switching power loss
- Low switching surge and noise
- Advanced Field Stop technology
- Low EMI
- Qualified according to JEDEC for target applications
- Pb-free lead plating, halogen-free mold compound, RoHS compliant
- Internal insulation

Applications

- Industrial UPS
- Welding machine
- Solar converters
- Energy Storage
- EV Charger

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	I_C	$T_c = 25^\circ C$	80	A
		$T_c = 100^\circ C$	40	
Pulsed Collector Current	I_{CM}	120	A	
Diode Current	I_F	$T_c = 25^\circ C$	80	A
		$T_c = 100^\circ C$	40	
Power Dissipation	P_D	$T_c = 25^\circ C$	336	W
		$T_c = 100^\circ C$	165	
Operating Junction Temperature	T_J	-40~+150	$^\circ C$	
Storage Temperature	T_{STG}	-55~+150	$^\circ C$	
Wave Soldering Temperature for 10 sec	T_L	270	$^\circ C$	

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	
Collector-Emitter Breakdown Voltage	BV_{CE}	$V_{GE}=0V, I_C=250\mu A$	650	-	-	V	
C-E Leakage Current	I_{CES}	$V_{CE}=650V, V_{GE}=0V$	-	-	1.0	mA	
G-E Leakage Current	I_{GES}	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	± 200	nA	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C=1mA, V_{CE}=V_{GE}$	4.5	5.7	6.5	V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=40A, V_{GE}=15V$	$T_c=25^\circ C$	-	1.7	2.2	V
			$T_c=125^\circ C$	-	2.1	-	
Input Capacitance	C_{ies}	$V_{CE}=30V, V_{GE}=0V, f=1MHz$	-	2758	-	pF	
Output Capacitance	C_{oes}		-	170	-		
Reverse Transfer Capacitance	C_{res}		-	88	-		
Turn-on Delay Time	$t_{d(on)}$	$V_{CE}=400V, V_{GE}=15V, R_G=10\Omega, I_C=40A$	$T_c=25^\circ C$	-	42	-	ns
			$T_c=125^\circ C$	-	46	-	
Rise Time	t_r		$T_c=25^\circ C$	-	50	-	
			$T_c=125^\circ C$	-	61	-	
Turn-off Delay Time	$t_{d(off)}$		$T_c=25^\circ C$	-	218	-	
			$T_c=125^\circ C$	-	252	-	
Fall Time	t_f		$T_c=25^\circ C$	-	57	-	
			$T_c=125^\circ C$	-	36	-	
Turn-on Energy Loss	E_{on}	$V_{CE}=400V, V_{GE}=15V, R_G=10\Omega, I_C=40A$	$T_c=25^\circ C$	-	1.67	-	mJ
			$T_c=125^\circ C$	-	2.32	-	
Turn-off Energy Loss	E_{off}		$T_c=25^\circ C$	-	0.97	-	
			$T_c=125^\circ C$	-	1.16	-	
Total Switching Loss	E_{st}		$T_c=25^\circ C$	-	2.64	-	
		$T_c=125^\circ C$	-	3.48	-		
Total Gate Charge	Q_g	$V_{CE}=400V, V_{GE}=15V, I_C=40A$	-	165	-	nC	
Gate to Emitter Charge	Q_{ge}		-	15	-		
Gate to Collector Charge	Q_{gc}		-	96	-		
Diode Forward Voltage	V_F	$I_F=40A$	-	1.6	2.1	V	
Reverse Recovery Time	t_{rr}	$I_F=40A, di/dt=200A/\mu s$	-	48	-	ns	
Reverse Recovery Charge	Q_{rr}		-	106	-	nC	
Reverse Recovery Current	I_{rrm}		-	2.0	-	A	

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction to case for IGBT	$R_{th(J-C)}$	-	-	0.446	$^\circ C/W$
Thermal Resistance, Junction to case for Diode	$R_{th(J-C)}$	-	-	0.68	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{th(J-A)}$	-	-	40	$^\circ C/W$

Typical Characteristics

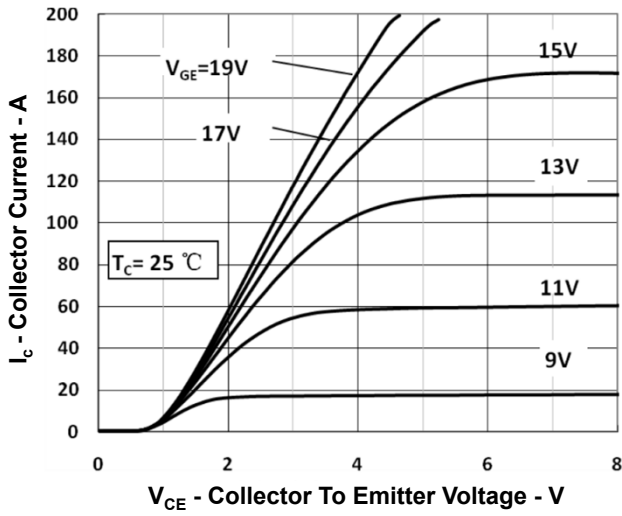


Figure 1. Output Characteristics

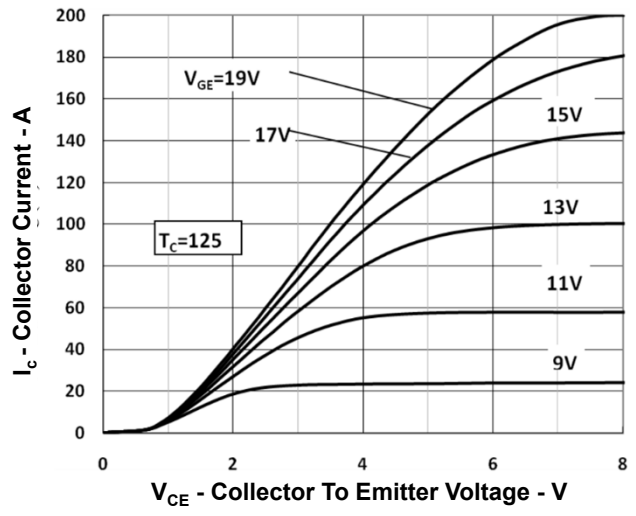


Figure 2. Output Characteristics

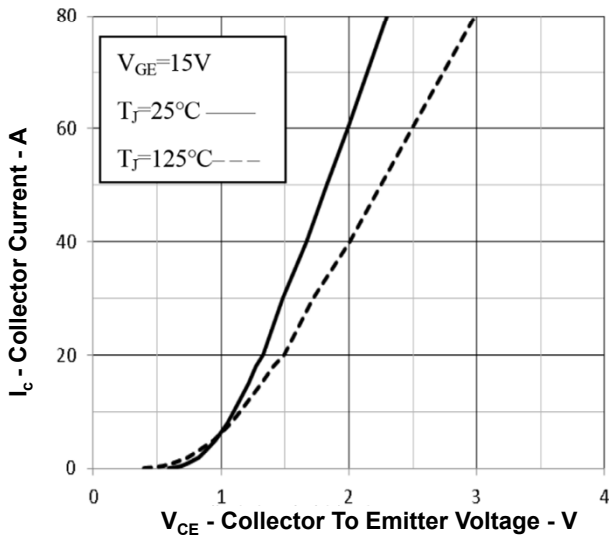


Figure 3. Saturation Voltage Characteristics

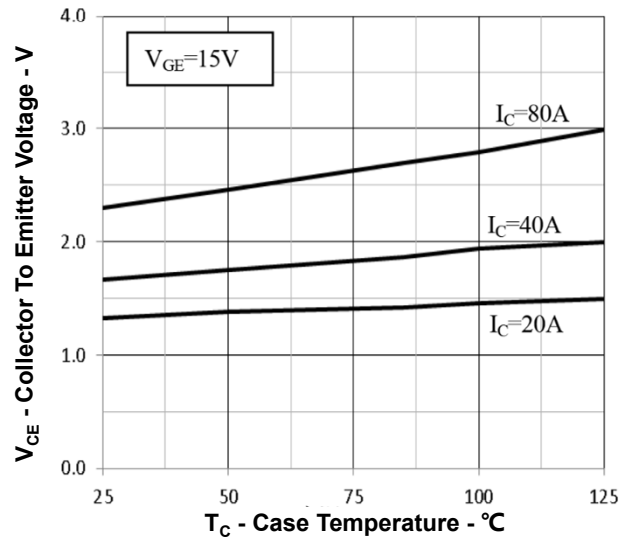


Figure 4. Saturation Voltage - T_C Characteristics

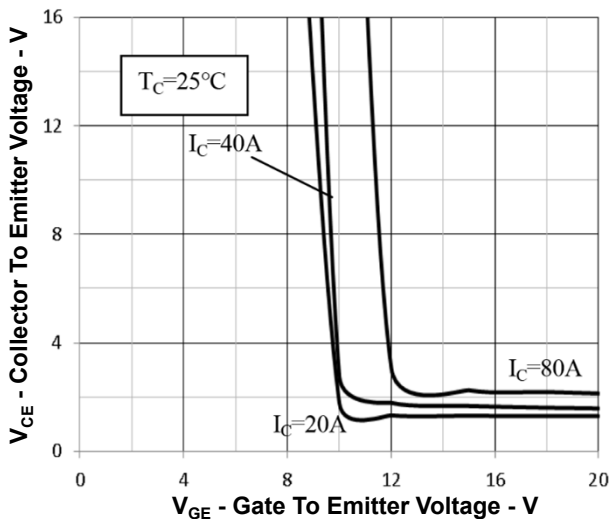


Figure 5. Saturation Voltage - V_{GE} Characteristics

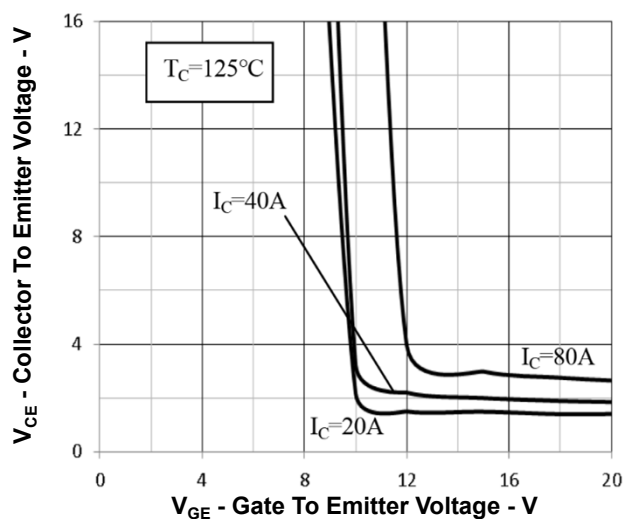


Figure 6. Saturation Voltage - V_{GE} Characteristics

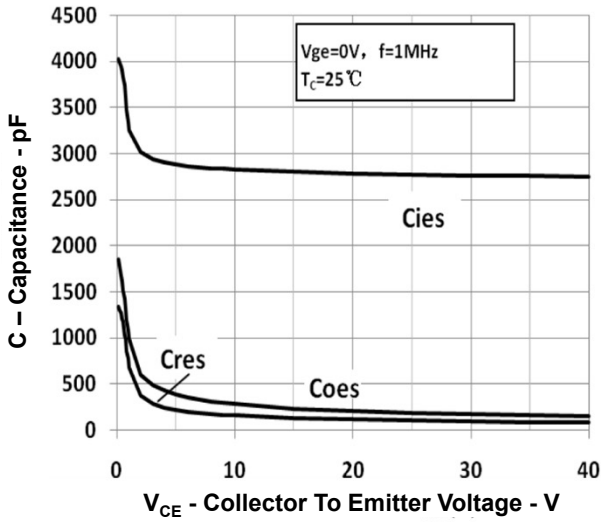


Figure 7. Capacitance Characteristics

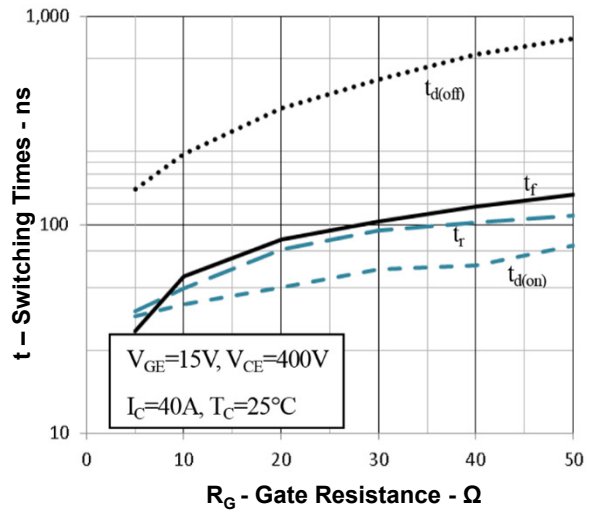


Figure 8. Switching Time- R_G Characteristics

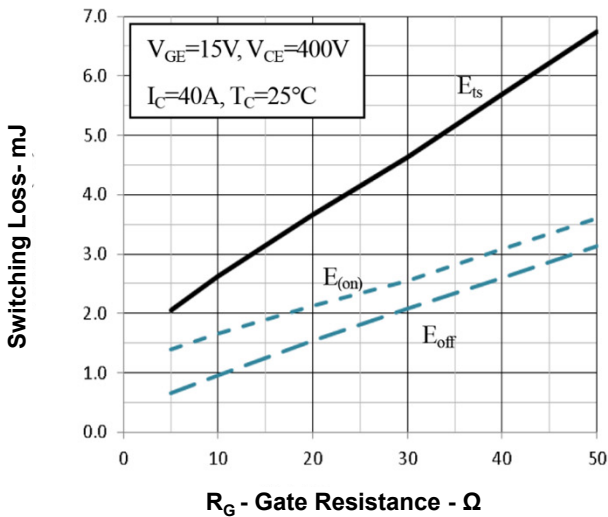


Figure 9. Switching Loss- R_G Characteristics

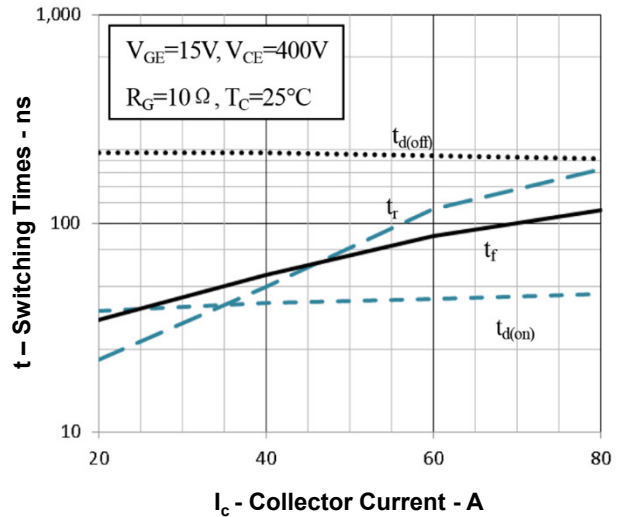


Figure 10. Switching Time- I_C Characteristics

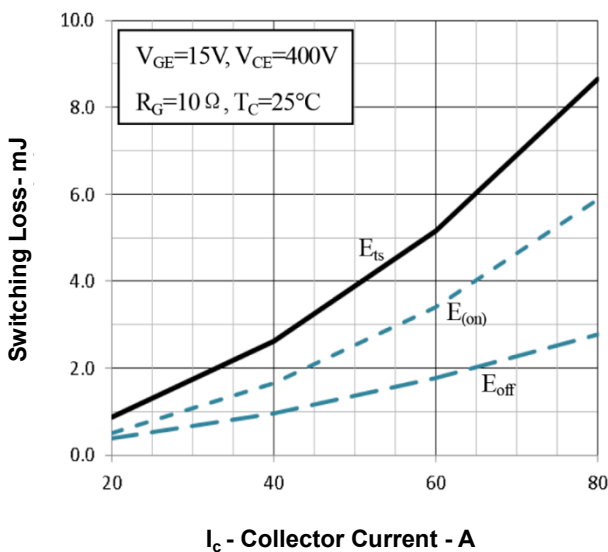


Figure 11. Switching Loss- I_C Characteristics

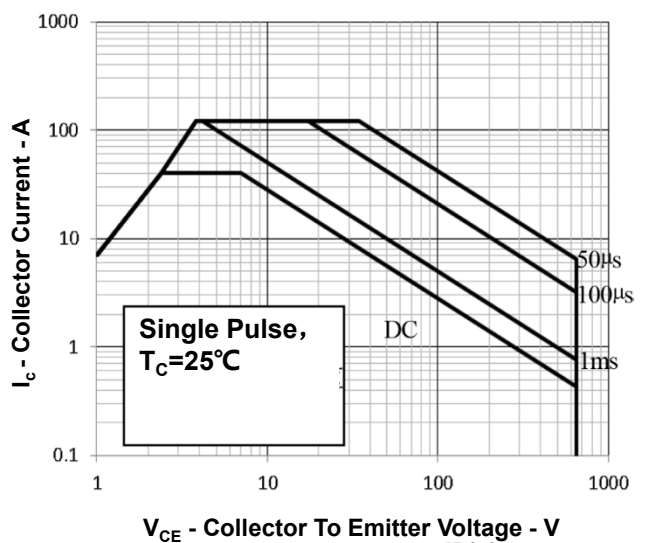


Figure 12. Forward Bias Safe Operating Area

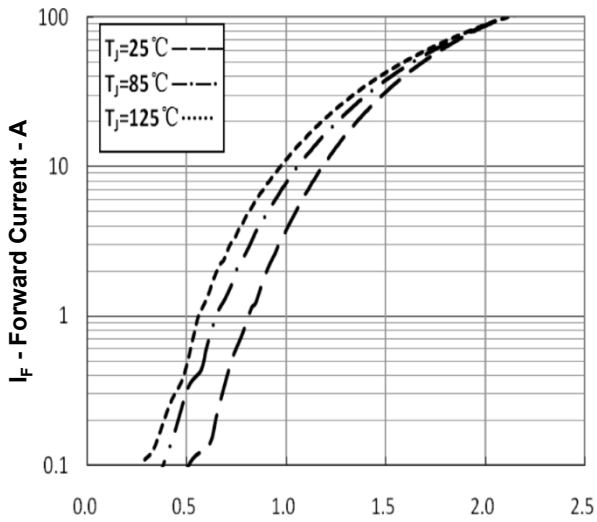
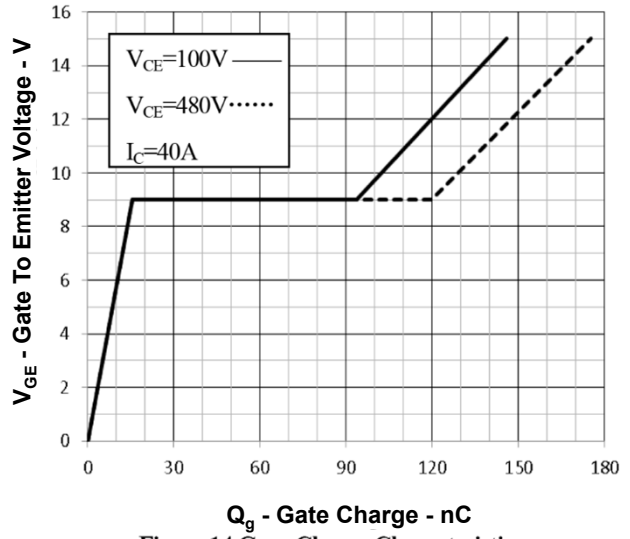
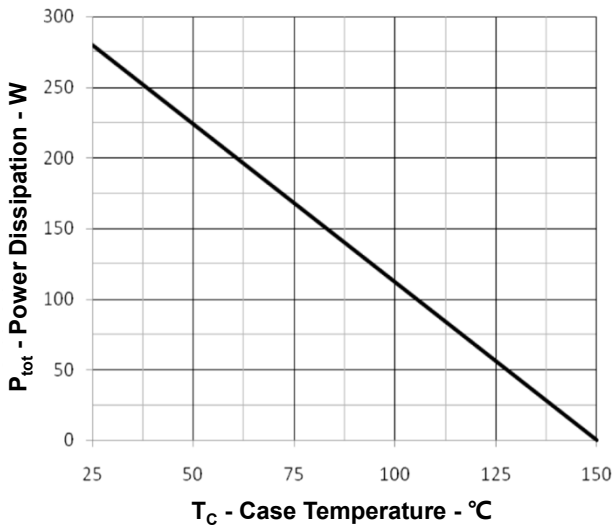


Figure 15. Diode Forward Characteristics

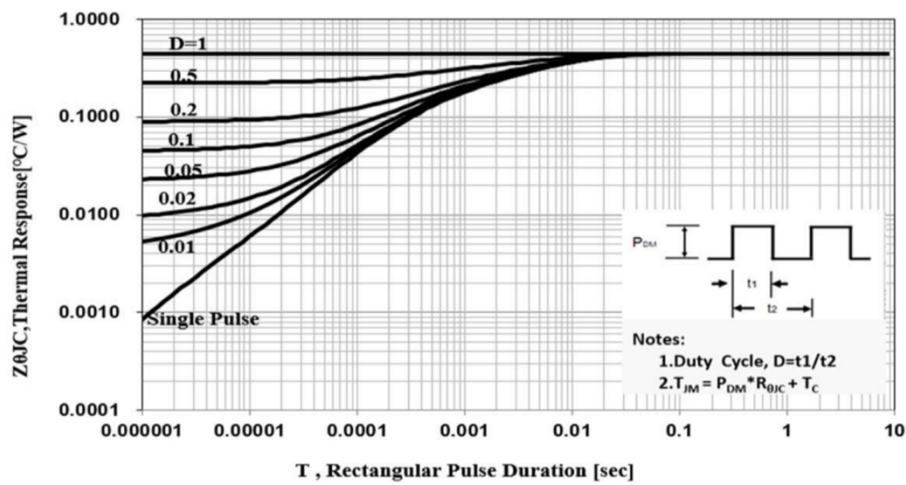
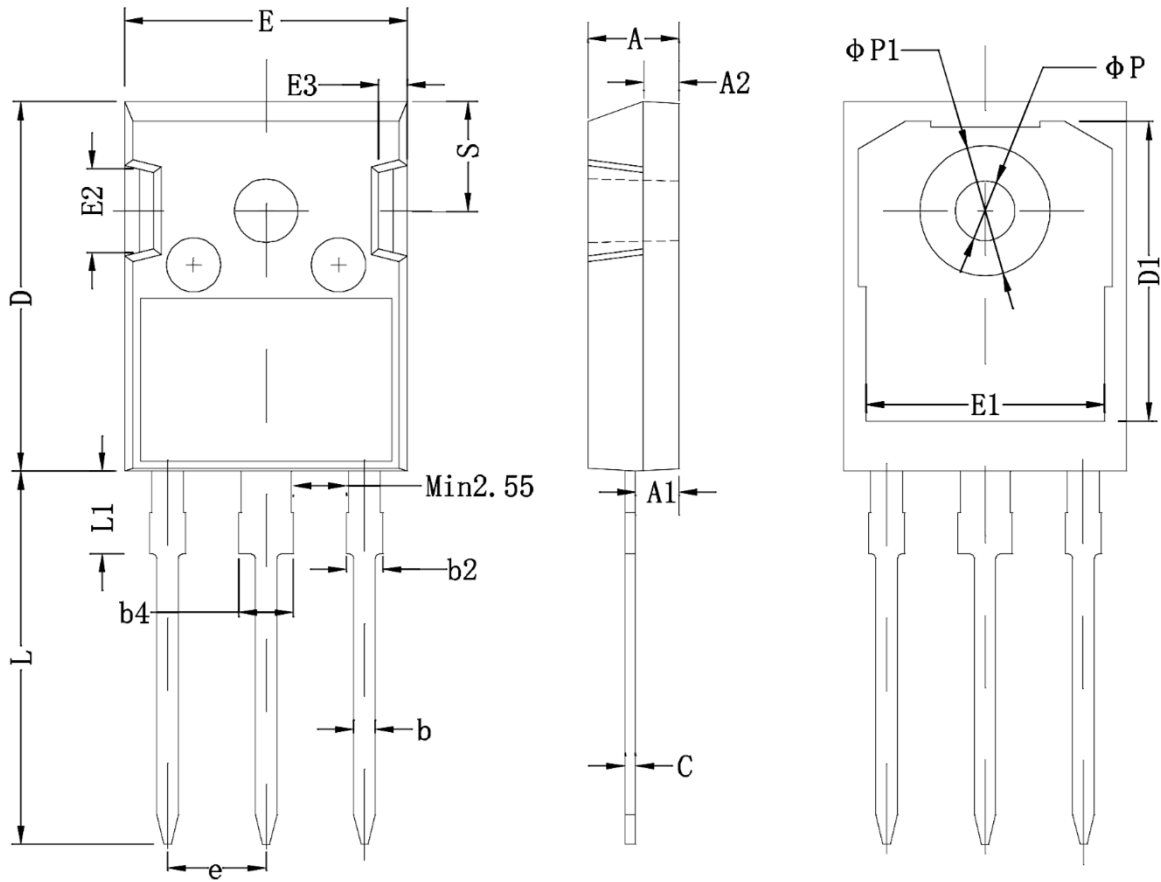



Figure 16. IGBT Transient Thermal Impedance

Product Dimension (TO-247-3L)



Dim	Millimeters		Inches		Dim	Millimeters		Inches	
	Min	Max	Min	Max		Min	Max	Min	Max
A	4.80	5.20	0.189	0.205	E1	13.00	13.60	0.512	0.535
A1	2.21	2.59	0.087	0.102	E2	4.80	5.20	0.189	0.205
A2	1.85	2.15	0.073	0.085	E3	2.30	2.70	0.091	0.106
b	1.11	1.36	0.044	0.054	e	5.44 BSC.		0.214 BSC.	
b2	1.91	2.21	0.075	0.087	L	19.82	20.22	0.780	0.796
b4	2.91	3.21	0.115	0.126	L1	-	4.30	-	0.169
c	0.51	0.75	0.020	0.030	φP	3.40	3.80	0.134	0.150
D	20.80	21.30	0.819	0.839	φP1	-	7.30	-	0.287
D1	16.25	16.85	0.640	0.663	S	6.15 BSC.		0.242 BSC.	
E	15.50	16.10	0.610	0.634					


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