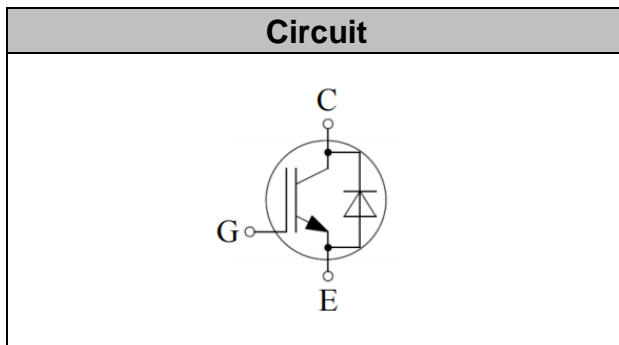




## IGBT Discrete

$V_{CE}$	<b>650</b>	<b>V</b>
$I_C$	<b>20</b>	<b>A</b>
$V_{CE(SAT)} I_C=20A$	<b>1.60</b>	<b>V</b>



## Applications

- Soft switching applications
- Air conditioning
- Motor drive inverter

## Features

- High speed smooth switching device for hard & soft switching
- Maximum junction temperature 175°C
- Positive temperature coefficient
- High ruggedness, temperature stable

## Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	$V_{CE}$	650	V
DC Collector Current, limited by $T_{jmax}$ $T_C=25^\circ C$ $T_C=100^\circ C$	$I_C$	40 20	A
Diode Forward Current, limited by $T_{jmax}$ $T_C=25^\circ C$ $T_C=100^\circ C$	$I_F$	40 20	A
Continuous Gate-Emitter Voltage	$V_{GE}$	$\pm 20$	V
Transient Gate-Emitter Voltage ( $t_p \leq 10\mu s, D < 0.010$ )	$V_{GE}$	$\pm 30$	V
Turn off Safe Operating Area $V_{CE} \leq 600V$ , $T_j \leq 150^\circ C$		60	A
Pulsed Collector Current, $V_{GE}=15V$ , $t_p$ limited by $T_{jmax}$	$I_{CM}$	60	A
Short Circuit Withstand Time, $V_{GE}=15V$ , $V_{CE} \leq 400V$	$T_{sc}$	5	$\mu s$
Diode Pulsed Current, $t_p$ limited by $T_{jmax}$	$I_{Fpuls}$	60	A
Power Dissipation, $T_j=175^\circ C, T_c=25^\circ C$	$P_{tot}$	120	W



Operating Junction Temperature	$T_j$	-40...+175	°C
Storage Temperature	$T_s$	-55...+150	°C
Soldering Temperature, wave soldering 1.6mm (0.063in.) from case for 10s		260	°C

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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Collector-Emitter Breakdown Voltage	$BV_{CES}$	$V_{GE}=0V, I_C=250\mu A$	650		-	V
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=1mA$	5.0	5.8	6.5	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=20A$ $T_j=25^\circ\text{C}$ , $T_j=125^\circ\text{C}$ $T_j=150^\circ\text{C}$		1.60 1.75 1.80	1.95	V
Zero Gate Voltage Collector Current	$I_{CES}$	$V_{CE}=650V, V_{GE}=0V$ $T_j=25^\circ\text{C}$ , $T_j=150^\circ\text{C}$			0.25 1.00	mA
Gate-Emitter Leakage Current	$I_{GES}$	$V_{CE}=0V, V_{GE}=\pm 20V$			$\pm 200$	nA

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic</b>						
Input Capacitance	$C_{ies}$	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz$	-	0.90	-	nF
Output capacitance	$C_{oes}$		-	0.04	-	
Reverse Transfer Capacitance	$C_{res}$		-	0.01	-	
Gate Charge	$Q_G$	$V_{CC}=300V, I_C=20A,$ $V_{GE}=15V$	-	0.085	-	uC
Short circuit collector current	$I_{C(SC)}$	$V_{GE}=15V, t_{SC}\leq 5\mu s$ $V_{CC}=400V,$ $T_{j,start}=25^\circ\text{C}$	-	115	-	A



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

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Static</b>						
Diode Forward Voltage	$V_F$	$I_F = 20\text{A}$ $T_j = 25^\circ\text{C}$ , $T_j = 125^\circ\text{C}$ $T_j = 150^\circ\text{C}$		2.00 1.80 1.70	2.50	V

**Switching Characteristic, Inductive Load**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic , at <math>T_j = 25^\circ\text{C}</math></b>						
Turn-on Delay Time	$t_{d(on)}$	$T_j = 25^\circ\text{C}$ $V_{CC} = 300\text{V}$ , $I_C = 20\text{A}$ , $V_{GE} = -5\text{V} \sim 15\text{V}$ , $R_g = 51\ \Omega$	-	12	-	ns
Rise Time	$t_r$		-	33	-	ns
Turn-on Energy	$E_{on}$		-	0.41	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	68	-	ns
Fall Time	$t_f$		-	129	-	ns
Turn-off Energy	$E_{off}$		-	0.22	-	mJ
<b>Dynamic , at <math>T_j = 125^\circ\text{C}</math></b>						
Turn-on Delay Time	$t_{d(on)}$	$T_j = 125^\circ\text{C}$ $V_{CC} = 300\text{V}$ , $I_C = 20\text{A}$ , $V_{GE} = -5\text{V} \sim 15\text{V}$ , $R_g = 51\ \Omega$	-	16	-	ns
Rise Time	$t_r$		-	41	-	ns
Turn-on Energy	$E_{on}$		-	0.48	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	69	-	ns
Fall Time	$t_f$		-	154	-	ns
Turn-off Energy	$E_{off}$		-	0.35	-	mJ
<b>Dynamic , at <math>T_j = 150^\circ\text{C}</math></b>						
Turn-on Delay Time	$t_{d(on)}$	$T_j = 150^\circ\text{C}$ $V_{CC} = 300\text{V}$ , $I_C = 20\text{A}$ , $V_{GE} = -5\text{V} \sim 15\text{V}$ , $R_g = 51\ \Omega$	-	18	-	ns
Rise Time	$t_r$		-	49	-	ns
Turn-on Energy	$E_{on}$		-	0.52	-	mJ
Turn-off Delay Time	$t_{d(off)}$		-	69	-	ns
Fall Time	$t_f$		-	173	-	ns
Turn-off Energy	$E_{off}$		-	0.38	-	mJ



## Electrical Characteristics of the DIODE

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>Dynamic , at T<sub>j</sub>= 25°C</b>						
Reverse Recovery Current	I <sub>rr</sub>	I <sub>F</sub> =20A, V <sub>R</sub> =300V, -di/dt= 500A/μs,	-	11	-	A
Reverse Recovery Charge	Q <sub>rr</sub>		-	0.20	-	uC
Reverse Recovery Energy	E <sub>rec</sub>		-	0.07	-	mJ
<b>Dynamic , at T<sub>j</sub>= 125°C</b>						
Reverse Recovery Current	I <sub>rr</sub>	I <sub>F</sub> =20A, V <sub>R</sub> =300V, -di/dt=500A/μs,	-	14	-	A
Reverse Recovery Charge	Q <sub>rr</sub>		-	0.75	-	uC
Reverse Recovery Energy	E <sub>rec</sub>		-	0.20	-	mJ
<b>Dynamic , at T<sub>j</sub>= 150°C</b>						
Reverse Recovery Current	I <sub>rr</sub>	I <sub>F</sub> =20A, V <sub>R</sub> =300V, -di/dt= 500A/μs,	-	16	-	A
Reverse Recovery Charge	Q <sub>rr</sub>		-	0.86	-	uC
Reverse Recovery Energy	E <sub>rec</sub>		-	0.25	-	mJ

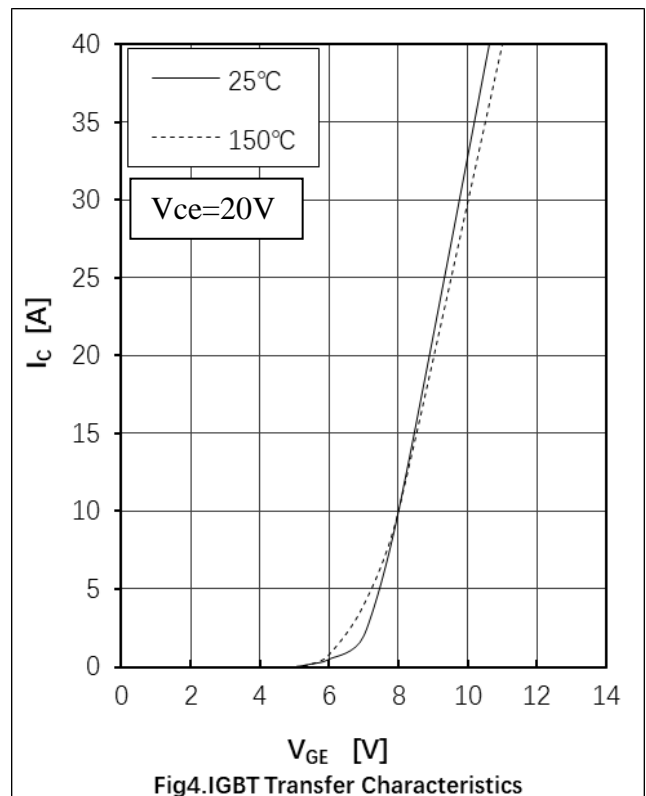
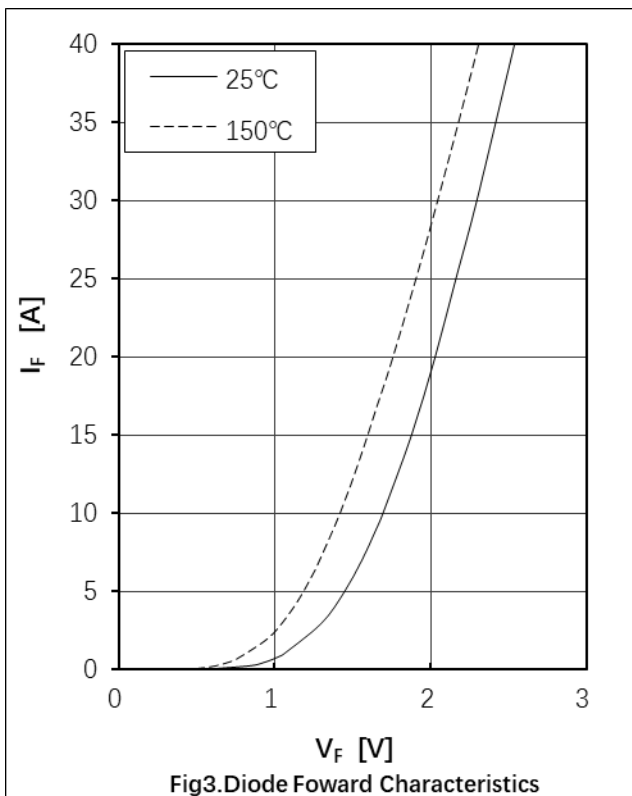
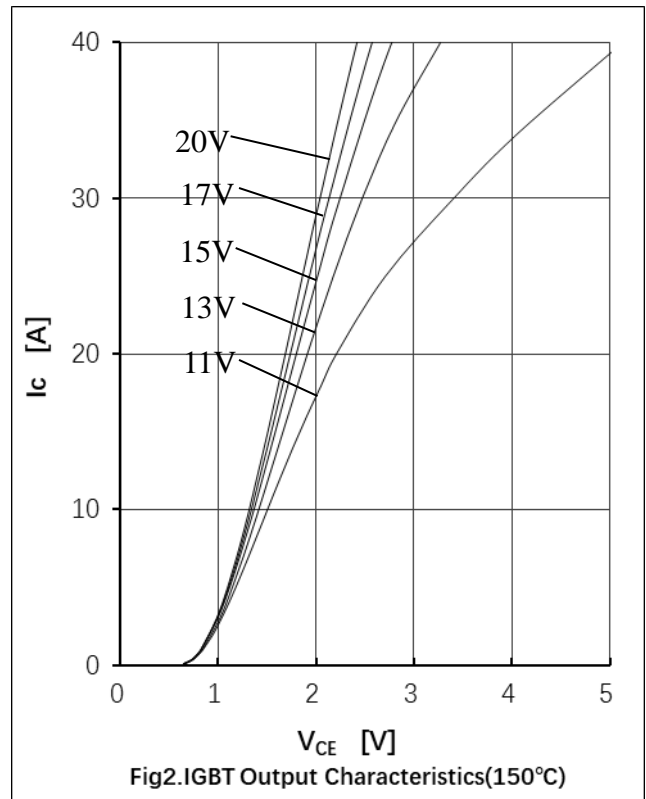
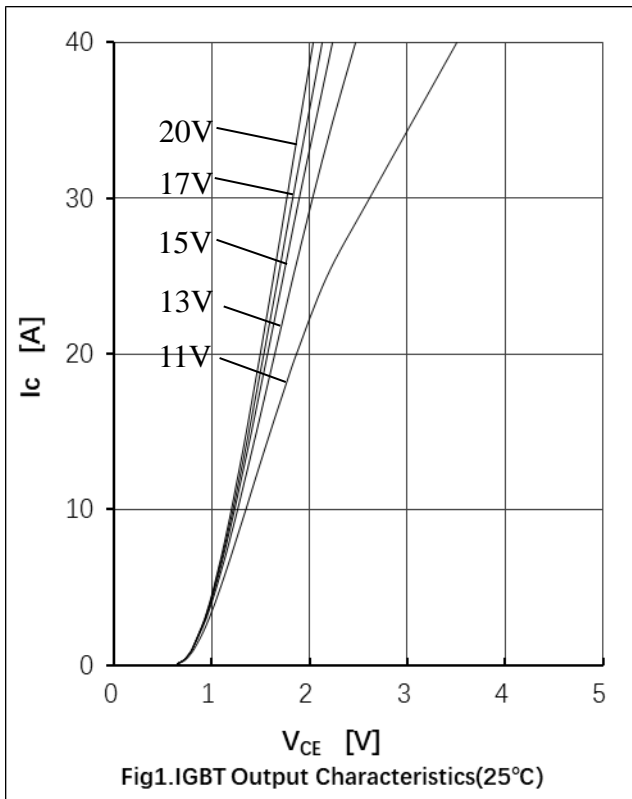
## Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	R <sub>th(j-c)</sub>	4.0	K/W
Diode Thermal Resistance, Junction - Case	R <sub>th(j-c)</sub>	4.8	K/W
Thermal Resistance, Junction - Ambient	R <sub>th(j-a)</sub>	60	K/W



# DGF20N65CTL0

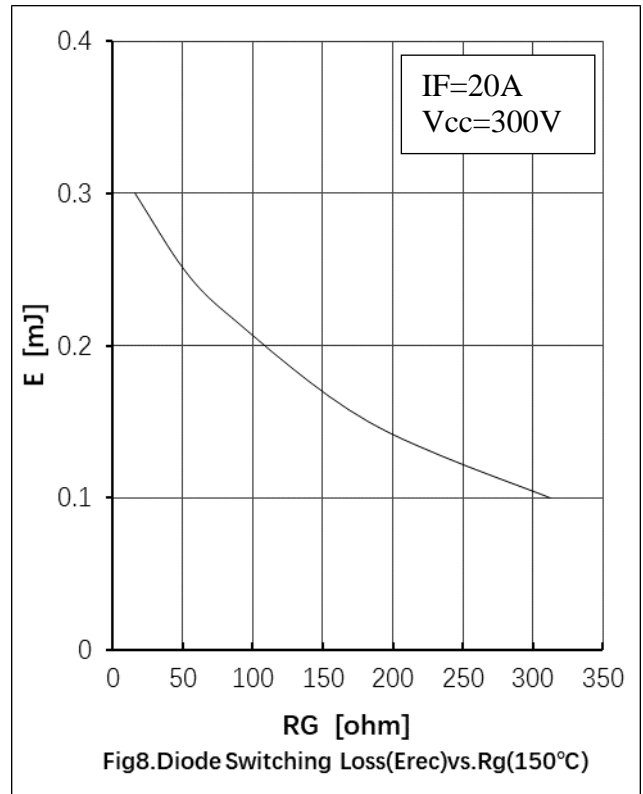
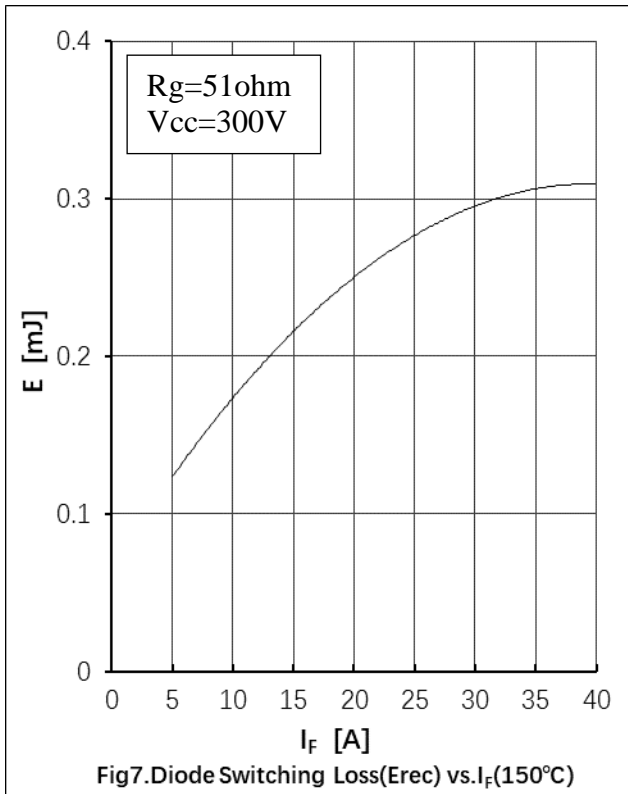
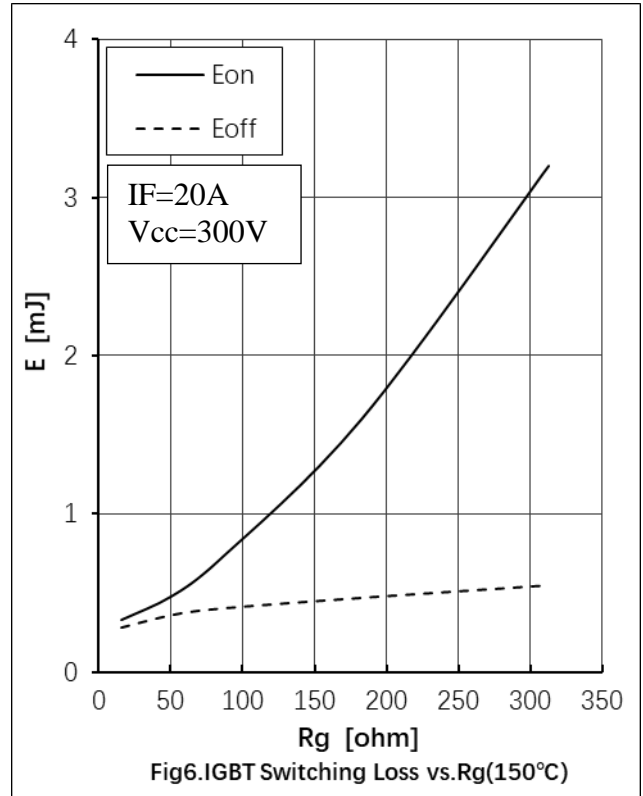
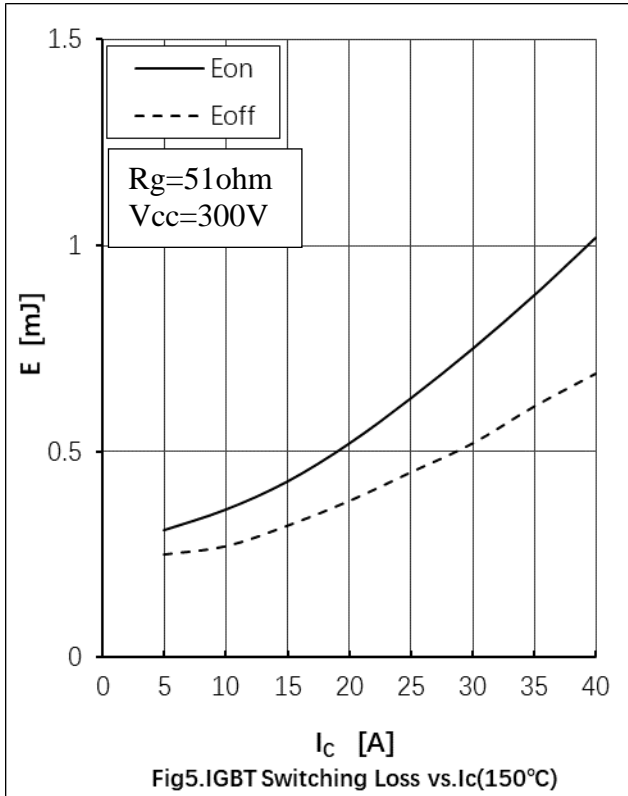
**RoHS**  
COMPLIANT

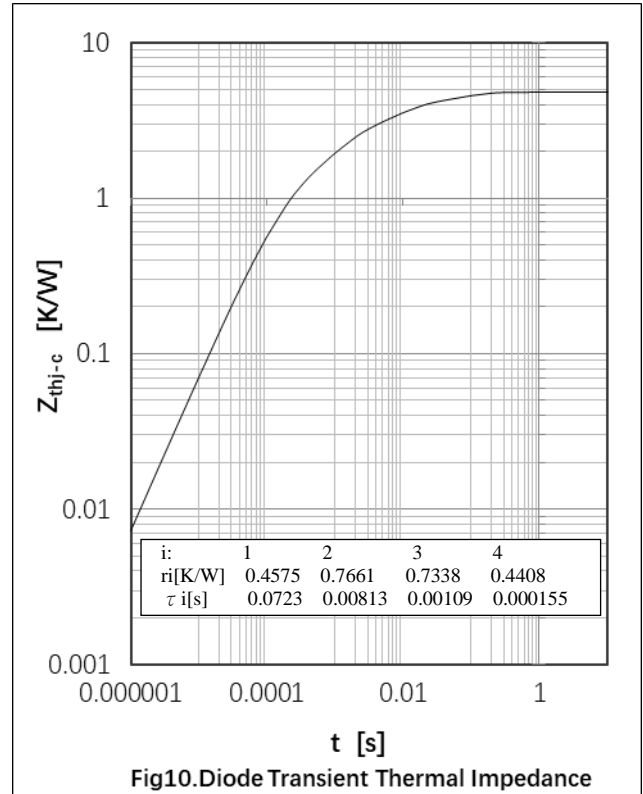
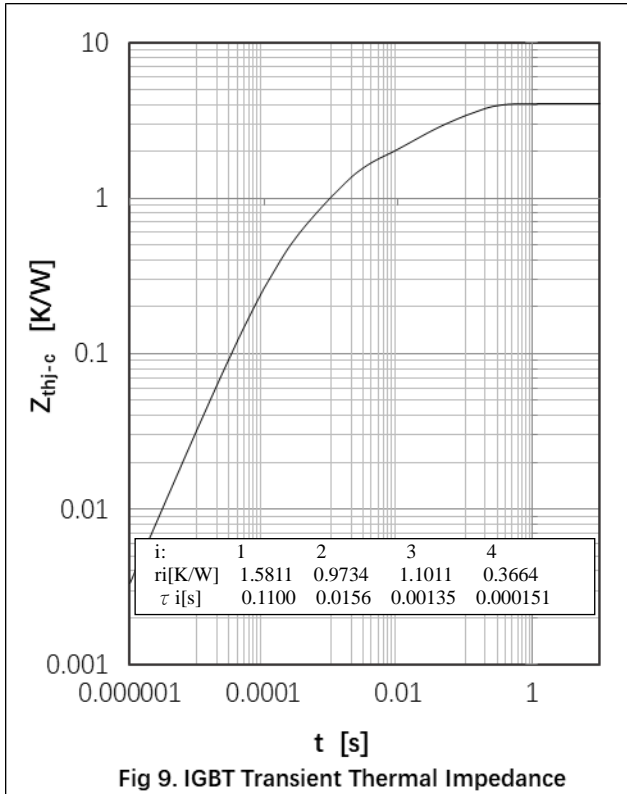




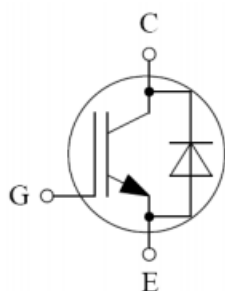
# DGF20N65CTL0

**RoHS**  
COMPLIANT



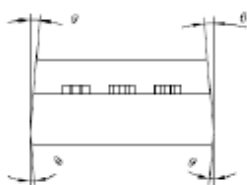
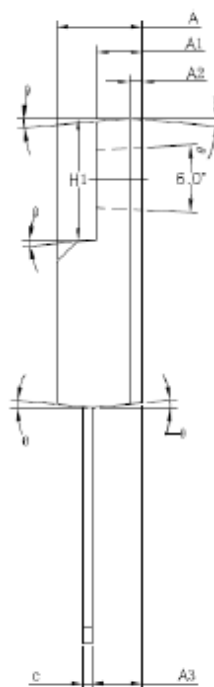
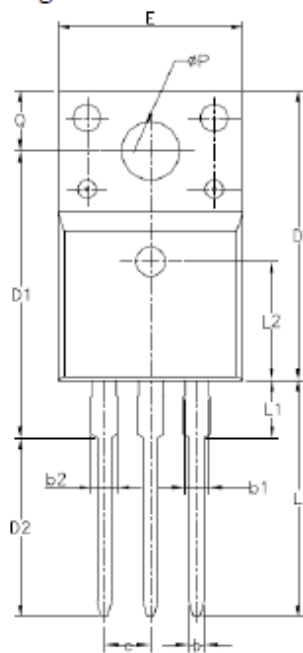


● **Circuit Diagram**



● **Package Outline Information**

**TO-220F package information**



SYMBOL	MIN	NOM	MAX
A	4.50	4.70	4.83
A1	2.34	2.54	2.74
A2	0.70 REF		
A3	2.56	2.76	2.93
b	0.70	-	0.90
b1	1.18	-	1.38
b2	-	-	1.47
c	0.45	0.50	0.60
D	15.67	15.87	16.07
D1	15.55	15.75	15.95
D2	9.60	9.80	10.0
E	9.96	10.16	10.36
e	2.54BSC		
H1	6.48	6.68	6.88
L	12.68	12.98	13.28
L1	-	-	3.50
L2	6.50REF		
$\phi P$	3.08	3.18	3.28
Q	3.20	-	3.40
$\theta 1$	1°	3°	5°