



### General Description:

Using HUAJING's proprietary trench design and advanced Field Stop (FS) technology, offering superior conduction and switching performances. RoHS Compliant.

V <sub>CES</sub>	600	V
I <sub>C</sub>	15	A
V <sub>CE(sat)</sub>	1.7	V

### Features:

- FS Trench Technology, Positive temperature coefficient
- Low saturation voltage:

V<sub>CE(sat)</sub>, TYP=1.7V @ I<sub>C</sub>=15A, V<sub>GE</sub>=15V;

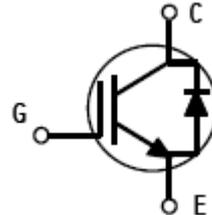
### Applications:

- Motor control
- UPS, PFC

TO-220



TO-220F



### Package Parameters

Type	Package	Marking	Packing
CRG15T60A83L	TO-220	G15T60A83L	Tube
CRG15T60A93L	TO-220F	G15T60A93L	Tube

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

Symbol	Parameter	Rating		Units
		TO-220	TO-220F	
$V_{CES}$	Collector-Emitter Voltage	600	600	V
$V_{GES}$	Gate- Emitter Voltage	$\pm 20$	$\pm 20$	V
$I_C$	Collector Current @ $T_C = 25^\circ\text{C}$	30	30 <sup>al</sup>	A
	Collector Current @ $T_C = 100^\circ\text{C}$	15	15 <sup>al</sup>	
$I_{CM}^{al}$	Pulsed Collector Current @ $T_C = 25^\circ\text{C}$	45	45 <sup>al</sup>	A
$I_F$	Diode Continuous Forward Current @ $T_C = 100^\circ\text{C}$	20	20 <sup>al</sup>	A
	Diode Continuous Forward Current @ $T_C = 25^\circ\text{C}$	10	10 <sup>al</sup>	A
$I_{FM}$	Diode Maximum Forward Current	40	40 <sup>al</sup>	A
$P_D$	Power Dissipation @ $T_C = 25^\circ\text{C}$	96	26	W
$T_J$	Operating Junction	150	$-40 \sim 150$	$^\circ\text{C}$
$T_{stg}$	Storage Temperature Range	$-55 \sim 150$	$-55 \sim 150$	$^\circ\text{C}$
$T_L$	Maximum Temperature for Soldering	270	270	$^\circ\text{C}$

al: Repetitive rating; pulse width limited by maximum junction temperature

**Thermal Characteristics**

Symbol	Parameter	TO-220	TO-220F	Units
$R_{\theta JC}$	Thermal Resistance, Junction to case for IGBT	1.3	4.8	$^\circ\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction to case for Diode	2.8	6.9	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	62.5		$^\circ\text{C}/\text{W}$

**Electrical Characteristics of the IGBT** (  $T_C = 25^\circ\text{C}$  unless otherwise specified )

Symbol	Parameter	Test Conditions	SPEC			Units
			Min.	Typ.	Max.	
<b>OFF Characteristics</b>						
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_{CE}=250\mu\text{A}$	600	--	--	V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{GE}=0V, V_{CE}=600V$	--	--	1.0	mA
$I_{GES(F)}$	Gate to Emitter Forward Leakage	$V_{GE}=+20V$	--	--	+250	nA
$I_{GES(R)}$	Gate to Source Reverse Leakage	$V_{GE}=-20V$	--	--	-250	nA
<b>ON Characteristics</b>						
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=15A, V_{GE}=15V$	--	1.7	2.4	V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=250\mu\text{A}, V_{CE}=V_{GE}$	4.5	5.7	7.0	V
Pulse width $t_p \leq 300\mu\text{s}, \delta \leq 2\%$						
<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE}=25V, V_{GE}=0V$ $f=1\text{MHz}$	--	1095	--	pF
$C_{oes}$	Output Capacitance		--	60	--	
$C_{res}$	Reverse Transfer Capacitance		--	32	--	

<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{CE}=400V, I_C=15A,$ $R_g=10\Omega, V_{GE}=15V,$ Inductive Load $T_J=25^\circ C,$	--	30	--	ns
$t_r$	Rise Time		--	30	--	
$t_{d(off)}$	Turn-Off Delay Time		--	45	--	
$t_f$	Fall Time		--	34	--	
$E_{on}$	Turn-On Switching Loss	$V_{CE}=480V, I_C=15A,$ $V_{GE}=15V,$	--	0.6	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	0.19	--	
$E_{ts}$	Total Switching Loss		--	0.79	--	
$Q_g$	Total Gate Charge	$V_{CE}=480V, I_C=15A,$ $V_{GE}=15V,$	--	59	--	nC
<b>Electrical Characteristics of the DIODE</b> ( $T_C=25^\circ C$ unless otherwise specified):						
$V_F$	Diode Forward Voltage	$I_F=10A$	--	1.4	2.0	V
$t_{rr}$	Reverse Recovery Time	$I_F=10A$ $di/dt=100A/\mu S$	--	47	--	ns
$I_{rrm}$	Reverse Recovery Current		--	7.5	--	A
$Q_{rr}$	Reverse Recovery Charge		--	176	--	nC

Typical Performance Characteristics

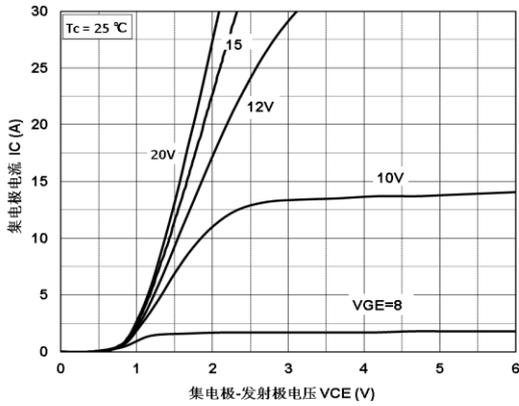


Figure 1. Output Characteristics

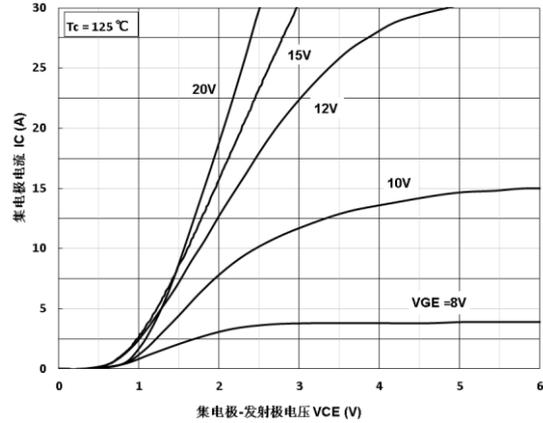


Figure 2. Output Characteristics

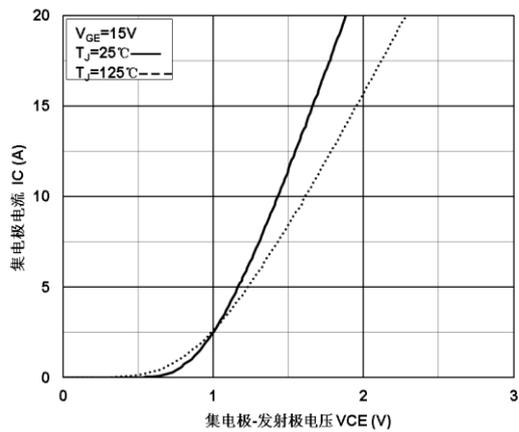


Figure 3. Saturation Voltage Characteristics

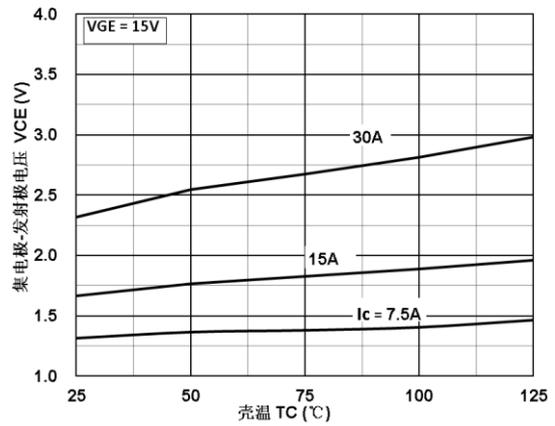


Figure 4. Saturation Voltage -  $T_C$  Characteristics

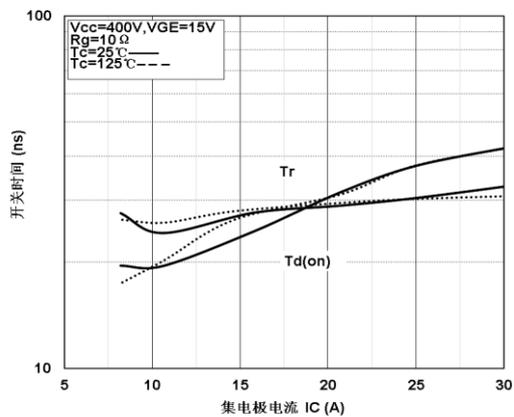


Figure 5. Switching Time-  $I_C$  Characteristics

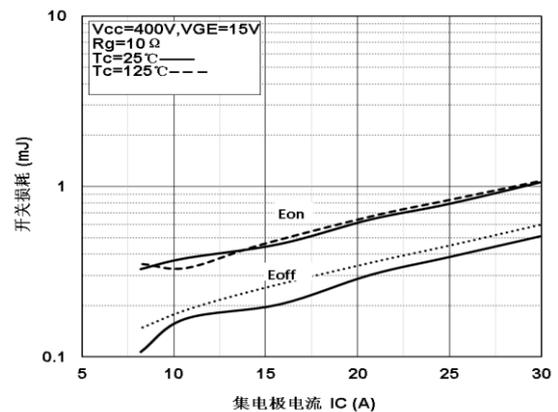


Figure 6. Switching Loss- $I_C$  Characteristics

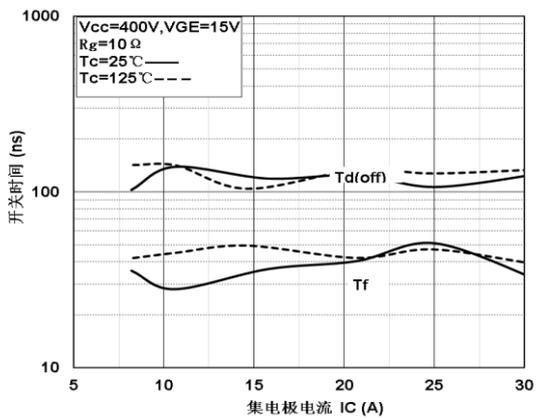


Figure 7. Switching Time-  $I_C$  Characteristics

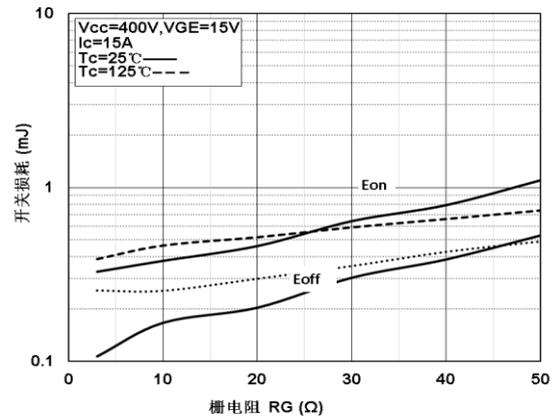


Figure 8. Switching Loss-  $R_G$  Characteristics

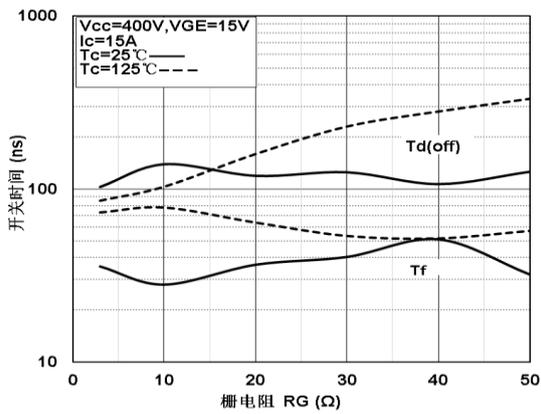


Figure 9. Switching Time-  $R_G$  Characteristics

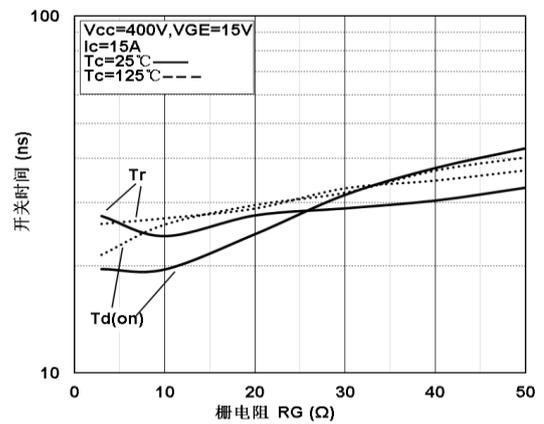


Figure 10. Switching Time-  $R_G$  Characteristics

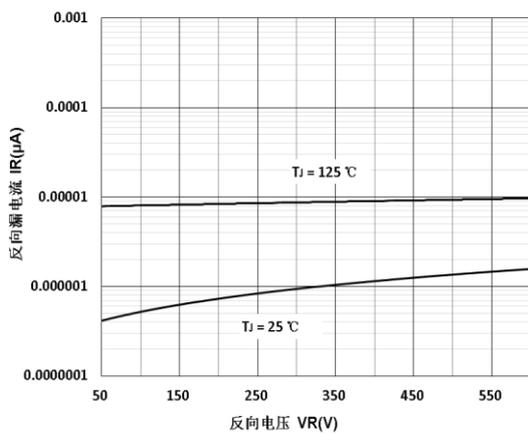


Figure 11. Diode  $I_R$ - $V_R$  Characteristics

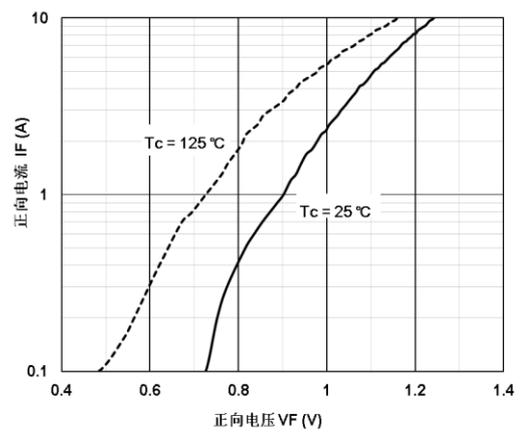


Figure 12. Diode Forward Characteristics

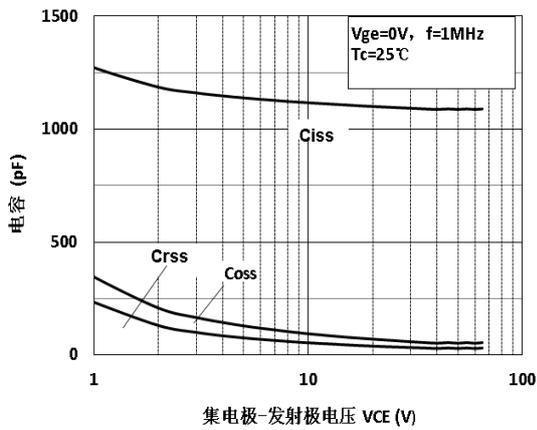


Figure 13. Capacitance Characteristics

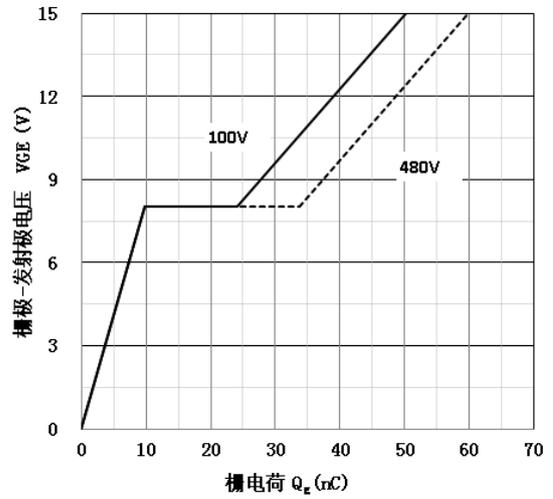


Figure 14. Gage Charge Characteristics

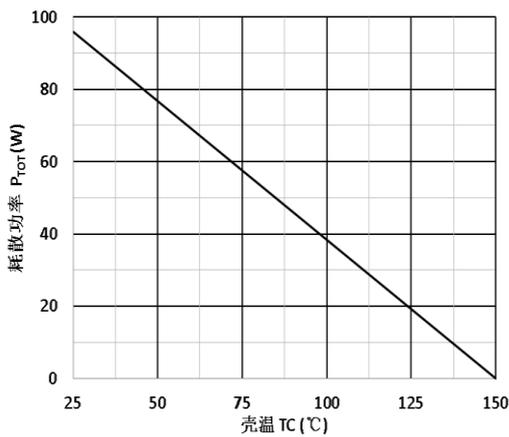


Figure 15. Ptot/Tc Characteristics (TO-220AB)

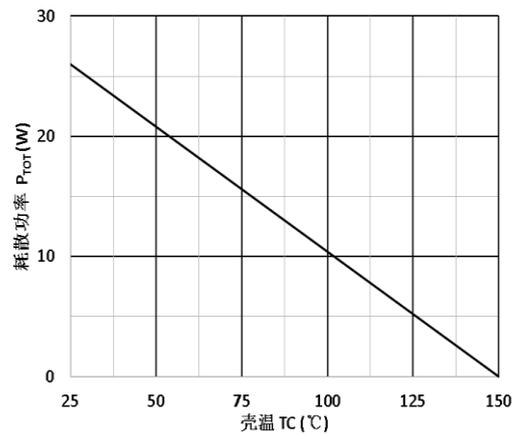


Figure 16. Ptot-Tc Characteristics (TO-220F)

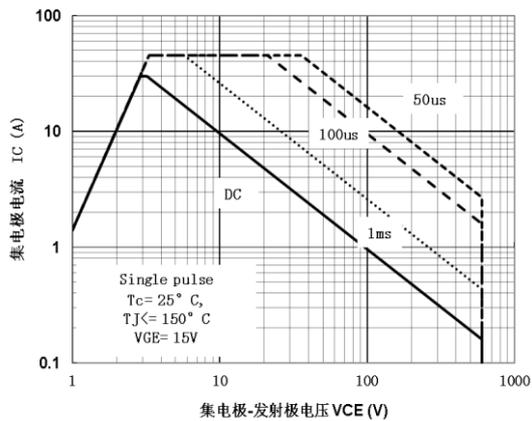


Figure 17. Forward Bias Safe Operating Area (TO-220F)

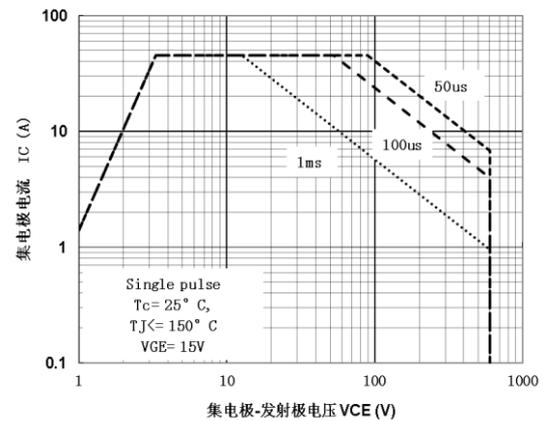


Figure 18. Forward Bias Safe Operating Area (TO-220AB)

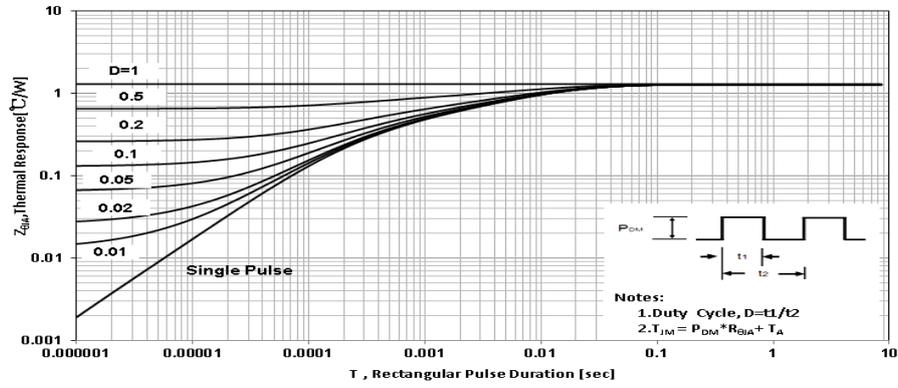


Figure 19.IGBT Transient Thermal Impedance(TO-220)

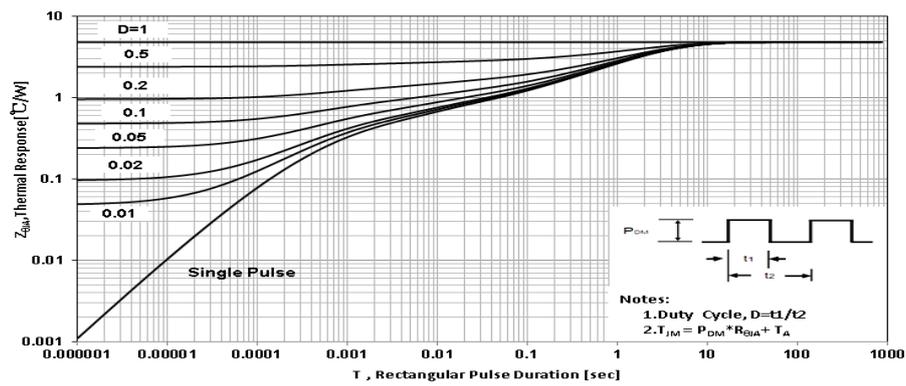
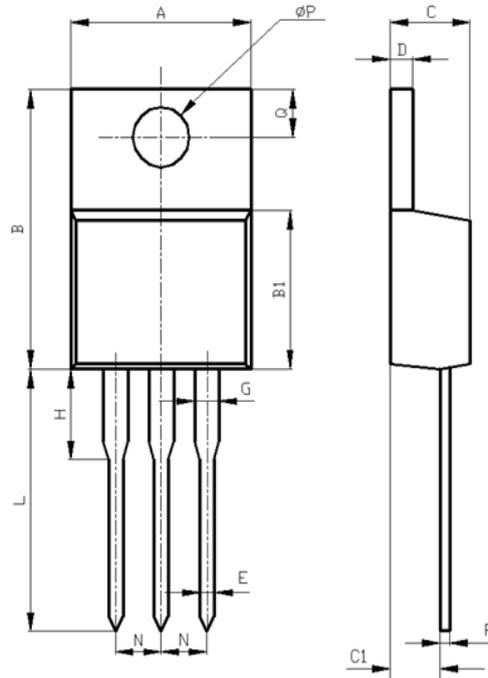
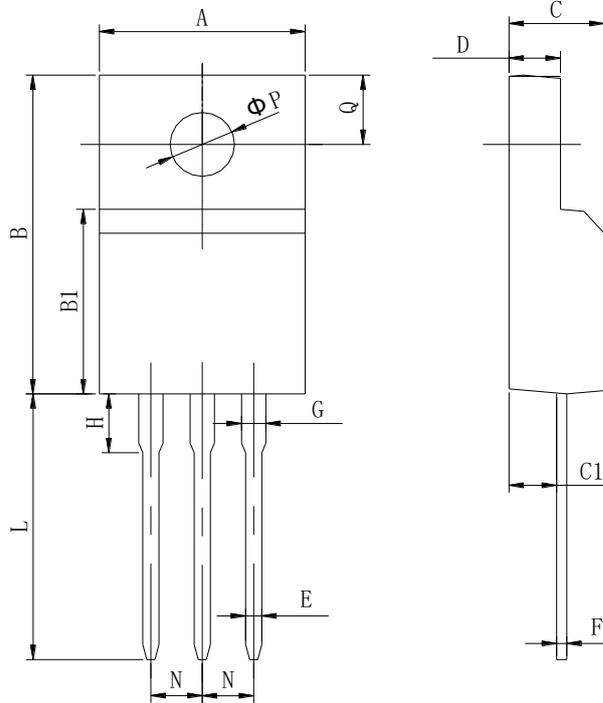


Figure 20.IGBT Transient Thermal Impedance (TO-220F)

**Package Information: CRG15T60A83L (TO-220)**


Items	Values (mm)	
	MIN	MAX
A	9.60	10.6
B	15.0	16.0
B1	8.90	9.50
C	4.30	4.80
C1	2.30	3.10
D	1.20	1.40
E	0.70	0.90
F	0.30	0.60
G	1.17	1.37
H	2.70	3.80
L	12.6	14.8
N	2.34	2.74
Q	2.40	3.00
Ø P	3.50	3.90

TO-220 Package

**Package Information: CRG15T60A93L (TO-220F)**


Items	Values(mm)	
	MIN	MAX
A	9.60	10.4
B	15.4	16.2
B1	8.90	9.50
C	4.30	4.90
C1	2.10	3.00
D	2.40	3.00
E	0.60	1.00
F	0.30	0.60
G	1.12	1.42
H	3.40	3.80
L	12.0	14.0
N	2.34	2.74
Q	3.15	3.55
$\phi P$	2.90	3.30

TO-220F Package

