

1. PRODUCT Insulated Gate Bipolar Transistor (Silicon N-channel Enhancement Mode)
2. TYPE R G S 0 0 T S 6 5 E
3. APPLICATION General Inverter for Automotive and Industrial Use
4. FEATURE
 - 650V / 50A (RGS-series)
 - Low Collector-Emitter Saturation Voltage
 - Low Switching Loss
 - Short Circuit Withstand Time 8μs
 - Built in Very Fast & Soft Recovery FRD
 - Qualified to AEC-Q101

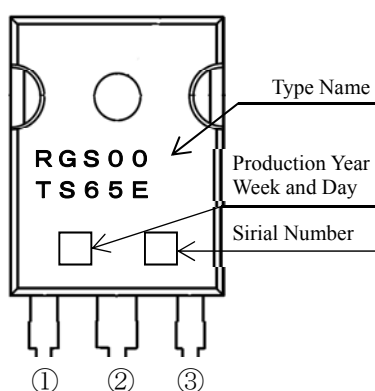
5. ABSOLUTE MAXIMUM RATINGS (at $T_C=25^{\circ}\text{C}$ unless otherwise specified)

Item		Symbol	Ratings	Units
Collector-Emitter Voltage		V_{CES}	650	V
Gate-Emitter Voltage		V_{GES}	± 30	V
Collector Current	$T_C=25^{\circ}\text{C}$	I_C	88	A
	$T_C=100^{\circ}\text{C}$	I_C	50	A
Pulsed Collector Current ^{*1}		I_{CP}	150	A
Diode Forward Current	$T_C=25^{\circ}\text{C}$	I_F	84	A
	$T_C=100^{\circ}\text{C}$	I_F	50	A
Diode Pulsed Forward Current ^{*1}		I_{FP}	150	A
Power Dissipation	$T_C=25^{\circ}\text{C}$	P_D	326	W
	$T_C=100^{\circ}\text{C}$	P_D	163	W
Operating Junction Temperature		T_j	$-40 \sim +175$	$^{\circ}\text{C}$
Storage Temperature		T_{stg}	$-55 \sim +175$	$^{\circ}\text{C}$

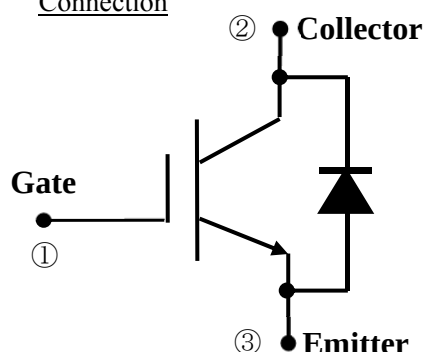
*1) Pulse width limited by T_{jmax} .

6. MARKING AND CONNECTION

Marking



Connection



DESIGN	CHECK	APPROVAL	DATE : 20/SEP./2016	SPECIFICATION No. : TSQ50404-RGS00TS65E
<i>S. Umeki</i>	<i>J. Kouramoto</i>	<i>J. Terada</i>	REV. : 001	ROHM Co., Ltd.

7. THERMAL RESISTANCE

Item	Symbol	Min.	Typ.	Max.	Units
Thermal Resistance IGBT Junction-Case	$R_{\theta(j-c)}$	—	—	0.46	°C/W
Thermal Resistance DIODE Junction-Case	$R_{\theta(j-c)}$	—	—	0.80	°C/W

8. ELECTRICAL CHARACTERISTICS (at $T_j=25^{\circ}\text{C}$ unless otherwise specified)

Item	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Breakdown Voltage	BV_{CES}	$I_C=10\mu\text{A}$, $V_{GE}=0\text{V}$	650	—	—	V
Collector Cut-off Current	I_{CES}	$V_{CE}=650\text{V}$, $V_{GE}=0\text{V}$	—	—	10	μA
Collector Cut-off Current*2	I_{CES}	$V_{CE}=650\text{V}$, $V_{GE}=0\text{V}$ $T_j=175^{\circ}\text{C}$	—	—	5	mA
Gate-Emitter Leakage Current	I_{GES}	$V_{GE}=\pm 30\text{V}$, $V_{CE}=0\text{V}$	—	—	± 200	nA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{CE}=5\text{V}$, $I_C=2.5\text{mA}$	5.0	6.0	7.0	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=50\text{A}$, $V_{GE}=15\text{V}$	—	1.65	2.10	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=50\text{A}$, $V_{GE}=15\text{V}$ $T_j=175^{\circ}\text{C}$	—	2.15	—	V
Input Capacitance	C_{ies}	$V_{CE}=30\text{V}$, $V_{GE}=0\text{V}$ $f=1\text{MHz}$	—	1568	—	pF
Output Capacitance	C_{oes}		—	134	—	pF
Reverse Transfer Capacitance	C_{res}		—	23	—	pF
Total Gate Charge	Q_g	$V_{CE}=300\text{V}$, $I_C=50\text{A}$ $V_{GE}=15\text{V}$	—	58	—	nC
Gate-Emitter Charge	Q_{ge}		—	15	—	nC
Gate-Collector Charge	Q_{gc}		—	24	—	nC
Turn-on Delay Time	$t_{d(on)}$	$I_C=50\text{A}$, $V_{CC}=400\text{V}$ $V_{GE}=15\text{V}$, $R_G=10\Omega$ $T_j=25^{\circ}\text{C}$ Inductive Load * E_{on} include diode Reverse recovery	—	36	—	ns
Rise Time	t_r		—	21	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	115	—	ns
Fall Time	t_f		—	91	—	ns
Turn-on Switching Loss	E_{on}		—	1.46	—	mJ
Turn-off Switching Loss	E_{off}		—	1.29	—	mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=50\text{A}$, $V_{CC}=400\text{V}$ $V_{GE}=15\text{V}$, $R_G=10\Omega$ $T_j=175^{\circ}\text{C}$ Inductive Load * E_{on} include diode Reverse recovery	—	37	—	ns
Rise Time	t_r		—	33	—	ns
Turn-off Delay Time	$t_{d(off)}$		—	145	—	ns
Fall Time	t_f		—	154	—	ns
Turn-on Switching Loss	E_{on}		—	2.00	—	mJ
Turn-off Switching Loss	E_{off}		—	1.87	—	mJ

Item	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Reverse Bias Safe Operating Area	RBSOA	$I_C=150A$, $V_{CC}=520V$ $V_P=650V$, $V_{GE}=15V$ $R_G=50\Omega$, $T_j=175^\circ C$	FULL SQUARE			—
Short Circuit Withstand Time	t_{sc}	$V_{CC} \leq 360V$, $V_{GE}=15V$ $T_j=25^\circ C$	8	—	—	μs
Short Circuit Withstand Time ^{*2}	t_{sc}	$V_{CC} \leq 360V$, $V_{GE}=15V$ $T_j=150^\circ C$	6	—	—	μs
Diode Forward Voltage	V_F	$I_F=50A$	—	1.45	1.90	V
Diode Forward Voltage	V_F	$I_F=50A$, $T_j=175^\circ C$	—	1.50	—	V
Diode Reverse Recovery Time	t_{rr}	$I_F=50A$, $V_{CC}=400V$ $di_F/dt=400A/\mu s$ $T_j=25^\circ C$	—	113	—	ns
Diode Peak Reverse Recovery Current	I_{rr}		—	14.1	—	A
Diode Reverse Recovery Charge	Q_{rr}		—	0.92	—	μC
Diode Reverse Recovery Energy	E_{rr}		—	275	—	μJ
Diode Reverse Recovery Time	t_{rr}	$I_F=50A$, $V_{CC}=400V$ $di_F/dt=400A/\mu s$ $T_j=175^\circ C$	—	256	—	ns
Diode Peak Reverse Recovery Current	I_{rr}		—	18.6	—	A
Diode Reverse Recovery Charge	Q_{rr}		—	2.54	—	μC
Diode Reverse Recovery Energy	E_{rr}		—	565	—	μJ

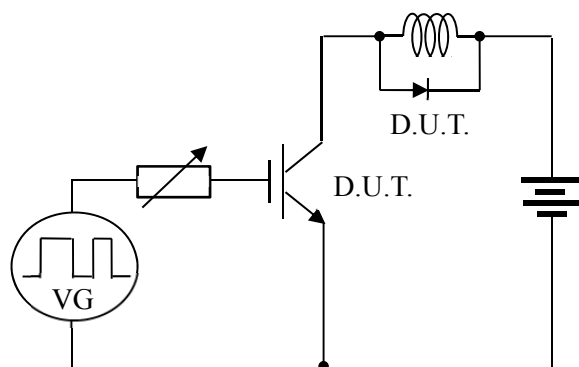
*2) Design assurance without measurement

9. PACKAGE OUTLINE NAME

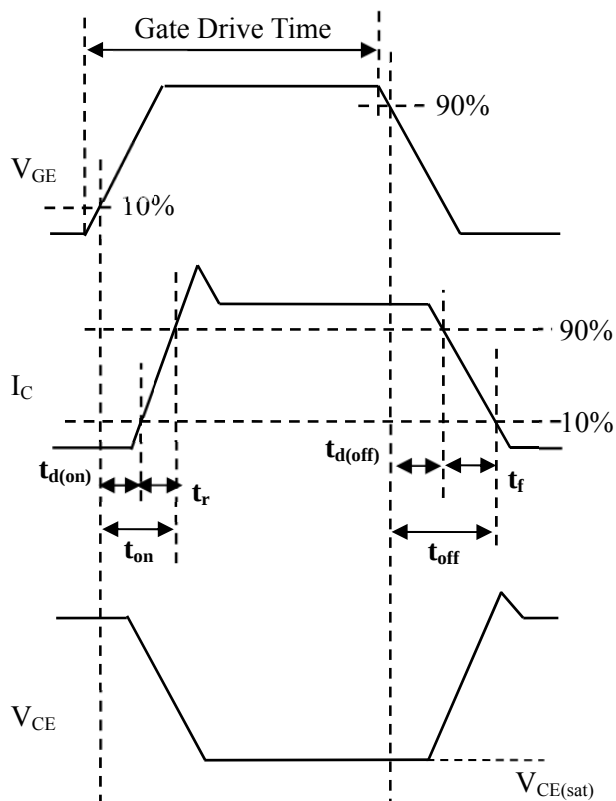
Package Type	TO-247N
Circuit Type	IGBT with Anti-parallel Diode

1 0. DEFINITION OF L-LOAD SWITCHING TIME MEASUREMENT

L-LOAD SWITCHING TIME MEASUREMENT CIRCUIT



SWITCHING TIME WAVEFORM



DIODE RECOVERY TIME WAVEFORM

