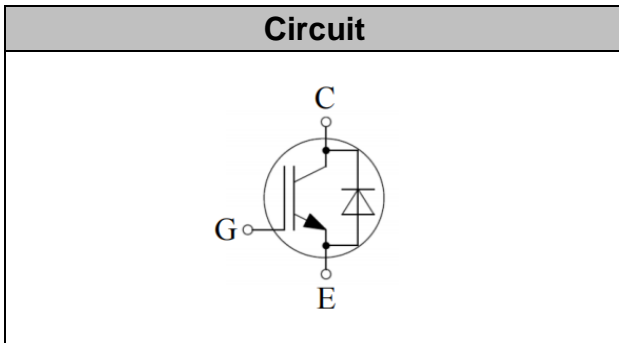




IGBT Discrete

V_{CE}	650	V
I_C	20	A
$V_{CE(SAT)} I_C=20A$	1.60	V



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}	± 20	V
Transient Gate-Emitter Voltage ($t_p \leq 10\mu s, D < 0.010$)	V_{GE}	± 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	μs
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
Static						
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}	$V_{CE}=0V, V_{GE}=\pm 20V$			± 200	nA

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Dynamic						
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
Static						
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
Dynamic , at $T_j = 25^\circ\text{C}$						
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
Dynamic , at $T_j = 125^\circ\text{C}$						
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
Dynamic , at $T_j = 150^\circ\text{C}$						
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
Dynamic , at T_j= 25°C						
Reverse Recovery Current	I _{rr}	I _F =20A, V _R =300V, -di/dt= 500A/μs,	-	11	-	A
Reverse Recovery Charge	Q _{rr}		-	0.20	-	uC
Reverse Recovery Energy	E _{rec}		-	0.07	-	mJ
Dynamic , at T_j= 125°C						
Reverse Recovery Current	I _{rr}	I _F =20A, V _R =300V, -di/dt=500A/μs,	-	14	-	A
Reverse Recovery Charge	Q _{rr}		-	0.75	-	uC
Reverse Recovery Energy	E _{rec}		-	0.20	-	mJ
Dynamic , at T_j= 150°C						
Reverse Recovery Current	I _{rr}	I _F =20A, V _R =300V, -di/dt= 500A/μs,	-	16	-	A
Reverse Recovery Charge	Q _{rr}		-	0.86	-	uC
Reverse Recovery Energy	E _{rec}		-	0.25	-	mJ

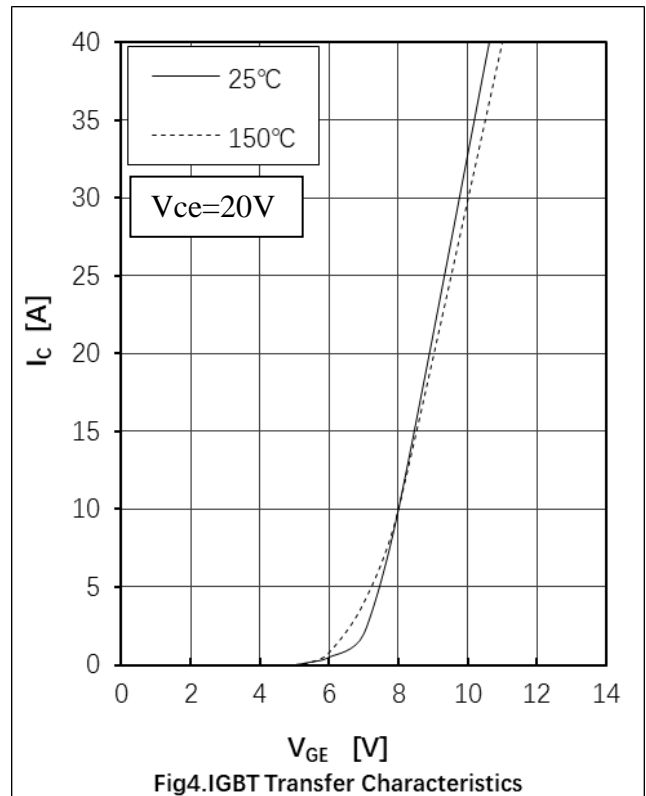
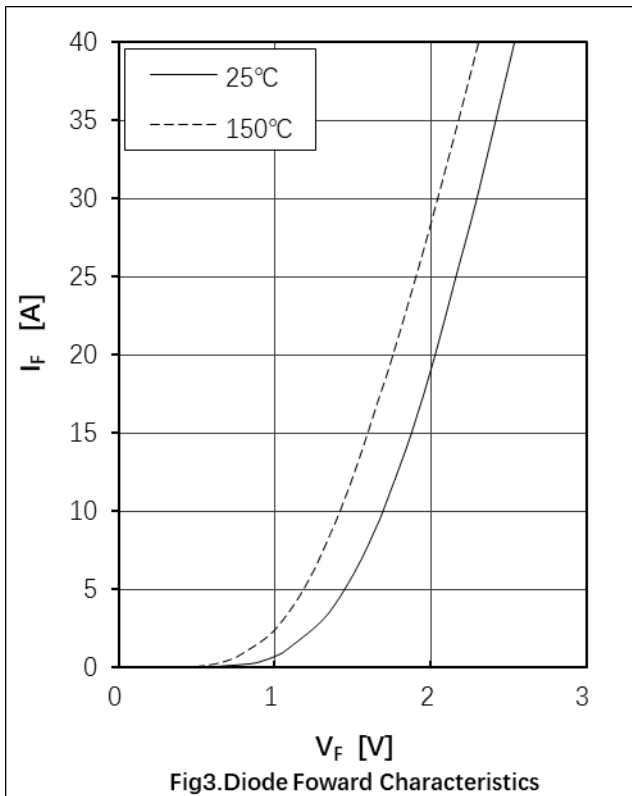
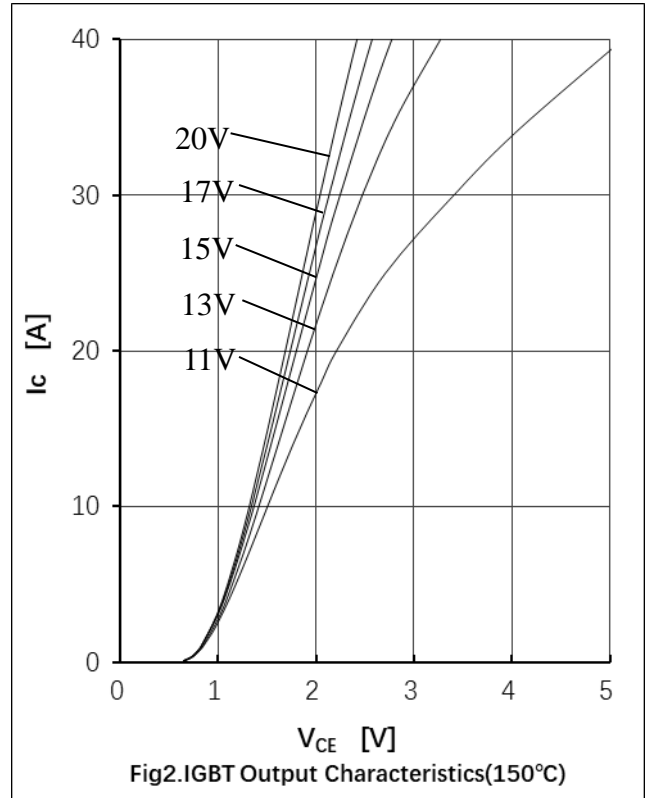
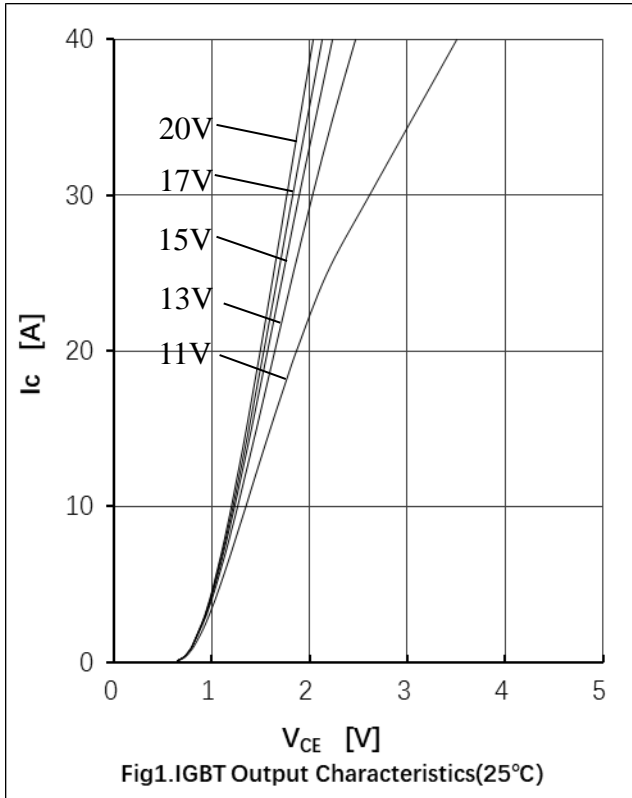
Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT Thermal Resistance, Junction - Case	R _{th(j-c)}	1.25	K/W
Diode Thermal Resistance, Junction - Case	R _{th(j-c)}	1.5	K/W
Thermal Resistance, Junction - Ambient	R _{th(j-a)}	60	K/W



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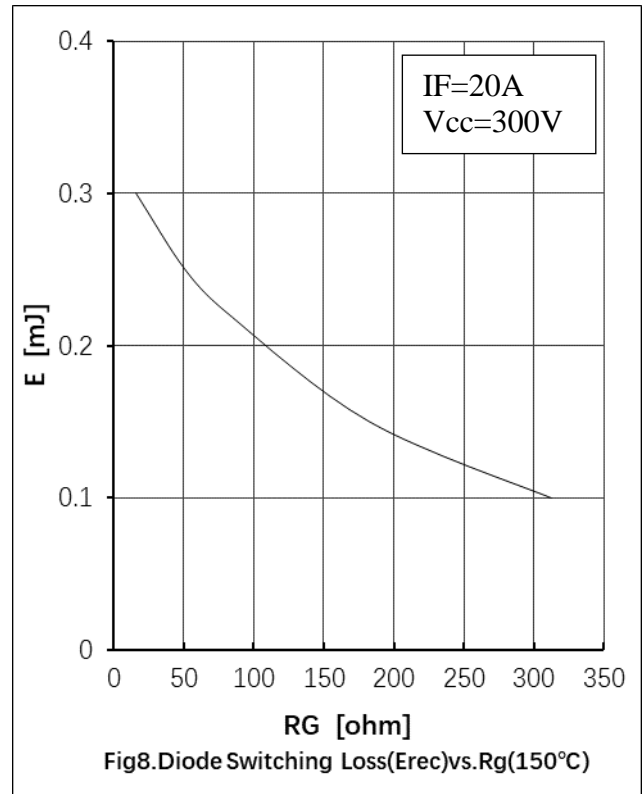
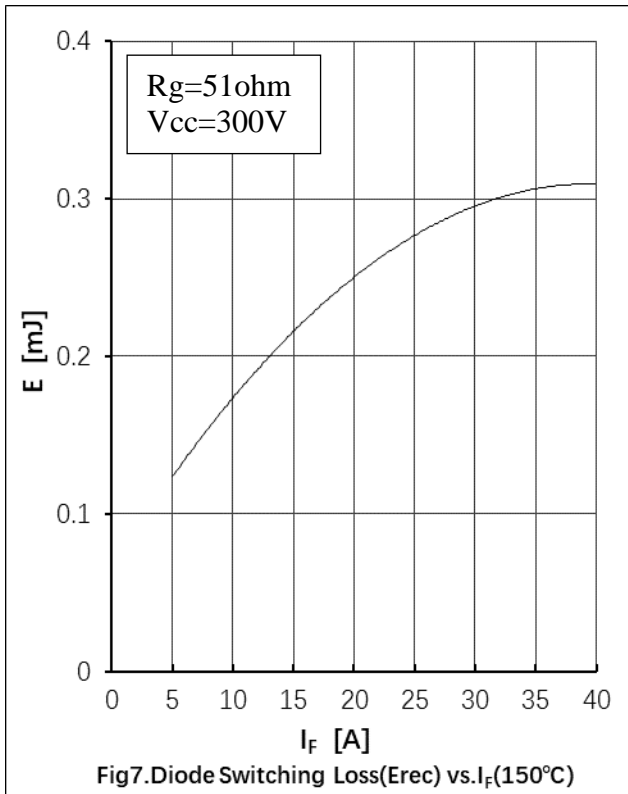
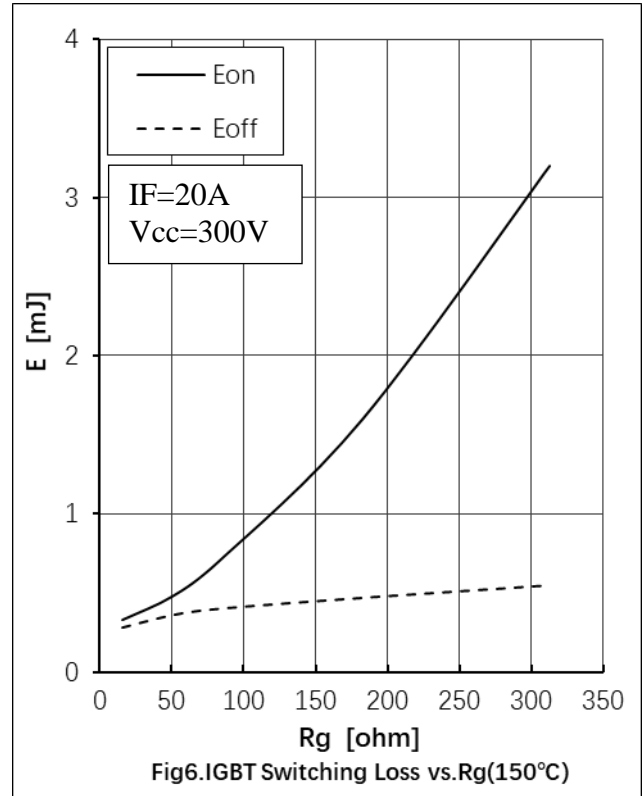
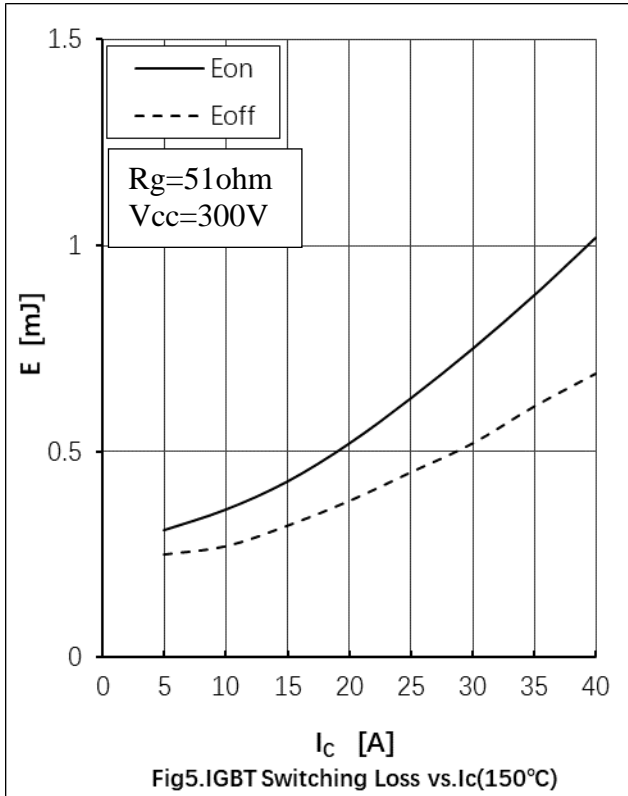
RoHS
COMPLIANT

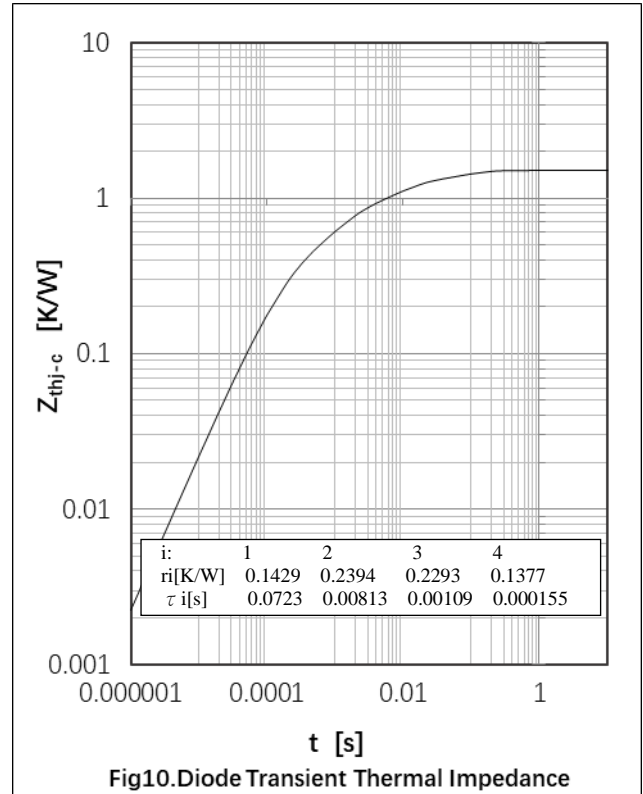
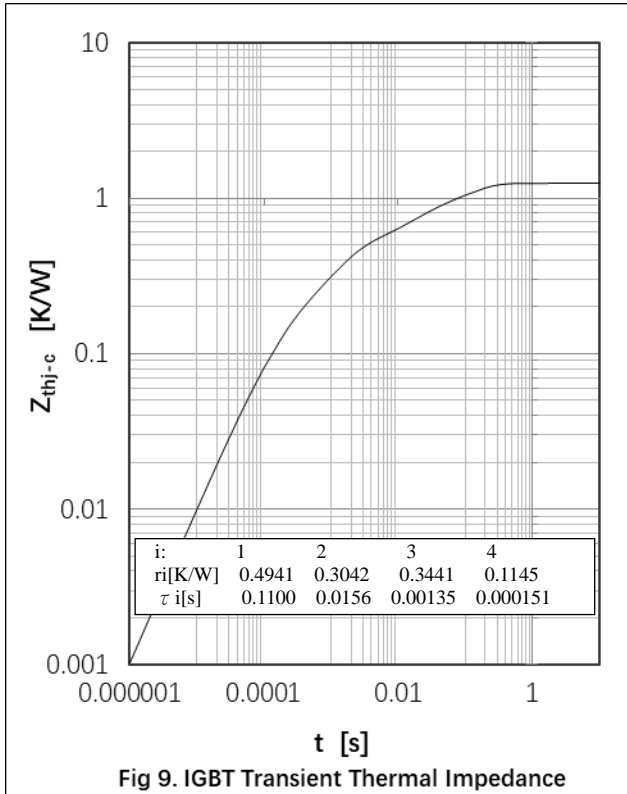




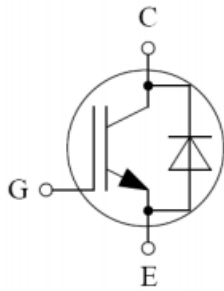
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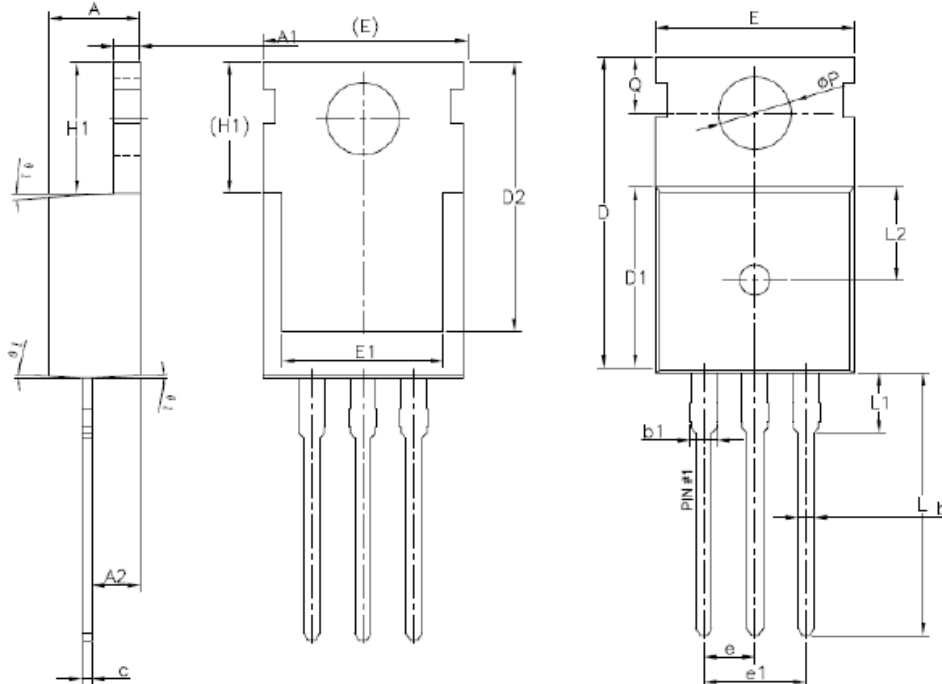


● **Circuit Diagram**



● **Package Outline Information**

CASE: TO-220 package information



SYMBOL	MIN	NOM	MAX
A	4.40	4.50	4.60
A1	1.27	1.30	1.33
A2	2.30	2.40	2.50
b	0.70	—	0.90
b1	1.27	—	1.40
c	0.45	0.50	0.60
D	15.30	15.70	16.10
D1	9.10	9.20	9.30
D2	13.10	—	13.70
E	9.70	9.90	10.20
E1	7.80	8.00	8.20
e	2.49	2.54	2.59
e1	5.03	5.08	5.12
H1	6.30	6.50	6.70
L	12.78	13.08	13.38
L1	3.30	—	3.50
L2	4.50	4.60	4.70
øP	3.55	3.60	3.65
Q	2.73	—	2.87
θ1	1°	3°	5°

