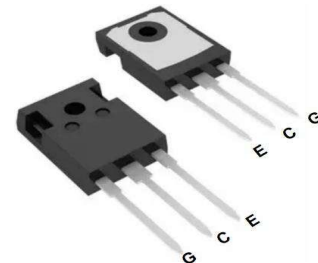
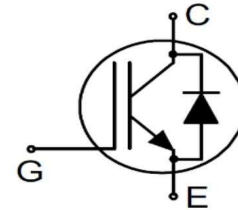


Description

Features

- 650V, 40A IGBT
- Easy paralleling capability due to positive temperature coefficient in $V_{CE(SAT)}$
- Low EMI
- Low Gate Charge
- Low Saturation Voltage $V_{CE(SAT)}$
- Maximum junction temperature $T_{VJmax}=175^{\circ}C$



Application

- UPS
- EV-Charger
- Solar String Inverter
- Energy Storage Inverter

Key Performance and Package Parameters

Device	V_{CE}	I_C ($T_C = 25^{\circ}C$)	$V_{CE(SAT)}$ ($T_{VJ} = 25^{\circ}C$, $V_{GE} = 15V$)	V_F ($T_{VJ} = 25^{\circ}C$, $I_F = 40A$)	Package	Packing
RSTK40N65H	650V	40A	1.6V	1.8V	TO-247-3L	30PCS

Absolute Maximum Ratings (@ $T_{VJ} = 25^{\circ}C$ unless otherwise specified)

Symbol	Parameter	Value	Units	
V _{CE}	Collector emitter voltage	650	V	
I _C	DC collector current ⁽¹⁾	T _C = 25°C	70	A
		T _C = 100°C	40	A
I _{CM}	Pulsed collector current	T _C = 25°C	160	A
I _F	Maximum Diode forward current ⁽¹⁾	T _C = 25°C	70	A
		T _C = 100°C	40	A
I _{FM}	Diode pulsed current	T _C = 25°C	160	A
V _{GE}	Gate-Emitter voltage	T _{VJ} = 25°C	±20	V
	Transient Gate-Emitter Voltage (tp ≤ 10μs, D < 0.010)	T _{VJ} = 25°C	±30	V
P _{tot}	Power Dissipation	T _C = 25°C	250	W
		T _C = 100°C	125	W
T _{VJ}	Operating Junction Temperature Range	-40 to +175	°C	
T _{STG}	Storage Temperature Range	-55 to +150	°C	

Thermal Resistance

Symbol	Parameter	Conditions	Max.	Unit
$R_{\theta JA}$	Thermal resistance: junction - ambient		40	°C/W
$R_{\theta JC}$	IGBT Thermal resistance: junction - case	IGBT	0.6	°C/W
$R_{\theta JC}$	Diode Thermal resistance: junction - case	Diode	0.65	°C/W

Electrical Characteristics (@ $T_{VJ} = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
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Static Characteristics

$V_{(BR)CES}$	Collector - Emitter Breakdown Voltage	$V_{GE} = 0V, I_C = 0.5mA$	650	-	-	V
		$V_{GE} = 15V, I_C = 40A$	-	1.6	2.1	V
V_{CESAT}	Collector - Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 40A, T_{VJ} = 125^{\circ}\text{C}$	-	1.85	-	V
		$V_{GE} = 15V, I_C = 40A, T_{VJ} = 175^{\circ}\text{C}$	-	1.95	-	V
		$V_{GE} = 0V, I_C = 40A$	-	1.8	-	V
V_F	Diode forward voltage	$V_{GE} = 0V, I_C = 40A, T_{VJ} = 125^{\circ}\text{C}$	-	1.5	-	V
		$V_{GE} = 0V, I_C = 40A, T_{VJ} = 175^{\circ}\text{C}$	-	1.35	-	V
$V_{GE(th)}$	Gate-Emitter threshold voltage	$V_{GE} = V_{CE}, I_C = 250\mu A$	3.2	4	4.8	V
I_{CES}	Zero Gate voltage Collector current	$V_{CE} = 650V, V_{GE} = 0V$	-	-	40	μA
I_{GES}	Gate-Emitter leakage current	$V_{GE} = \pm 20V, V_{CE} = 0V$	-	-	± 100	nA
g_{fs}	Transconductance	$V_{GE} = 15V, I_C = 40A$	-	55	-	S

Dynamic Characteristics

C_{ies}	Input Capacitance		-	1520	-	pF
C_{oes}	Output Capacitance	$V_{GE} = 0V, V_{CE} = 25V, f = 1MHz$	-	110	-	pF
C_{res}	Reverse Transfer Capacitance		-	11	-	pF
Q_g	Gate Charge		-	57	-	nC
Q_{ge}	Gate to Emitter charge	$V_{GE} = 0 \text{ to } 15V$	-	6.5	-	nC
Q_{gc}	Gate to Collector charge	$V_{CE} = 520V, I_C = 40A$	-	17.5	-	nC

Switching Characteristics

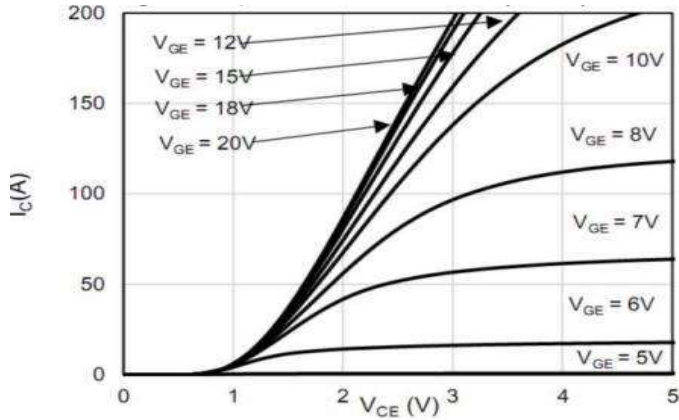
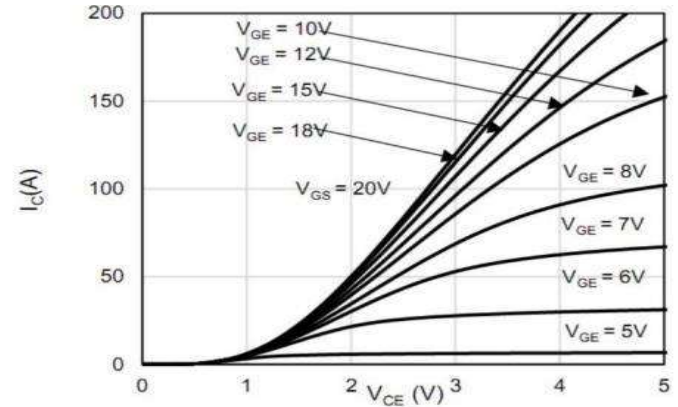
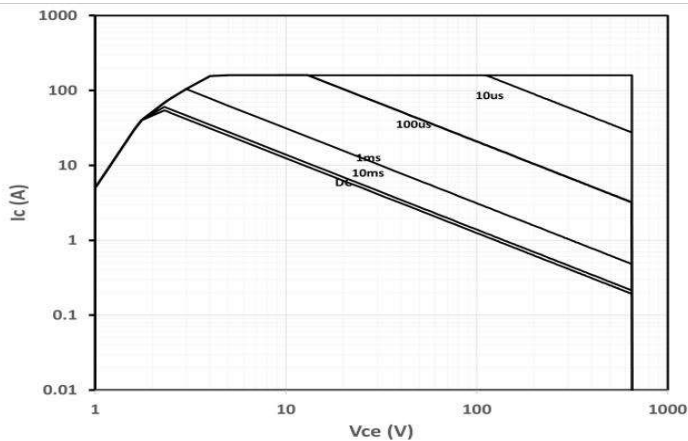
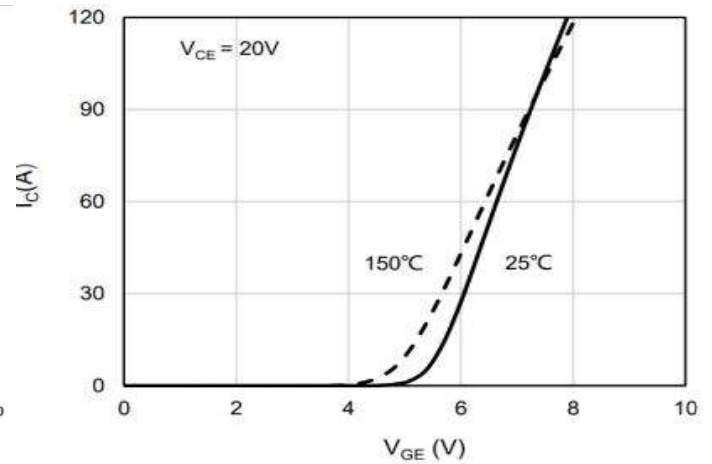
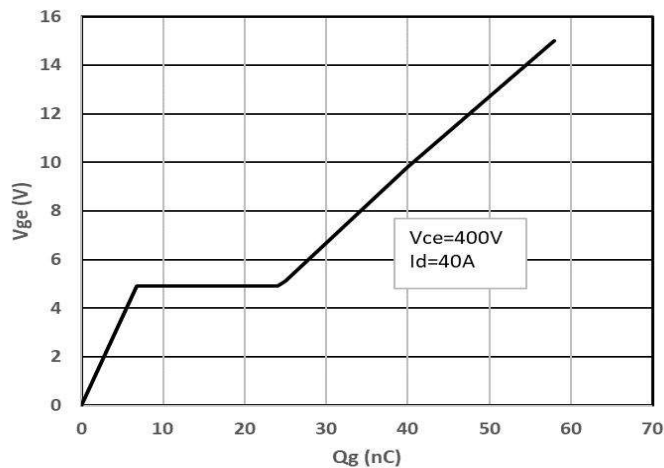
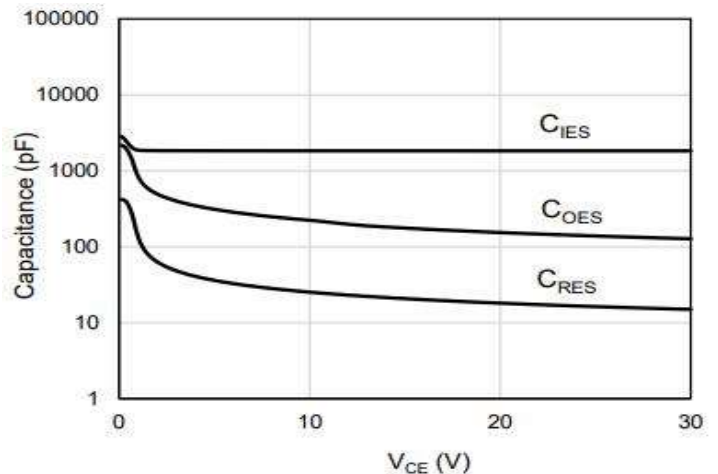
$t_{d(on)}$	Turn-On DelayTime		-	26	-	ns
t_r	Turn-On Rise Time		-	28	-	ns
$t_{d(off)}$	Turn-Off DelayTime		-	136	-	ns
t_f	Turn-Off Fall Time	$V_{GE} = 15V, V_{CC} = 400V$ $I_C = 40A, R_{G(on)} = 15\Omega, R_{G(off)} = 15\Omega$	-	34	-	ns
E_{on}	Turn-on energy		-	0.9	-	mJ
E_{off}	Turn-off energy		-	0.43	-	mJ
E_{ts}	Total switching energy		-	1.33	-	mJ

Diode Recovery Characteristics

T_{rr}	Reverse recovery time		-	56	-	ns
Q_{rr}	Reverse recovery charge	$V_R = 400V, I_F = 40A, di/dt = 400A/\mu S$	-	0.27	-	μC
I_{rrm}	Peak reverse recovery current		-	8.0	-	A

Notes: 1. The max Collector current rating is package limited

Typical Performance Characteristics

Fig.1 Typical Output characteristics (25°C)

Fig.2 Typical Output characteristics (150°C)

Fig.3 Forward Bias Safe Operating Area

Fig.4 Transfer characteristics

Fig.5 Gate charge characteristics

Fig.6 Typical capacitance characteristics


Typical Performance Characteristics

Fig.7 Vcesat vs. Junction Temperature

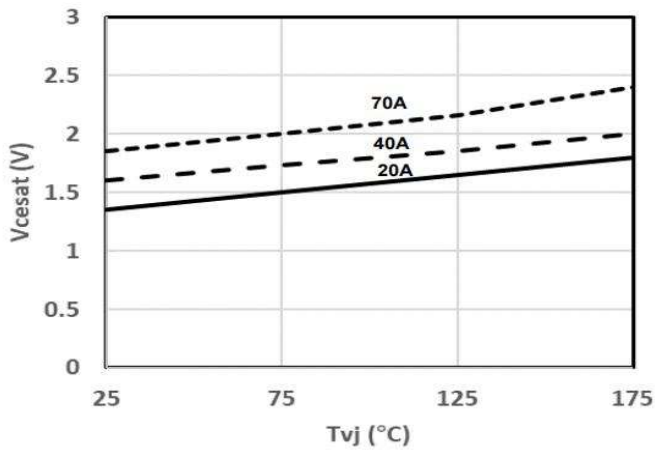


Fig.8 Typical diode VF vs. IF Characteristic

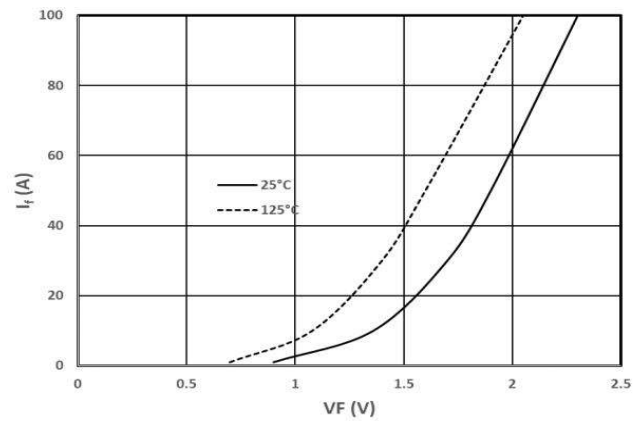


Fig.9 Threshold voltage vs. Junction temperature

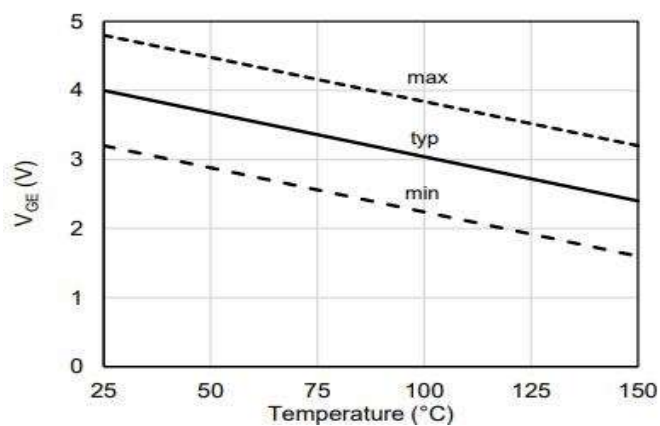


Fig.10 Transient Thermal Impedance IGBT

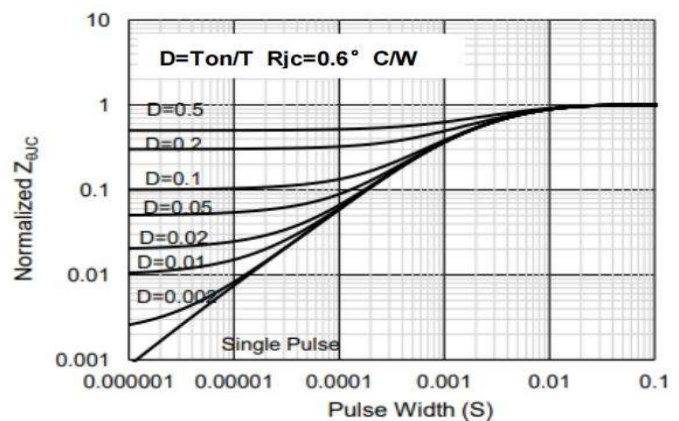
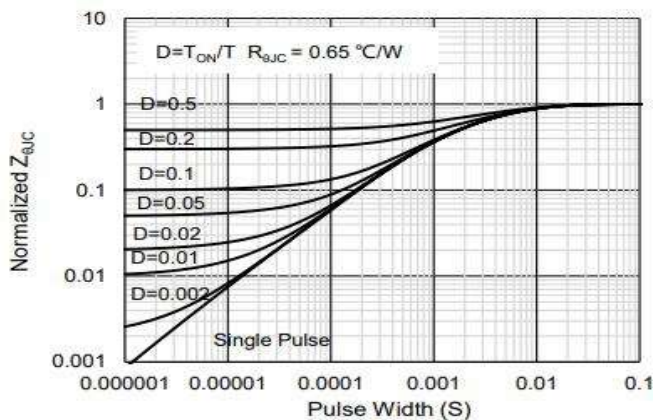
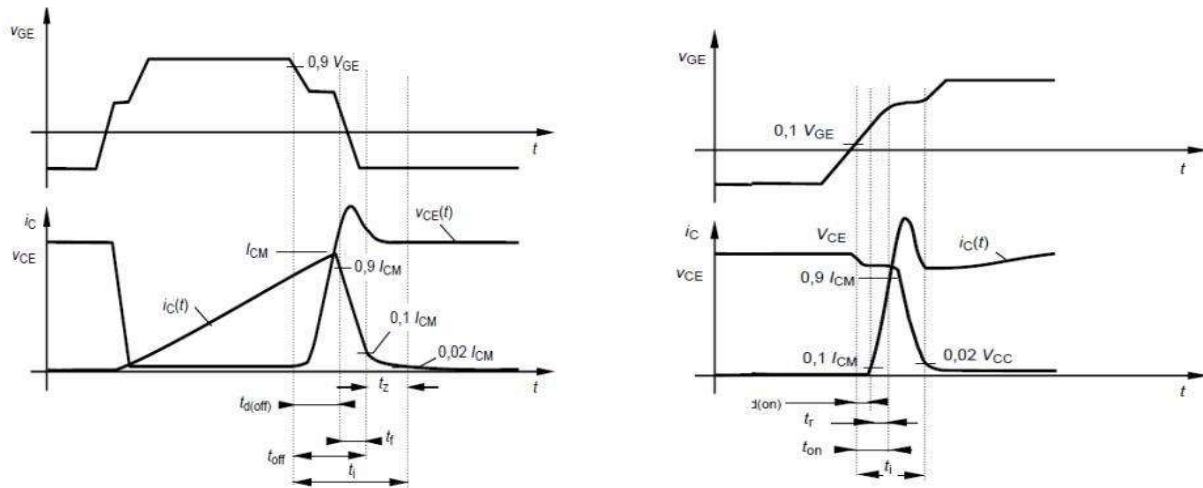


Fig.11 Transient Thermal Impedance Diode

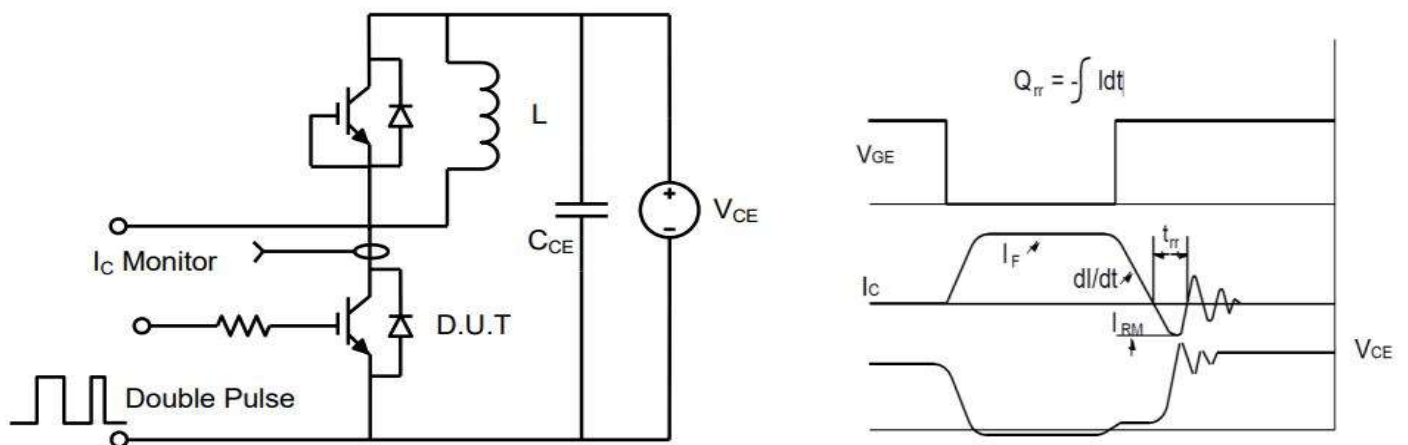


Test Circuit

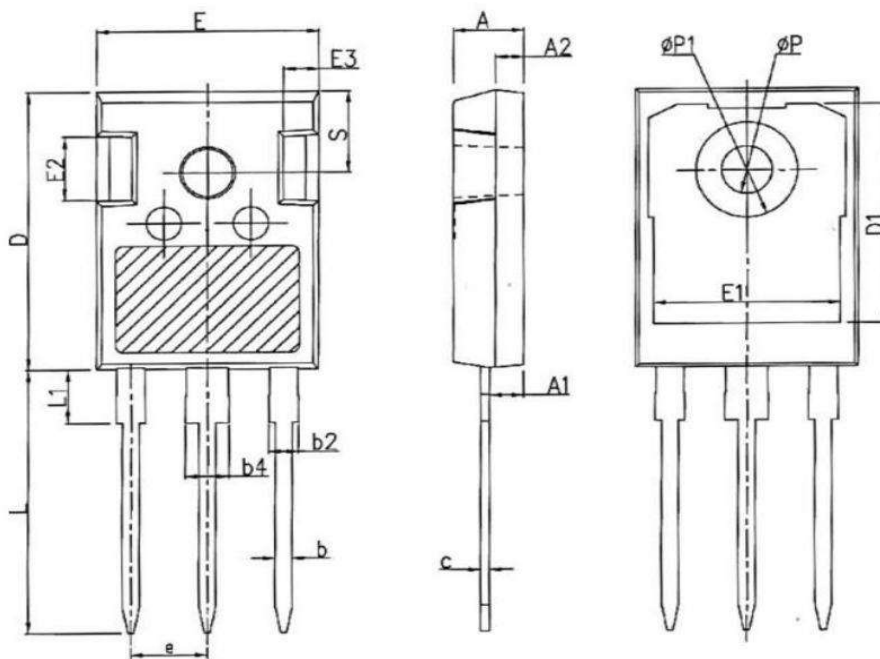
Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



Package Mechanical Data(TO-247-3L)



SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	—	—	4.30
ØP	3.40	3.60	3.80
ØP1	—	—	7.30
S	6.15BSC		