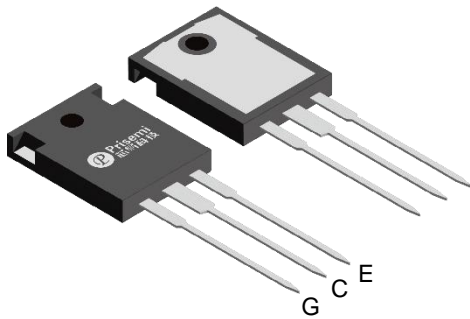
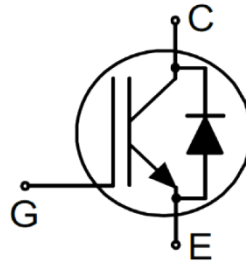
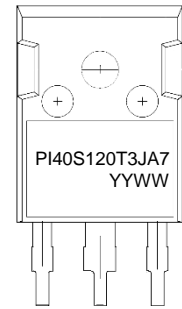


Description

TO-247-3L

Circuit Diagram

Marking (Top View)
Feature

- AEC-Q101 qualified
- High Speed switching and Low Power Loss
- Advanced Field Stop technology
- Maximum junction temperature 175°C
- Positive temperature coefficient
- $V_{CE(sat)}$ typ=1.75V @ $I_C=40A$,

Applications

- PTC Heater
- General Inverter
- Electric Compressor

Absolute maximum rating@25°C

Parameter	Symbol	Value	Units	
Collector-Emitter Voltage	V_{CES}	1200	V	
Gate-Emitter Voltage	V_{GES}	± 20	V	
Transient Gate-emitter Voltage ($t_p \leq 10\mu s$, $D < 0.010$)		± 30		
DC Collector Current, limited by T_{VJmax}	I_C	$T_c = 25^\circ C$	A	
		$T_c = 100^\circ C$		40
Pulsed Collector Current, t_p limited by T_{VJmax}	I_{CP}	160	A	
Turn-Off Safe Operating Area @ $V_{CE} \leq 1200V$, $T_J \leq 175^\circ C$, $t_p = 1\mu s$	-	160	A	
Diode Forward Current, limited by T_{VJmax}	I_F	$T_c = 25^\circ C$	A	
		$T_c = 100^\circ C$		40
IGBT Max. Power Dissipation	P_D	$T_c = 25^\circ C$	550	W
		$T_c = 100^\circ C$	275	W
Operating Junction Temperature	T_{VJ}	-40~+175	°C	
Storage Temperature	T_{STG}	-55~+175	°C	

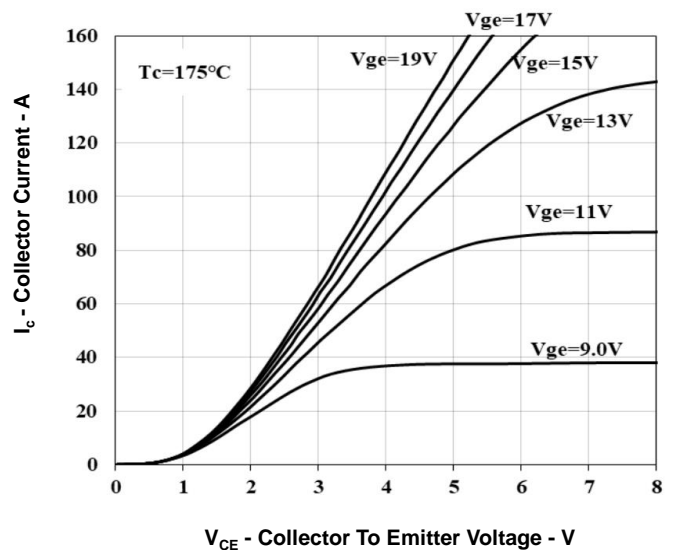
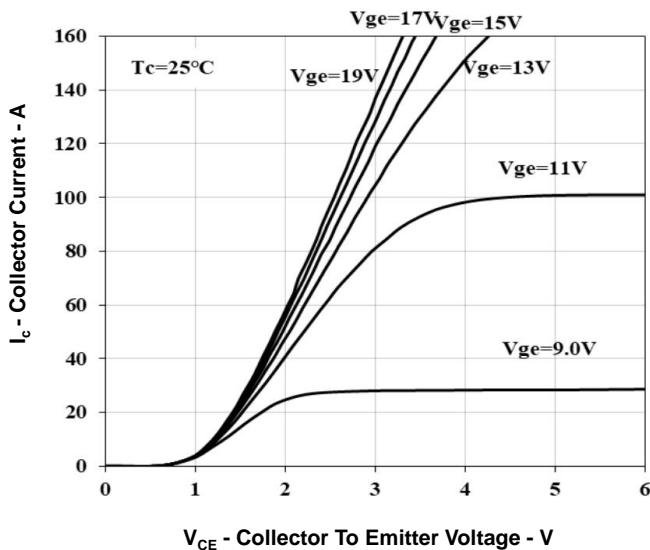
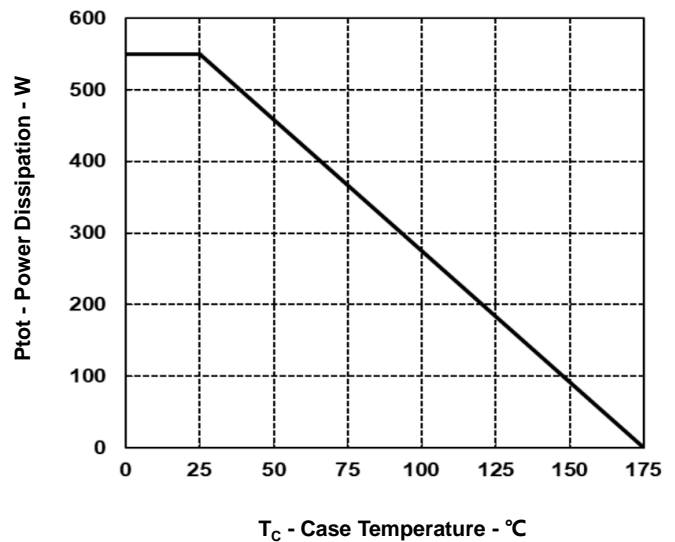
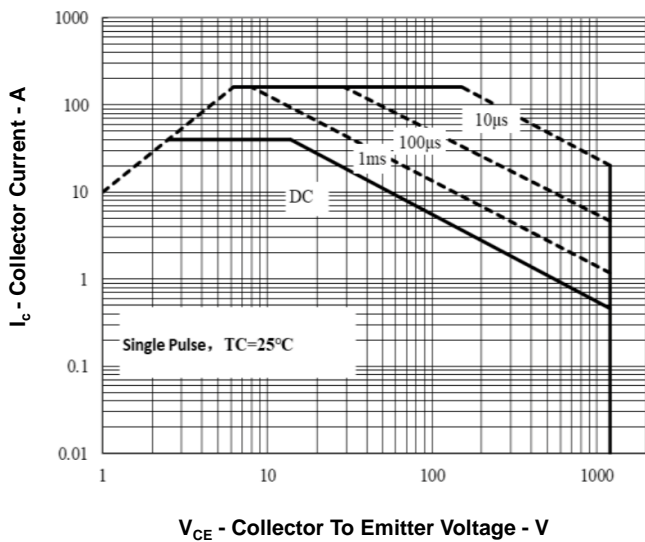
Electrical characteristics per line @25°C (unless otherwise specified)

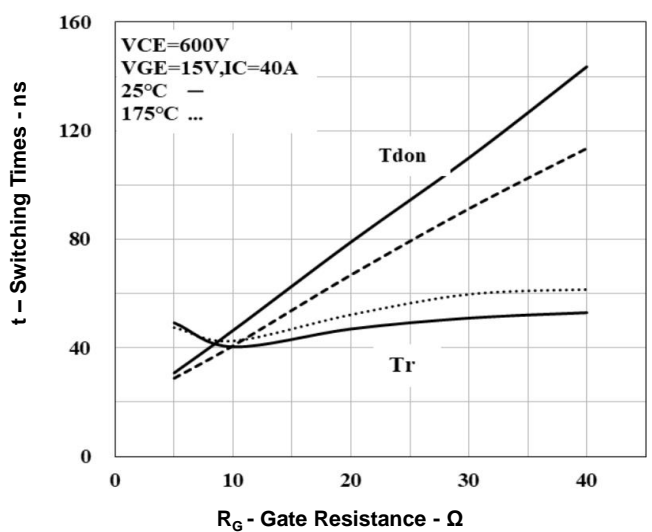
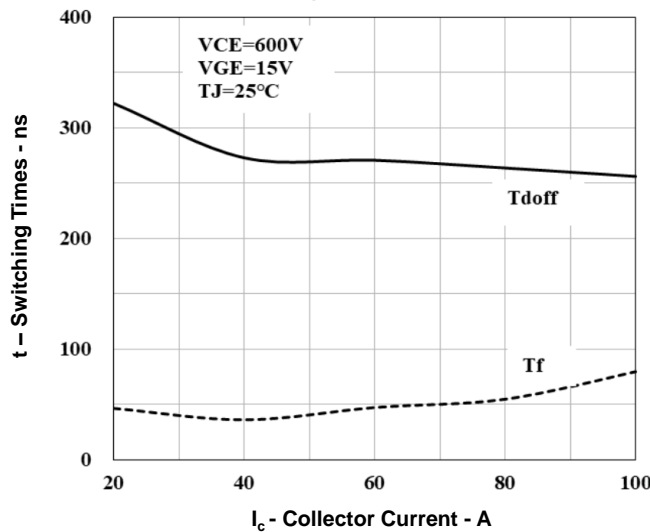
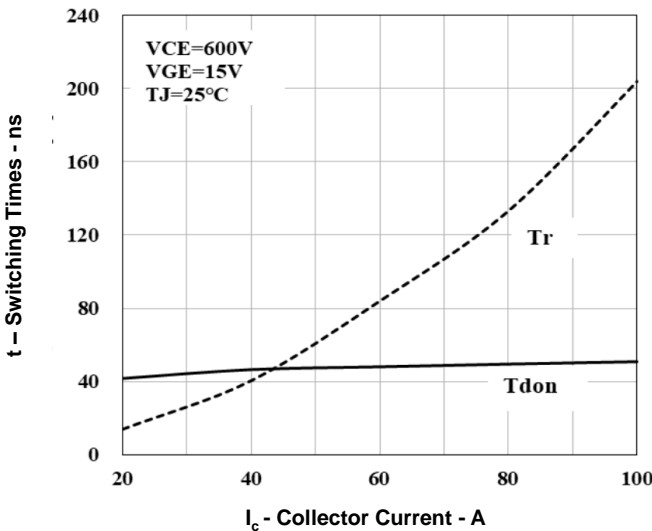
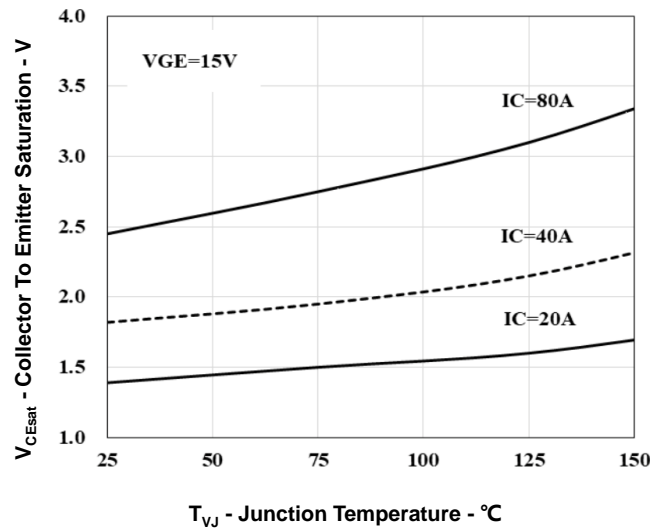
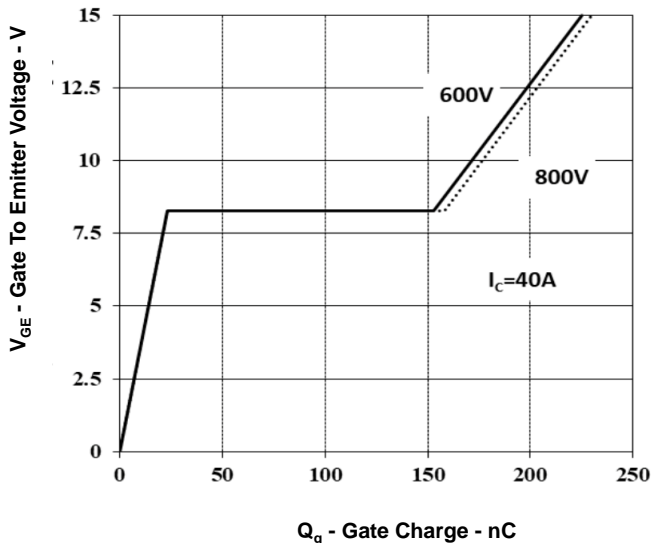
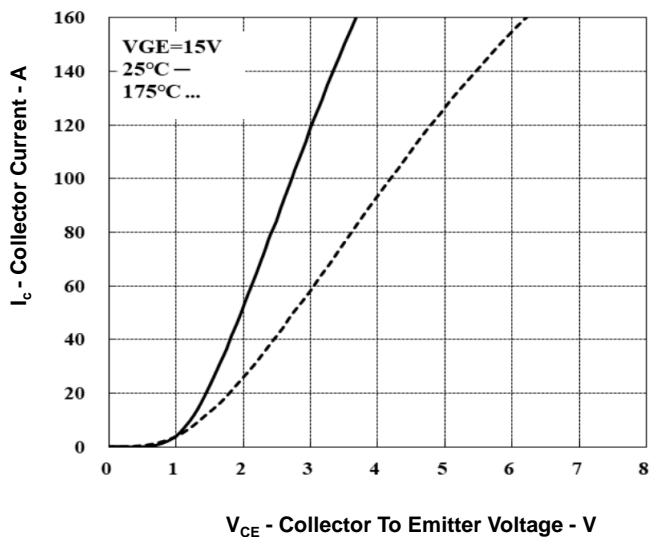
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=0.50mA$	1200	-	-	V	
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V$	-	-	100	μA	
Gate-Emitter Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$	-	-	± 200	nA	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C=250\mu A, V_{CE}=V_{GE}$	4.7	5.8	6.7	V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=40A, V_{GE}=15V$	$T_{VJ}=25^\circ C$	-	1.75	2.4	V
			$T_{VJ}=175^\circ C$	-	2.5	-	
Input Capacitance	C_{ies}	$V_{CE}=30V, V_{GE}=0V, f=1MHz$	-	4065	-	pF	
Output Capacitance	C_{oes}		-	167	-		
Reverse Transfer Capacitance	C_{res}		-	90	-		
Gate Charge	Q_G	$I_C=40A, V_{CC}=600V, V_{GE}=15V$	-	225	-	nC	
Forward Voltage	V_F	$I_F=40A$	$T_{VJ}=25^\circ C$	-	2.4	3.2	V
			$T_{VJ}=175^\circ C$	-	1.8	-	
Turn-on Delay Time	$t_{d(on)}$	$I_C=40A, V_{CC}=600V, V_{GE}=15V, R_G=10\Omega$	$T_{VJ}=25^\circ C$	-	46	-	ns
Rise Time	t_r		$T_{VJ}=175^\circ C$	-	41	-	
			$T_{VJ}=25^\circ C$	-	41	-	
Turn-off Delay Time	$t_{d(off)}$		$T_{VJ}=175^\circ C$	-	43	-	
			$T_{VJ}=25^\circ C$	-	270	-	
Fall Time	t_f		$T_{VJ}=175^\circ C$	-	291	-	
		$T_{VJ}=25^\circ C$	-	36	-		
Turn-on Energy Loss	E_{on}	$I_C=40A, V_{CC}=600V, V_{GE}=15V, R_G=10\Omega$	$T_{VJ}=25^\circ C$	-	4.2	-	mJ
			$T_{VJ}=175^\circ C$	-	4.4	-	
Turn-off Energy Loss	E_{off}		$T_{VJ}=25^\circ C$	-	1.4	-	
			$T_{VJ}=175^\circ C$	-	1.8	-	
Total Switching Energy	E_{ts}		$T_{VJ}=25^\circ C$	-	5.6	-	
			$T_{VJ}=175^\circ C$	-	6.2	-	
Diode Reverse Recovery Time	t_{rr}	$V_{CC}=600V, I_F=40A, di_F/dt=100A/\mu s$	$T_{VJ}=25^\circ C$	-	120	-	ns
			$T_{VJ}=175^\circ C$	-	285	-	
Diode Reverse Recovery Charge	Q_{rr}	$V_{CC}=600V, I_F=40A, di_F/dt=100A/\mu s$	$T_{VJ}=25^\circ C$	-	223	-	nC
			$T_{VJ}=175^\circ C$	-	557	-	
Diode Peak Reverse Recovery Current	I_{rrm}	$V_{CC}=600V, I_F=40A, di_F/dt=100A/\mu s$	$T_{VJ}=25^\circ C$	-	3.6	-	A
			$T_{VJ}=175^\circ C$	-	7.5	-	

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction-Ambient	$R_{th(J-A)}$	-	-	40	$^{\circ}C/W$
Thermal Resistance, IGBT Junction to Case	$R_{th(J-C)}$	-	-	0.26	$^{\circ}C/W$
Thermal Resistance, Diodes Junction to Case	$R_{th(J-C)}$	-	-	0.95	$^{\circ}C/W$

Typical Characteristics





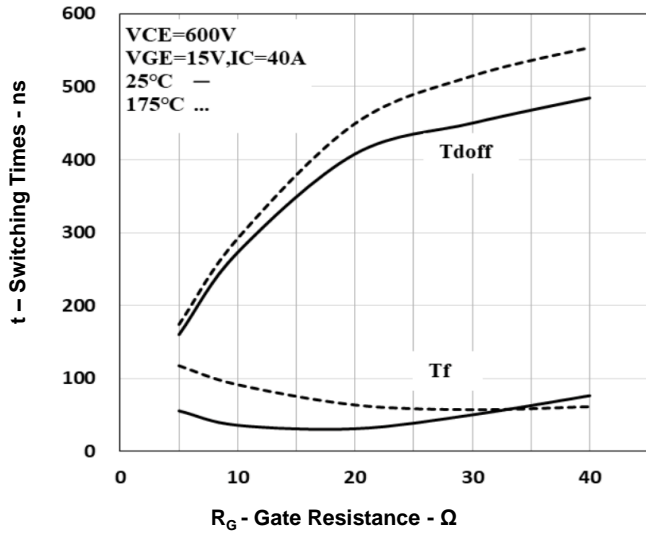


Fig 11. Typical Switching Times vs. Gate Resistor

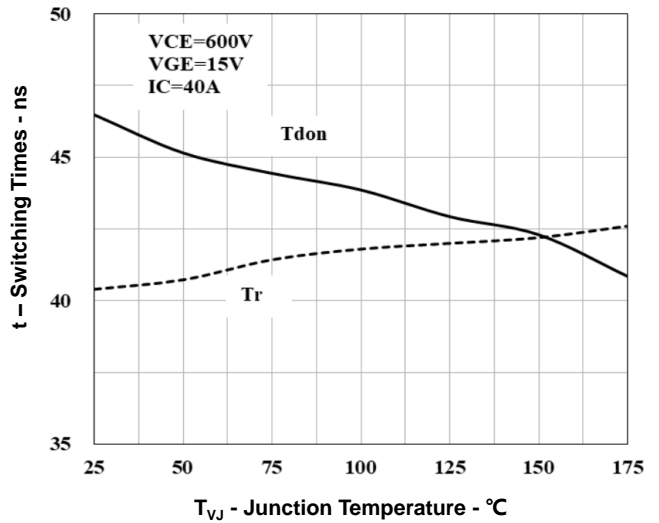


Fig 12. Typical Switching Times vs. T_{vj}

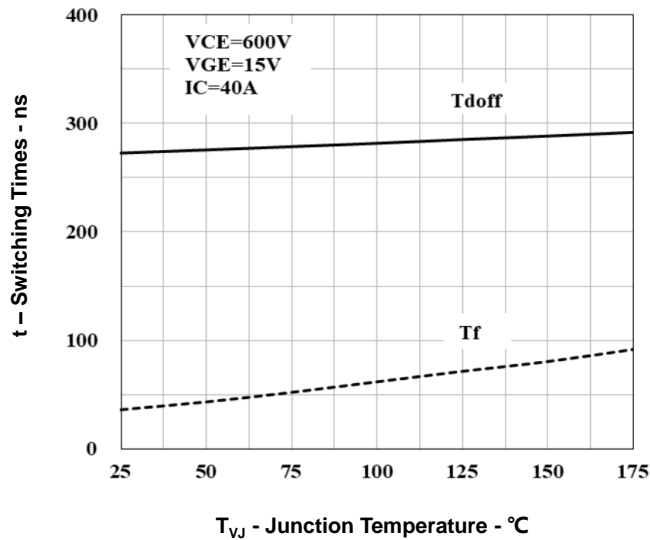


Fig 13. Typical Switching Times vs. T_{vj}

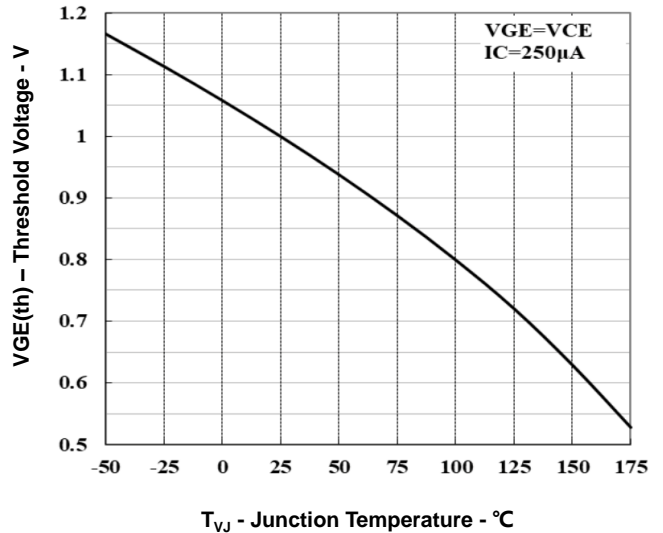


Fig 14. Threshold Voltage vs. T_{vj}

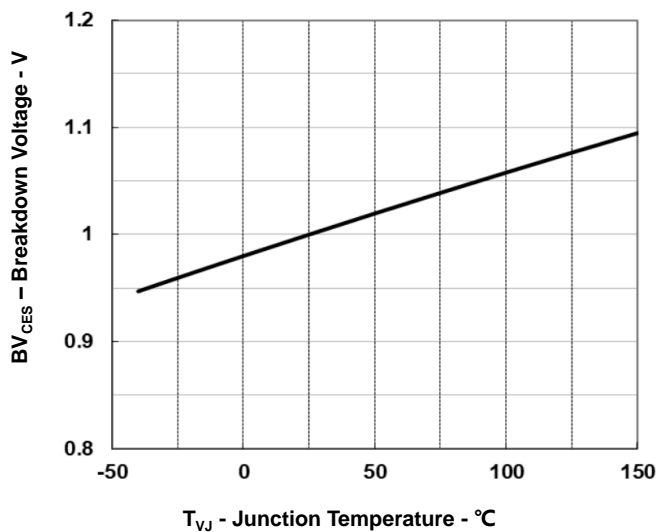


Fig 15. Breakdown Voltage vs. T_{vj}

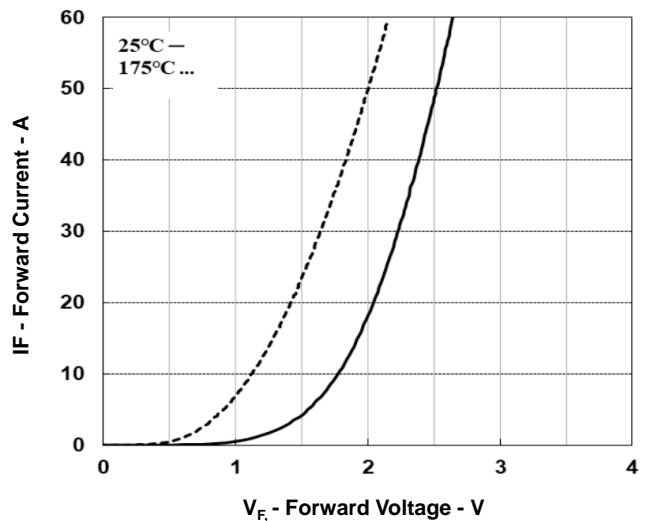


Fig 16. Typical Diode Forward Current vs. Forward Voltage

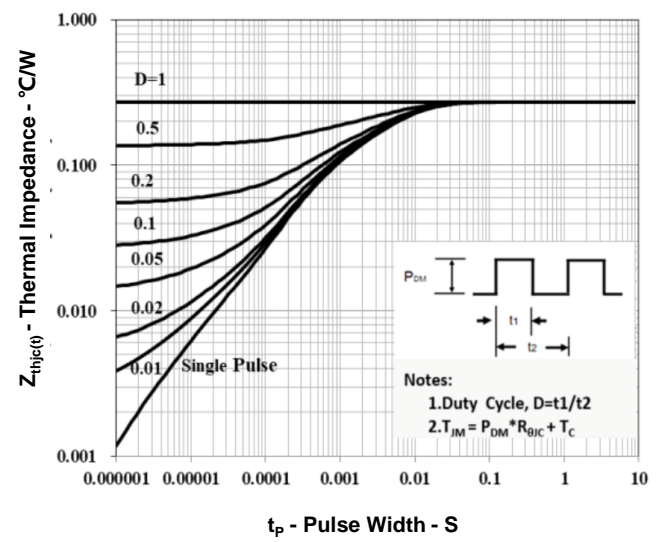
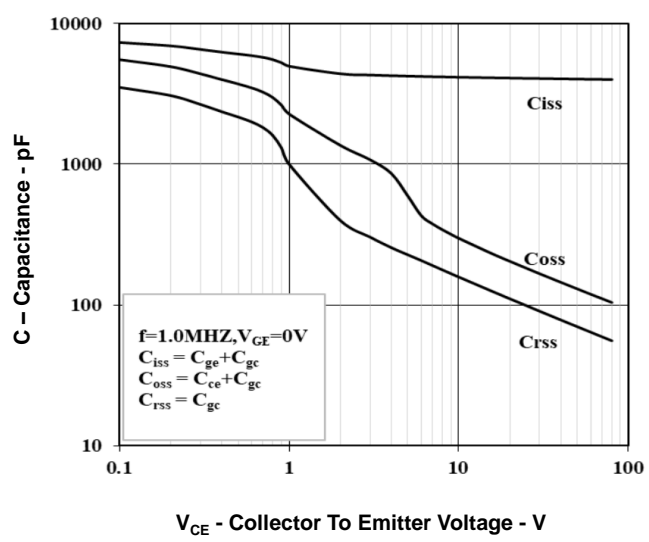
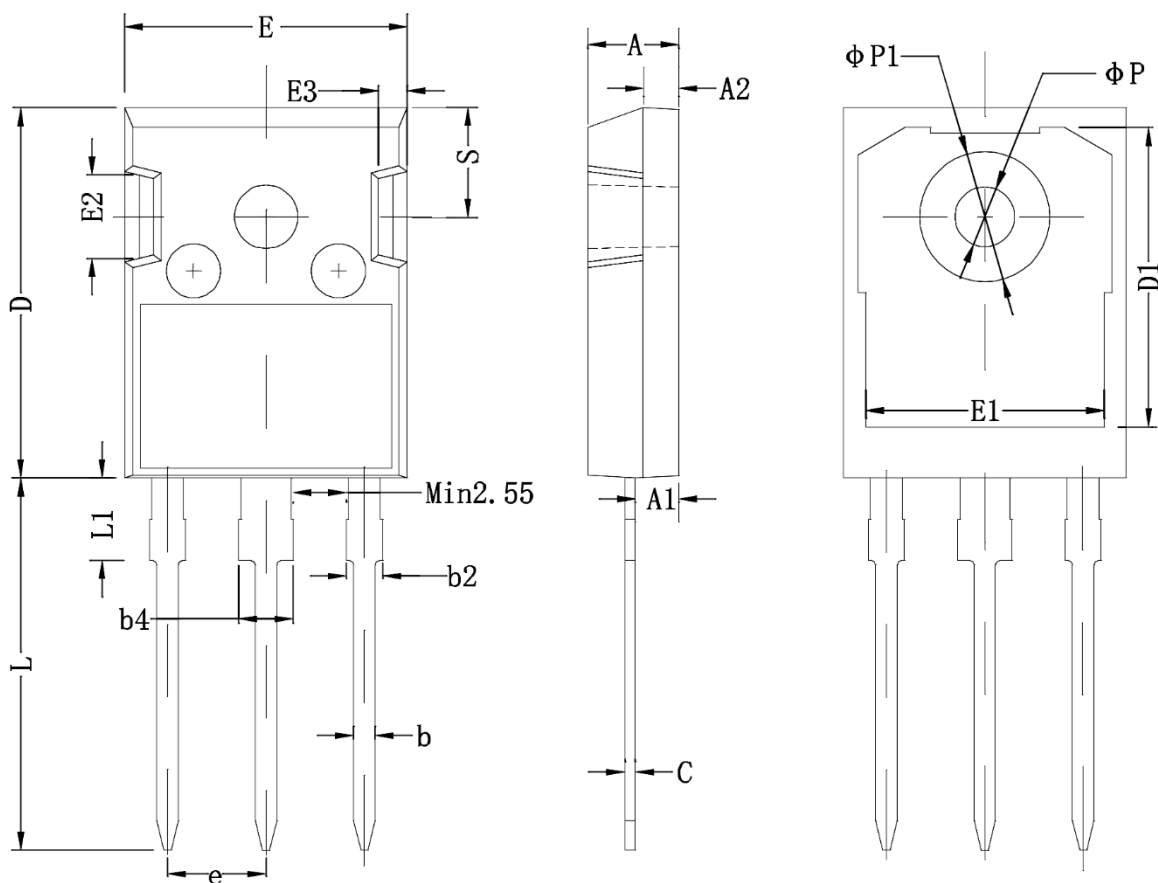


Fig 17. Typical Capacitance vs. Collector-Emitter Voltage


Fig 18. 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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