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Data Sheet

Customer : _____

Product : Insulated Gate Bipolar Transistor (IGBT) _____

Type : H40G3U120SC _____

Issued Date: 08-Jan.-2024 _____

Edition : Ver. 2 _____

Record of change

Date	Ver.	Description	Page
06-Sep.-2023	1		
08-Jan.-2024	2	Revise Cies_Coes_Cres Unit: pF	2

VENDOR :

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MAKER :

Changzhou Starsea Electronics Co., Ltd.

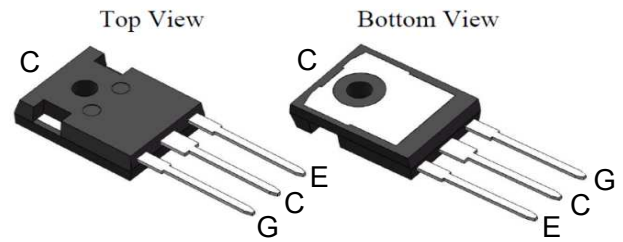
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FEATURES

- Low switching losses
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Pb-free Lead Plating
- Halogen-free and RoHS-compliant



TO-247-3L

MECHANICAL DATA

Case: TO-247-3L molded plastic body
Terminals : Leads solderable per MIL-STD-750, Method 2026
Polarity: As marked
Mounting Position: Any



MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Absolute Maximum Ratings (@ $T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions	Values	Unit
V_{CES}	Collector Emitter Voltage	$T_J = 25^\circ\text{C}$	V
V_{GES}	Gate Emitter Voltage		
I_C	DC Collector Current	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
I_{Cpuls}	Pulsed collector current, tp limited by T_{Jmax}		
P_{tot}	Power Dissipation Per IGBT	$T_C = 25^\circ\text{C}$	W
		$T_C = 100^\circ\text{C}$	
V_{RRM}	Repetitive Reverse Voltage	$T_J = 25^\circ\text{C}$	V
I_F	Average Forward Current	$T_C = 25^\circ\text{C}$	A
		$T_C = 100^\circ\text{C}$	
T_{Jmax}	Max. Junction Temperature		$^\circ\text{C}$
T_{Jop}	Operating Temperature		$^\circ\text{C}$
T_{stg}	Storage Temperature		$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
R_{th} Characteristics						
IGBT thermal resistance, junction - case(IGBT)	$R_{th(j-c)}$		-	-	0.45	$^\circ\text{C}/\text{W}$
Diode thermal resistance, junction - case(per diode)	$R_{th(j-c)}$		-	-	0.70	$^\circ\text{C}/\text{W}$
Thermal resistance junction - ambient	$R_{th(j-a)}$		-	-	40	$^\circ\text{C}/\text{W}$

IGBT

Electrical Characteristic (at TC = 25 °C, unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit		
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=250\mu A$	4.5	5.7	7.0	V		
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=40A, V_{GE}=15V, T_J=25^\circ C$		1.74	2.40			
		$I_C=40A, V_{GE}=15V, T_J=150^\circ C$		2.30				
I_{CES}	Collector Leakage Current	$V_{CE}=1200V, V_{GE}=0V, T_J=25^\circ C$			1.0	mA		
I_{GES}	Gate Leakage Current	$V_{CE}=0V, V_{GE}=\pm 20V, T_J=25^\circ C$	-250		250	nA		
Q_g	Total Gate Charge	$V_{CE}=600V, I_C=40A, V_{GE}=15V$		225		nC		
Q_{ge}	Gate emitter charge			23				
Q_{gc}	Gate collector charge			130				
$t_{d(on)}$	Turn on Delay Time	$V_{CE}=600V, I_C=40A$ $R_G=10\Omega,$ $V_{GE}=15V,$ Inductive Load	$T_J=25^\circ C$		69.5	ns		
			$T_J=150^\circ C$		67			
t_r	Rise Time		$T_J=25^\circ C$		34			
			$T_J=150^\circ C$		40			
$t_{d(off)}$	Turn off Delay Time		$T_J=25^\circ C$		458			
			$T_J=150^\circ C$		495			
t_f	Fall Time		$T_J=25^\circ C$		47			
			$T_J=150^\circ C$		135			
E_{on}	Turn on Energy	$V_{CE}=600V, I_C=40A$ $R_G=10\Omega,$ $V_{GE}=15V,$ Inductive Load	$T_J=25^\circ C$		3.2	mJ		
			$T_J=150^\circ C$		3.7			
E_{off}	Turn off Energy		$T_J=25^\circ C$		2.3			
			$T_J=150^\circ C$		3.0			
E_{ts}	Total Energy		$T_J=25^\circ C$		5.5			
			$T_J=150^\circ C$		6.7			
C_{ies}	Input Capacitance		$V_{CE}=30V, V_{GE}=0V, f=1MHz$		4246			pF
C_{oes}	output Capacitance				167			
C_{res}	Reverse Transfer Capacitance			106				

Anti-Parallel Diode

Electrical Characteristic (at TC = 25 °C, unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	$I_F=40A, V_{GE}=0V, T_J=25^\circ C$		2.1	3.2	V
		$I_F=40A, V_{GE}=0V, T_J=150^\circ C$		1.7		
t_{rr}	Reverse Recovery Time	$I_F=40A$		88		ns
I_{RRM}	Max. Reverse Recovery Current	$di_F/dt=100A/\mu s$		7.6		A
Q_{RR}	Reverse Recovery Charge	$T_C=25^\circ C$		326		nC

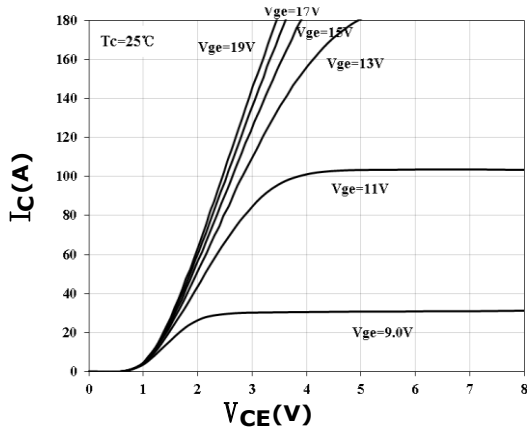


Figure 1. Output Characteristics

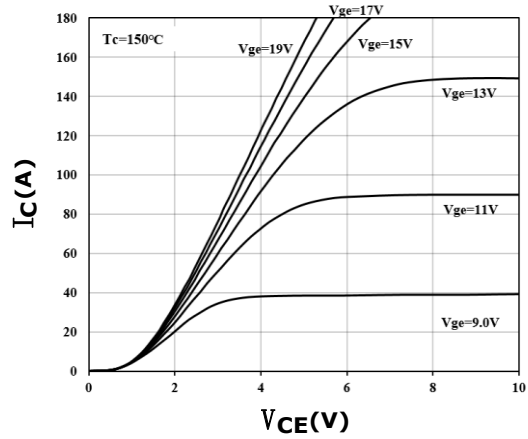


Figure 2. Output Characteristics

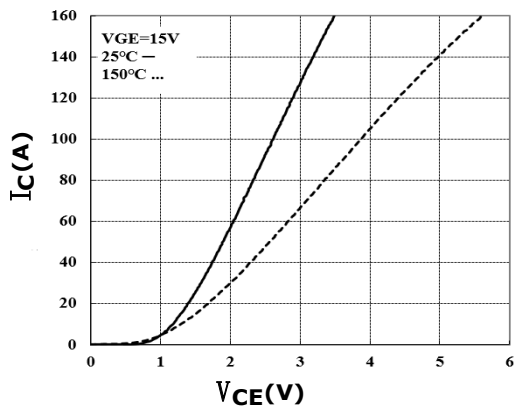


Figure 3. Saturation Voltage Characteristics

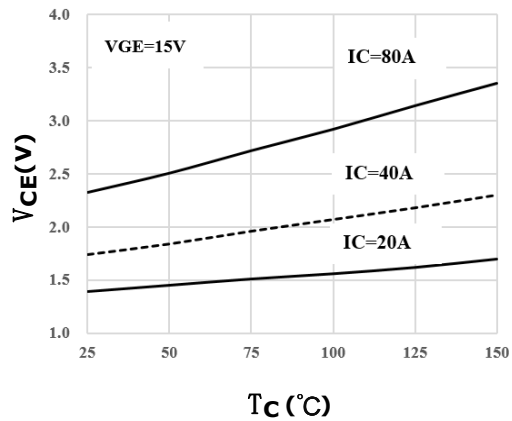


Figure 4. Saturation Voltage - TC Characteristics

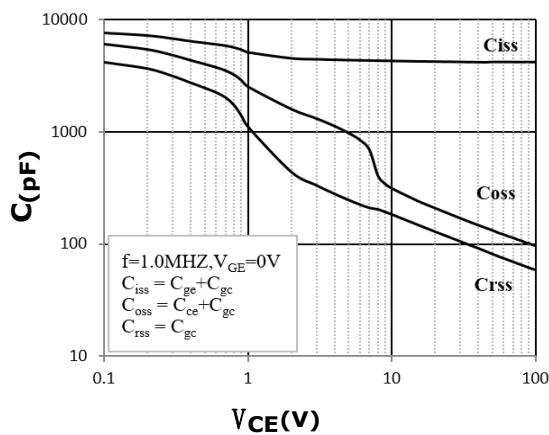


Figure 5. Capacitance Characteristics

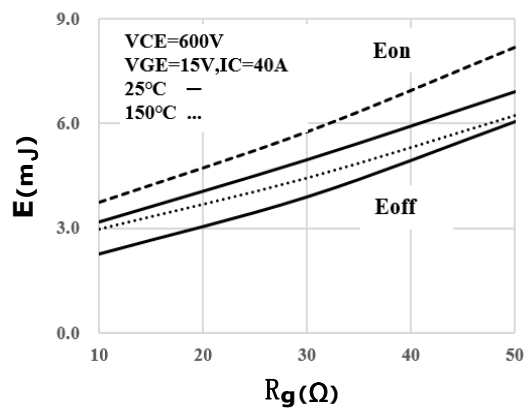


Figure 6. Switching Loss-RG Characteristics

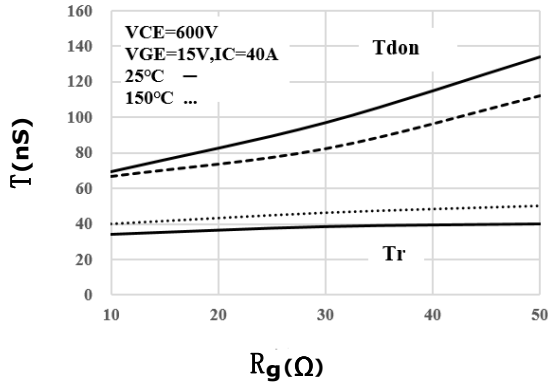


Figure 7. Opening Time-RG Characteristics

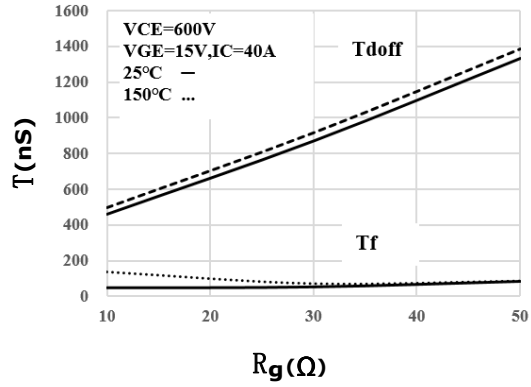


Figure 8. Closing Time-RG Characteristics

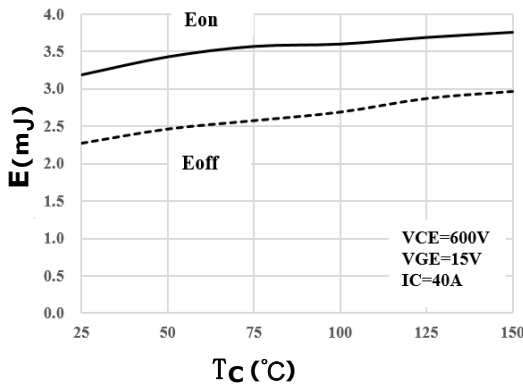


Figure 9. Switching loss-Tc Characteristics

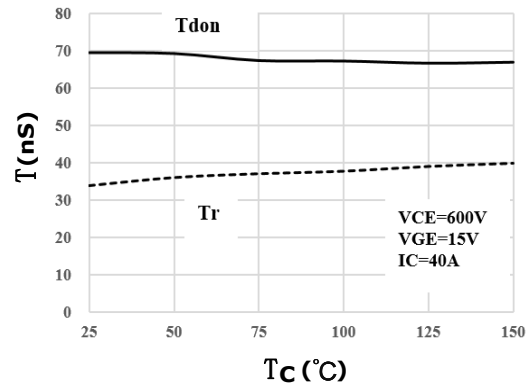


Figure 10. Opening Time-Tc Characteristics

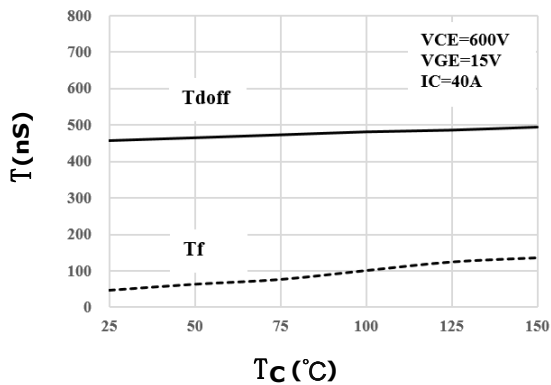


Figure 11. Closing Time-Tc Characteristics

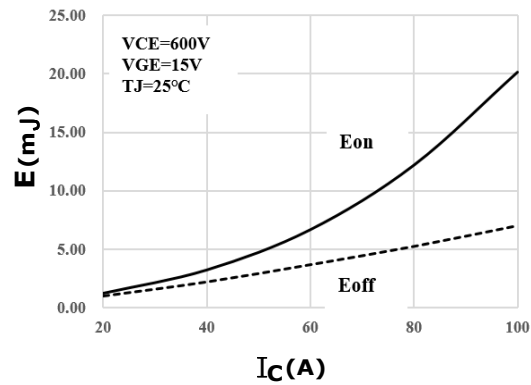


Figure 12. Switching Loss-IC Characteristics

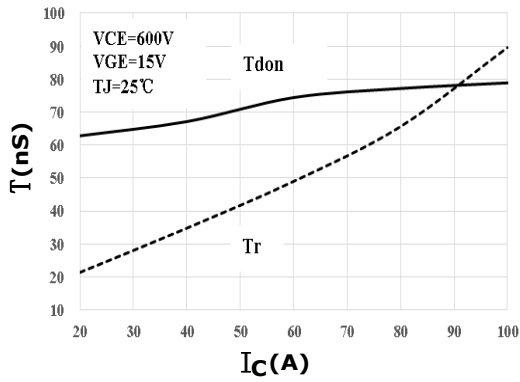


Figure 13. Opening Time- I_C Characteristics

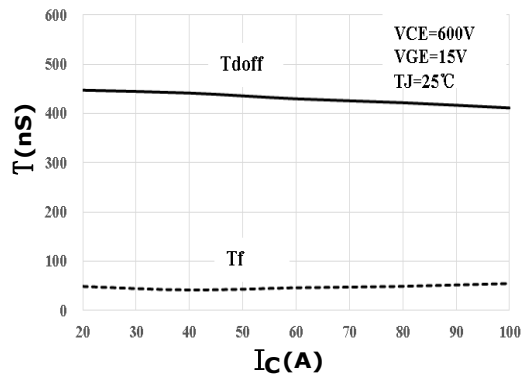


Figure 14. Closing Time- I_C Characteristics

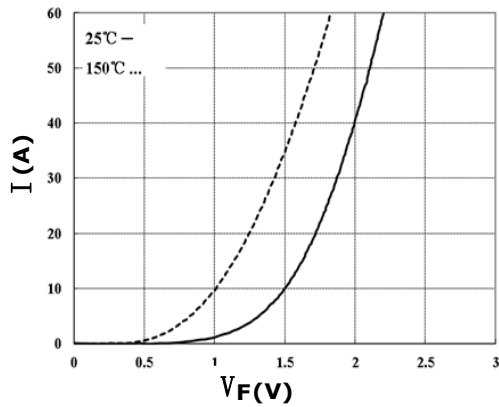


Figure 15. Diode Forward Characteristics

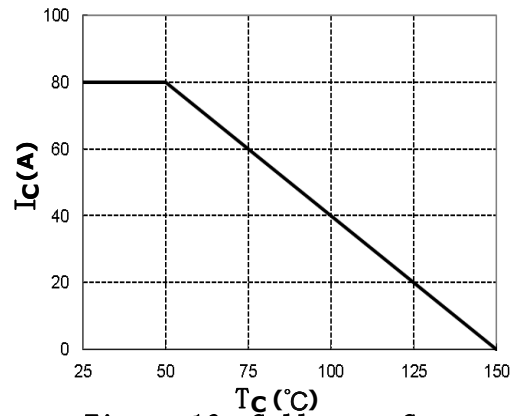


Figure 16. Collector Current- T_C Characteristics

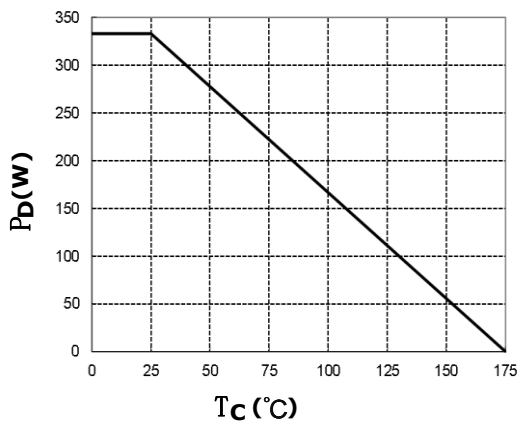


Figure 17. Power Dissipation- T_C Characteristics ($T_J \leq 175^\circ C$)

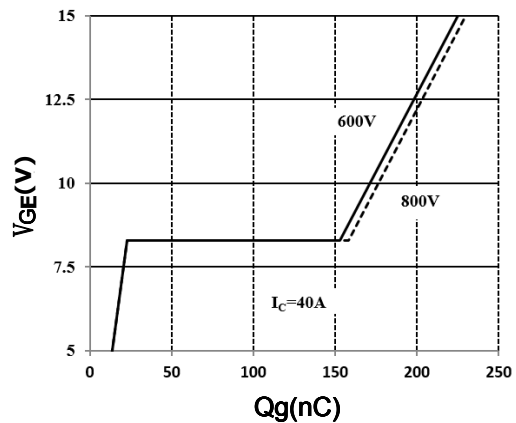


Figure 18. Gage Charge Characteristics

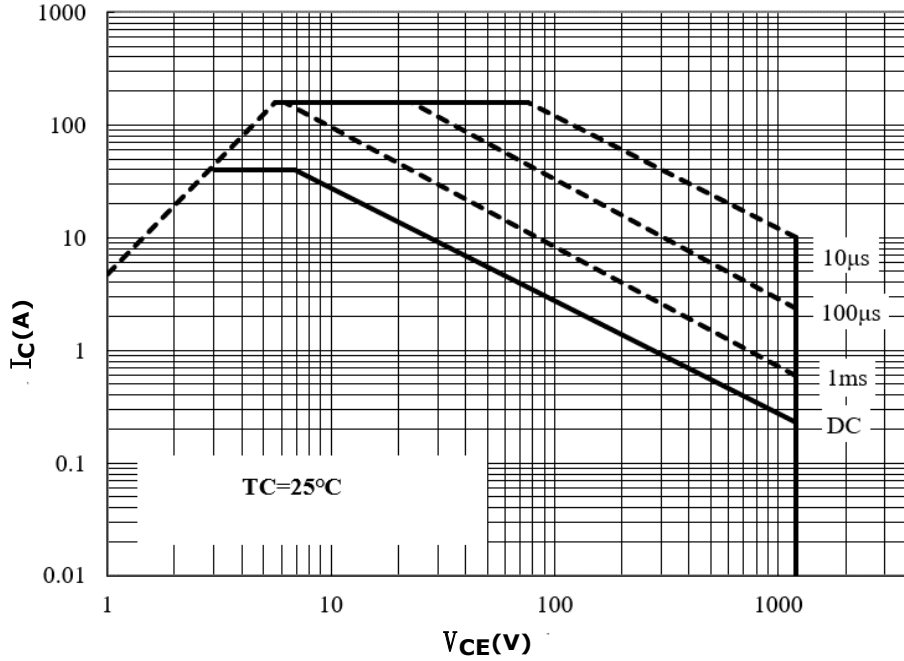


Figure 19. Forward Bias Safe Operating Area

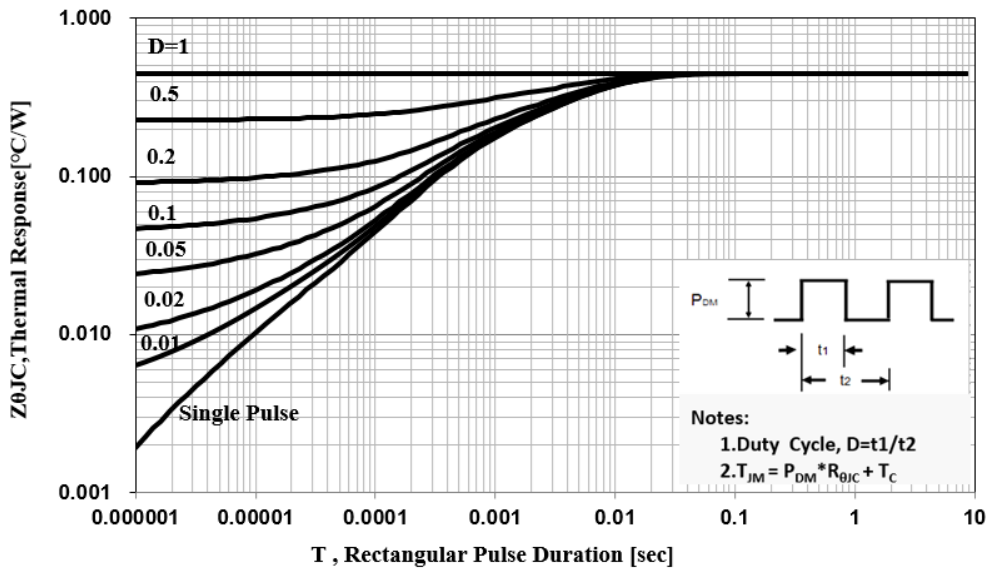
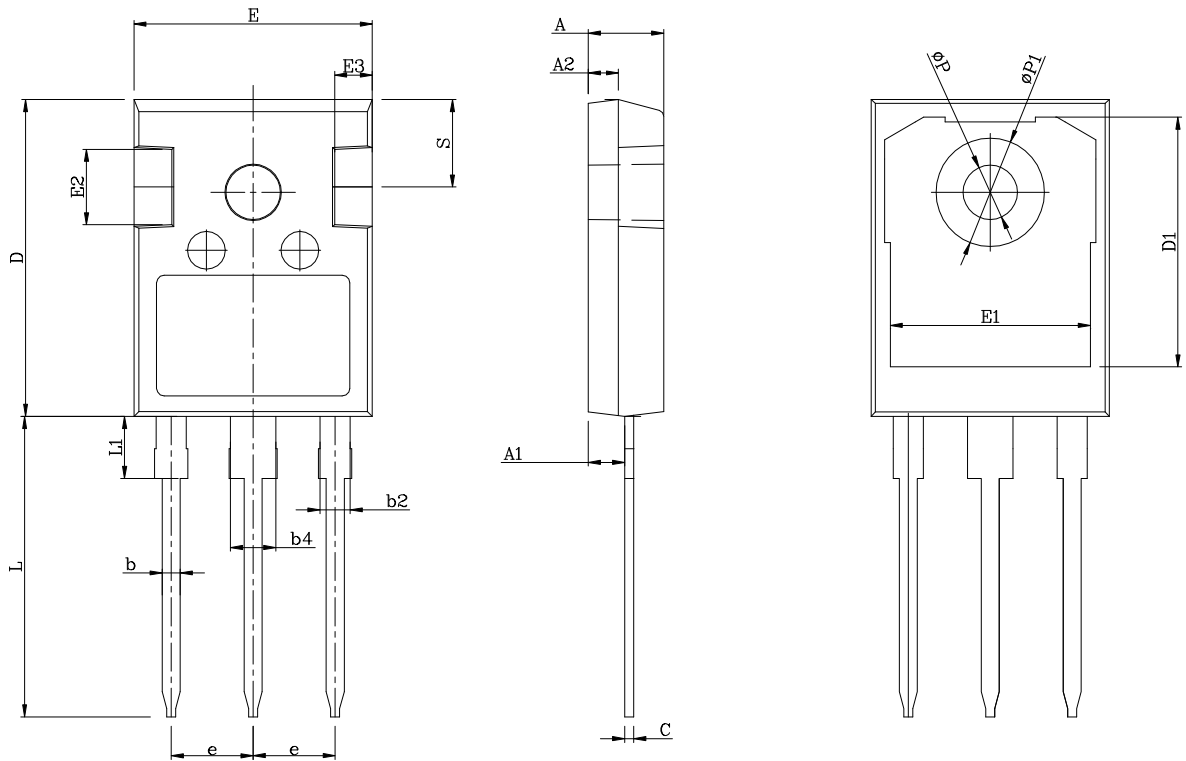


Figure 20. Transient Thermal Impedance

TO-247-3L



COMMON DIMENSIONS

SYMBOL	mm			SYMBOL	mm		
	Min	Nom	Max		Min	Nom	Max
A	4.80	5.00	5.20	E1	13.00	13.26	13.56
A1	2.23	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	5.44BSC		
b2	1.91	2.01	2.21	L	19.82	19.92	20.22
b4	2.91	3.01	3.21	L1	3.94	4.12	4.30
c	0.51	0.61	0.75	ØP	3.40	3.60	3.80
D	20.80	21.00	21.30	ØP1	7.08	7.19	7.30
D1	16.25	16.55	16.85	S	6.15BSC		
E	15.50	15.80	16.10				