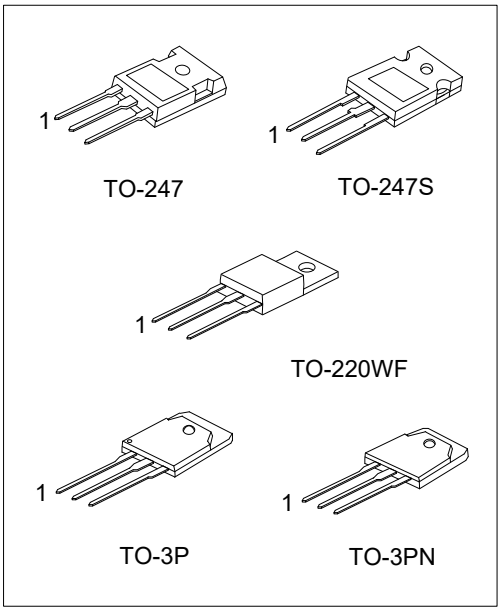
UTG40N65SQ

Insulated Gate Bipolar Transistor

650V, TRENCH GATE FIELD-STOP IGBT



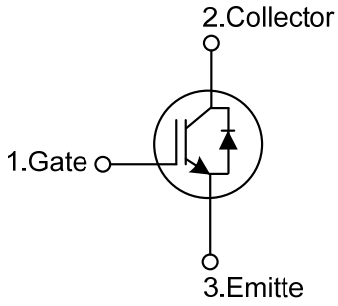
■ DESCRIPTION

Using UTC's proprietary trench design and advanced Field Stop (FS) technology, offering superior conduction and switching performances.

■ FEATURES

* FS Trench Technology, Positive temperature coefficient
* Low saturation voltage: $V_{CE(SAT).Typ.}$ = 1.7V @ I_C=40A, V_{GE}=15V (T_C =25°C)

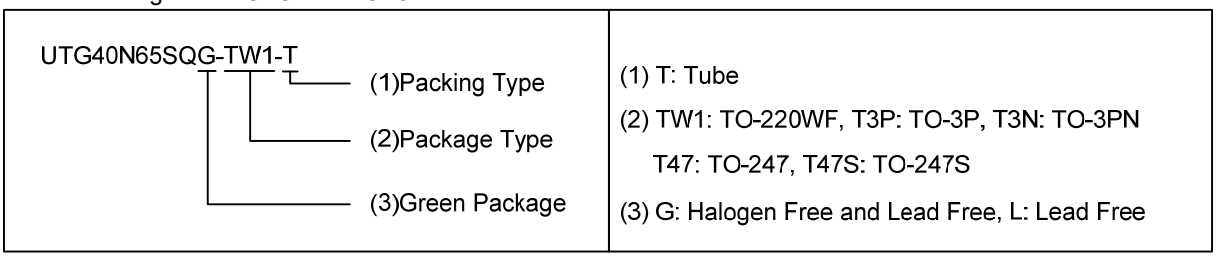
■ SYMBOL



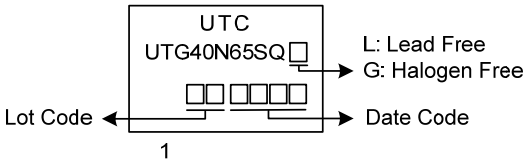
■ ORDERING INFORMATION

Ordering Number		Package	Pin Assignment			Packing
Lead Free	Halogen Free		1	2	3	
UTG40N65SQL-TW1-T	UTG40N65SQG-TW1-T	TO-220WF	G	C	E	Tube
UTG40N65SQL-T3P-T	UTG40N65SQG-T3P-T	TO-3P	G	C	E	Tube
UTG40N65SQL-T3N-T	UTG40N65SQG-T3N-T	TO-3PN	G	C	E	Tube
UTG40N65SQL-T47-T	UTG40N65SQG-T47-T	TO-247	G	C	E	Tube
UTG40N65SQL-T47S-T	UTG40N65SQG-T47S-T	TO-247S	G	C	E	Tube

Note: Pin Assignment: G: Gate C: Collector E: Emitter



■ MARKING


UTC
UTG40N65SQ□
L: Lead Free
G: Halogen Free
Lot Code
Date Code
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■ ABSOLUTE MAXIMUM RATINGS (T_A=25°C, unless otherwise noted)

PARAMETER		SYMBOL	RATINGS	UNIT
Collector-Emitter Voltage		V_{CES}	650	V
Gate-Emitter Voltage		V_{GES}	±20	V
Transient Gate-Emitter Voltage (tp ≤ 10 μs, D < 0.01)			±30	V
Continuous Collector Current	T_C=25°C	I_C	80	A
	T_C=100°C		40	A
Collector Current Pulsed (Note 1)		I_{CM}	120	A
Diode Forward Current	T_C=25°C	I_F	40	A
	T_C=100°C		20	A
Short Circuit Withstand Time V_{GE} = 15V, V_{CC} ≤ 200V Allowed number of short circuits < 1000 Time between short circuits: ≥1.0s T_{VJ}= 25°C		t_{SC}	5	μs
Power Dissipation (T_C=25°C)	TO-220WF	P_D	35	W
	TO-3P TO-3PN		298	W
	TO-247 TO-247S		220	W
Operating Junction Temperature		T_J	-40 ~ +150	°C
Storage Temperature Range		T_{STG}	-55 ~ +150	°C

Notes: 1. Absolute maximum ratings are stress ratings only and functional device operation is not implied. Absolute maximum ratings are those values beyond which the device could be permanently damaged.
2. Pulse width limited by maximum junction temperature.

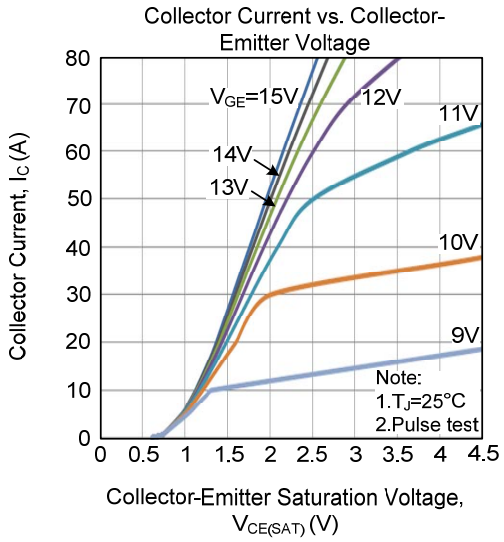
■ THERMAL DATA

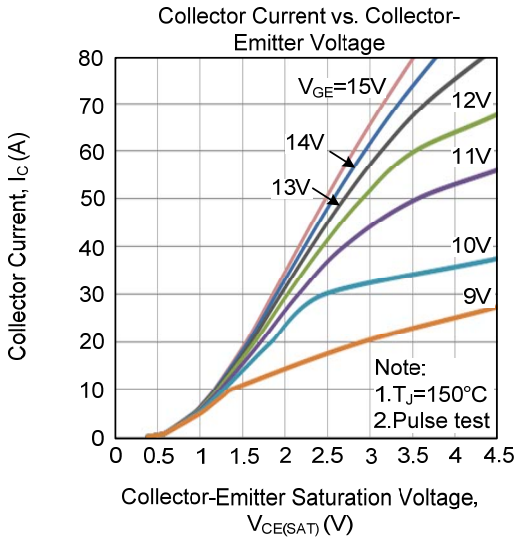
PARAMETER		SYMBOL	RATING	UNIT
Junction to Case	TO-220WF	$θ_{JC}$	3.57	°C/W
	TO-3P TO-3PN		0.42	°C/W
	TO-247 TO-247S		0.57	°C/W

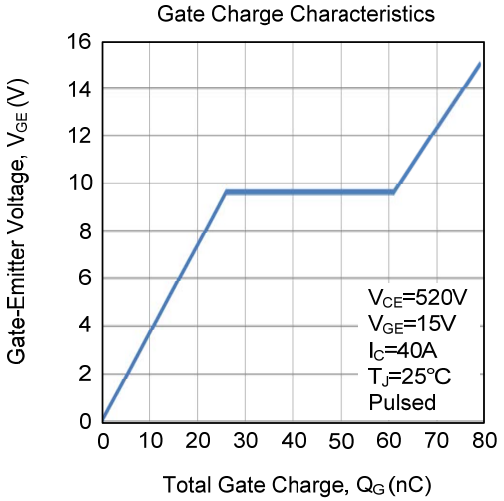
■ ELECTRICAL CHARACTERISTICS (T_C=25°C, unless otherwise noted)

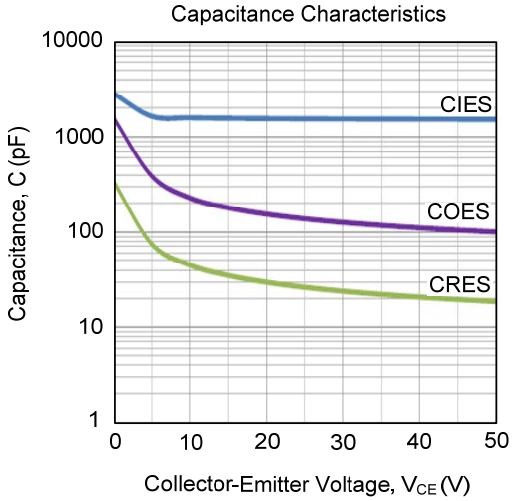
PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
OFF CHARACTERISTICS							
Collector-Emitter Breakdown Voltage	BV_{CES}			650			V
Collector Cut-Off Current	I_{CES}	V_{CE}=650V, V_{GE}=0V				1	mA
Gate-Emitter Forward Leakage Current	I_{GES_F}	V_{CE}=0V, V_{GE}=+20V				+250	nA
Gate-Emitter Reverse Leakage Current	I_{GES_F}	V_{CE}=0V, V_{GE}=-20V				-250	nA
ON CHARACTERISTICS							
Gate to Emitter Threshold Voltage	$V_{GE(TH)}$	I_C=250μA, V_{CE}=V_{GE}		4.5		6.5	V
Collector to Emitter Saturation Voltage	$V_{CE(SAT)}$	I_C=40A, V_{GE}=15V	T_C=25°C		1.7	2.1	V
			T_C=125°C		2.1		V
DYNAMIC CHARACTERISTICS							
Input Capacitance	C_{IES}	V_{CE}=25V, V_{GE}=0V, f=1MHz			1560		pF
Output Capacitance	C_{OES}				125		pF
Reverse Transfer Capacitance	C_{RES}				23		pF
SWITCHING CHARACTERISTICS							
Total Gate Charge	Q_G	V_{CE}=520V, I_C=40A, V_{GE}=15V			79		nC
Gate-Emitter Charge	Q_{GE}				26		nC
Gate-Collector Charge	Q_{GC}				35		nC
Turn-On Delay Time	$t_{DON)}$	V_{CC}=400V, I_C=40A, R_G=5Ω, V_{GE}=0~15V, L=500μH			16		ns
Rise Time	t_R				41		ns
Turn-Off Delay Time	$t_{DOFF)}$				58		ns
Fall Time	t_F				117		ns
Turn-On Switching Loss	E_{ON}				1.8		mJ
Turn-Off Switching Loss	E_{OFF}				1.1		mJ
SOURCE- DRAIN DIODE RATINGS AND CHARACTERISTICS							
Forward Voltage Drop	V_F	I_F=20A			2.1	3.0	V
Reverse Recovery Time	t_{rr}	I_F=20A, dI/dt=100A/μS, V_{CC}=400V			88		ns
Reverse Recovery Charge	Q_{rr}				75		nC

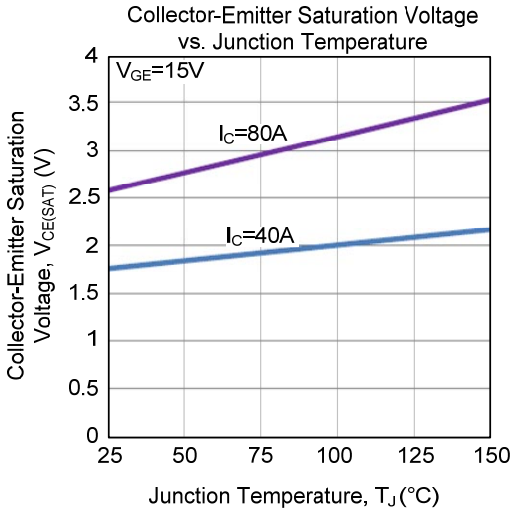
■ TYPICAL CHARACTERISTICS

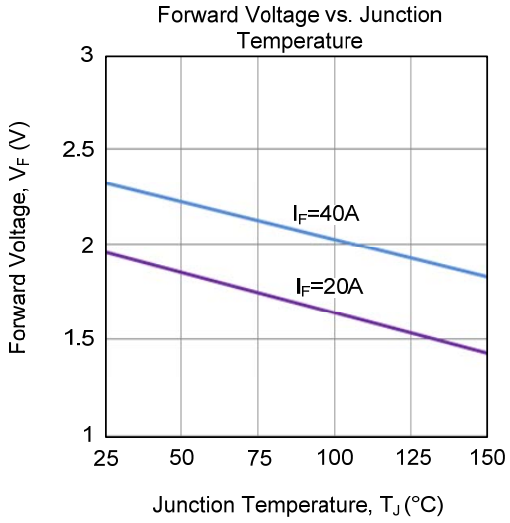






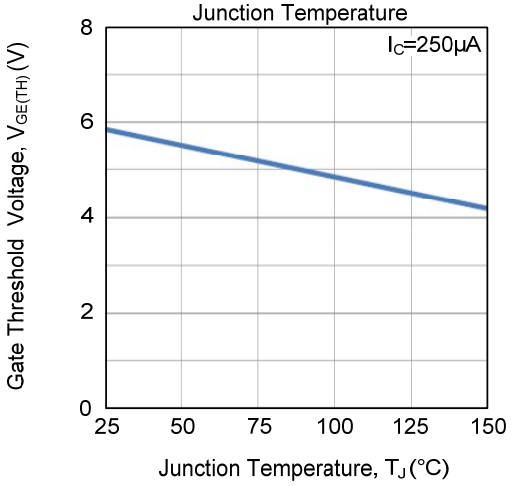




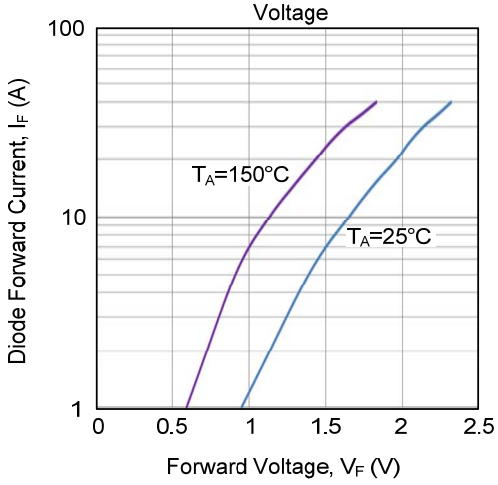


■ TYPICAL CHARACTERISTICS (Cont.)

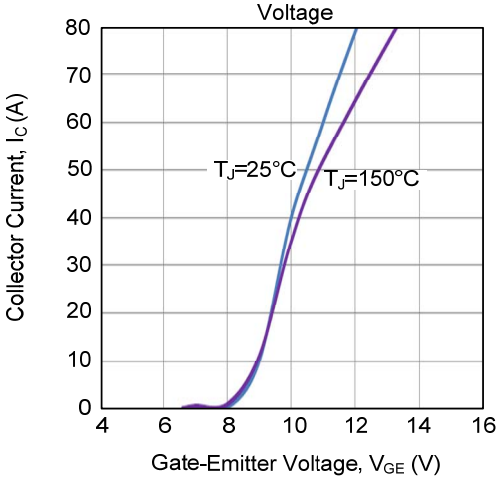
Gate Threshold Voltage vs. Junction Temperature



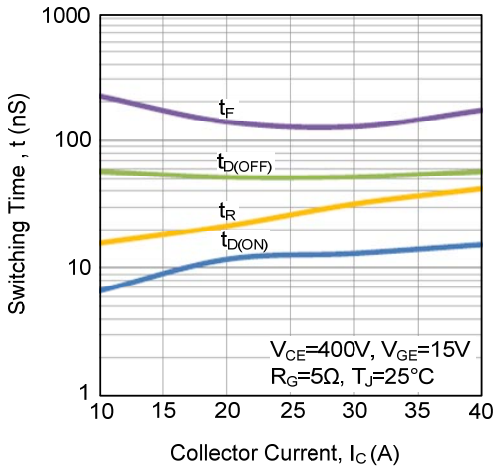
Diode Forward Current vs. Forward Voltage



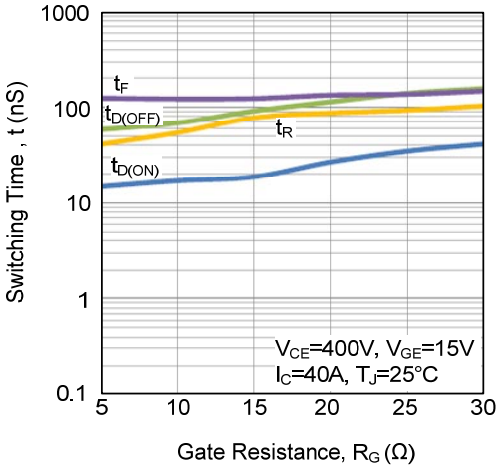
Collector Current vs. Gate-Emitter Voltage



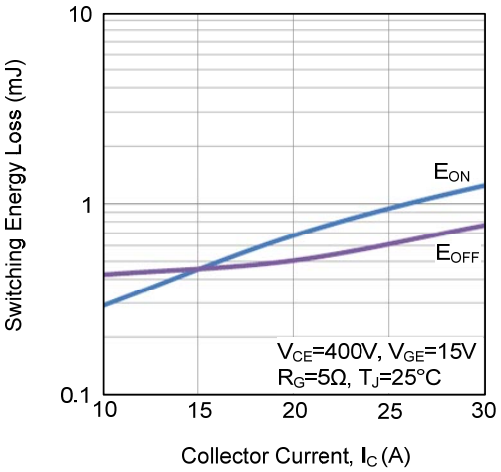
Switching Time vs. Collector Current



Switching Time vs. Gate Resistance



Switching Loss vs. Collector Current



■ TYPICAL CHARACTERISTICS (Cont.)