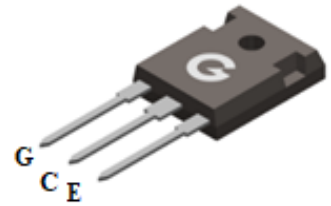
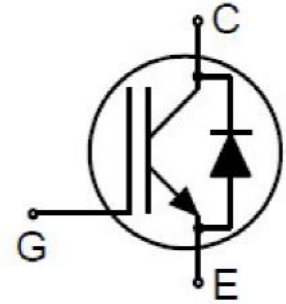


Features

- High breakdown voltage to 650V for improved reliability
- Hybrid IGBT(Trench-Stop IGBT Technology and SiC Schottky Diode) technology offering:
 - High speed switching
 - High ruggedness, temperature stable behavior
 - Low $V_{CE(SAT)}$
 - Easy parallel switching capability due to positive temperature coefficient in $V_{CE(SAT)}$
- Enhanced avalanche capability
- RoHS compliant with Halogen-free
- Qualified to AEC-Q101 Standards

HF



TO-247

Applications

- PFC application
- Welding Converters
- Automotive

Mechanical Data

- Case: TO-247
- Molding Compound: UL Flammability Classification Rating 94V-0
- Terminals: Matte tin-plated leads; solderability-per MIL-STD-202, Method 208

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
TGKU50N65RF5	TO-247	30 pcs / Tube	KU50N65RF5

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

Parameter	Symbol	Value	Unit
Collector-to-Emitter Voltage	V_{CES}	650	V
Gate-Emitter Voltage	V_{GES}	± 20	V
DC Collector Current ($T_C = 25^\circ\text{C}$, limited by maximum T_J)	I_C	100	A
DC Collector Current ($T_C = 100^\circ\text{C}$, limited by maximum T_J)		50	A
Diode Continuous Forward Current ($T_C = 25^\circ\text{C}$, limited by maximum T_J)	I_F	60	A
Diode Continuous Forward Current ($T_C = 100^\circ\text{C}$, limited by maximum T_J)		30	A
Pulsed Collector Current (Pulse width limited by maximum T_J , $V_{GE} = 15\text{V}$)	I_{CM}	200	A
Pulsed Source-Drain Current (Pulse width limited by maximum T_J)	I_{FM}	120	A
Soldering Temperature, Wave Soldering 1.6mm (0.063in.) from case for 10s	T_{SOLD}	260	$^\circ\text{C}$
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	300	W
Operating Junction Temperature Range	T_J	$-55 \sim +175$	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	$-55 \sim +150$	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case, IGBT	R _{θJC}	-	0.33	0.5	°C/W
Thermal Resistance Junction-to-Case, Diode		-	0.62	0.8	°C/W
Thermal Resistance Junction-to-Air	R _{θJA}	-	-	40	°C/W

Electrical Characteristics of the IGBT (@ T_J = 25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Static Characteristics						
V _{(BR)CES}	Collector-Emitter Breakdown Voltage	V _{GE} = 0V, I _C = 250μA	650	-	-	V
I _{CES}	Collector-Emitter Leakage Current	V _{CE} = 650V, V _{GE} = 0V	-	-	100	μA
I _{GES}	Gate to Emitter Leakage Current	V _{GE} = ±20V, V _{CE} = 0V	-	-	±200	nA
V _{CE(sat)}	Collector-Emitter Saturation Voltage	V _{GE} = 15V, I _C = 50A, T _J = 25°C	-	1.45	1.95	V
		V _{GE} = 15V, I _C = 50A, T _J = 175°C	-	1.74	-	V
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250μA	4	4.8	5.6	V
Dynamic Characteristics						
Q _G	Total Gate-Charge	V _{CC} = 520V, V _{GE} = 15V, I _C = 50A	-	440	-	nC
C _{ies}	Input Capacitance	V _{CE} = 30V V _{GE} = 0V f = 100kHz	-	12084	-	pF
C _{oes}	Output Capacitance		-	355	-	
C _{res}	Reverse Transfer Capacitance		-	57	-	
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{CE} = 400V V _{GE} = 15V I _C = 50A R _G = 10Ω T _J = 25°C	-	95	-	ns
t _r	Turn-on Rise Time		-	82	-	
t _{d(off)}	Turn-Off Delay Time		-	472	-	
t _f	Turn-Off Fall Time		-	62	-	
E _{on}	Turn-On Switching Loss			-	1.62	-
E _{off}	Turn-Off Switching Loss		-	0.65	-	

Electrical Characteristics of the Diode (@ T_J = 25°C unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Dynamic Characteristics						
V _{FM}	Diode Forward Voltage	I _F = 30A, V _{GE} = 0V	-	1.75	-	V
t _{rr}	Reverse recovery time	V _{GS} = 0V, I _F = 30A di/dt = 300A/μs	-	54	-	ns
Q _{rr}	Reverse recovery charge		-	85	-	nC
I _{rrm}	Peak Reverse Recovery Current		-	2.95	-	A

Ratings and Characteristics Curves (@ $T_A = 25^\circ\text{C}$ unless otherwise specified)

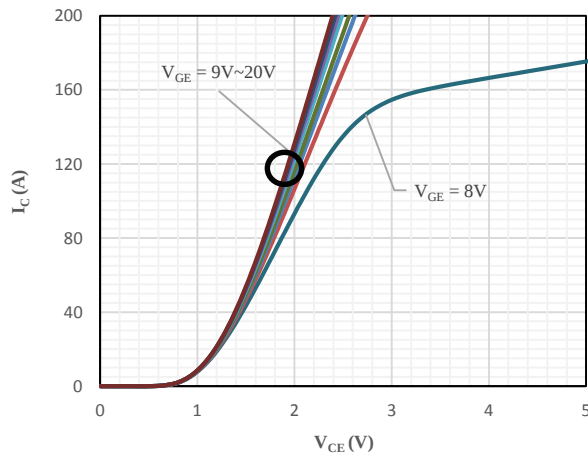


Fig 1 Typical Output Characteristics

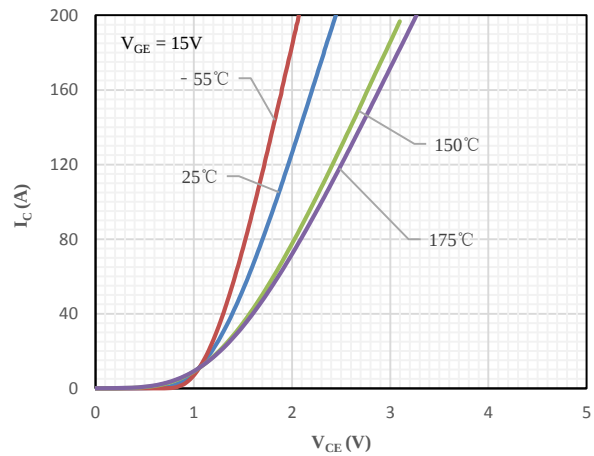


Fig 2 Saturation Voltage Characteristics

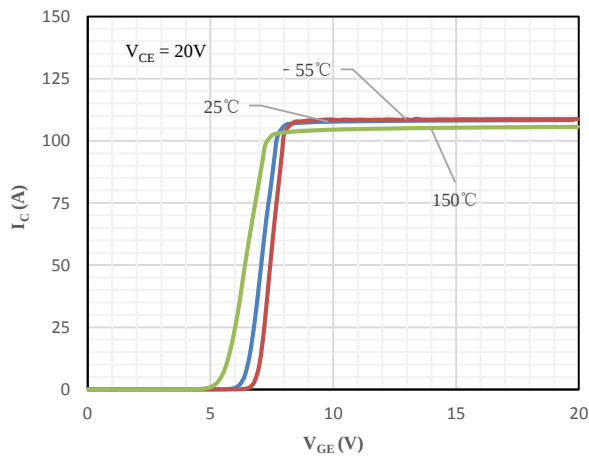


Fig 3 Transfer Characteristics

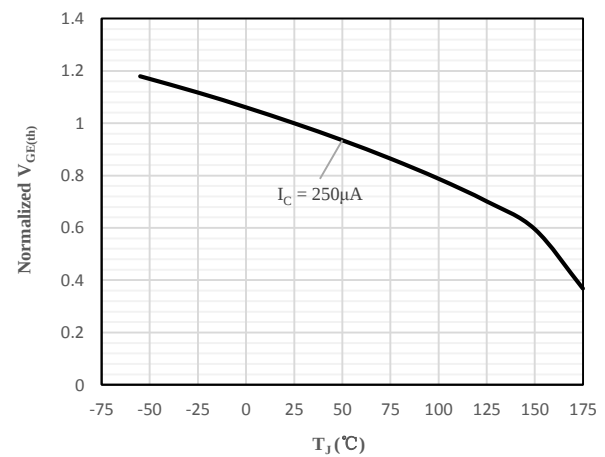


Fig 4 Normalized $V_{GE(th)}$ vs. Junction Temperature

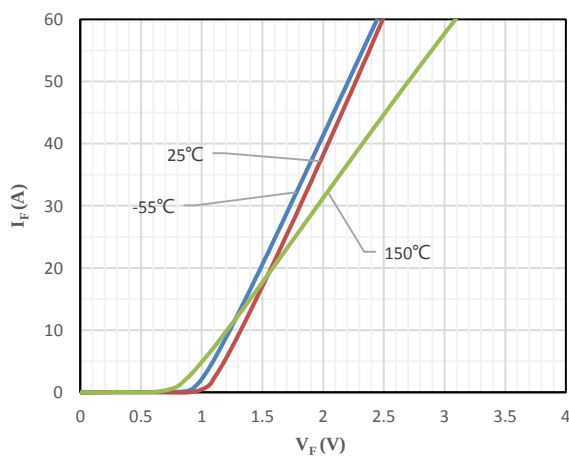


Fig 5 Diode forward current as a function of forward voltage V_F vs. I_F

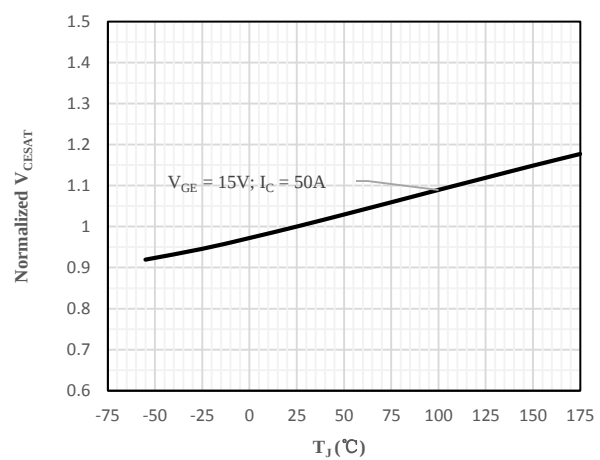
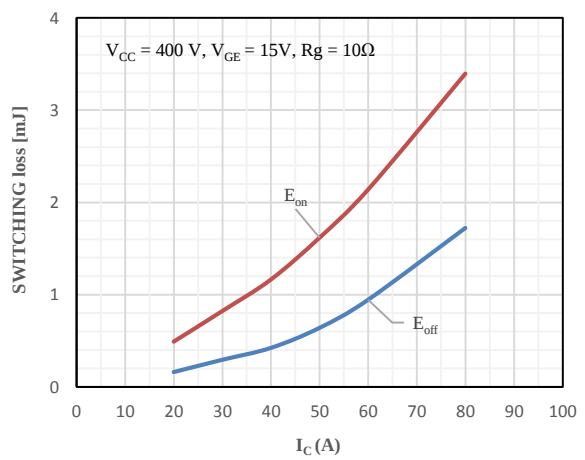
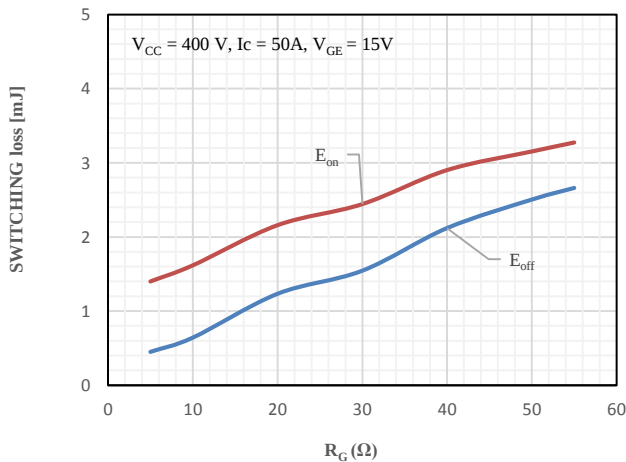
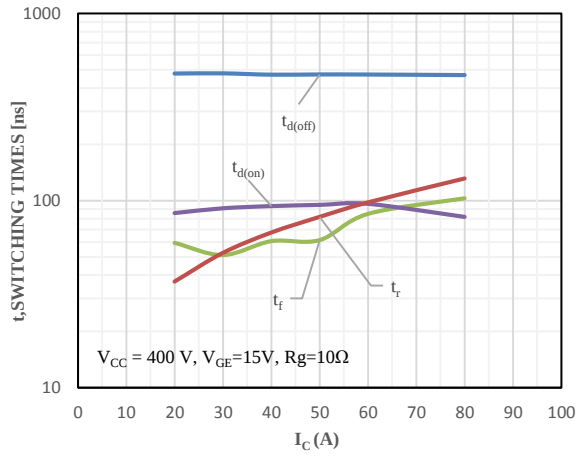
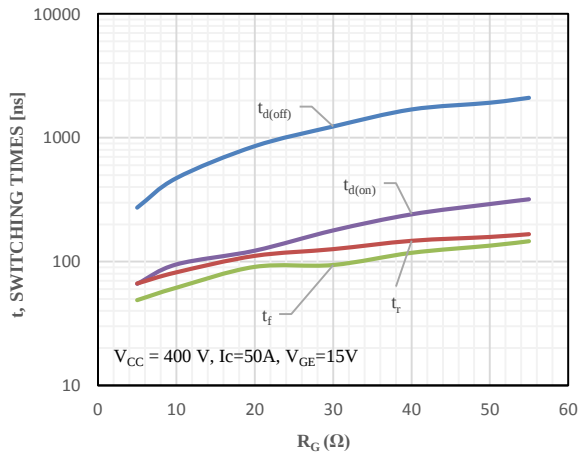
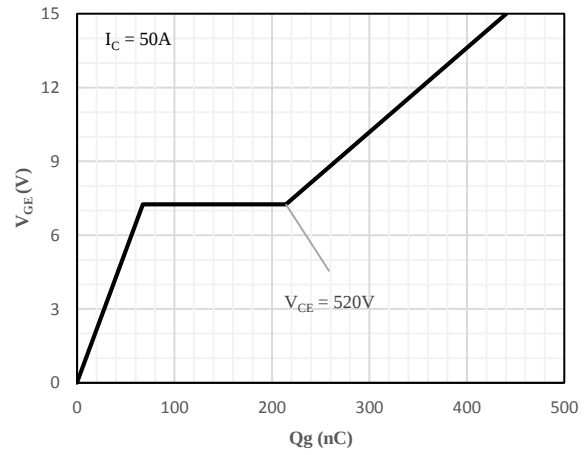
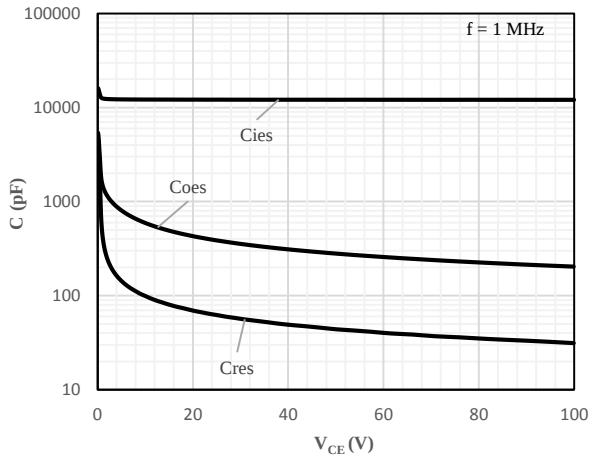


Fig 6 Normalized Collector-Emitter Saturation Voltage vs. Junction Temperature



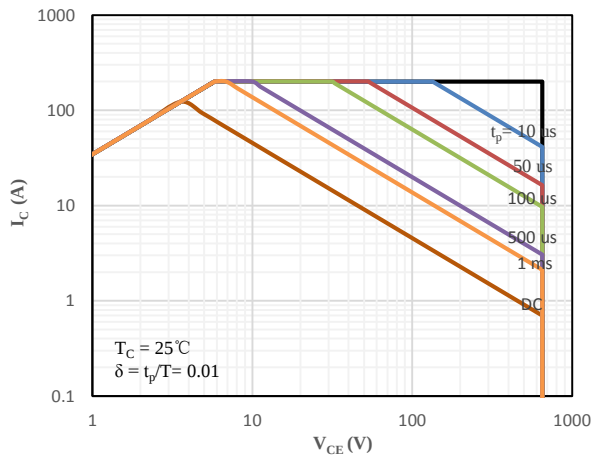


Fig 13 SOA characteristics

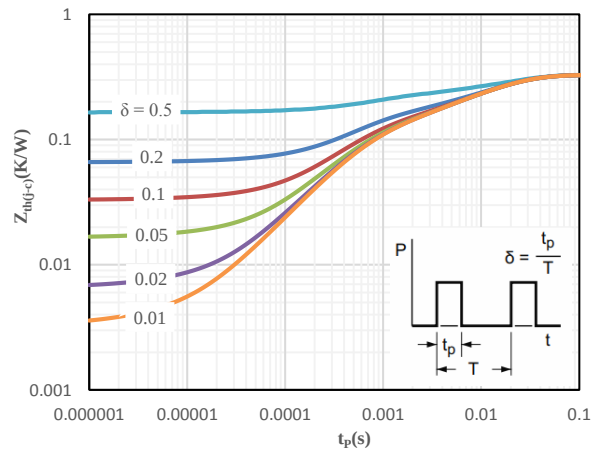
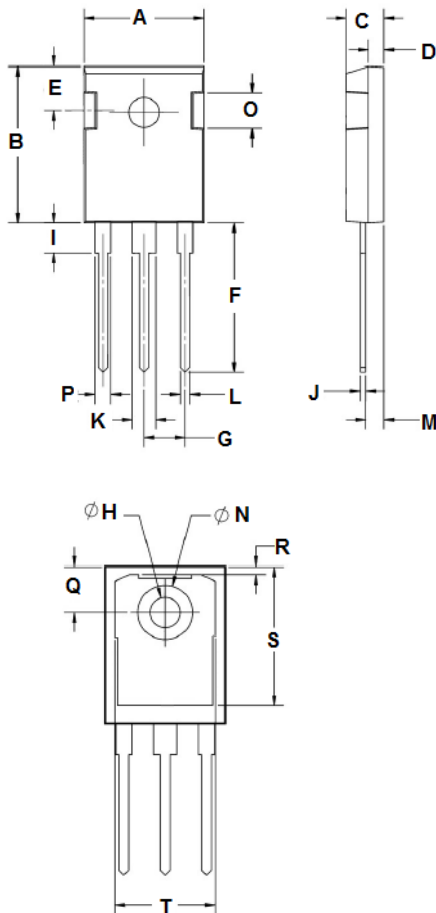


Fig 14 Maximum transient thermal impedance

Package Outline Dimensions (Unit: mm)



TO-247		
Dimension	Min.	Max.
A	15.50	16.10
B	20.70	21.30
C	4.70	5.30
D	1.80	2.20
E	5.20	5.80
F	19.70	20.30
G	5.20	5.60
H	3.30	3.70
I	3.90	4.30
J	0.50	0.70
K	2.80	3.20
L	1.00	1.40
M	2.20	2.60
N	7.00	7.20
O	4.90	5.30
P	1.80	2.20
Q	5.70	5.90
R	0.80	1.20
S	17.00	17.80
T	13.60	14.20