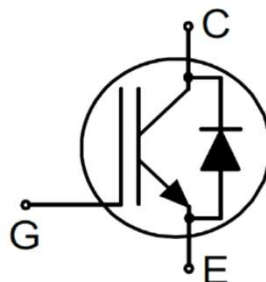
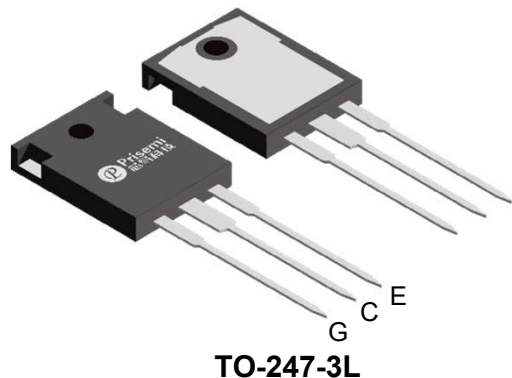
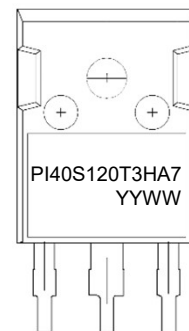


**Description**

**Circuit Diagram**

**Marking (Top View)**
**Feature**

- Low switching power loss
- Low switching surge and noise
- Advanced Field Stop technology
- Low EMI
- Maximum junction temperature 175°C
- 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	$V_{CES}$	1200	V	
Gate-Emitter Voltage	$V_{GES}$	$\pm 20$	V	
Transient Gate-emitter Voltage ( $t_p \leq 10\mu s$ , $D < 0.010$ )		$\pm 30$		
Collector Current	$I_C$	$T_c = 25^\circ C$	80	A
		$T_c = 100^\circ C$	40	
Pulsed Collector Current	$I_{CM}$	160	A	
Diode Current	$I_F$	$T_c = 25^\circ C$	40	A
		$T_c = 100^\circ C$	20	
Diode Pulsed Current	$I_{FM}$	80	A	
Power Dissipation	$P_D$	312	W	
Operating Junction Temperature	$T_J$	-55~+150	°C	
Storage Temperature	$T_{STG}$	-55~+150	°C	

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units	
Collector-Emitter Breakdown Voltage	$BV_{CE}$	$V_{GE}=0V, I_C=1mA$	1200	-	-	V	
C-E Leakage Current	$I_{CES}$	$V_{CE}=1200V, V_{GE}=0V$	-	-	500	$\mu A$	
G-E Leakage Current	$I_{GES}$	$V_{GE}=\pm 20V, V_{CE}=0V$	-	-	$\pm 400$	nA	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C=250\mu A, V_{CE}=V_{GE}$	4.8	6.4	8	V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=40A, V_{GE}=15V$	$T_C=25^\circ C$	-	2.2	2.7	V
			$T_C=150^\circ C$	-	2.5	-	
Input Capacitance	$C_{ies}$	$V_{CE}=30V, V_{GE}=0V, f=1MHz$	-	4404	-	pF	
Output Capacitance	$C_{oes}$		-	140	-		
Reverse Transfer Capacitance	$C_{res}$		-	30	-		
Diode Forward Voltage	$V_{FM}$	$I_F=20A$	$T_C=25^\circ C$	-	2.4	3.1	V
			$T_C=125^\circ C$	-	1.9	-	
Turn-on Delay Time	$t_{d(on)}$	$V_{CE}=600V, V_{GE}=15V, R_G=10\Omega, I_C=40A$	-	44	-	ns	
Rise Time	$t_r$		-	118	-		
Turn-off Delay Time	$t_{d(off)}$		-	102	-		
Fall Time	$t_f$		-	84	-		
Turn-on Energy Loss	$E_{on}$	$V_{CE}=600V, V_{GE}=15V, R_G=10\Omega, I_C=40A$	-	3.9	-	mJ	
Turn-off Energy Loss	$E_{off}$		-	0.6	-		
Total Switching Loss	$E_{st}$		-	4.5	-		
Total Gate Charge	$Q_g$	$V_{CE}=600V, V_{GE}=15V, I_C=40A$	-	134	-	nC	
Gate to Emitter Charge	$Q_{ge}$		-	44	-		
Gate to Collector Charge	$Q_{gc}$		-	46	-		
Diode Reverse Recovery Time	$t_{rr}$	$V_{DD}=200V, T_J=25^\circ C, I_{ES}=20A, dI_{ES}/dt=100A/\mu s$	-	62	-	ns	
Diode Reverse Recovery Charge	$Q_{rr}$		-	90	-	nC	
Diode Reverse Recovery Current	$I_{rm}$		-	2.8	-	A	
Diode Reverse Recovery Current Tb Slope	$Di_{rr}/Dt$		-	104	-	A/ $\mu s$	

## 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	$R_{th(J-C)}$	-	-	0.4	$^{\circ}C/W$
Thermal Resistance, FRD Junction to Case	$R_{th(J-C)}$	-	-	1.2	$^{\circ}C/W$

## Typical Characteristics

Figure 1. Typical output characteristics

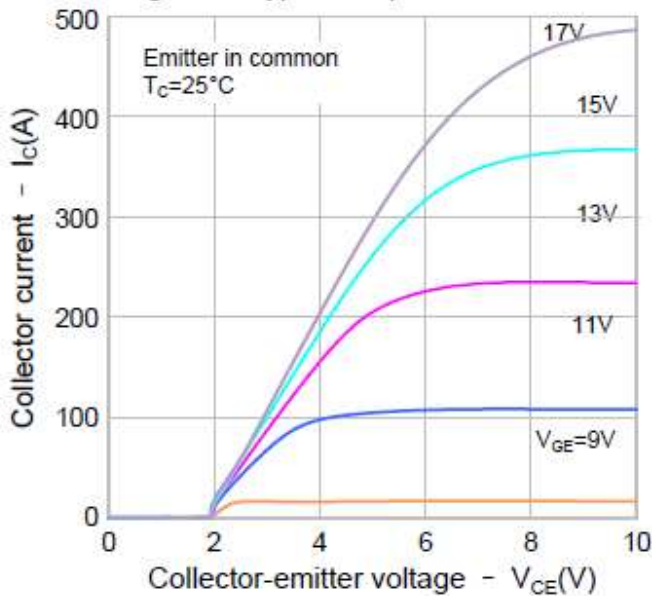


Figure 2. Typical saturation voltage characteristics

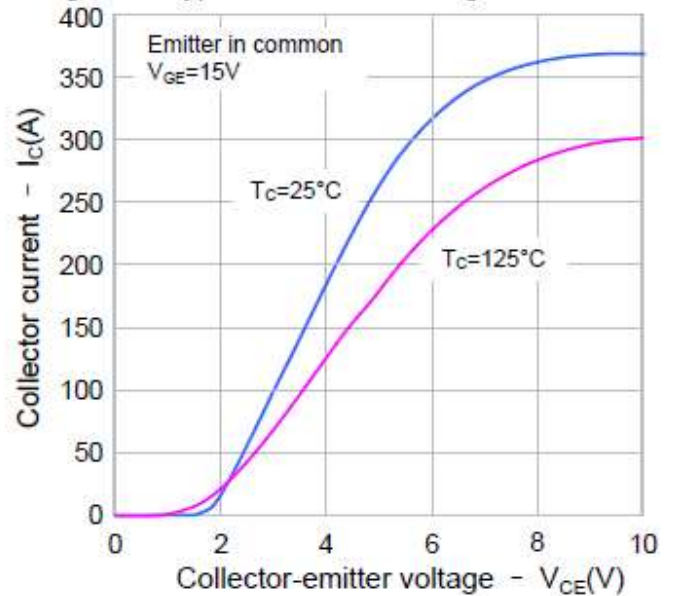


Figure 3. Transmission characteristics

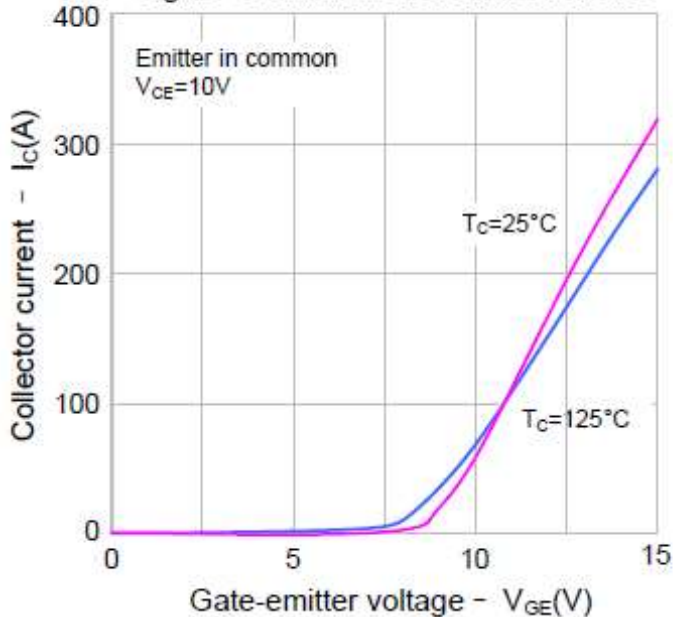
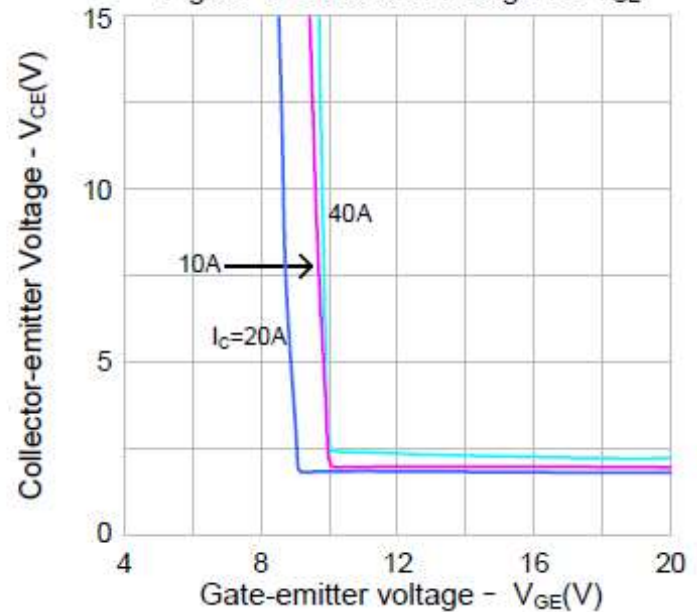


Figure 4. Saturation voltage vs.  $V_{GE}$



## Typical Characteristics

Figure 5. Saturation voltage vs.  $V_{GE}$

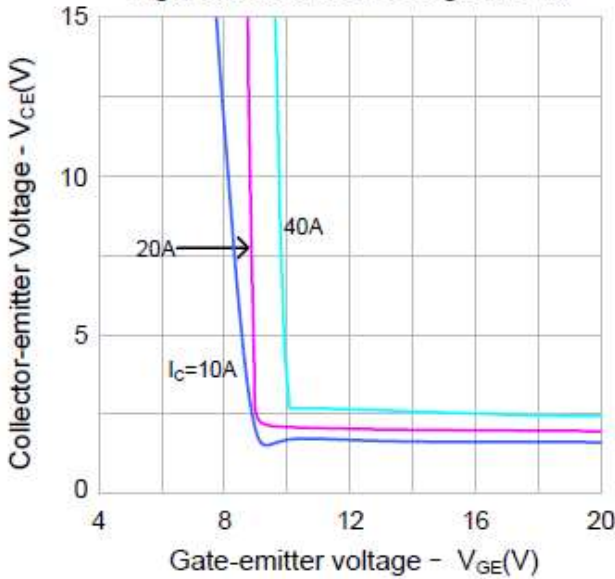


Figure 6. Saturation Voltage Drop vs. Temperature

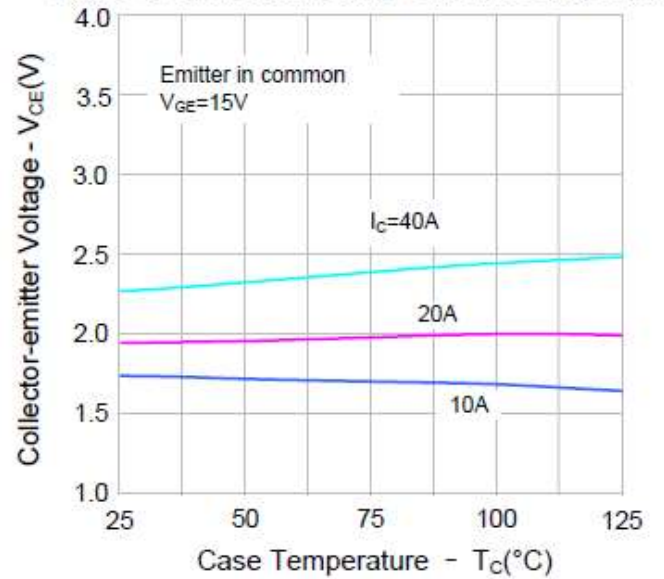


Figure 7. Capacitance Characteristics

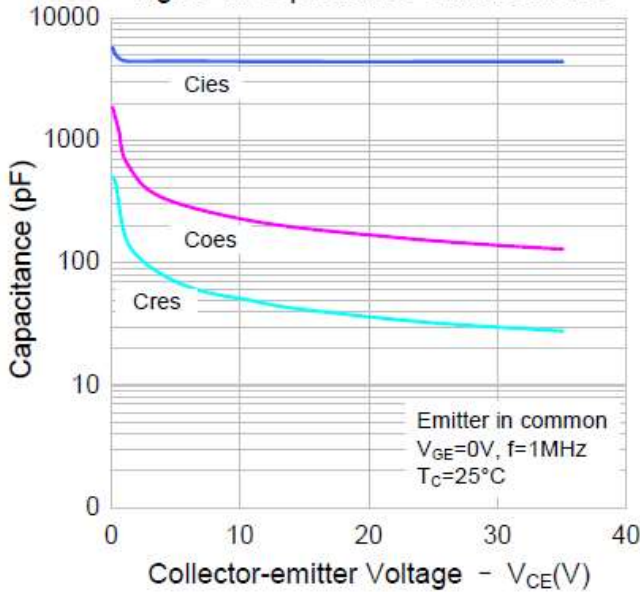


Figure 8. Gate Charge Characteristics

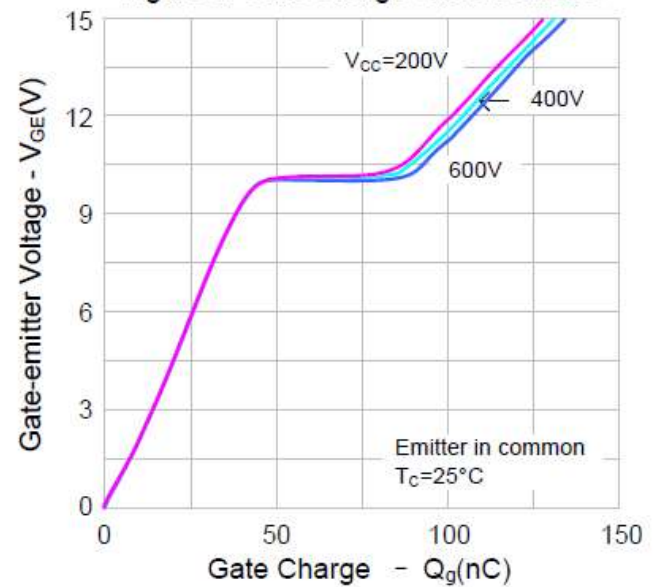


Figure 9. Turn-on Characteristics vs. Gate Resistance

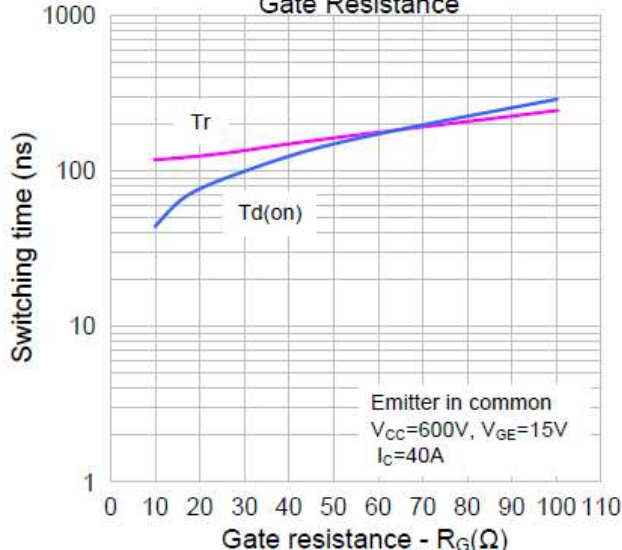


Figure 10. Turn-off characteristics vs. Gate resistance

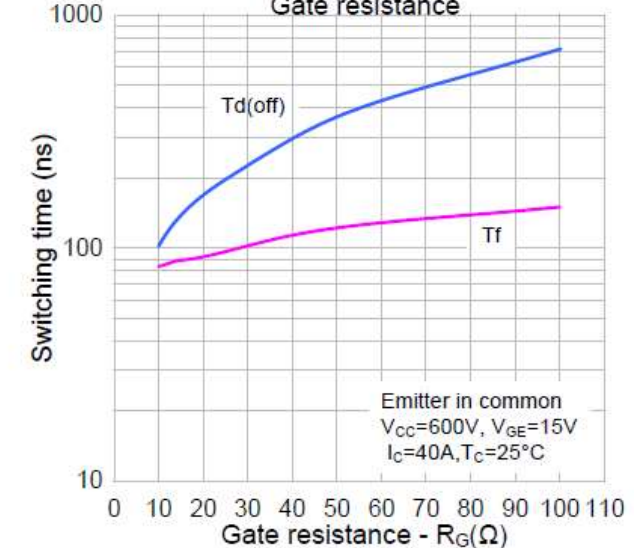


Figure 11. Switching Loss vs. Gate Resistance

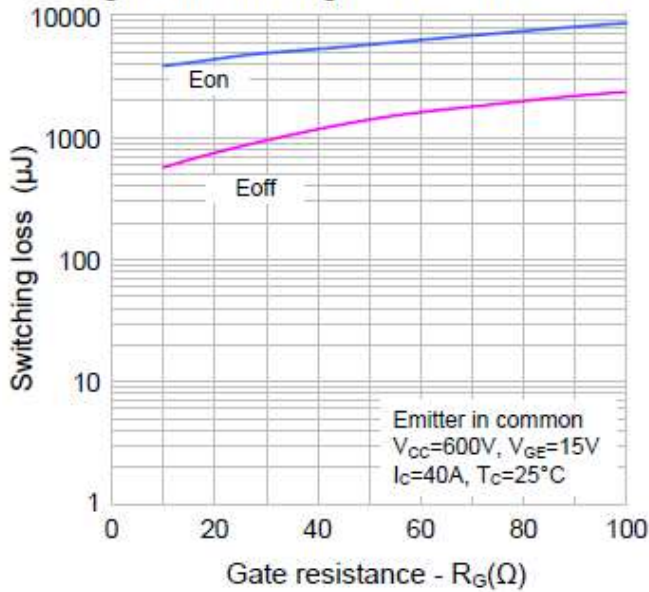


Figure 12. Conduction characteristics vs. Collector current

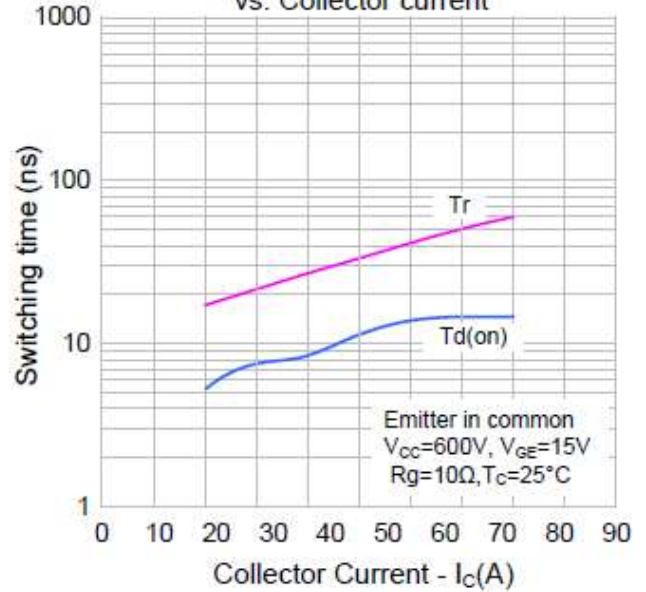


Figure 13. Turn-off characteristics vs. Collector current

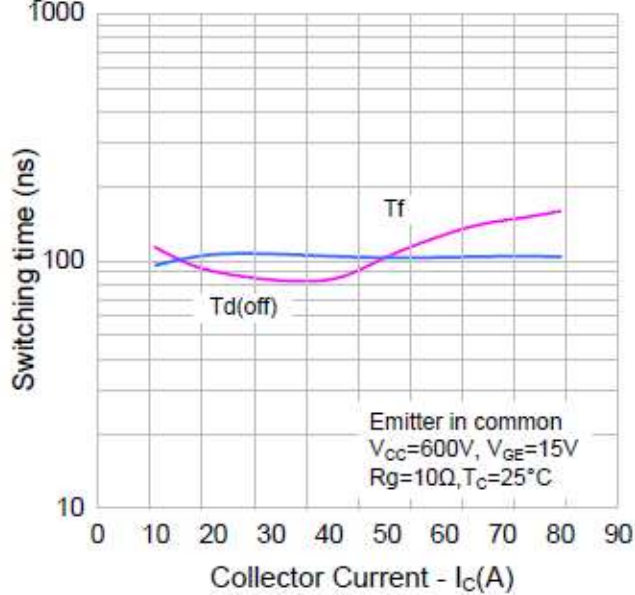


Figure 14. Switching Loss vs. Collector Current

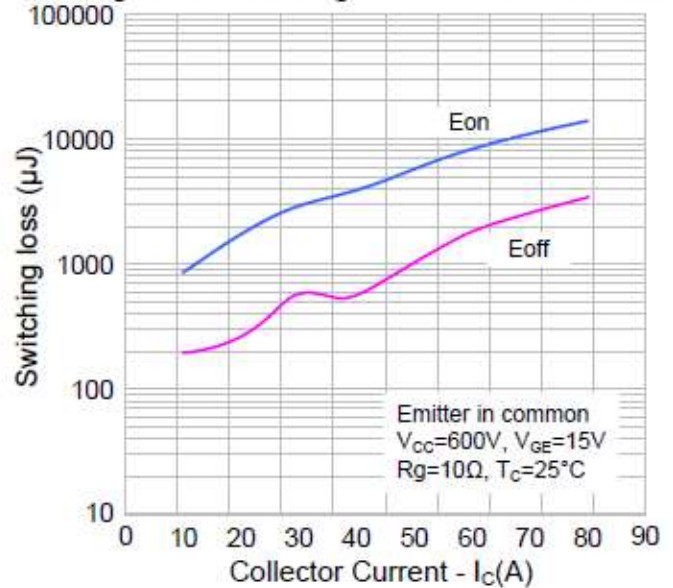


Figure 15. Forward characteristics

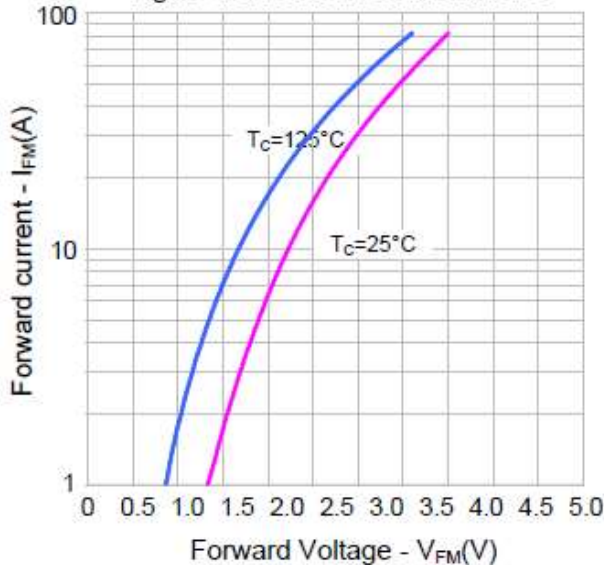


Figure 16. Reverse recovery time vs. Forward current

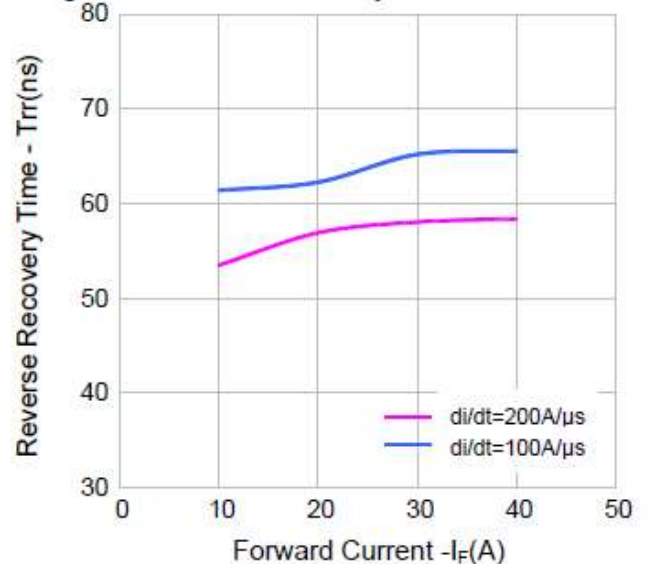


Figure 17. Reverse Recovery Charge vs. Forward Current

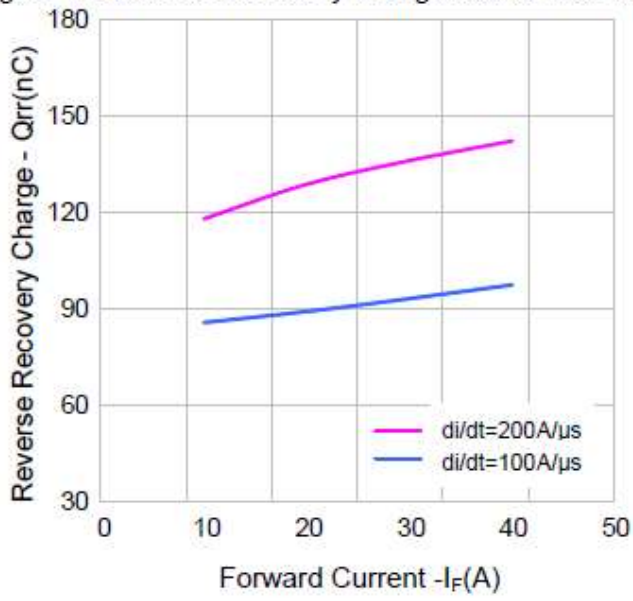
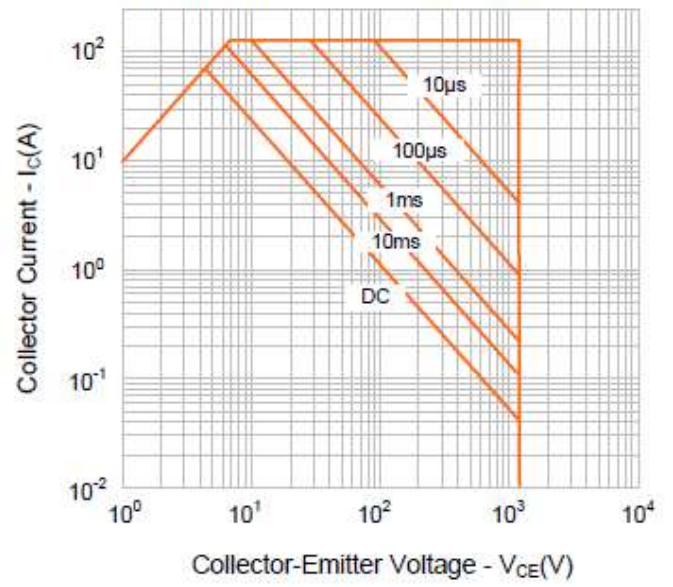
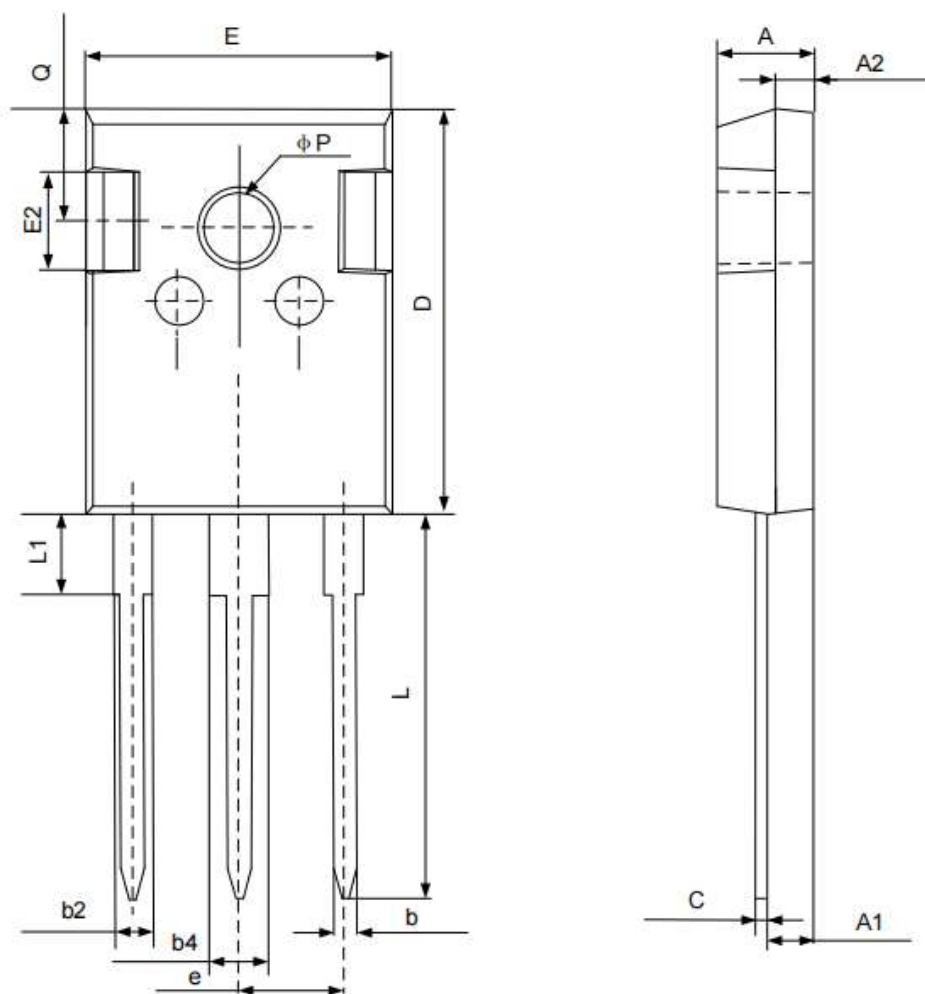


Figure 18. Max. Safe Operating Area




## Product Dimension (TO-247-3L)



Dim	Millimeters			Dim	Millimeters		
	Min	Nom	Max		Min	Nom	Max
A	4.80	5.00	5.20	e	5.44 BSC		
A1	2.21	2.41	2.59	L	19.72	19.92	20.22
A2	1.85	2.00	2.15	L1	-	-	4.30
b	1.11	-	1.36	Q	5.60	5.80	6.00
b2	1.91	-	2.25	P	3.40	-	3.80
b4	2.91	-	3.25				
C	0.51	-	0.75				
D	20.80	21.00	21.30				
E	15.50	15.80	16.10				
E2	4.40	5.00	5.20				


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