1．PRODUCT Insulated Gate Bipolar Transistor（Silicon N-channel Enhancement Mode）

2．TYPE ＲＧＳ００ＴＳ６５Ｅ

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

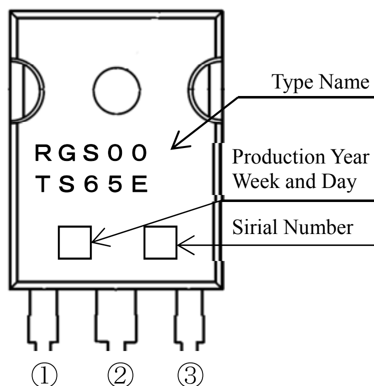
5．ABSOLUTE MAXIMUM RATINGS（at T_C=25℃ unless otherwise specified）

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

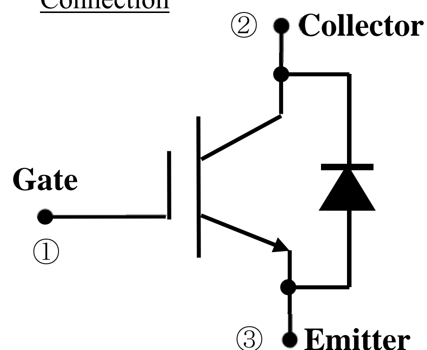
*1) Pulse width limited by $T_j$max.

6．MARKING AND CONNECTION

Marking



Connection



7． THERMAL RESISTANCE

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

8． ELECTRICAL CHARACTERISTICS（at T_j=25℃ unless otherwise specified）

Item	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Collector-Emitter Breakdown Voltage	BV_{CES}	I_C=10μA, V_{GE}=0V	650	—	—	V
Collector Cut-off Current	I_{CES}	V_{CE}=650V, V_{GE}=0V	—	—	10	μA
Collector Cut-off Current*2	I_{CES}	V_{CE}=650V, V_{GE}=0V T_j=175℃	—	—	5	mA
Gate-Emitter Leakage Current	I_{GES}	V_{GE}=±30V, V_{CE}=0V	—	—	±200	nA
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{CE}=5V, I_C=2.5mA	5.0	6.0	7.0	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=50A, V_{GE}=15V	—	1.65	2.10	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=50A, V_{GE}=15V T_j=175℃	—	2.15	—	V
Input Capacitance	C_{ies}	V_{CE}=30V, V_{GE}=0V f=1MHz	—	1568	—	pF
Output Capacitance	C_{oes}		—	134	—	pF
Reverse Transfer Capacitance	C_{res}		—	23	—	pF
Total Gate Charge	Q_g	V_{CE}=300V, I_C=50A V_{GE}=15V	—	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=50A, V_{CC}=400V V_{GE}=15V, R_G=10Ω T_j=25℃ 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=50A, V_{CC}=400V V_{GE}=15V, R_G=10Ω T_j=175℃ 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=50Ω, T_j=175℃	FULL SQUARE			—
Short Circuit Withstand Time	t_{sc}	Vcc≦360V, V_{GE}=15V T_j=25℃	8	—	—	μs
Short Circuit Withstand Time*2	t_{sc}	Vcc≦360V, V_{GE}=15V T_j=150℃	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℃	—	1.50	—	V
Diode Reverse Recovery Time	t_{rr}	I_F=50A, V_{CC}=400V di_F/dt=400A/μs T_j=25℃	—	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/μs T_j=175℃	—	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

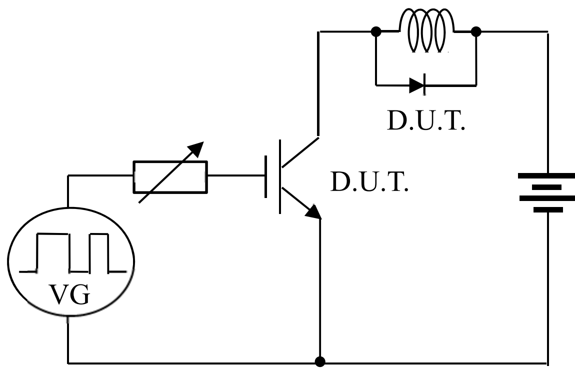
*2) Design assurance without measurement

９. PACKAGE OUTLINE NAME

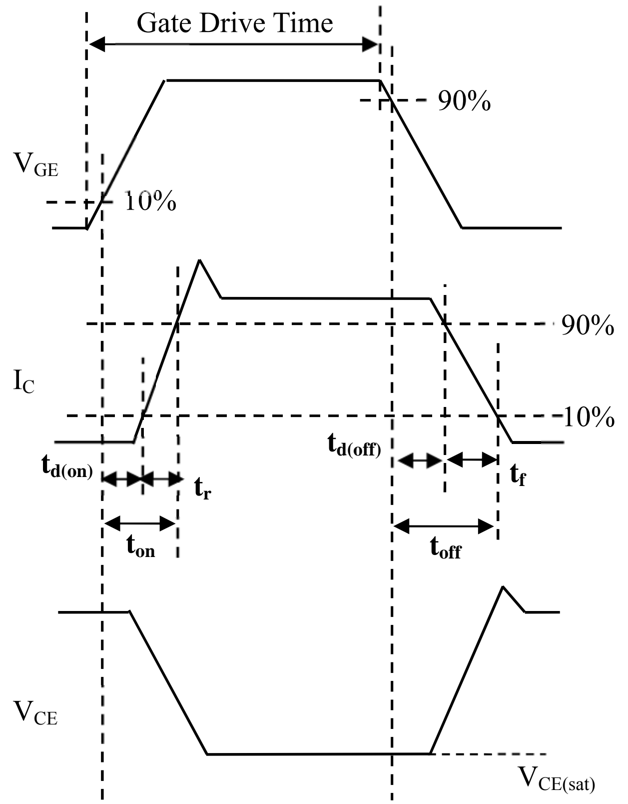
Package Type	TO-247N
Circuit Type	IGBT with Anti-parallel Diode

１０．DEFINITION OF L-LOAD SWITCHING TIME MEASUREMENT

L-LOAD SWITCHING TIME MEASUREMENT CIRCUIT



SWITCHING TIME WAVEFORM



DIODE RECOVERY TIME WAVEFORM