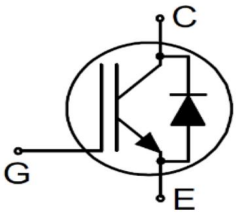
AFGHL40T65SPD

Insulated Gate Bipolar Transistor

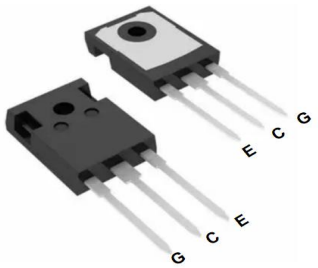
Features

- 650V, 40A IGBT
- Easy paralleling capability due to positive temperature coefficient in V_{CESAT}
- Low EMI
- Low Gate Charge
- Low Saturation Voltage $V_{CE(SAT)}$
- Maximum junction temperature T_{VJmax}=175°C



Application

- UPS
- EV-Charger
- Solar String Inverter
- Energy Storage Inverter



Key Performance and Package Parameters

Device	V_{CE}	I_C (T_C = 25 °C)	$V_{CE(SAT)}$ (T_{VJ} = 25 °C, V_{GE} = 15 V)	V_F (T_{VJ} = 25 °C, I_F=40A)	Package	Packing
AFGHL40T65SPD	650V	40A	1.6 V	1.8V	TO-247	30PCS

Absolute Maximum Ratings (@ T_{VJ} = 25°C unless otherwise specified)

Symbol	Parameter		Value	Units
V_{CE}	Collector emitter voltage		650	V
I_C	DC collector current(1)	T_C = 25°C	70	A
		T_C = 100°C	40	A
I_{CM}	Pulsed collector current	T_C = 25°C	160	A
I_F	Maximum Diode forward current(1)	T_C = 25°C	70	A
		T_C = 100°C	40	A
I_{FM}	Diode pulsed current	T_C = 25°C	160	A
V_{GE}	Gate-Emitter voltage	T_{VJ} = 25°C	±20	V
	Transient Gate-Emitter Voltage (tp ≤ 10μs, D < 0.010)	T_{VJ} = 25°C	±30	V
P_{tot}	Power Dissipation	T_C = 25°C	250	W
		T_C = 100°C	125	W
T_{VJ}	Operating Junction Temperature Range		-40 to +175	°C
T_{STG}	Storage Temperature Range		-55 to +150	°C

Thermal Resistance

Symbol	Parameter	Conditions	Max.	Unit
$R_{\theta JA}$	Thermal resistance: junction - ambient		40	°C/W
$R_{\theta JC}$	IGBT Thermal resistance: junction - case	IGBT	0.6	°C/W
$R_{\theta JC}$	Diode Thermal resistance: junction - case	Diode	0.65	°C/W

Electrical Characteristics (@ T_{VJ} = 25°C unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
$V_{(BR)CES}$	Collector - Emitter Breakdown Voltage	V_{GE} = 0V , I_C = 0.5mA	650	-	-	V
V_{CESAT}	Collector - Emitter Saturation Voltage	V_{GE} = 15V , I_C = 40A	-	1.6	2.1	V
		V_{GE} = 15V , I_C = 40A ,T_{VJ} = 125°C	-	1.85	-	V
		V_{GE} = 15V , I_C = 40A ,T_{VJ} = 175°C	-	1.95	-	V
V_F	Diode forward voltage	V_{GE} = 0V , I_C =40A	-	1.8	-	V
		V_{GE} = 0V , I_C =40A ,T_{VJ} = 125°C	-	1.5	-	V
		V_{GE} = 0V , I_C = 40A ,T_{VJ} = 175°C	-	1.35	-	V
$V_{GE(th)}$	Gate-Emitter threshold voltage	V_{GE} = V_{CE}, I_C = 250μA	3.2	4	4.8	V
I_{CES}	Zero Gate voltage Collector current	V_{CE} = 650V , V_{GE} = 0V	-	-	40	μA
I_{GES}	Gate-Emitter leakage current	V_{GE} = ±20V , V_{CE} = 0V	-	-	±100	nA
g_{fs}	Transconductance	V_{GE} =15V, I_C = 40A	-	55	-	S
Dynamic Characteristics						
C_{ies}	Input Capacitance	V_{GE} = 0V, V_{CE} = 25V, f = 1MHz	-	1520	-	pF
C_{oes}	Output Capacitance		-	110	-	pF
C_{res}	Reverse Transfer Capacitance		-	11	-	pF
Q_g	Gate Charge	V_{GE} = 0 to 15V V_{CE} = 520V, I_C = 40A	-	57	-	nC
Q_{ge}	Gate to Emitter charge		-	6.5	-	nC
Q_{gc}	Gate to Collector charge		-	17.5	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-On DelayTime	V_{GE} = 15V, V_{CC} = 400V I_C= 40A, $R_{G(on)}$ =15Ω,$RG_{(off)}$ =15Ω	-	26	-	ns
t_r	Turn-On Rise Time		-	28	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	136	-	ns
t_f	Turn-Off Fall Time		-	34	-	ns
E_{on}	Turn-on energy		-	0.9	-	mJ
E_{off}	Turn-off energy		-	0.43	-	mJ
E_{ts}	Total switching energy		-	1.33	-	mJ
Diode Recovery Characteristics						
T_{rr}	Reverse recovery time	V_R = 400 V, I_F = 40 A, di/dt = 400 A/μS	-	56	-	ns
Q_{rr}	Reverse recovery charge		-	0.27	-	μC
I_{rrm}	Peak reverse recovery current		-	8.0	-	A

Notes: 1. The max Collector current rating is package limited

Typical Performance Characteristics

Fig.1 Typical Output characteristics (25°C)

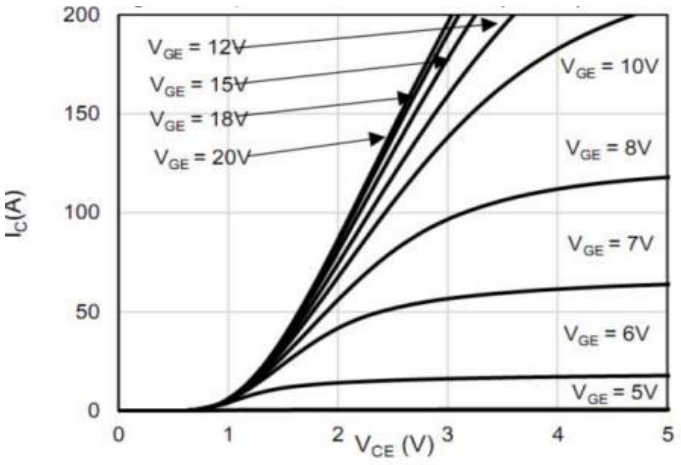


Fig.2 Typical Output characteristics (150°C)

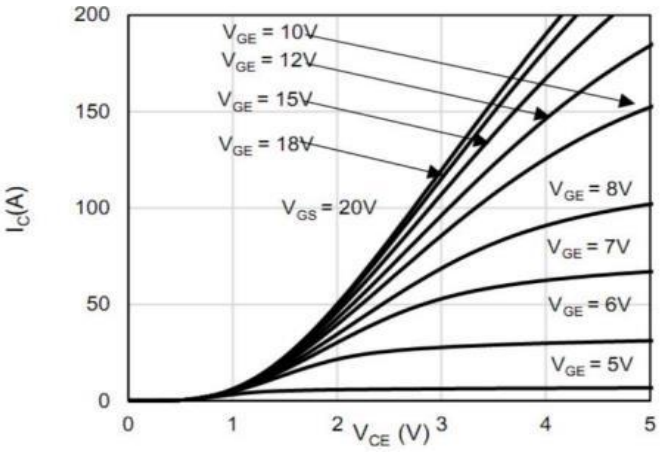


Fig.3 Forward Bias Safe Operating Area

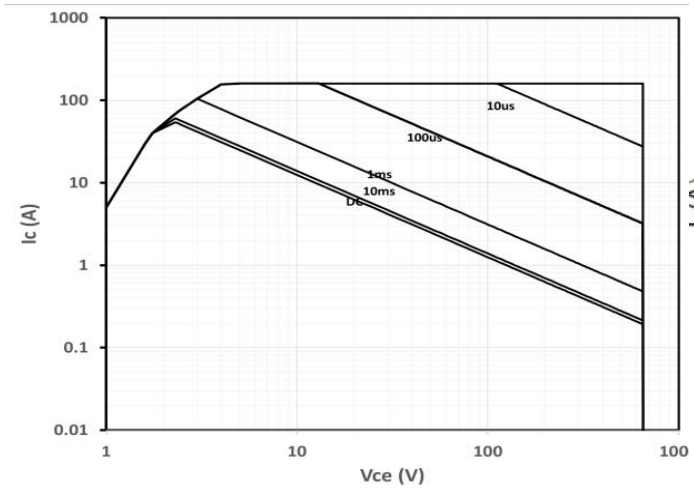


Fig.4 Transfer characteristics

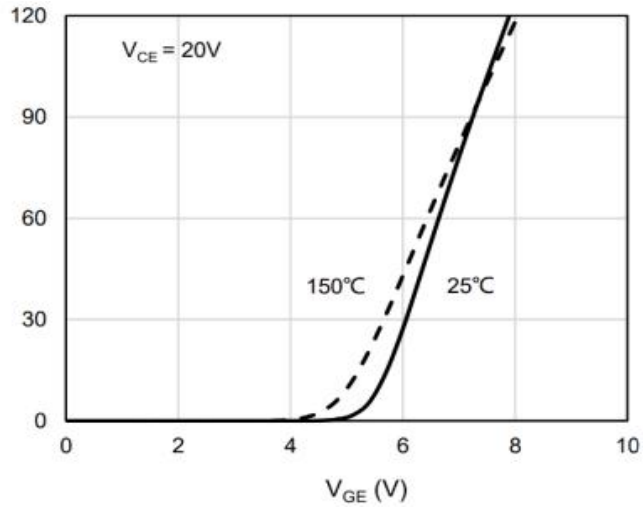


Fig.5 Gate charge characteristics

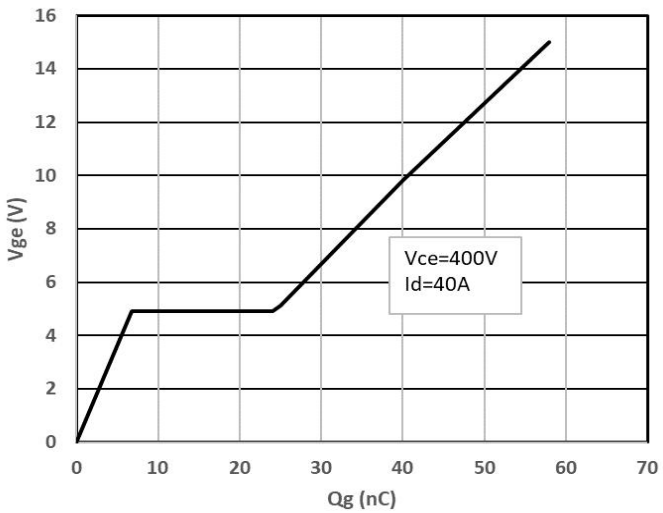


Fig.6 Typical capacitance characteristics

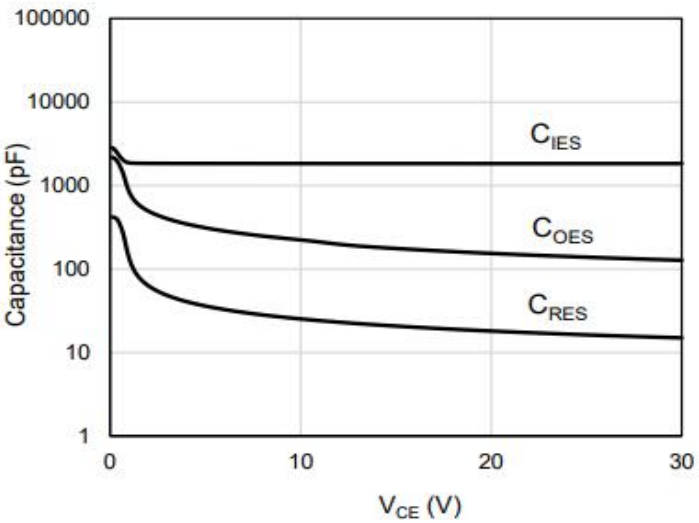


Fig.7 Vcesat vs. Junction Temperature

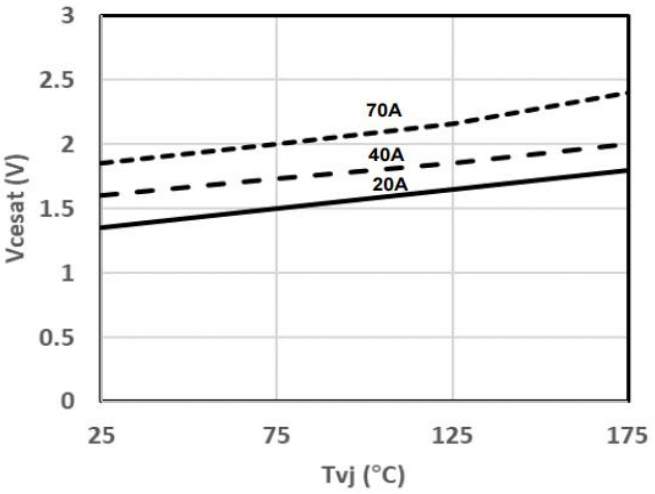


Fig.8 Typical diode VF vs. IF Characteristics

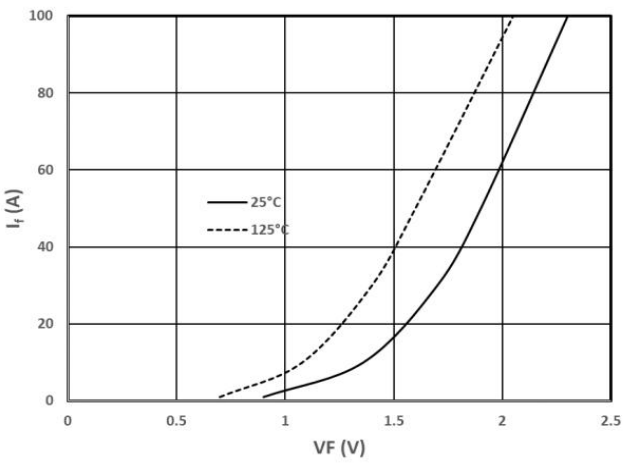


Fig.9 Threshold voltage vs. Junction temperature

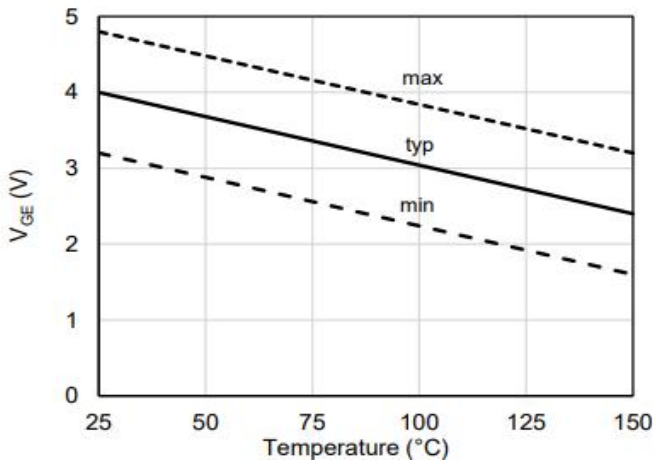


Fig.10 Transient Thermal Impedance IGBT

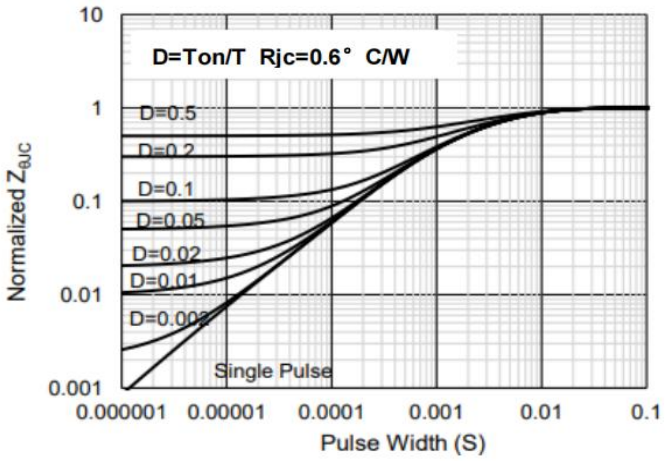
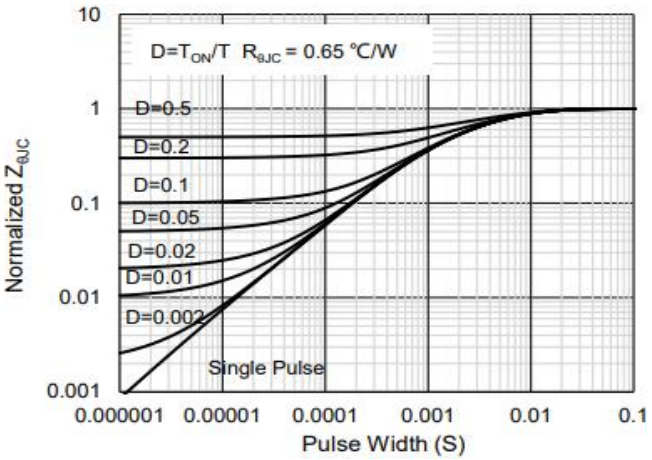
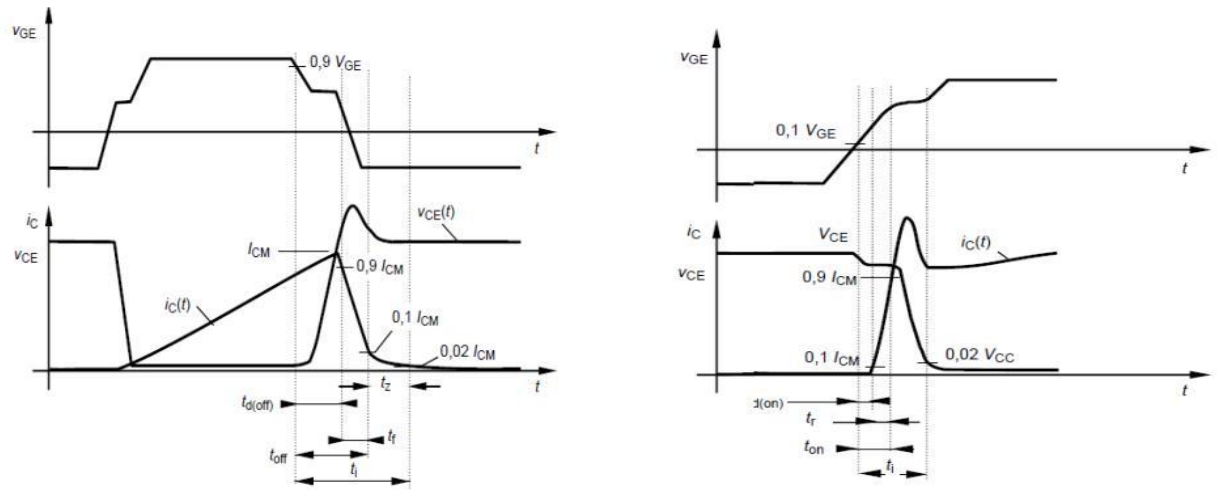


Fig.11 Transient Thermal Impedance Diode

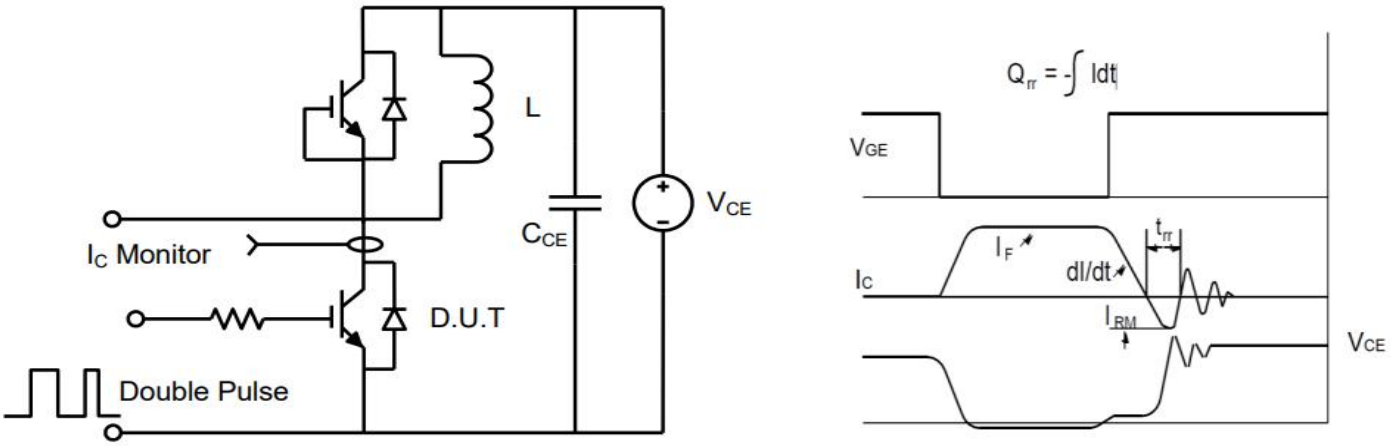


Test Circuit

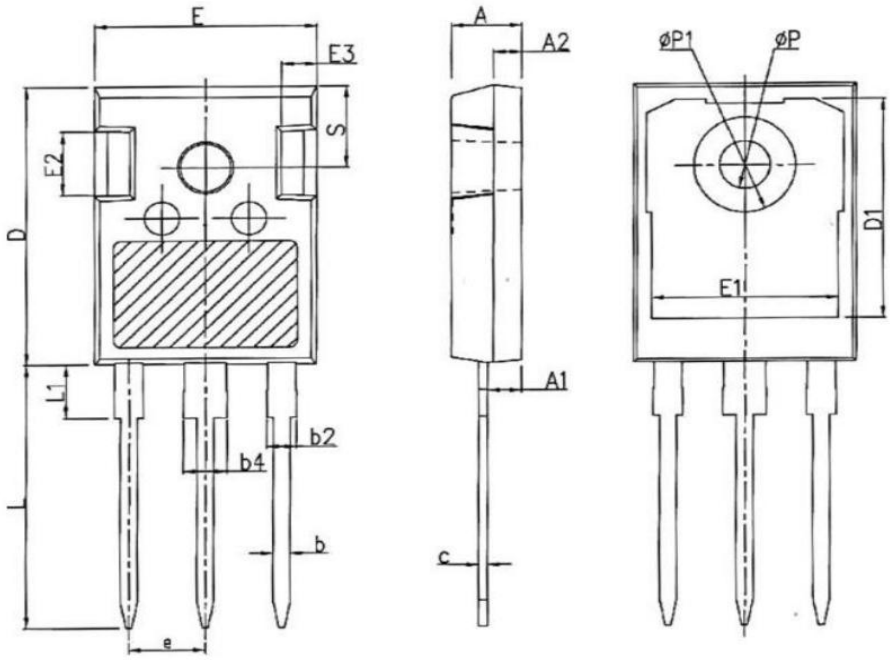
Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Mechanical Data(TO-247)



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	–	–	4.30
ΦP	3.40	3.60	3.80
ΦP1	–	–	7.30
S	6.15BSC		

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