

## Insulated Gate Bipolar Transistor

### General Description:

Using DongHai's proprietary Planar design and advanced FS technology, the 650V FS IGBT offers superior conduction and switching performances, high avalanche ruggedness and easy parallel operation.

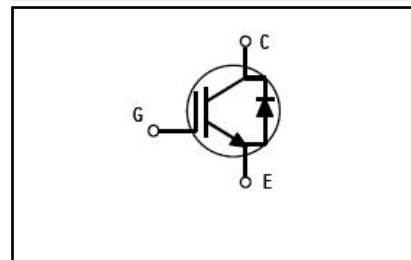
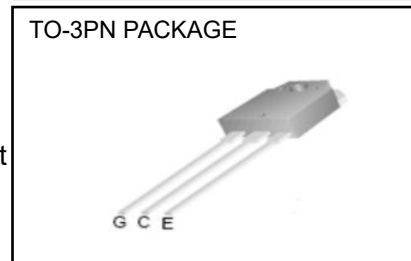
### Features:

- FS Trench Technology, Positive temperature coefficient
- Low saturation voltage:  $V_{CE(sat)}$ , typ = 1.85V @  $I_C = 60A$  and  $T_C = 25^\circ C$
- Extremely enhanced avalanche capability

### Applications:

Aircondition、Welding、UPS...

$V_{CES}$	650	V
$I_C$	60	A
$P_{tot}$ ( $T_C=25^\circ C$ )	406	W
$V_{CE(sat)}$	1.85	V



### Absolute Maximum Ratings ( $T_C = 25^\circ C$ unless otherwise specified ) :

Symbol	Parameter	Rating	Units
$V_{CES}$	Collector-Emitter Voltage	650	V
$V_{GES}$	Gate- Emitter Voltage	$\pm 20$	V
$I_C$	Collector Current	120	A
	Collector Current @ $T_C = 100^\circ C$	60	
$I_{CM}^{a1}$	Pulsed Collector Current	180	A
$I_F$	Diode Continuous Forward Current @ $T_C = 100^\circ C$	30	A
$I_{FM}$	Diode Maximum Forward Current	90	A
$P_D$	Power Dissipation @ $T_C = 25^\circ C$	406	W
	Power Dissipation @ $T_C = 100^\circ C$	163	
$T_J$	Operating Junction	150	$^\circ C$
$T_{stg}$	Storage Temperature Range	$-55 \sim 150$	$^\circ C$
$T_L$	Maximum Temperature for Soldering	270	$^\circ C$

a1: The pulse width is limited by the maximum junction temperature

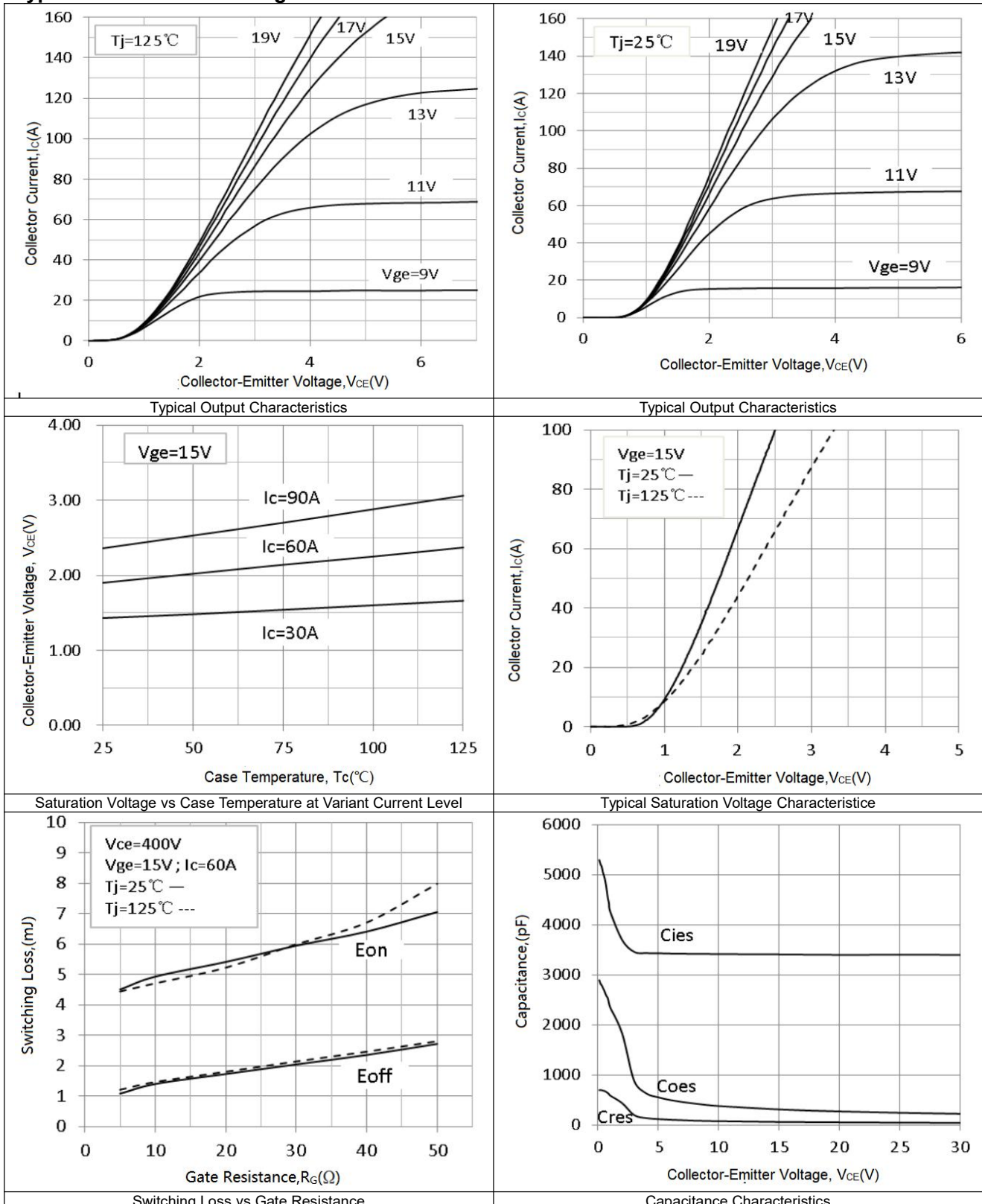
### Thermal Characteristics

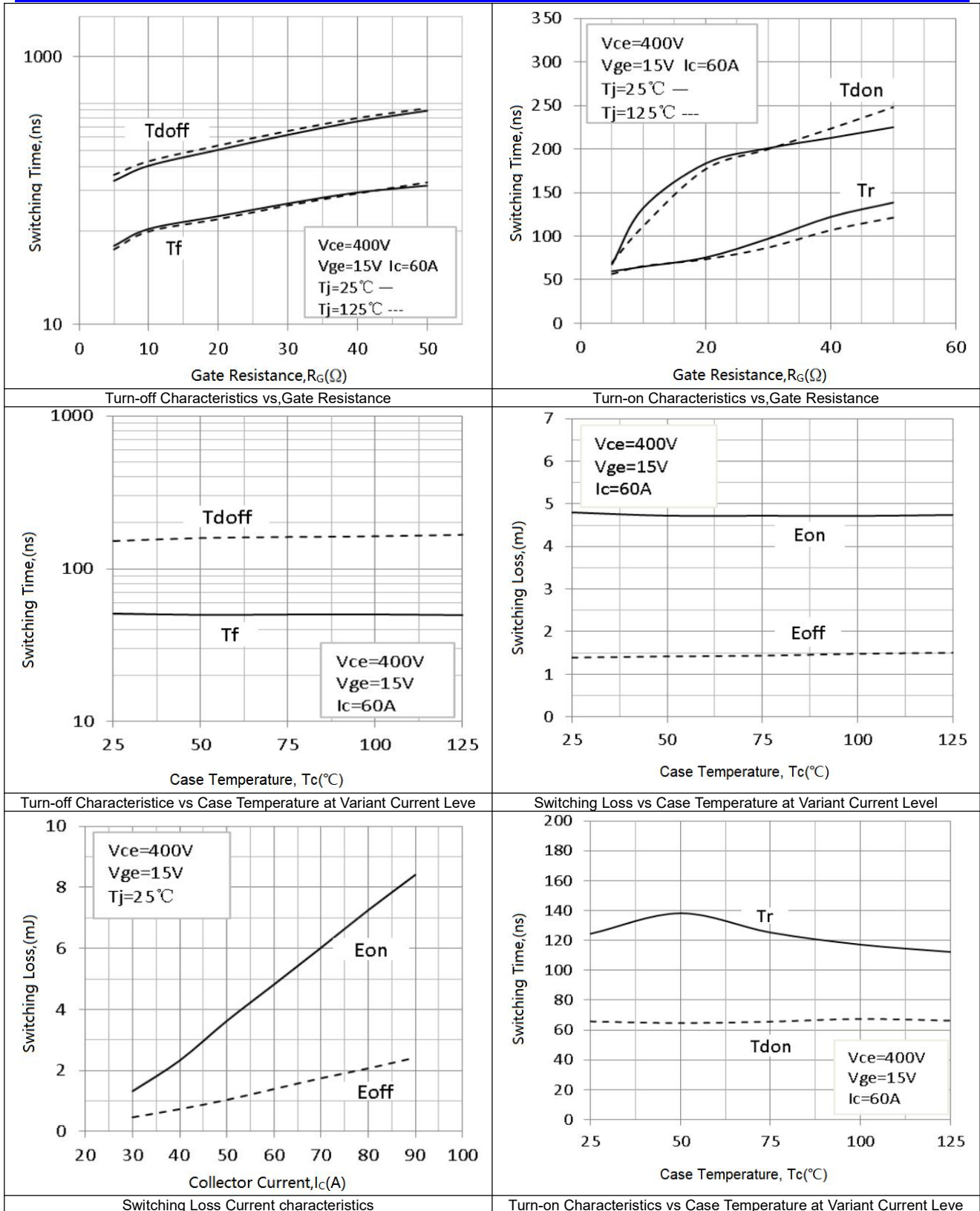
Symbol	Parameter	Typ.	Max.	Units
$R_{\theta_{JC}}$	Thermal Resistance, Junction to case for IGBT	--	0.446	$^\circ C/W$
$R_{\theta_{JC}}$	Thermal Resistance, Junction to case for Diode	--	1.25	$^\circ C/W$
$R_{\theta_{JA}}$	Thermal Resistance, Junction to Ambient	--	40	$^\circ C/W$

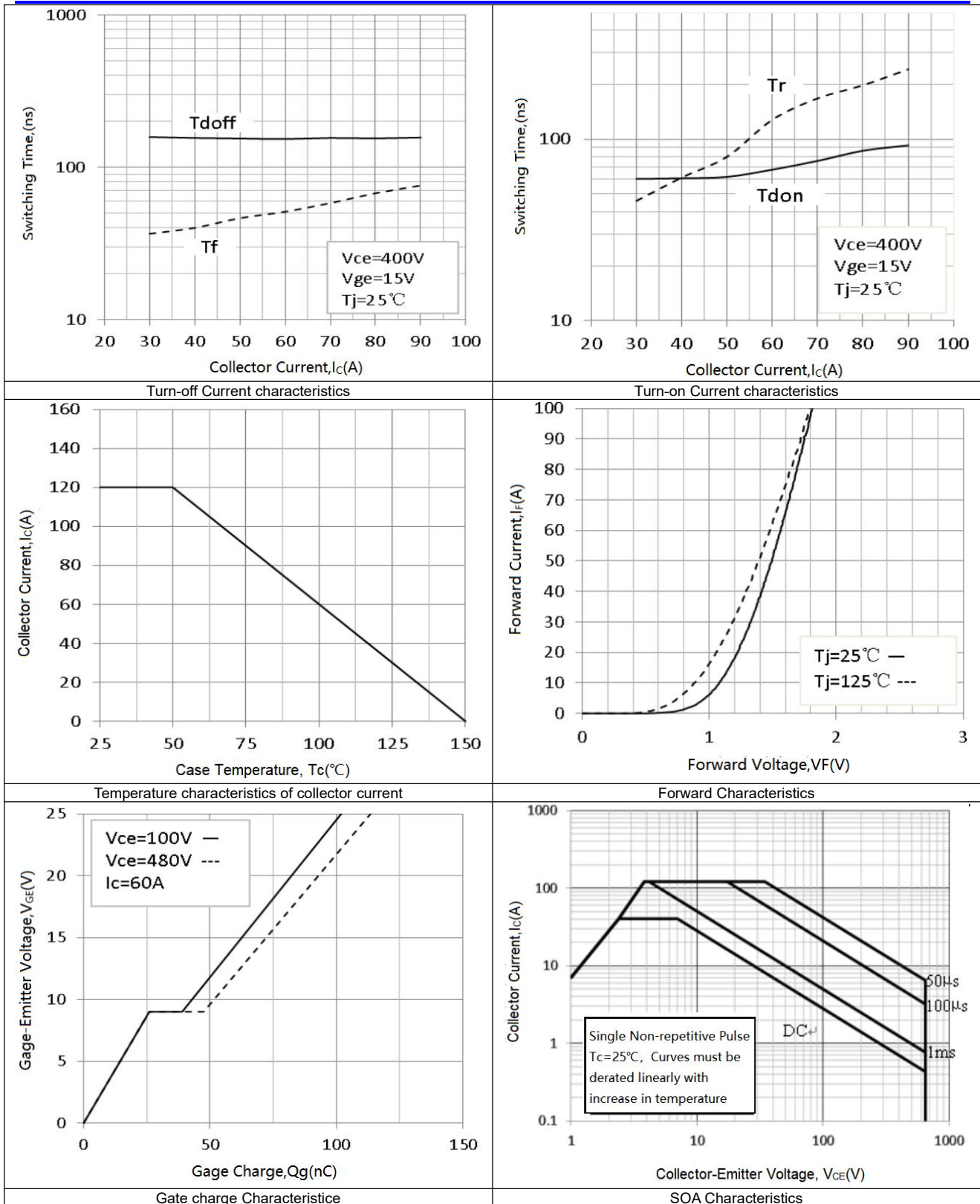
**Electrical Characteristics of the IGBT (Tc= 25°C unless otherwise specified) :**

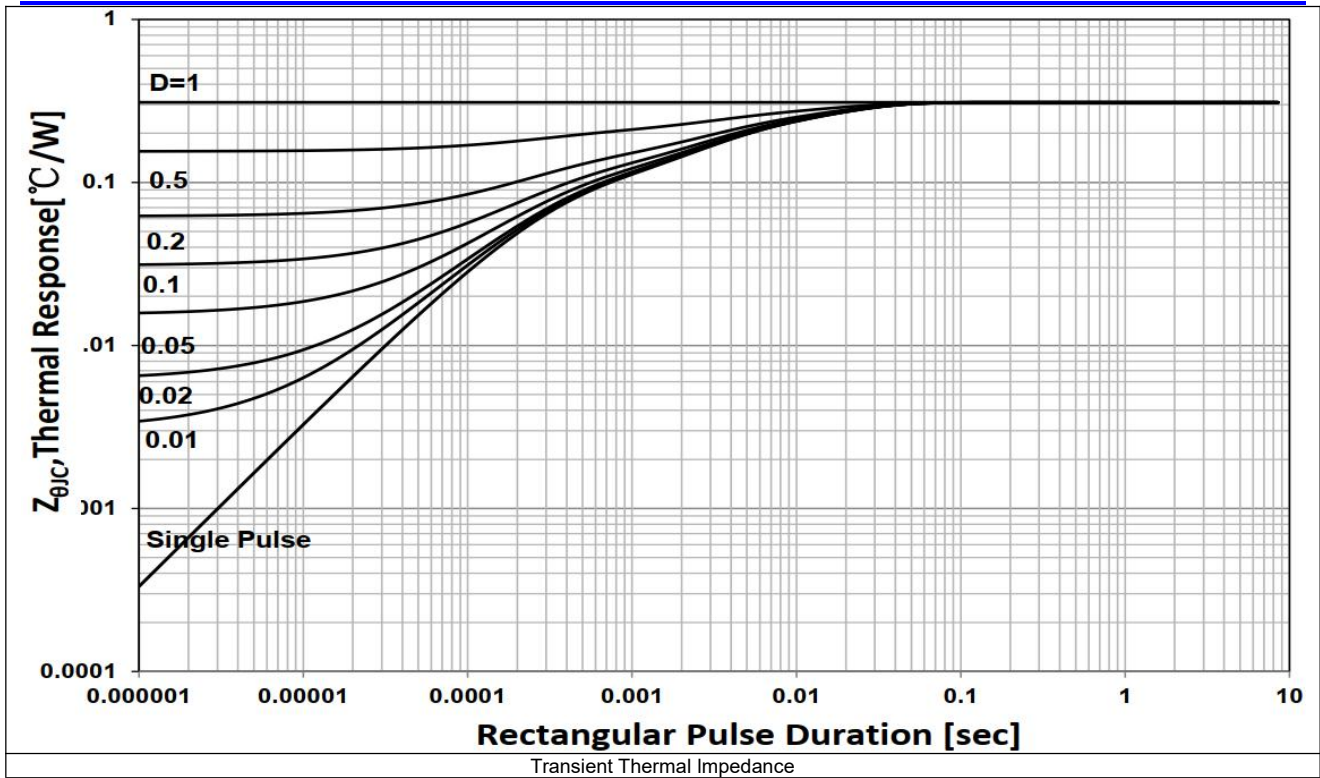
Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
<b>OFF Characteristics</b>						
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_{CE}=250\mu A$	650	720	--	V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{GE}=0V, V_{CE}=650V$	--	--	3.0	mA
$I_{GES(F)}$	Gate to Emitter Forward Leakage	$V_{GE}=+20V$	--	--	+250	nA
$I_{GES(R)}$	Gate to Source Reverse Leakage	$V_{GE}=-20V$	--	--	-250	nA
<b>ON Characteristics</b>						
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=60A, V_{GE}=15V$	--	1.85	2.4	V
$V_{GE(th)}$	Gate Threshold Voltage	$I_C=1mA, V_{CE}=V_{GE}$	4.0	5.4	7.0	V
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						
<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE}=30V, V_{GE}=0V$ $f=1MHz$	--	3398	--	pF
$C_{oes}$	Output Capacitance		--	224	--	
$C_{res}$	Reverse Transfer Capacitance		--	44	--	
<b>Resistive Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{CE}=400V, I_C=60A,$ $R_g=10\Omega, V_{GE}=15V,$ Inductive Load, $T_a=25^\circ C,$	--	66	--	ns
$t_r$	Rise Time		--	124	--	
$t_{d(off)}$	Turn-Off Delay Time		--	152	--	
$t_f$	Fall Time		--	51	--	
$E_{on}$	Turn-On Switching Loss	$V_{CE}=400V, I_C=60A,$ $R_g=10\Omega, V_{GE}=15V,$ Inductive Load, $T_a=25^\circ C,$	--	4.79	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	1.39	--	
$E_{ts}$	Total Switching Loss		--	6.18	--	
$t_{d(on)}$	Turn-on Delay Time	$V_{CE}=400V, I_C=60A,$ $R_g=10\Omega, V_{GE}=15V,$ Inductive Load, $T_a=25^\circ C,$	--	66	--	ns
$t_r$	Rise Time		--	112	--	
$T_{d(off)}$	Turn-Off Delay Time		--	167	--	
$t_f$	Fall Time		--	50	--	
$E_{on}^{a2}$	Turn-On Switching Loss	$V_{CE}=400V, I_C=60A,$ $V_{GE}=15V,$	--	4.73	--	mJ
$E_{off}$	Turn-Off Switching Loss		--	1.50	--	
$E_{ts}$	Total Switching Loss		--	6.23	--	
$Q_g$	Total Gate Charge	$V_{CE}=400V, I_C=60A,$ $V_{GE}=15V,$	--	117	--	nC
$Q_{ge}$	Gate to Emitter Charge		--	35	--	
$Q_{gc}$	Gate to Collector Charge		--	47	--	
<b>Electrical Characteristics of the DIODE</b>						
$V_F$	Diode Forward Voltage	$I_F=30A$	--	1.3	1.8	V
$t_{rr}$	Reverse Recovery Time	$I_F=30A$ $di/dt=200A/\mu S$	--	80	--	ns
$I_{rrm}$	Diode Peak Reverse Recovery Current		--	6	--	A
$Q_{rr}$	Reverse Recovery Charge		--	240	--	nC
Pulse width $t_p \leq 300\mu s, \delta \leq 2\%$						

**Typical characteristics diagrams**





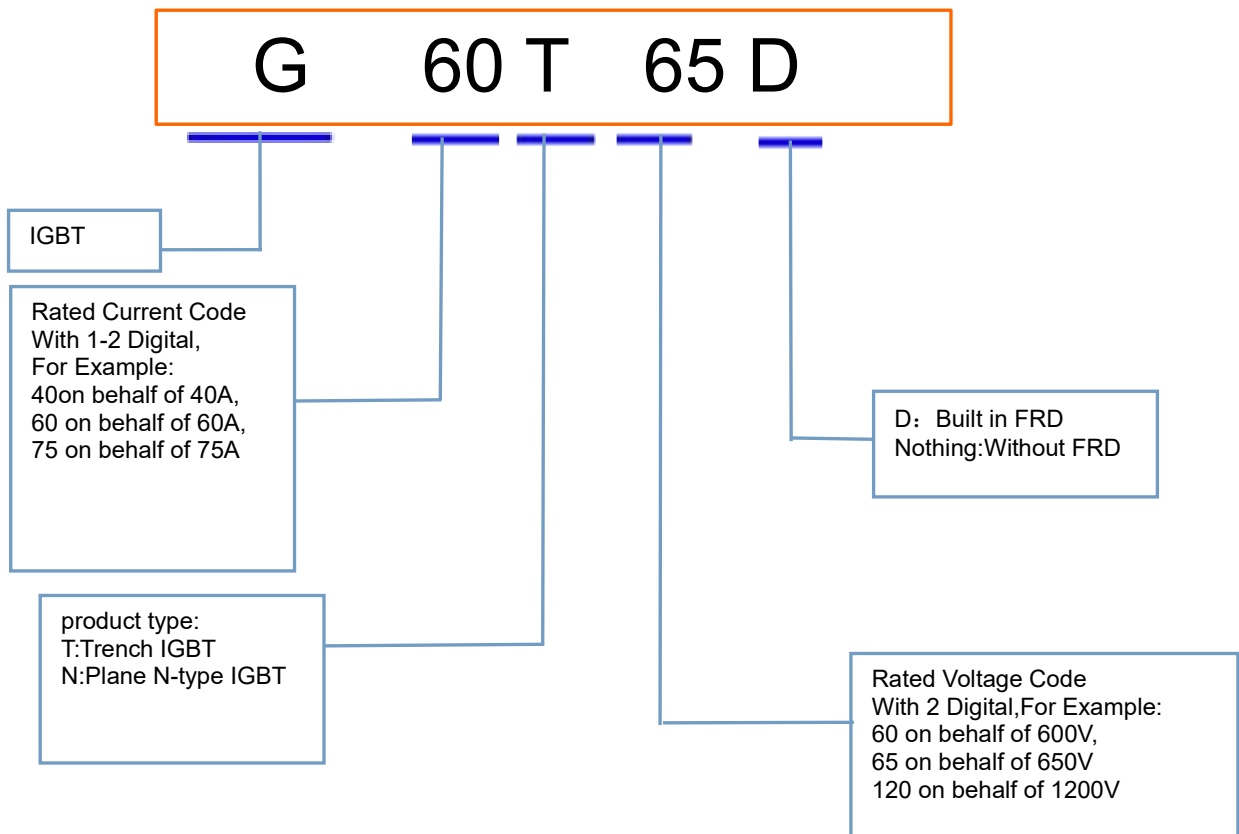




**Product Specifications and Packaging Models**

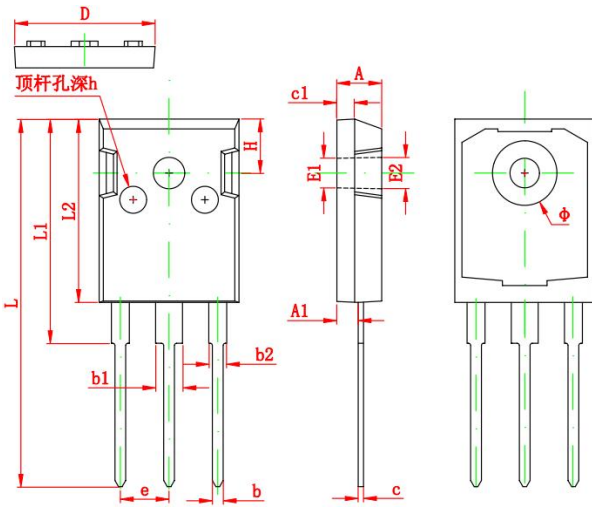
Product Model	Package Type	Mark Name	RoHS	Package	Quantity
DHG60T65D	TO-3PN	G60T65D	Pb-free	Tube	1000/box

**Product Names Rules**



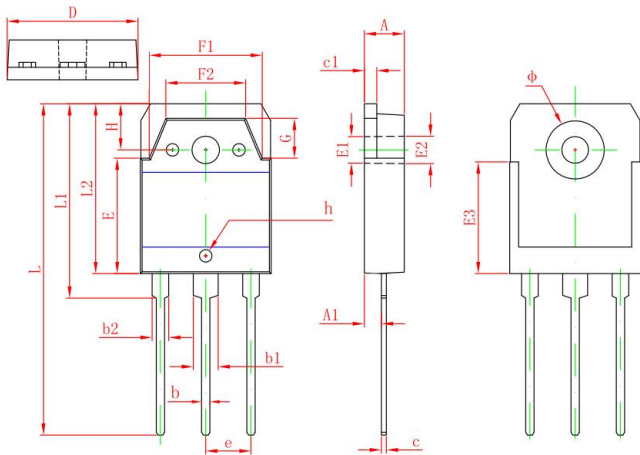
## Dimensions

### TO-247 PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
Phi	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	
h	0.000	0.300	0.000	0.012

### TO-3PN PACKAGE OUTLINE DIMENSIONS



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.600	5.000	0.181	0.197
A1	2.200	2.600	0.087	0.102
b	0.800	1.200	0.031	0.047
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.450	1.650	0.057	0.065
D	15.450	15.850	0.608	0.624
E	13.700	14.100	0.539	0.555
E1	3.200 REF		0.126 REF	
E2	3.300 REF		0.130 REF	
E3	13.450 REF		0.530 REF	
F1	13.400	13.800	0.528	0.543
F2	9.400	9.800	0.370	0.386
L	39.900	40.300	1.571	1.587
L1	23.200	23.600	0.913	0.929
L2	20.300	20.600	0.799	0.811
Phi	6.900	7.100	0.272	0.280
G	5.150	5.550	0.203	0.219
e	5.450 TYP		0.215 TYP	
H	5.000 REF		0.197 REF	
h	0.000	0.300	0.000	0.012

## Attentions

- Jiangsu Donghai Semiconductor Co.,Ltd. reserves the right to change the specification without prior notice! The customer should obtain the latest version of the information before making the order and verify that the information is complete and up to date.
- It is the responsibility of the purchaser for any failure or failure of any semiconductor product under certain conditions. It is the responsibility of the purchaser to comply with safety standards and to take safety measures in the system design and machine manufacturing of Jiangsu Donghai Semiconductor Co.,Ltd. products in order to avoid potential risk of failure. Injury or property damage.
- Product promotion is endless, our company will be dedicated to provide customers with better products.

## Appendix

Revision history:

Date	REV.	Description	Page
2021.03.09	1.0	Original	
2022.06.01	1.1	Modify company name	all
2022.09.21	1.2	Add Packaging Models	6 Page
		Add Product Names Rules	6 Page
		Add description	7 Page
		Add Revision history	7 Page