

Features

- High breakdown voltage to 650V for improved reliability
- Max junction temperature 175°C
- Short Circuit Rated
- Very low saturation voltage
- Soft current turn-off waveforms

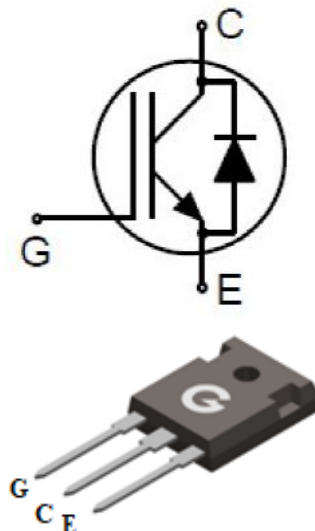
HF

Applications

- Soft switching applications
- Air conditioning
- Motor drive inverter

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



TO-247

Ordering Information

Part Number	Package	Shipping Quantity	Marking Code
GKU20N65EH3	TO-247	30 pcs / Tube	KU20N65EH3

Maximum Ratings (@ T_C = 25°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°C, limited by maximum T _J)	I _C	40	A
DC Collector Current (T _C = 100°C, limited by maximum T _J)		20	A
Diode Continuous Forward Current (T _C = 25°C, limited by maximum T _J)	I _F	40	A
Diode Continuous Forward Current (T _C = 100°C, limited by maximum T _J)		20	A
Pulsed Collector Current (Pulse width limited by maximum T _J , V _{GE} = 15V)	I _{CM}	60	A
Short Circuit Withstand Time (V _{GE} = 15V, V _{CE} ≤ 400V)	T _{SC}	5	μs
Soldering Temperature, Wave Soldering 1.6mm (0.063in.) from case for 10s	T _{sold}	260	°C
Power Dissipation (T _C = 25°C)	P _D	142	W
Operating Junction Temperature Range	T _J	-55 ~ +175	°C
Storage Temperature Range	T _{STG}	-55 ~ +175	°C

Thermal Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance Junction-to-Case, IGBT	R _{θJC}	-	-	1.05	°C/W
Thermal Resistance Junction-to-Case, Diode		-	-	1.7	°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 = 1mA	650	-	-	V
I _{CES}	Collector-Emitter Leakage Current	V _{CE} = 650V, V _{GE} = 0V	-	-	40	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 = 20A	-	2	2.3	V
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250μA	4	5.5	6.5	V
g _{fs}	Transconductance	V _{CE} = 20V, I _C = 15A	-	10	-	S
R _G	Gate Resistance	V _{GE} = 0V, f = 1MHz	-	1.86	-	Ω
Dynamic Characteristics						
Q _G	Total Gate-Charge	V _{CC} = 520V, V _{GE} = 15V, I _C = 20A	-	49.6	-	nC
C _{ies}	Input Capacitance	V _{CE} = 25V	-	1078	-	pF
C _{oes}	Output Capacitance	V _{GE} = 0V	-	41	-	
C _{res}	Reverse Transfer Capacitance	f = 1MHz	-	18	-	
I _{C(SC)}	Short Circuit Collector Current	V _{GE} = 15V, t _{SC} ≤ 5μs V _{CC} = 400V, T _J = 25°C	-	95	-	A
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{CE} = 400V V _{GE} = 15V I _C = 20A R _G = 20Ω T _J = 25°C	-	32	-	ns
t _r	Turn-on Rise Time		-	64	-	
t _{d(off)}	Turn-Off Delay Time		-	61	-	
t _f	Turn-Off Fall Time		-	58	-	
E _{on}	Turn-On Switching Loss		-	0.63	-	mJ
E _{off}	Turn-Off Switching Loss		-	0.16	-	

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 = 20A, V _{GE} = 0V	-	1.9	-	V
t _{rr}	Reverse recovery time	V _{GS} = 0V, I _F = 20A di/dt = 200A/μs	-	105	-	ns
Q _{rr}	Reverse recovery charge		-	334	-	nC
I _{rrm}	Peak Reverse Recovery Current		-	6	-	A

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

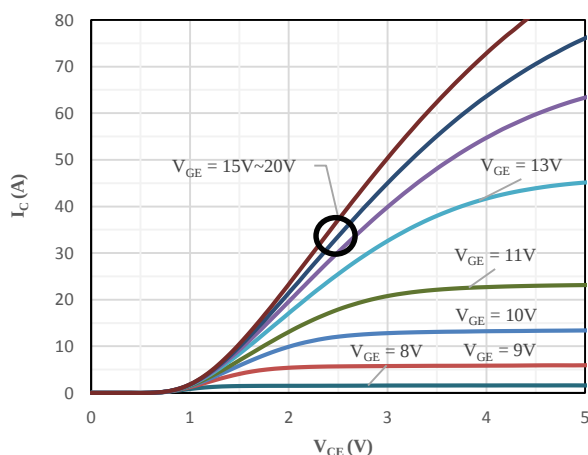


Fig 1 Typical Output Characteristics

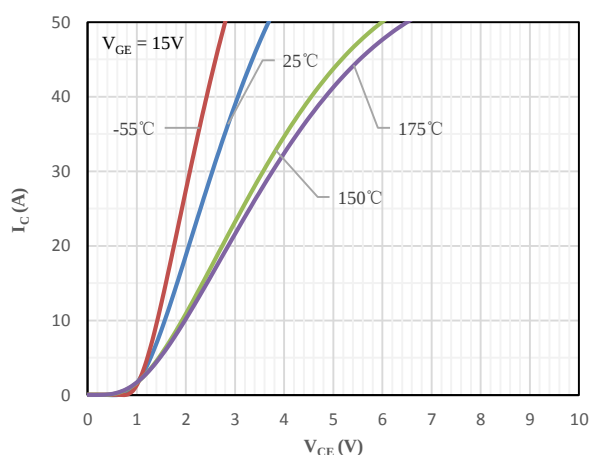


Fig 2 Saturation Voltage Characteristics

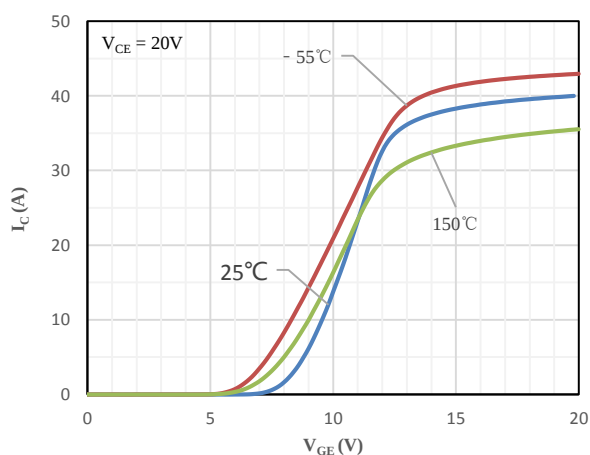


Fig 3 Transfer Characteristics

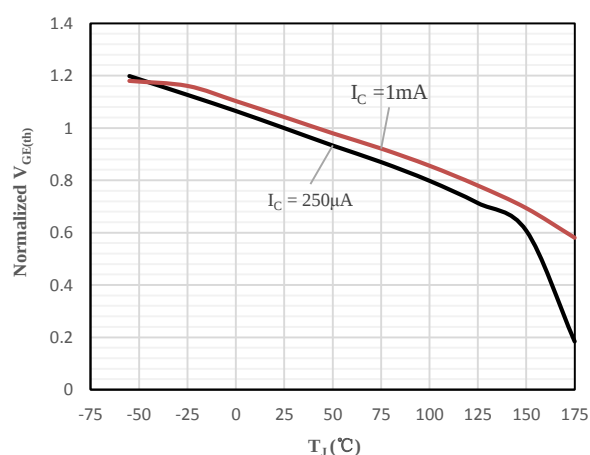


Fig 4 Normalized $V_{GE(th)}$ vs. Junction Temperature

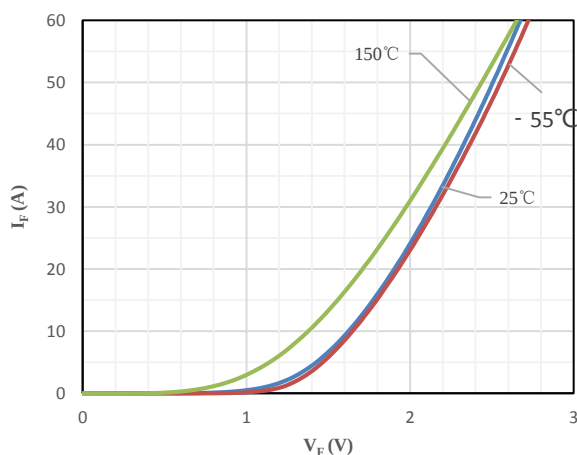


Fig 5 Body-Diode Characteristics

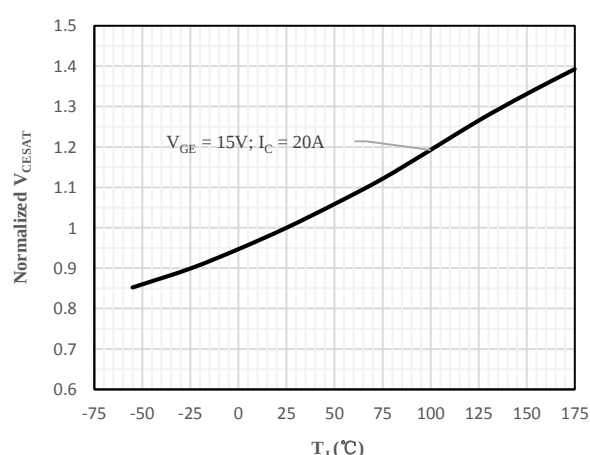


Fig 6 Normalized Collector-Emitter Saturation Voltage vs. Junction Temperature

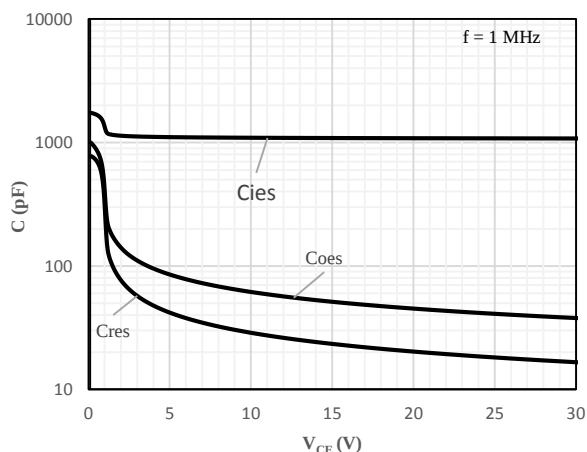


Fig 7 Capacitance Characteristics

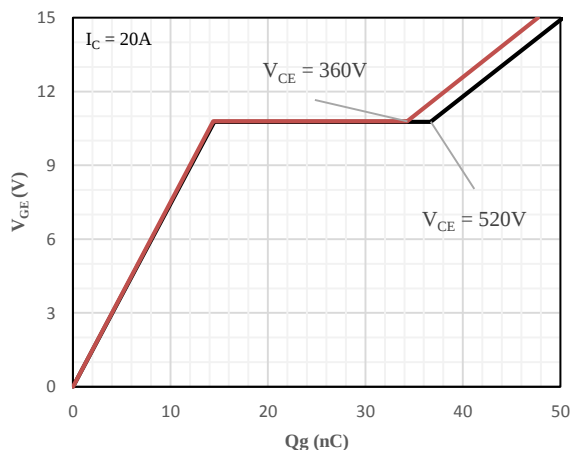


Fig 8 Gate-Charge Characteristics

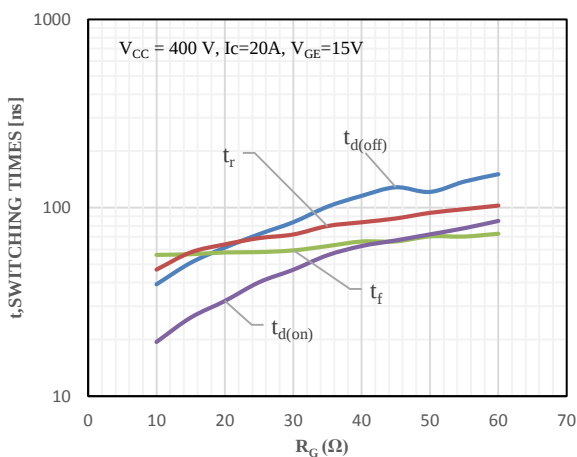


Fig 9 Switching Times vs. Gate Resistor

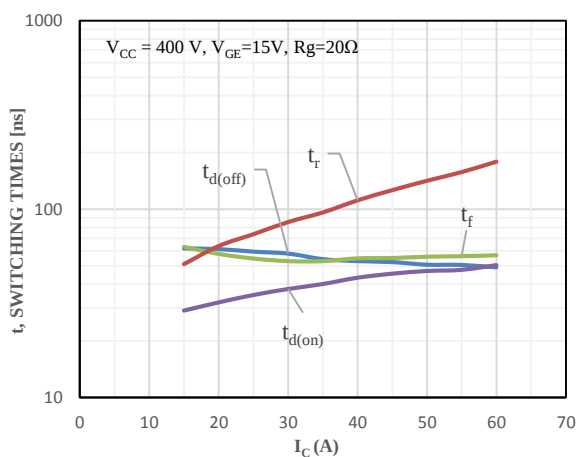


Fig 10 Switching Times vs. Collector Current

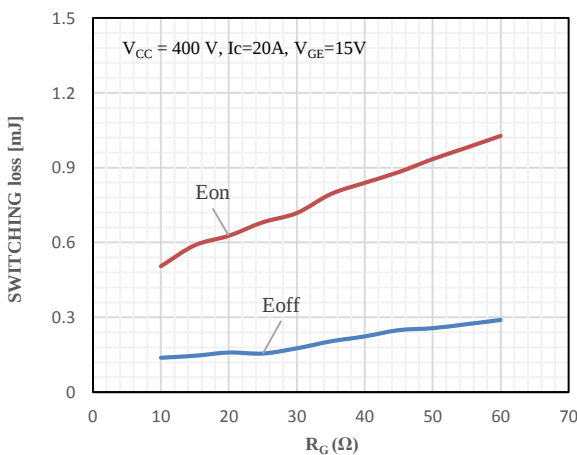


Fig 11 Switching Loss vs. Gate Resistor

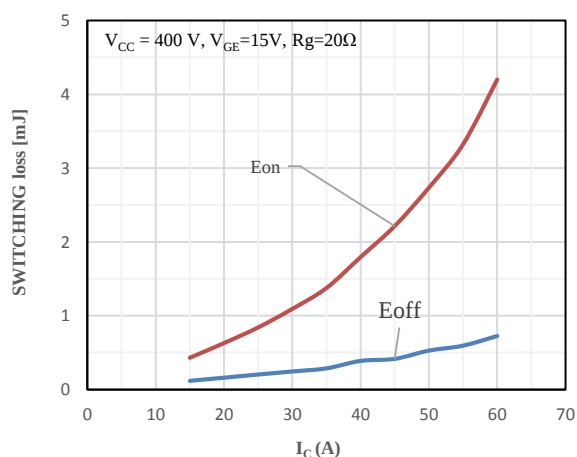
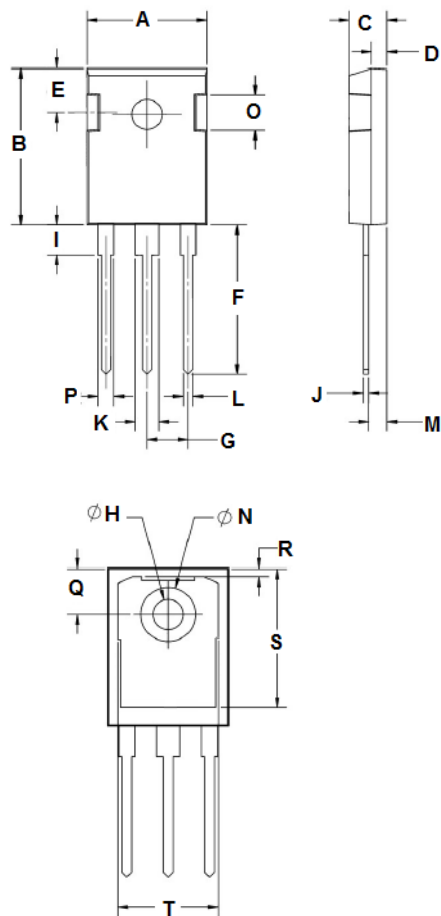


Fig 12 Switching Loss vs. Collector Current

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

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