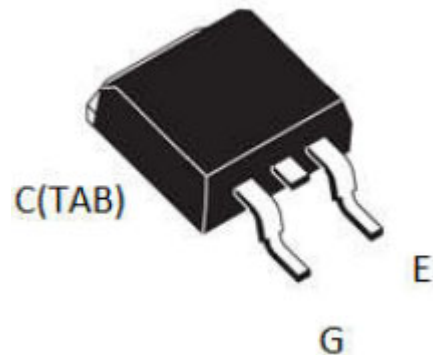


FEATURES

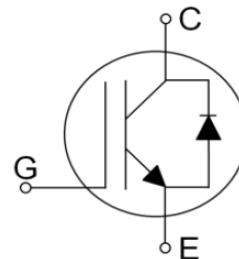
- High breakdown voltage up to 650V for improved reliability
- Trench-Stop Technology offering :
 - High speed switching
 - High ruggedness, temperature stable
 - Low V_{CEsat}
 - Easy parallel switching capability due to positive temperature coefficient in V_{CEsat}

V_{CE}	650	V
I_C	40	A
$V_{CE(SAT)} \quad I_C=40A$	1.8	V



APPLICATION

- Uninterruptible Power Supplies
- Inverter
- Welding Converters
- PFC applications
- Converter with high switching frequency



Product	Package	Packaging
AUGK40N65F1A1	TO-263-2L	Tape and reel

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

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	V_{CE}	650	V
DC collector current, limited by T_{jmax} $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_C	80 40	A
Diode Forward current, limited by T_{jmax} $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_F	80 40	A
Continuous Gate-emitter voltage	V_{GE}	± 20	V
Transient Gate-emitter voltage ($t_p \leq 10\mu\text{s}$, $D < 0.01$)	V_{GE}	± 30	V
Turn off safe operating area $V_{CE} \leq 650\text{V}$, $T_j \leq 175^\circ\text{C}$, $t_p = 1\mu\text{s}$	-	120	A
Pulse collector current, $V_{GE} = 15\text{V}$, t_p limited by T_{jmax}	I_{CM}	120	A
Diode Pulsed Current, t_p limited by T_{jmax}	I_{Fpuls}	120	A
Power dissipation, $T_j = 25^\circ\text{C}$	P_{tot}	188	W
Max Junction Temperature	T_{jmax}	175	$^\circ\text{C}$
Operating junction temperature	$T_{j,op}$	-40...+150	$^\circ\text{C}$
Storage temperature	T_s	-55...+150	$^\circ\text{C}$
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s	-	260	$^\circ\text{C}$

Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT thermal resistance, junction - case	$R_{\theta(j-c)}$	0.90	K/W
Diode thermal resistance, junction - case	$R_{\theta(j-c)}$	1.60	K/W
Thermal resistance, junction - ambient	$R_{\theta(j-a)}$	62.5	K/W

Electrical Characteristics (T_j= 25°C unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Static						
Collector-Emitter Breakdown Voltage	BV _{CES}	V _{GE} =0V, I _C =250uA	650	-	-	V
Gate Threshold Voltage	V _{GE(th)}	V _{GE} =V _{CE} , I _C =250uA	4.0	5.0	6.0	V
Collector-Emitter Saturation Voltage	V _{CE(sat)}	V _{GE} =15V, I _C =40A T _j = 25°C T _j = 175°C	- -	1.80 2.4	2.40 -	V
Zero gate voltage collector current	I _{CES}	V _{CE} = 650V, V _{GE} = 0V T _j = 25°C T _j = 175°C	- -	0.1 -	400 5000	μA
Gate-emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} = ±20V	-	-	100	nA
Transconductance	g _{fs}	V _{CE} = 20V, I _C = 40A	-	20	-	S

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic						
Input capacitance	C _{ies}	V _{CE} = 30V, V _{GE} = 0V, f = 1MHz	-	2035	-	pF
Output capacitance	C _{oes}		-	82	-	
Reverse transfer capacitance	C _{res}		-	37	-	
Gate charge	Q _G	V _{CC} = 520V, I _C = 40A, V _{GE} = 15V	-	93	-	nC

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic $T_j=25^{\circ}\text{C}$						
Turn-on Delay Time	$t_{d(on)}$	$T_j = 25^{\circ}\text{C},$ $V_{CC} = 400\text{V}, I_C = 40.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$ $R_g = 15\Omega$	-	37	-	ns
Rise Time	t_r		-	65	-	ns
Turn-off Delay Time	$t_{d(off)}$		-	169	-	ns
Fall Time	t_f		-	43	-	ns
Turn-on Energy	E_{on}		-	1.52	-	mJ
Turn-off Energy	E_{off}		-	0.88	-	mJ

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic						
Diode Forward Voltage	V_{FM}	$V_{GE}=0\text{V}, I_F = 40\text{A}$	-	2.0	-	V
Reverse Recovery Time	T_{rr}	$T_j = 25^{\circ}\text{C},$ $I_F = 40\text{A}$ $V_R = 400\text{V},$ $di/dt = 700\text{A}/\mu\text{s}$	-	95	-	ns
Reverse Recovery Current	I_{rr}		-	16	-	A
Reverse Recovery Charge	Q_{rr}		-	0.64	-	nC

Fig. 1 Saturation voltage characteristics

$$I_C = f(V_{CE})$$

$$V_{GE} = 15V$$

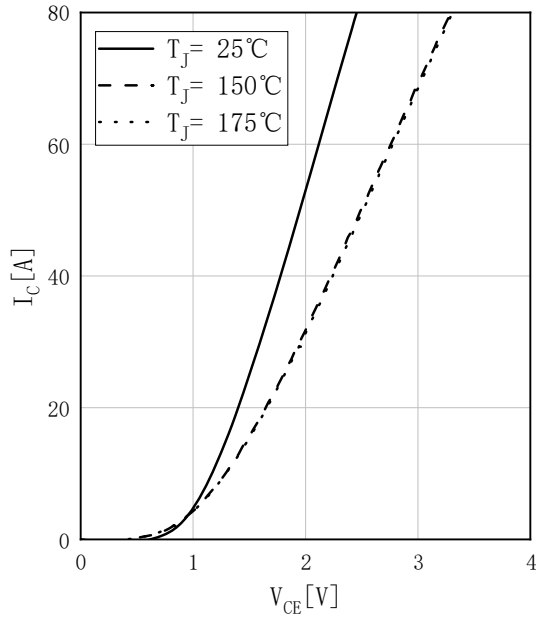


Fig. 2 Output characteristics

$$I_C = f(V_{CE})$$

$$T_J = 175^\circ C$$

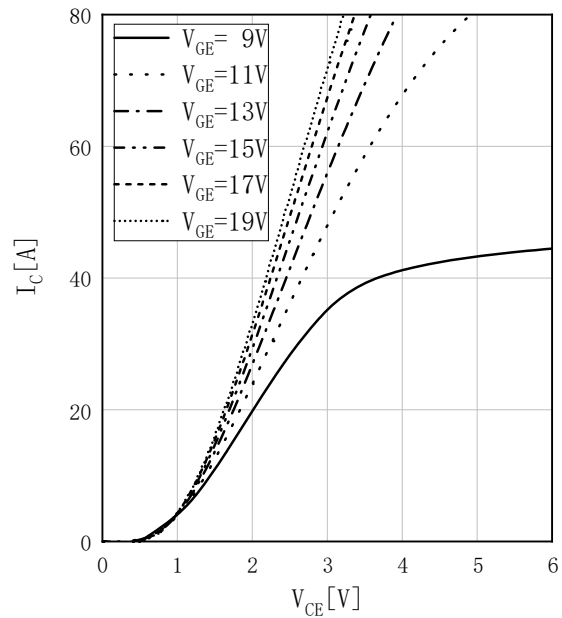


Fig. 3 Transfer characteristic

$$I_C = f(V_{GE})$$

$$V_{CE} = 20V$$

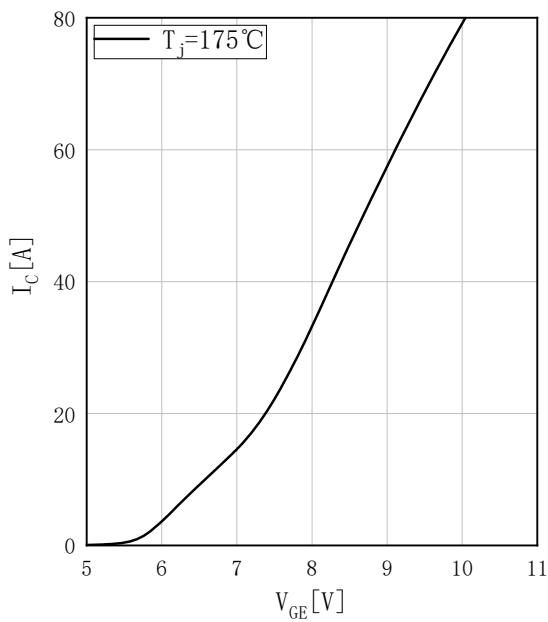


Fig. 4 Switching losses IGBT

$$E_{on} = f(I_C), E_{off} = f(I_C)$$

$$V_{GE} = 0-15V, R_G = 15\Omega, V_{CE} = 400V$$

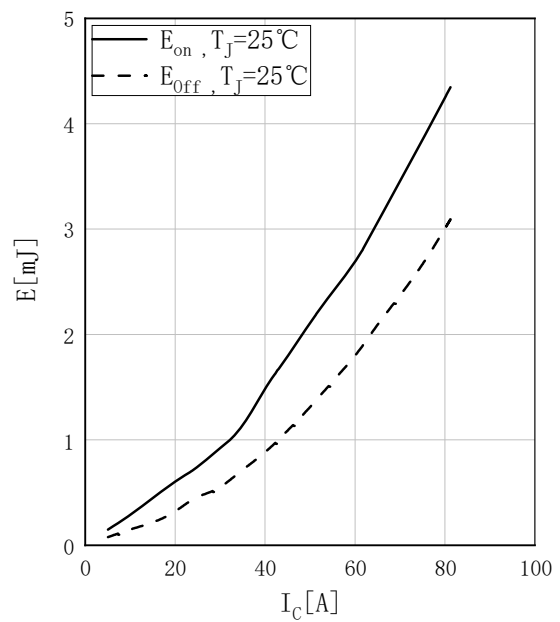


Fig. 5 Switching losses IGBT

$E_{on}=f(R_G)$, $E_{off}=f(R_G)$
 $V_{GE}=0-15V$, $I_C=40A$, $V_{CE}=400V$

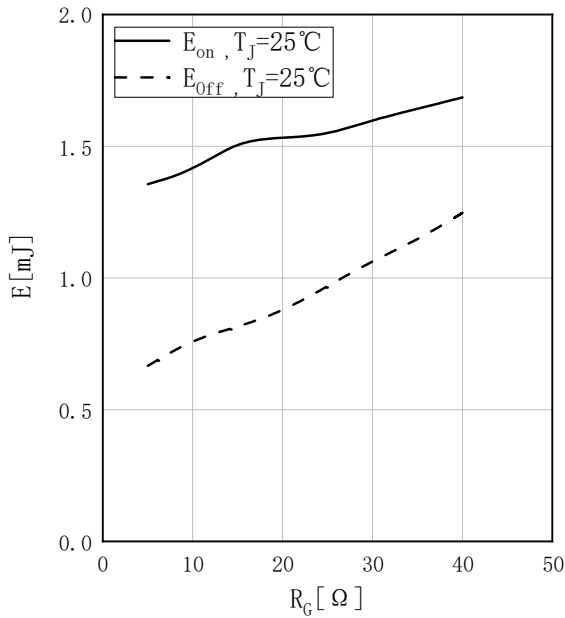


Fig. 6 Switching times IGBT

$T_{don}=f(I_C)$, $T_r=f(I_C)$, $T_{doff}=f(I_C)$, $T_f=f(I_C)$
 $V_{GE}=0-15V$, $R_G=15Ω$, $V_{CE}=400V$, $T_J=25°C$

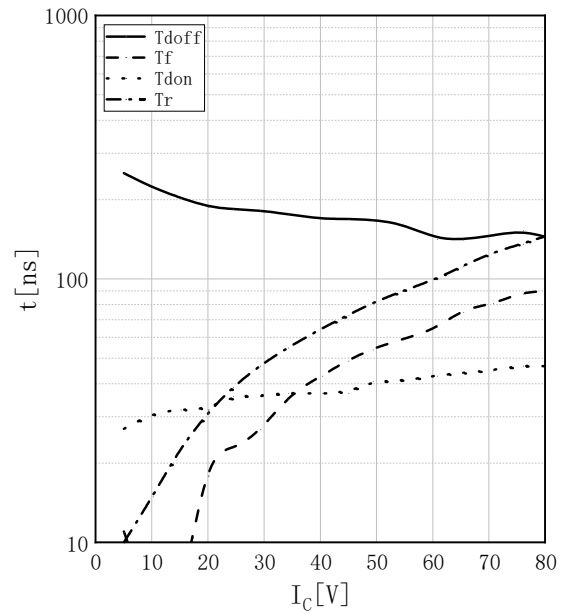


Fig. 7 Switching times IGBT

$T_{don}=f(R_G)$, $T_r=f(R_G)$, $T_{doff}=f(R_G)$, $T_f=f(R_G)$
 $V_{GE}=0-15V$, $I_C=40A$, $V_{CE}=400V$, $T_J=25°C$

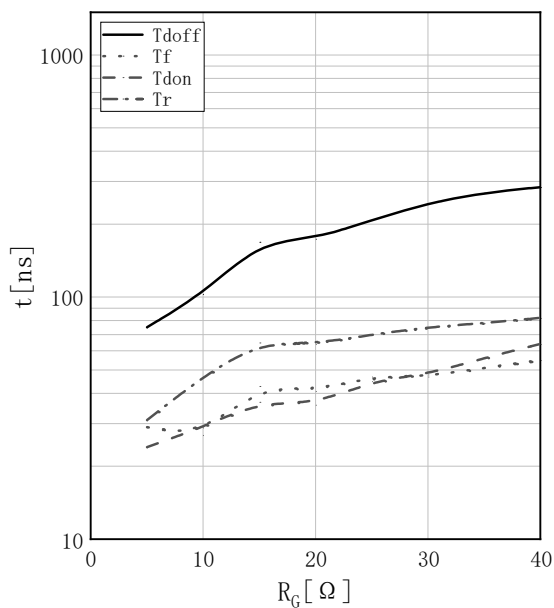


Fig. 8 Forward characteristic of Diode

$I_F=f(V_F)$

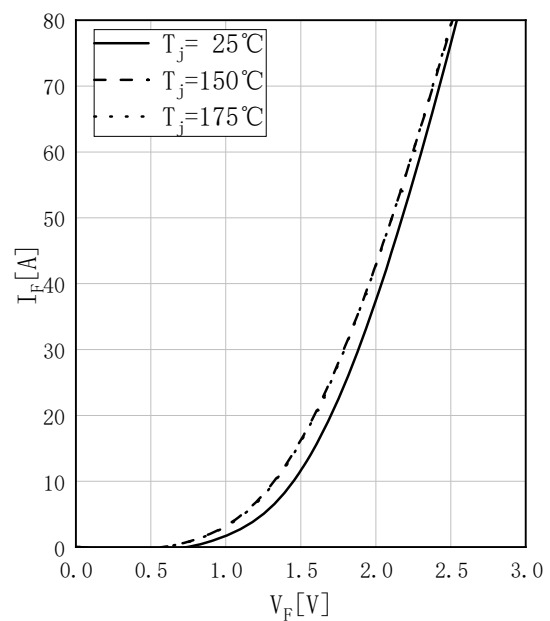


Fig. 9 Capacitance characteristics

$C_{ies}=f(V_{CE})$, $C_{oes}=f(V_{CE})$, $C_{res}=f(V_{CE})$
 $V_{GE}=0V$, $f=1MHz$, $T_J=25^{\circ}C$

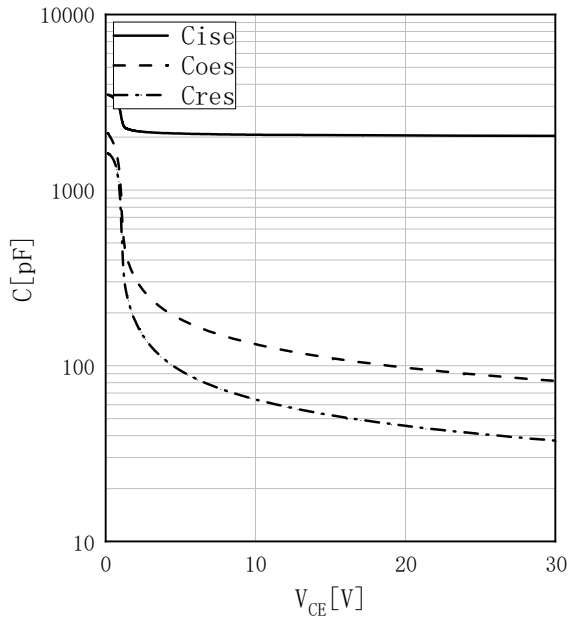
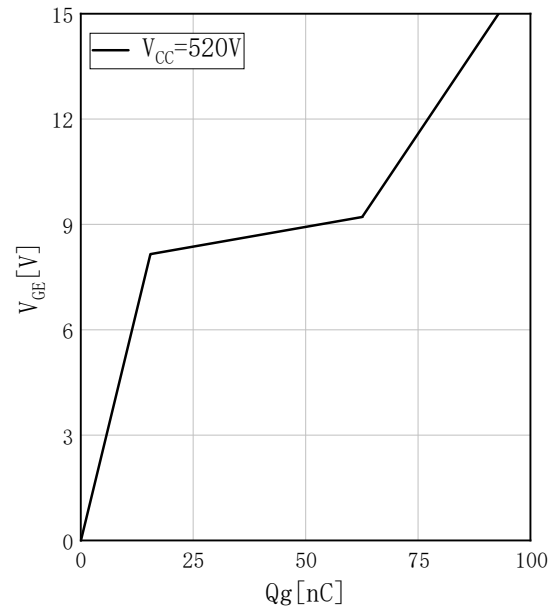
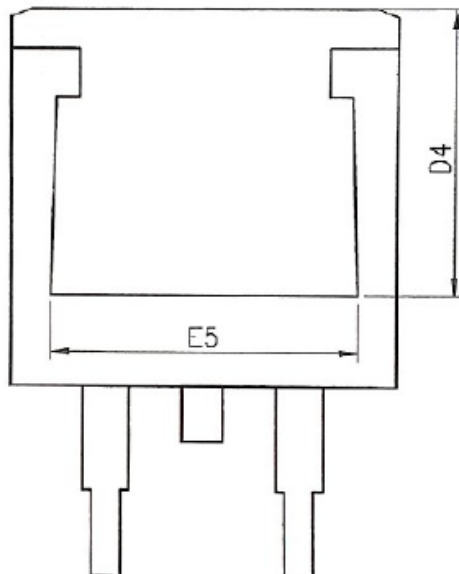
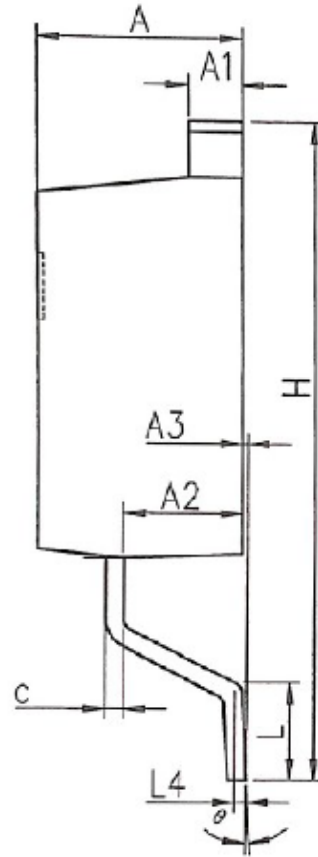
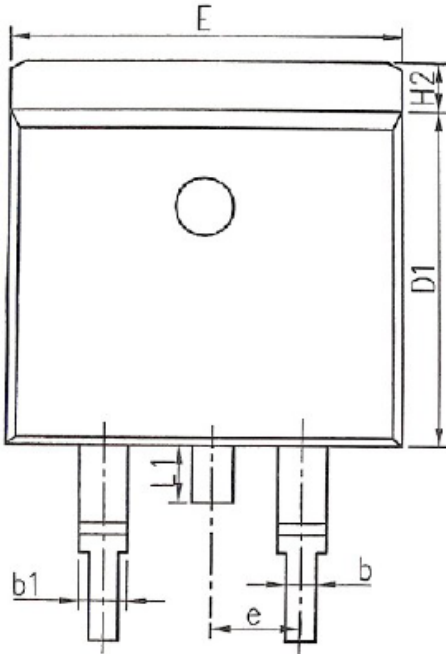


Fig. 10 Gate charge characteristics

$V_{GE}=f(Q_g)$
 $I_C=40A$, $T_J=25^{\circ}C$



TO-263 package information



SYMBOL	MM		
	MIN	NOM	MAX
A	4.37	4.57	4.77
A1	1.22	1.27	1.42
A2	2.49	2.69	2.89
A3	0.00	0.13	0.25
b	0.70	0.81	0.96
b1	1.17	1.27	1.47
c	0.30	0.38	0.53
D1	8.50	8.70	8.90
D4	6.60	-	-
E	9.88	10.16	10.36
E5	7.06	-	-
e	2.54 BSC		
H	14.70	15.10	15.50
H2	1.07	1.27	1.47
L	2.00	2.30	2.60
L1	1.40	1.55	1.70
L4	0.25 BSC		
θ	0°	5°	9°