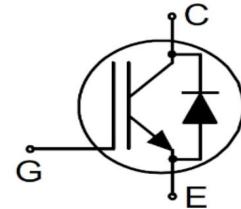




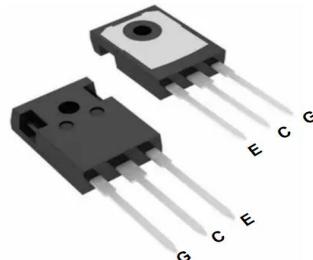
Features

- 650V, 50A 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 $T_{VJmax}=175^{\circ}\text{C}$



Application

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



Key Performance and Package Parameters

Device	V_{CE}	I_C ($T_C = 25^{\circ}\text{C}$)	$V_{CE(SAT)}$ ($T_{VJ} = 25^{\circ}\text{C}$, $V_{GE} = 15\text{ V}$)	V_F ($T_{VJ} = 25^{\circ}\text{C}$, $I_F=40\text{A}$)	Package	Packing
AIGW50N65H5	650V	50A	1.6 V	1.85V	TO-247	30PCS

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

Symbol	Parameter	Value	Units	
V_{CE}	Collector emitter voltage	650	V	
I_C	DC collector current ⁽¹⁾	$T_C = 25^{\circ}\text{C}$	80	A
		$T_C = 100^{\circ}\text{C}$	50	A
I_{CM}	Pulsed collector current	$T_C = 25^{\circ}\text{C}$	200	A
I_F	Maximum Diode forward current ⁽¹⁾	$T_C = 25^{\circ}\text{C}$	80	A
		$T_C = 100^{\circ}\text{C}$	50	A
I_{FM}	Diode pulsed current	$T_C = 25^{\circ}\text{C}$	200	A
V_{GE}	Gate-Emitter voltage	$T_{VJ} = 25^{\circ}\text{C}$	± 20	V
	Transient Gate-Emitter Voltage ($t_p \leq 10\mu\text{s}$, $D < 0.010$)	$T_{VJ} = 25^{\circ}\text{C}$	± 30	V
P_{tot}	Power Dissipation	$T_C = 25^{\circ}\text{C}$	250	W
		$T_C = 100^{\circ}\text{C}$	129	W
T_{VJ}	Operating Junction Temperature Range	-40 to +175	$^{\circ}\text{C}$	
T_{STG}	Storage Temperature Range	-55 to +150	$^{\circ}\text{C}$	



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	0.65	°C/W
$R_{\theta DC}$	Diode Thermal resistance: junction - case	Diode	0.58	°C/W

Electrical Characteristics (@ $T_{VJ} = 25^\circ C$ 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	$V_{GE} = 15V, I_C = 50A$	-	1.6	2.1	V
		$V_{GE} = 15V, I_C = 50A, T_{VJ} = 125^\circ C$	-	1.93	-	V
		$V_{GE} = 15V, I_C = 50A, T_{VJ} = 175^\circ C$	-	2.0	-	V
V_F	Diode forward voltage	$V_{GE} = 0V, I_C = 50A$	-	1.85	-	V
		$V_{GE} = 0V, I_C = 50A, T_{VJ} = 125^\circ C$	-	1.6	-	V
		$V_{GE} = 0V, I_C = 50A, T_{VJ} = 175^\circ C$	-	1.45	-	V
$V_{GE(th)}$	Gate-Emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 250\mu A$	3.2	4	4.8	V
I_{CES}	Zero Gate voltage Collector current	$V_{CE} = 650V, V_{GE} = 0V$	-	-	50	μA
I_{GES}	Gate-Emitter leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$	-	-	± 100	nA
g_{fs}	Transconductance	$V_{GE} = 20V, I_C = 50A$	-	56	-	S

Dynamic Characteristics

C_{ies}	Input Capacitance	$V_{GE} = 0V, V_{CE} = 25V, f = 1MHz$	-	1916	-	pF
C_{oes}	Output Capacitance		-	139	-	pF
C_{res}	Reverse Transfer Capacitance		-	13	-	pF
Q_g	Gate Charge	$V_{GE} = 0$ to $15V$ $V_{CE} = 520V, I_C = 50A$	-	71	-	nC
Q_{ge}	Gate to Emitter charge		-	10	-	nC
Q_{gc}	Gate to Collector charge		-	21	-	nC

Switching Characteristics

$t_{d(on)}$	Turn-On DelayTime	$V_{GE} = 15V, V_{CC} = 400V$ $I_C = 50A, R_{G(off)} = 12\Omega, R_{G(on)} = 12\Omega$	-	17	-	ns
t_r	Turn-On Rise Time		-	30	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	110	-	ns
t_f	Turn-Off Fall Time		-	34	-	ns
E_{on}	Turn-on energy		-	1.35	-	mJ
E_{off}	Turn-off energy		-	0.51	-	mJ
E_{ts}	Total switching energy		-	1.86	-	mJ

Diode Recovery Characteristics

T_{rr}	Reverse recovery time	$V_R = 400V, I_F = 50A, di/dt = 400A/\mu S$	-	56	-	ns
Q_{rr}	Reverse recovery charge		-	0.27	-	μC
I_{rrm}	Peak reverse recovery current		-	8	-	A

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



Typical Performance Characteristics

Fig.1 Typical Output characteristics (25°C)

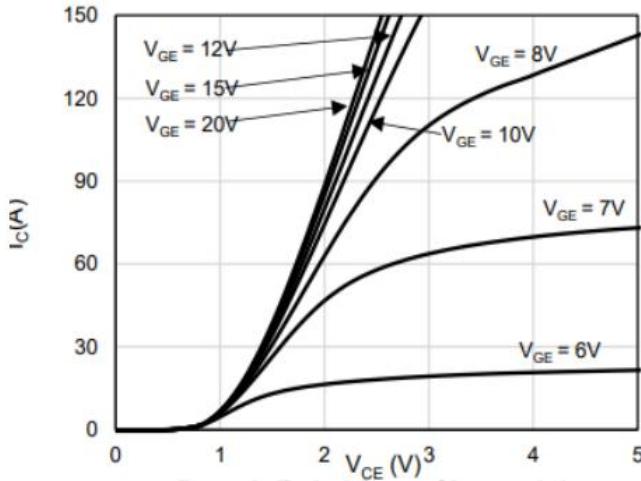


Fig.2 Typical Output characteristics (175°C)

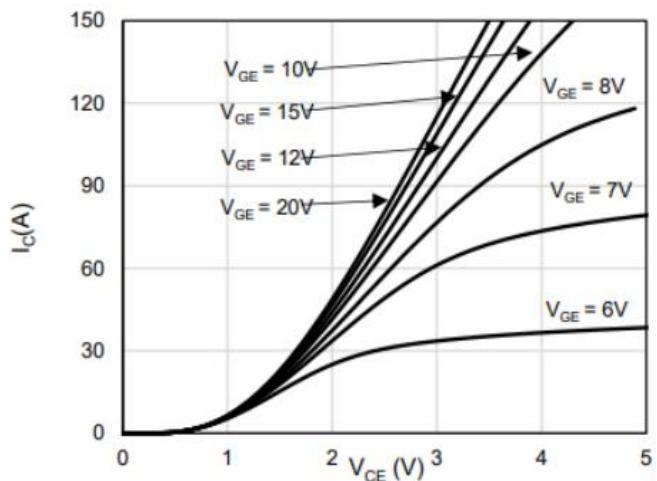


Fig.3 Forward Bias Safe Operating Area

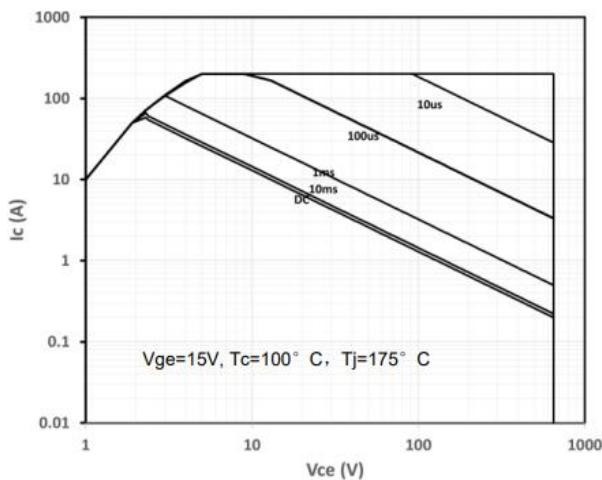


Fig.4 Transfer characteristics

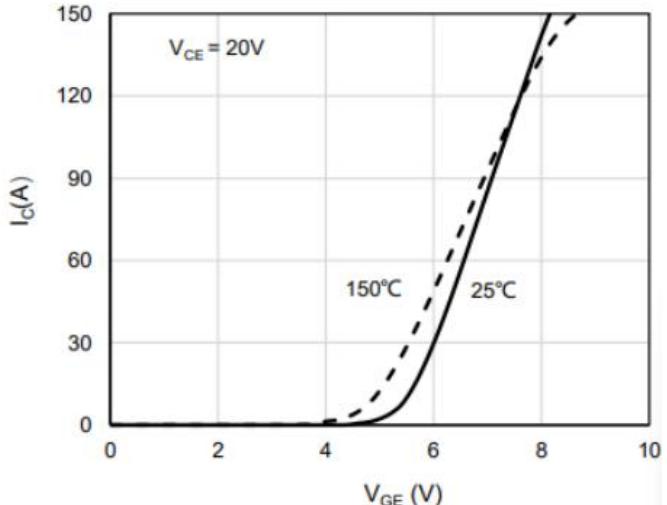


Fig.5 Gate charge

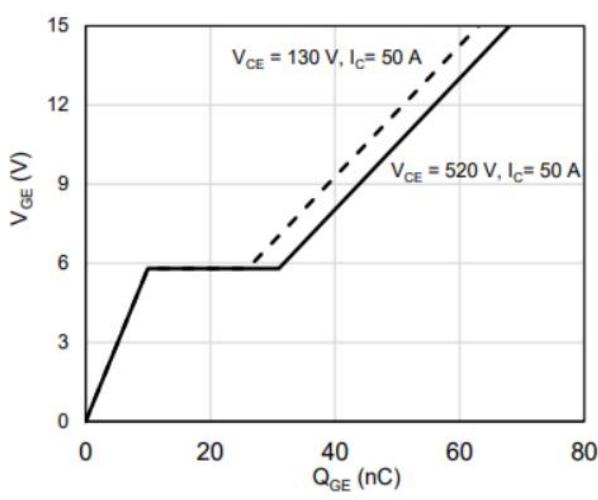


Fig.6 Typical capacitance

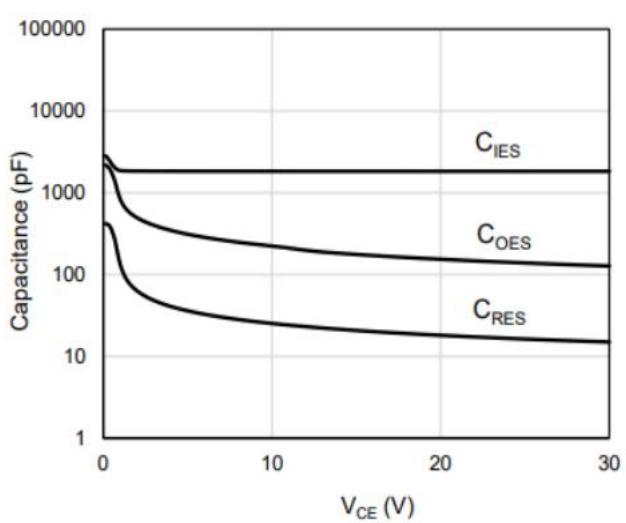




Fig.7 V_{CEsat} vs. Junction Temperature

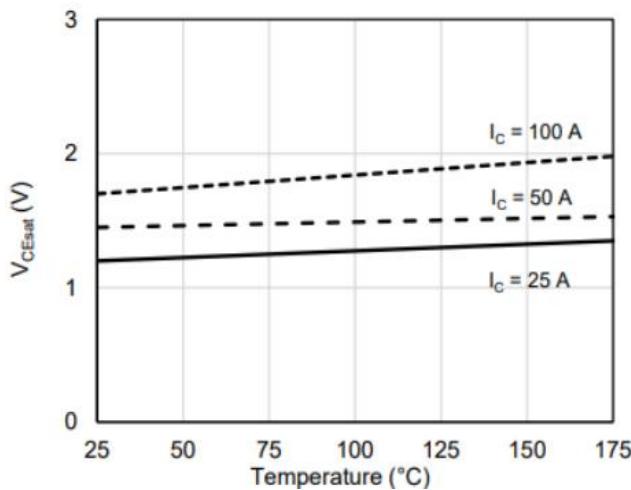


Fig.8 Typical diode VF vs. IF Characteristics

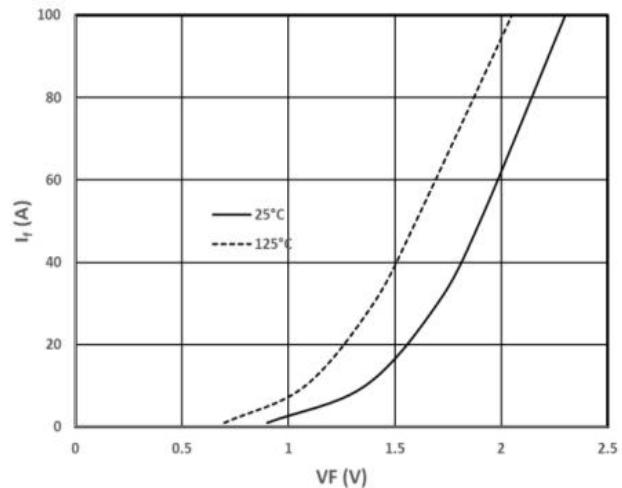


Fig.9 Threshold voltage vs. Junction temperature

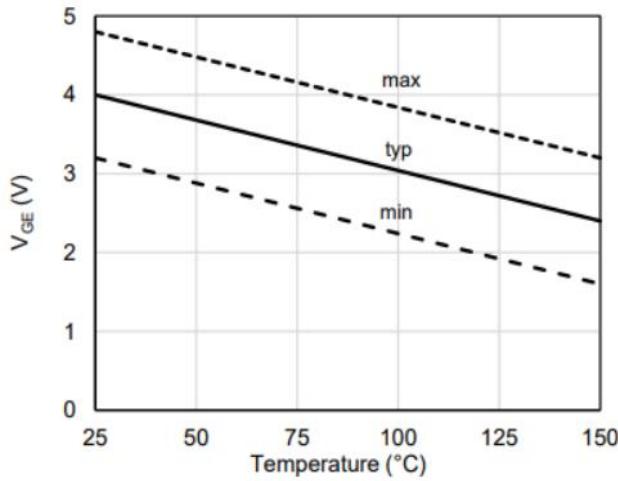


Fig.10 Switching Energy Loss vs. collector current

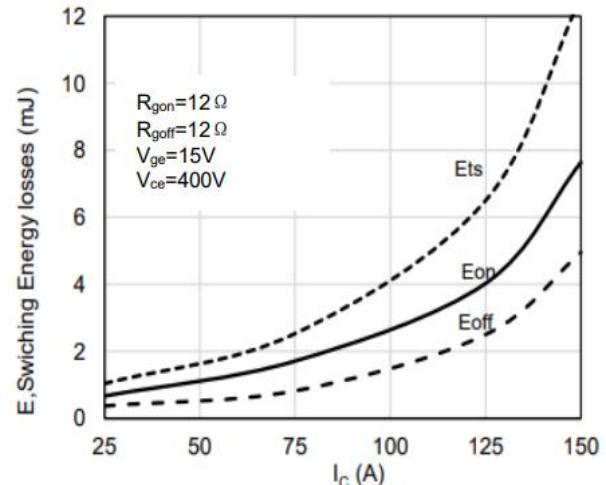


Fig.11 Switching Energy Loss vs. R_g

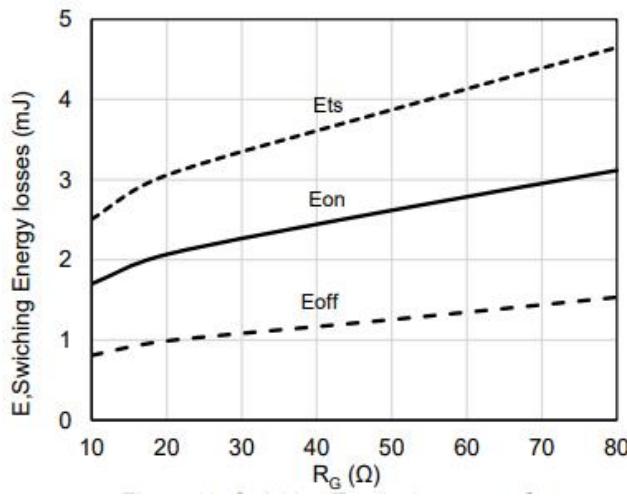


Fig.12 Transient Thermal Impedance IGBT

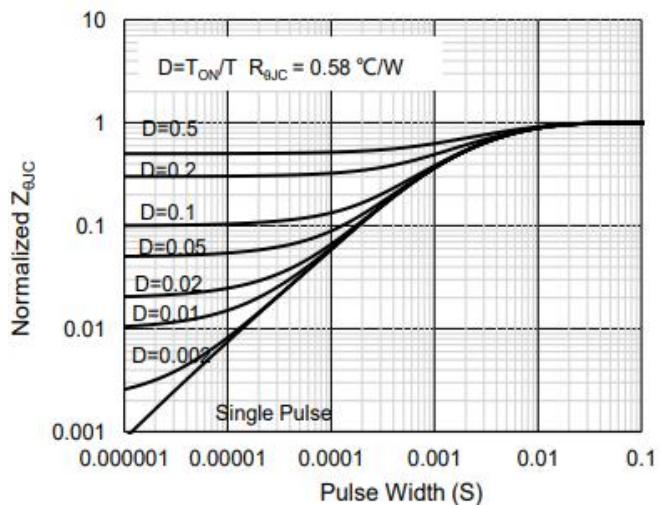
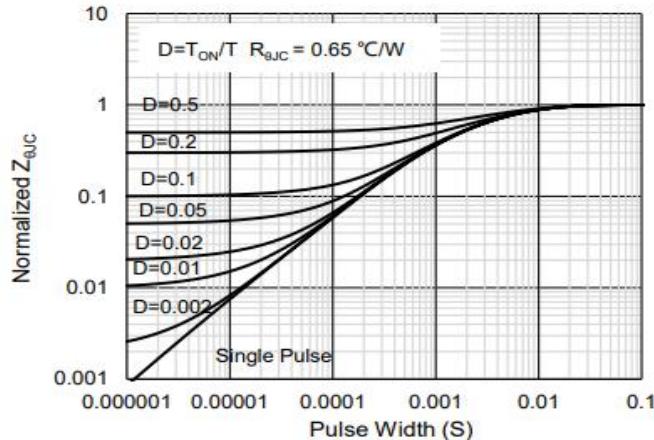


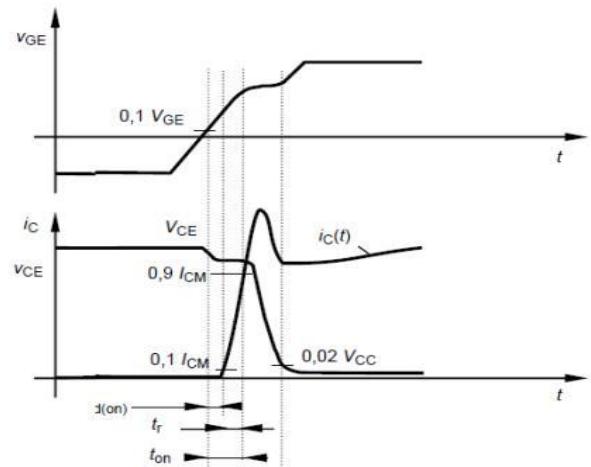
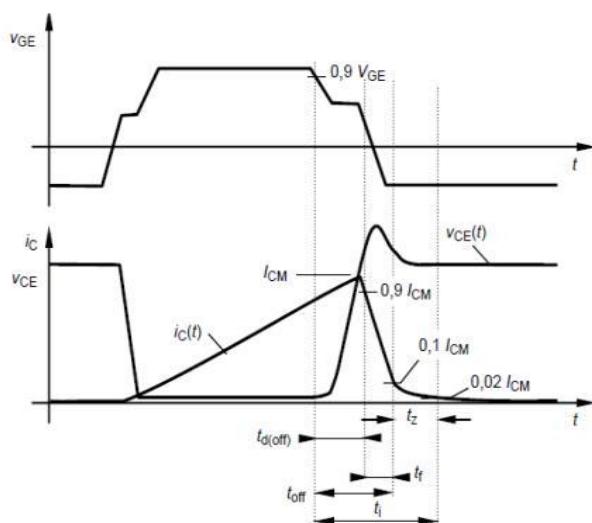


Fig.13 Transient Thermal Impedance Diode

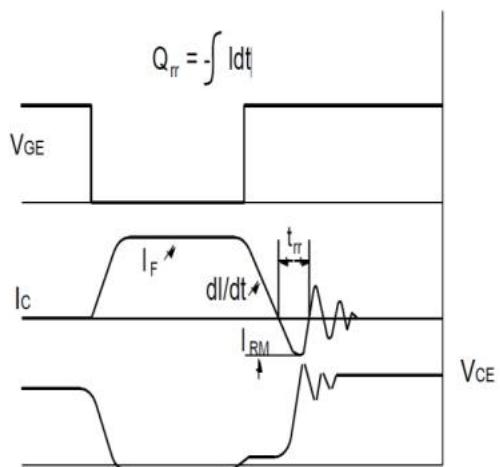
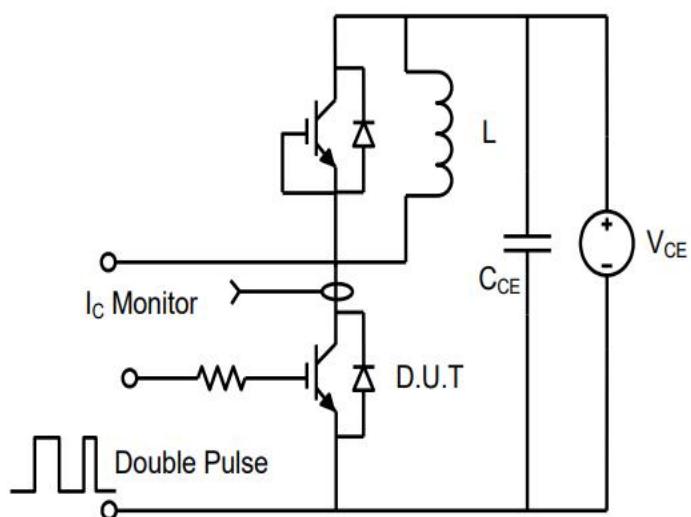


Test Circuit

Switching Test Circuit & Waveforms

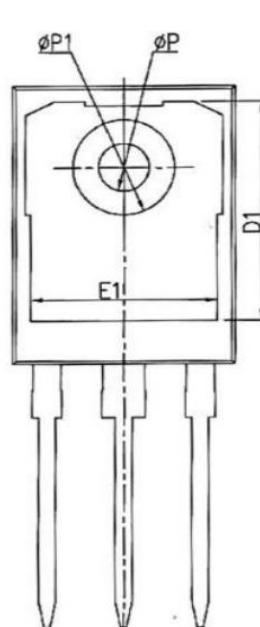
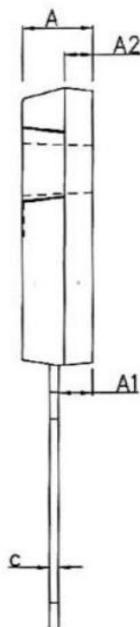
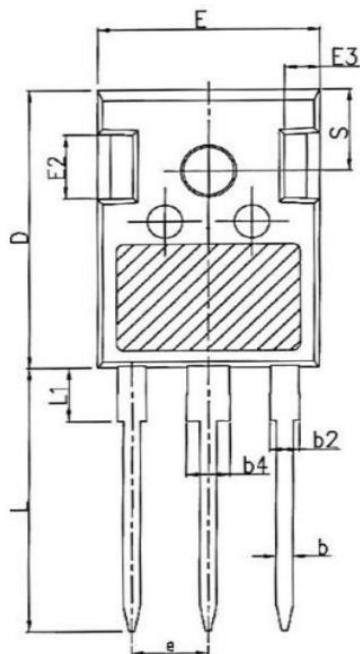


Diode Recovery Test Circuit & Waveforms





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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