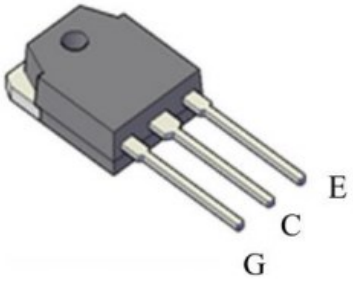
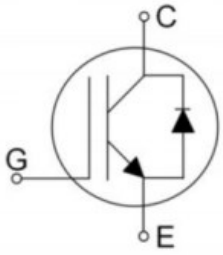
YGD65N65U1

650V /65A Trench Field Stop IGBT

V_{CE}	**650**	**V**
I_C	**65**	**A**
$V_{CE(SAT)}$ I_C=65A	**1.6**	**V**





FEATURES

- High breakdown voltage up to 650V for improved reliability
- Trench-Stop IGBT Technology offering :
  - ➢ High speed switching
  - ➢ High ruggedness, temperature stable
  - ➢ Short circuit withstand time – 5μs
  - ➢ Low V_{CEsat}
  - ➢ Easy parallel switching capability due to positive temperature coefficient in V_{CEsat}

APPLICATION

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

Product	Package	Packaging
YGD65N65U1	TO-3P	Tube

Maximum Ratings （T_j= 25℃ unless otherwise specified）

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage T_j ⩾25℃	V_{CE}	650	V
DC collector current, limited by T_{jmax} T_C = 25°C T_C = 100°C	I_C	130 65	A
Diode Forward current, limited by T_{jmax} T_C = 25°C T_C = 100°C	I_F	40 20	A
Continuous Gate-emitter voltage	V_{GE}	±20	V
Transient Gate-emitter voltage (t_p≤10μs,D＜0.01)	V_{GE}	±30	V
Turn off safe operating area V_{CE} ≤650V, T_j≤ 175°C, t_p= 1μs	-	195	A
Pulse collector current, V_{GE} =15V, t_p limited by T_{jmax}	I_{CM}	195	A
Diode Pulsed Current, t_p limited by T_{jmax}	I_{Fpuls}	60	A
Short Circuit Withstand Time, V_{GE}= 15V, V_{CE}≤ 400V	T_{SC}	5	μs
Power dissipation , T_j=25°C	P_{tot}	272	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
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm

Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT thermal resistance, junction - case	$R_{θ(j-c)}$	0.55	K/W
Diode thermal resistance, junction - case	$R_{θ(j-c)}$	1.95	K/W
Thermal resistance, junction - ambient	$R_{θ(j-a)}$	48	K/W

Electrical Characteristics （T_j= 25℃ unless otherwise specified）

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Static						
Collector-Emitter Breakdown Voltage	BV_{CES} ①	V_{GE}=0V , I_C=250μA	650	-	-	V
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=250μA	4.4	5.2	6.0	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=65A T_j = 25°C T_j = 175°C	 - -	 1.6 2.1	 2.0 -	V
Zero gate voltage collector current	I_{CES}	V_{CE}= 650V,V_{GE}=0V T_j = 25°C T_j = 175°C	 - -	 -	 100 5000	μA
Gate-emitter leakage current	I_{GES}	V_{CE}=0V,V_{GE}=±20V	-	-	400	nA
Transconductance	g_{fs}	V_{CE} = 20V, I_C = 65A	-	45	-	S
Diode Forward Voltage	V_{FM}	I_F = 20A	-	1.4	-	V

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic						
Input capacitance	C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	-	4820	-	pF
Output capacitance	C_{oes}		-	365	-	
Reverse transfer capacitance	C_{res}		-	35	-	
Gate charge	Q_G	V_{CC} = 520V, I_C = 65A, V_{GE} = 15V	-	138	-	nC
Short circuit collector current	$I_{C(SC)}$	V_{GE}=15V,t_{SC}≤5μs V_{CC}=400V,T_j =25°C	-	500	-	A

Note：

BVces testing without filter could damage the device. BVces is guaranteed by Ices@650V test.

Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic T_j=25°C						
Turn-on Delay Time	$t_{d(on)}$	V_{CC}=400V, I_C=65A, V_{GE} = 0/15V, R_g=10Ω	-	40	-	ns
Rise Time	t_r		-	87	-	ns
Turn-off Delay Time	$t_{d(off)}$		-	150	-	ns
Fall Time	t_f		-	80	-	ns
Turn-on Energy	E_{on}		-	1.8	-	mJ
Turn-off Energy	E_{off}		-	1.6	-	mJ
Dynamic T_j=150°C						
Turn-on Delay Time	$t_{d(on)}$	V_{CC}=400V,I_C=65A, V_{GE} = 0/15V, R_g=10Ω	-	45	-	ns
Rise Time	t_r		-	92	-	ns
Turn-off Delay Time	$t_{d(off)}$		-	170	-	ns
Fall Time	t_f		-	100	-	ns
Turn-on Energy	E_{on}		-	1.9	-	mJ
Turn-off Energy	E_{off}		-	1.8	-	mJ

Fig. 1 Saturation voltage characteristics

$I_C=f(V_{CE})$
$V_{GE}=15V$

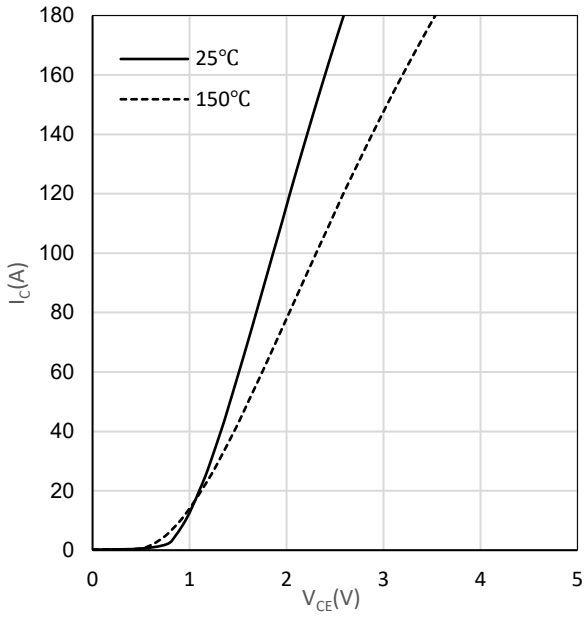


Fig. 2 Output characteristics

$I_C=f(V_{CE})$
$T_J=25℃$

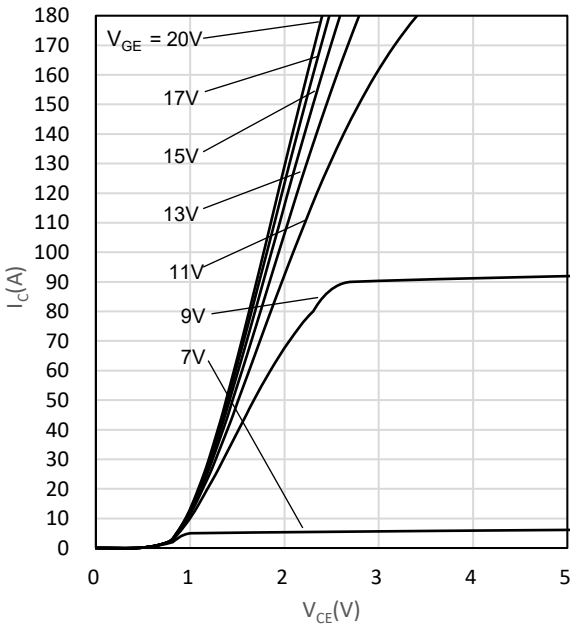


Fig. 3 Tansfer characteristic

$I_C=f(V_{GE})$
$V_{CE}=20V$

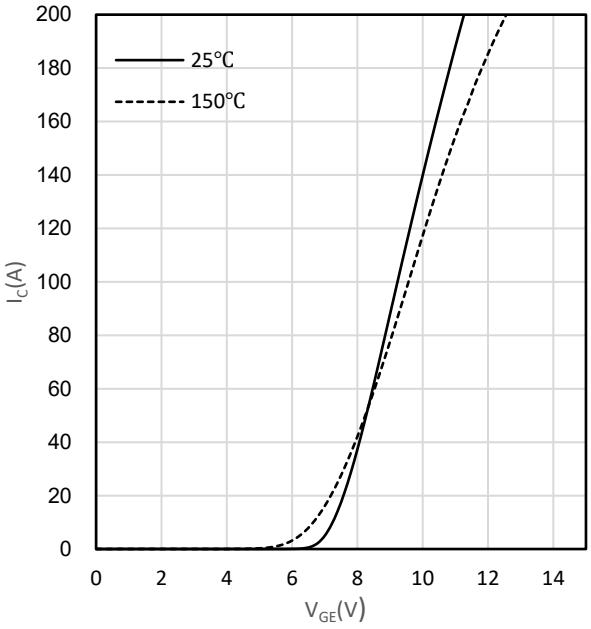


Fig. 4 Switching losses IGBT

$E_{on}=f(I_C)$, $E_{off}=f(I_C)$
V_{GE}=0-15V,R_G=10Ω, V_{CE}=400V, T_J=150℃

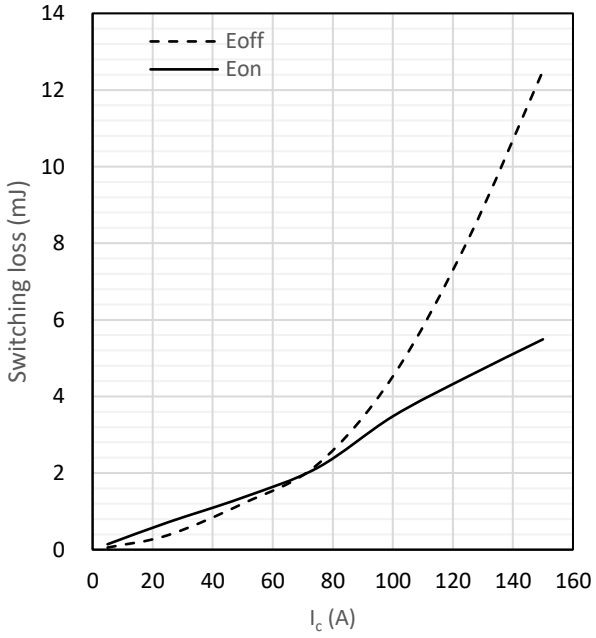


Fig. 5 Switching losses IGBT

$E_{on}=f(R_G)$, $E_{off}=f(R_G)$
V_{GE}=0-15V,I_C=65A,V_{CE}=400V, T_J=150℃

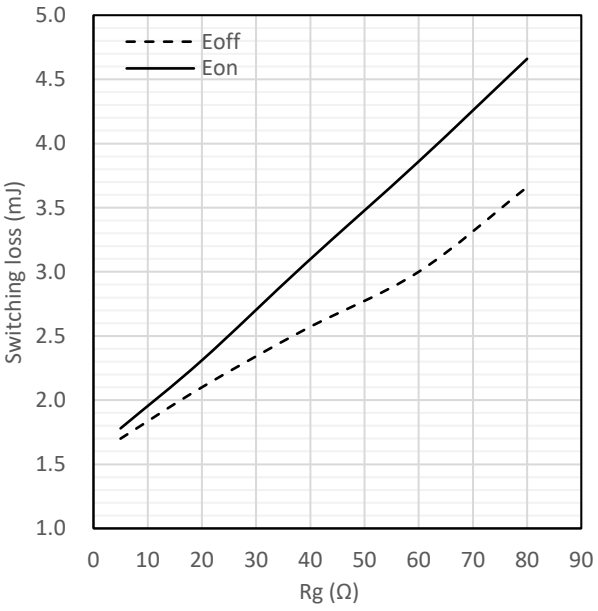


Fig. 6 Switching times IGBT

$T_{don}=f(I_C)$, $T_r=f(I_C)$, $T_{doff}=f(I_C)$, $T_f=f(I_C)$
V_{GE}=0-15V,R_G=10Ω,V_{CE}=400V, T_J=150℃

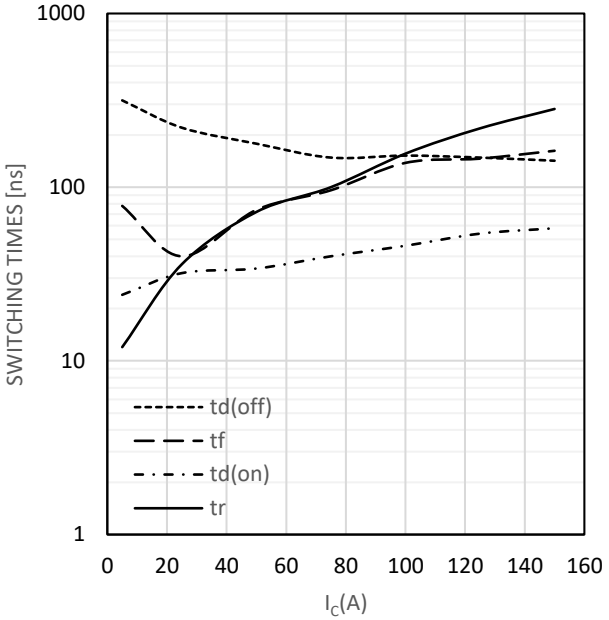


Fig. 7 Switching times IGBT

$T_{don}=f(R_G)$, $T_r=f(R_G)$, $T_{doff}=f(R_G)$, $T_f=f(R_G)$
V_{GE}=0-15V,I_C=65A,V_{CE}=400V, T_J=150℃

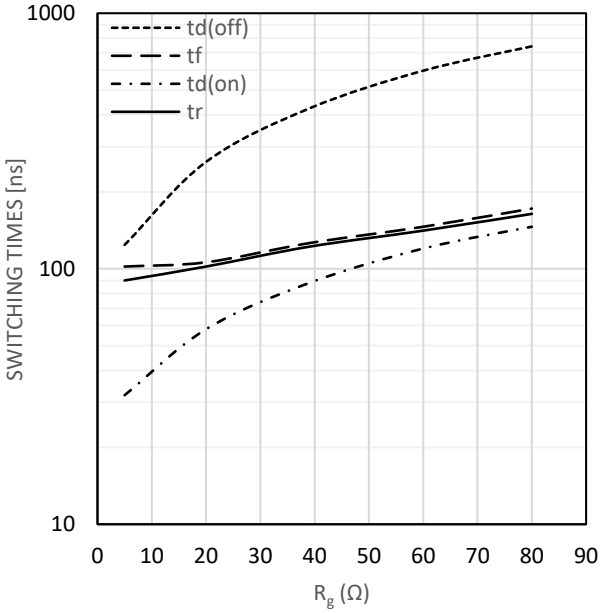


Fig. 8 Gate charge characteristics

$V_{GE}=f(Qg)$
I_C=65A, T_J =25℃

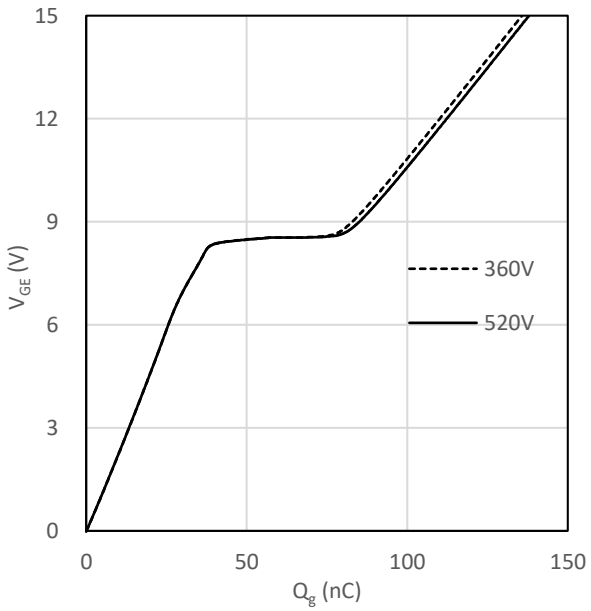


Fig. 9 Capacitance characteristics

Cies=f(V_{CE}) ,Coes=f(V_{CE}), Cres=f(V_{CE})
T_J =25℃

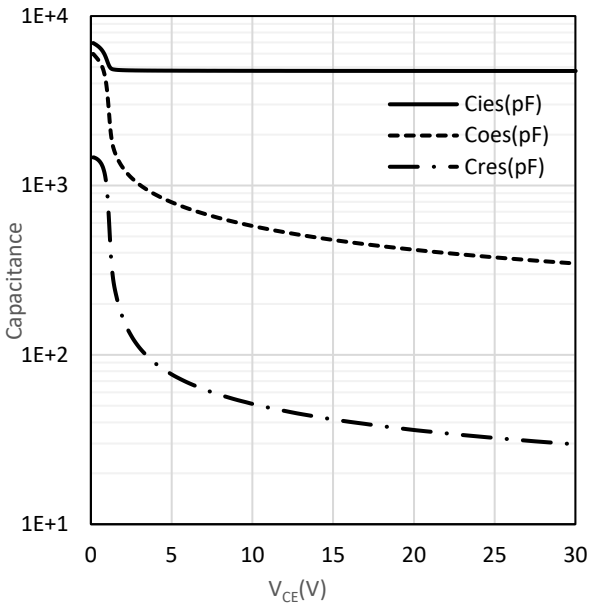
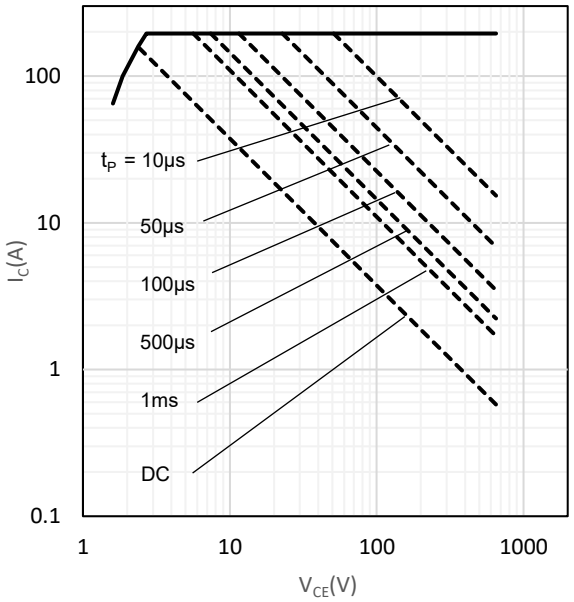
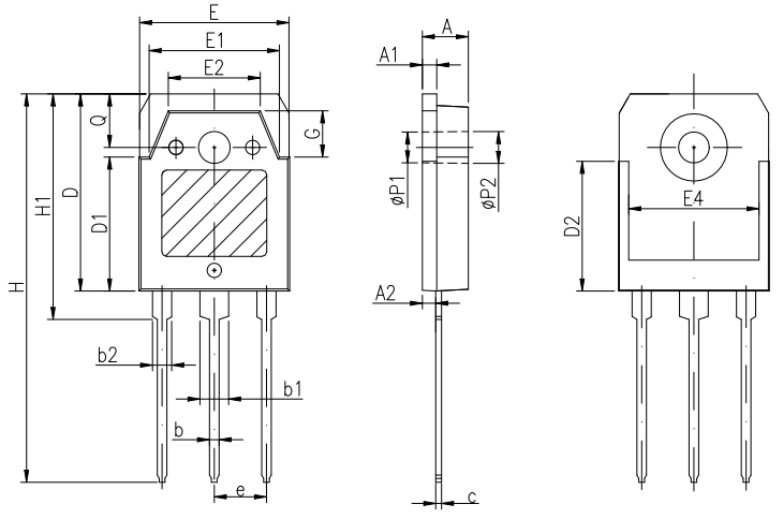


Fig. 10 Forward bias safe operating area

I_C=f(V_{CE})
D=0,T_C=25℃, T_J≤175℃;V_{GE}=15V



TO-3P package information



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	4.60	4.80	5.00
A1	1.40	1.50	1.65
A2	1.18	1.38	1.58
b	0.80	1.00	1.20
b1	2.80	3.00	3.20
b2	1.80	2.00	2.20
c	0.50	0.60	0.75
D	19.60	19.90	20.20
D1	13.55	13.90	14.25
D2		12.90	REF
E	15.35	15.60	15.85
E1	13.40	13.60	13.80
E2	9.40	9.60	9.80
E4	12.60	–	–
e		5.45	TYP
G	4.55	4.80	5.05
H	40.10	40.50	40.90
H1	23.15	23.40	23.65
ΦP1	3.03	3.20	3.37
ΦP2	3.30	3.50	3.70
Q	5.00 REF		

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