

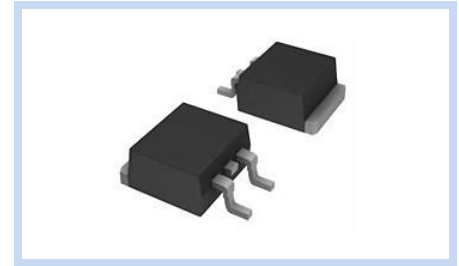
# Insulated Gate Bipolar Transistor 650V 14A 69W TO-252

MIG65N14T252

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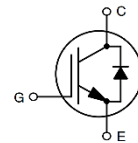
## FEATURE

- Trench Gate and Field Stop Processes IGBT
- Low Saturation Collector-to-Emitter Voltage and High Switching Speed
- Positive Saturation Collector-to-Emitter Voltage Temperature Coefficient
- Soft and Fast Recover Antiparallel Diode
- 10µs of Short - Circuit Withstand Time



## MECHANICAL DATA

- Case: T3P Package
- Terminals: Solderable per MIL-STD-750, Method 2026



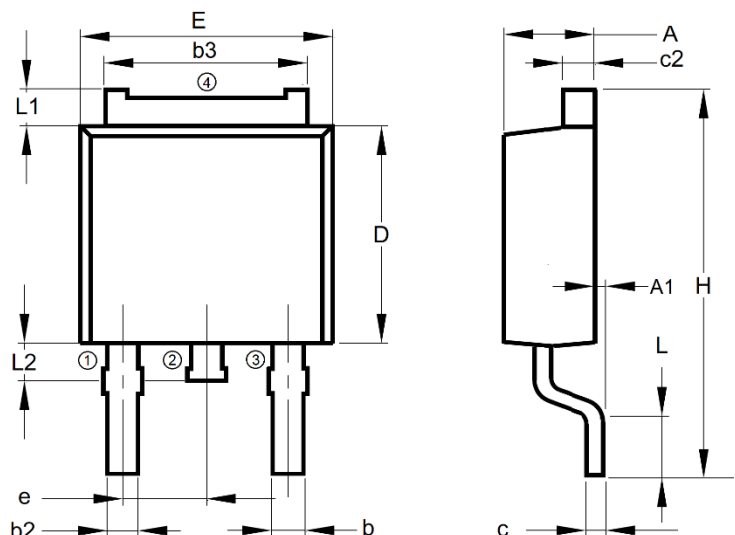
## MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Collector-to-Emitter Breakdown Voltage	$V_{CES}$	650	V
Gate-to-Emitter Voltage	$V_{GE}$	±30	V
Collector Current – Continuous	$I_C$	$T_C=25^{\circ}C$	14
		$T_C=100^{\circ}C$	7
Pulse Collector Current	$I_{CM}$	21	A
Diode Forward Current – Continuous	$I_F$	$T_C=25^{\circ}C$	14
		$T_C=100^{\circ}C$	7
Diode Forward Current – Pulsed	$I_{FM}$	21	A
Power Dissipation	$P_D$	$T_C=25^{\circ}C$	69
		$T_C=100^{\circ}C$	28
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	62	$^{\circ}C/W$
Thermal Resistance Junction to Case For IGBT	$R_{\theta JC}$	1.8	$^{\circ}C/W$
Operating Junction Temperature Range	$T_J$	-40 to 150	$^{\circ}C$
Storage Temperature Range	$T_{STG}$	-55 to 150	$^{\circ}C$

## DIMENSIONS

Item	Min (mm)	Max (mm)
A	2.20	2.40
A1	--	0.13
b	0.50	0.90
b2	0.50	0.90
b3	4.95	5.59
c	0.40	0.61
c2	0.45	0.89
D	5.40	6.63
E	6.05	7.10
e	1.98	2.59
H	8.80	10.6
L	0.25	--
L1	0.70	1.78
L2	0.50	1.20

Note: 1: Gate(G), 3: Emitter (E), 4: Collector(C).



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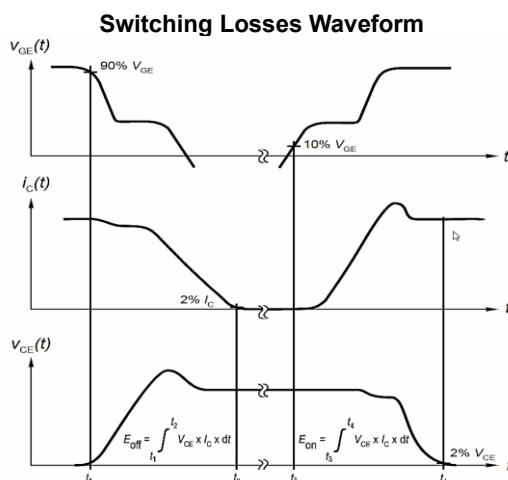
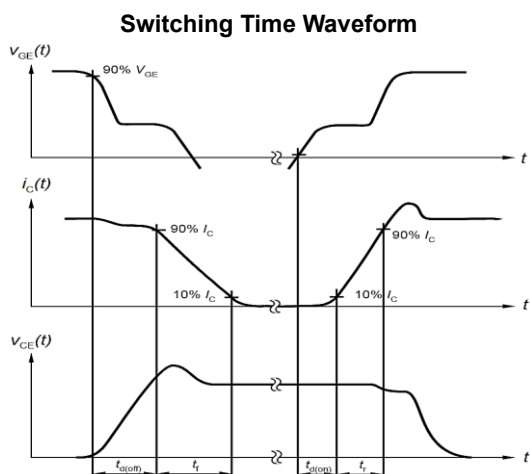
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## ELECTRICAL CHARACTERISTICS

Static Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=1mA$	$BV_{CES}$	650	--	--	V
Zero Gate Voltage Collector Current	$V_{CS}=650V, V_{GE}=0V$	$I_{CES}$	--	--	1	$\mu A$
Gate-Body Leakage Current, Forward	$V_{GE}=30V, V_{CS}=0V$	$I_{GESF}$	--	--	200	nA
Gate-Body Leakage Current, Reverse	$V_{GE}=-30V, V_{CS}=0V$	$I_{GESR}$	--	--	-200	nA
Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=7A$	$V_{CE(SAT)}$	--	1.55	2	V
Gate Threshold Voltage	$V_{GE}=V_{DS}, I_C=1mA$	$V_{GE(th)}$	4.5	--	6.5	V
Diode Forward Voltage	$I_F=7A$	$V_F$	--	1.5	2	V
Dynamic Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Total Gate Charge	$V_{CC}=480V, V_{GE}=15V, I_C=7A$	$Q_g$	--	15	--	nC
Gate-Emitter Charge		$Q_{ge}$	--	3	--	
Gate-Collector Charge		$Q_{gc}$	--	7.5	--	
Input Capacitance	$V_{CE}=25V, V_{GE}=0V, F=1MHz$	$C_{ies}$	--	410	--	pF
Output Capacitance		$C_{oes}$	--	25	--	
Reverse Transfer Capacitance		$C_{res}$	--	5	--	
Switching Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Turn-On Delay Time	$V_{CC}=400V, V_{GE}=15V, R_G=5\Omega$ $I_C=7A, T_C=25^\circ C,$ Inductive Load	$T_{d(on)}$	--	20	--	ns
Rise Time		$T_r$	--	16	--	
Turn-Off Delay Time		$T_{d(off)}$	--	40	--	
Fall Time		$T_f$	--	82	--	
Turn-On Switching Loss		$E_{on}$	--	17	--	$\mu J$
Turn-Off Switching Loss		$E_{off}$	--	17	--	
Reverse Recovery Time	$I_F=7A, di_F/dt = 100A/\mu s$	$t_{rr}$	--	45	--	ns
Reverse Recovery Charge		$Q_{rr}$	--	0.24	--	$\mu C$
Peak Reverse Recovery Current		$I_{rr}$	--	7.3	--	A

Note:

- $T_C = 25^\circ C$  unless otherwise noted
- Pulse width < 300 $\mu s$ , Duty cycle < 2%



# Insulated Gate Bipolar Transistor

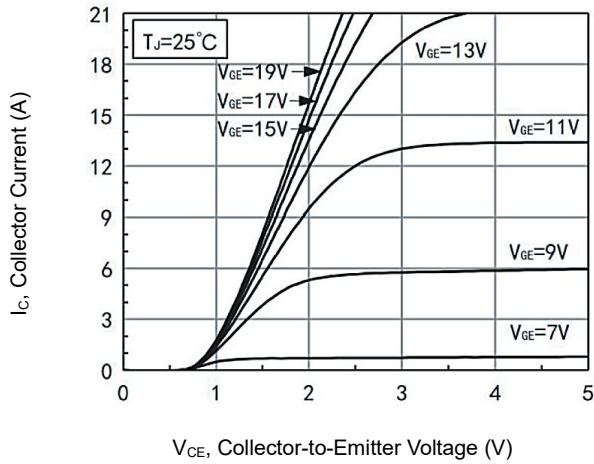
## 650V 14A 69W TO-252

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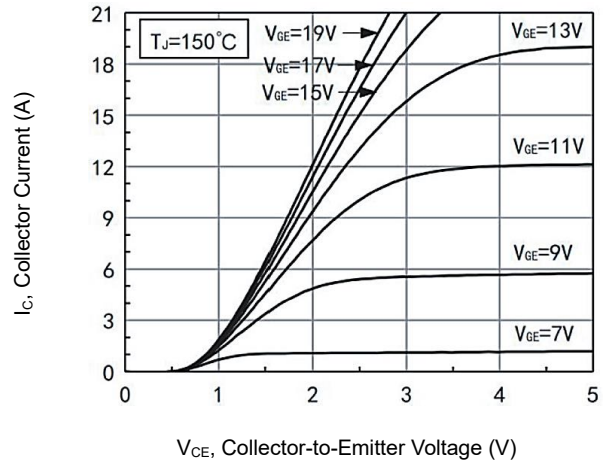
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### CHARACTERISTIC CURVES

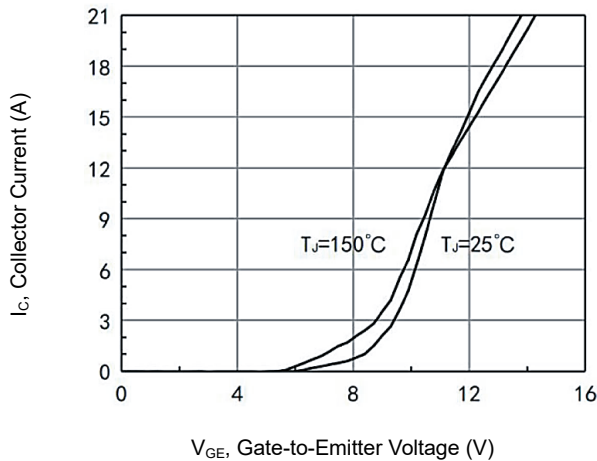
Output Characteristics



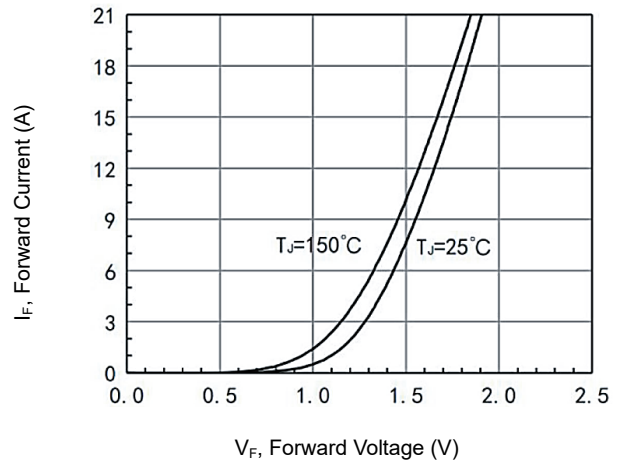
Output Characteristics



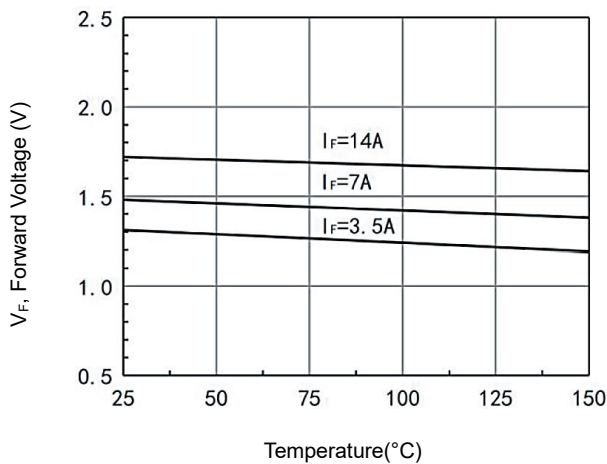
Transfer Characteristics



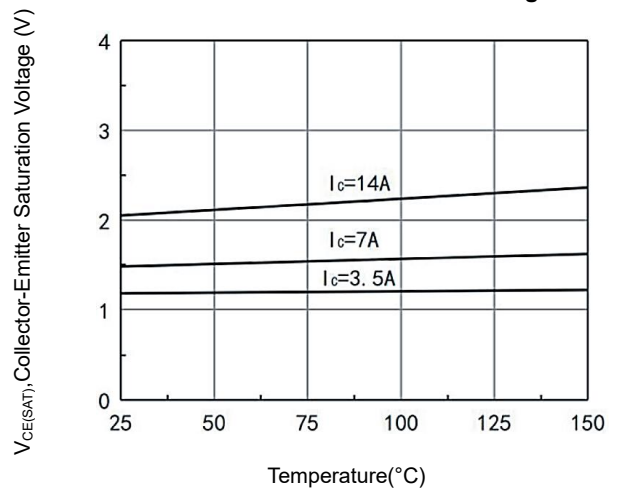
Diode Forward Characteristics



Forward Voltage Variation



Collector-Emitter Saturation Voltage



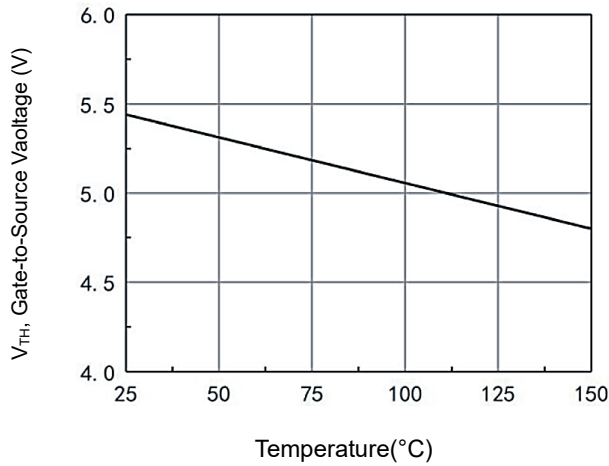
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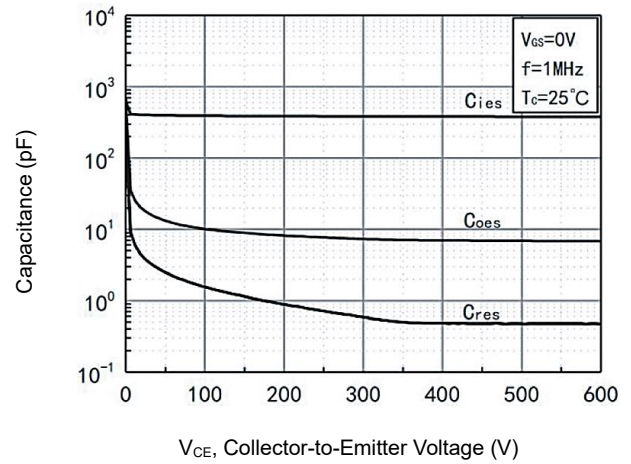
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## CHARACTERISTIC CURVES

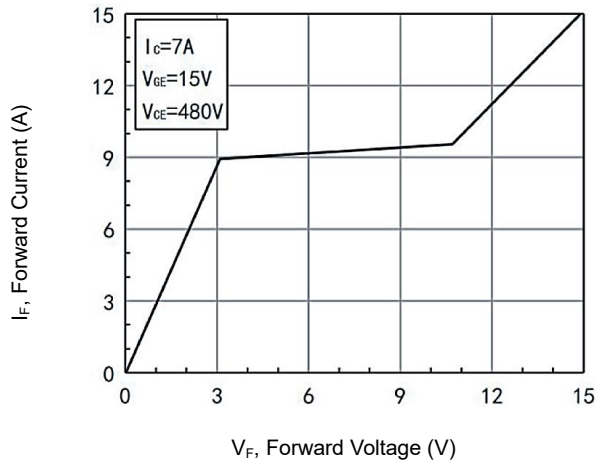
Gate Threshold Voltage Variation



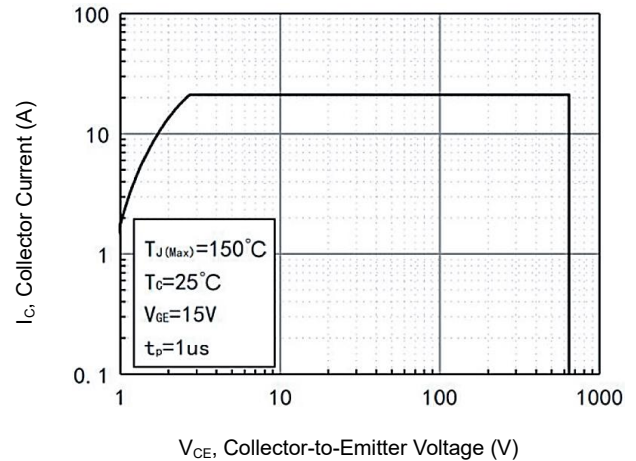
Capacitance Characteristics



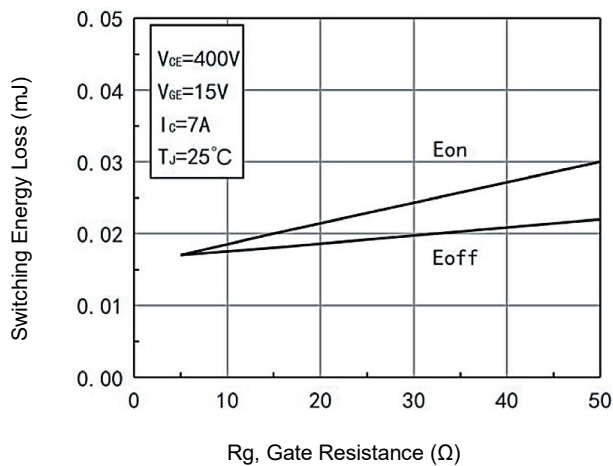
Gate-Charge Characteristics



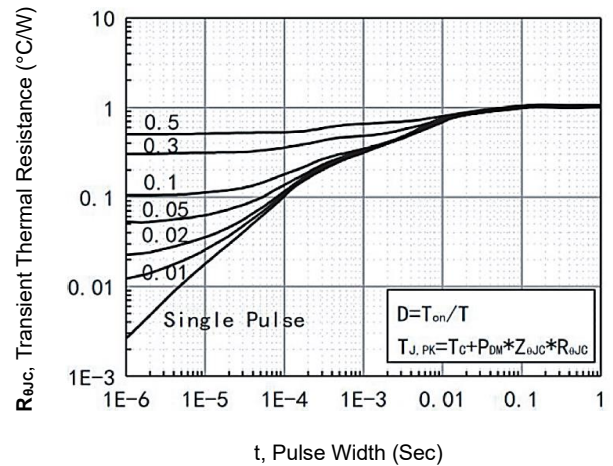
Forward Bias Safe Operating Area



Switching Energy Loss vs Gate Resistances

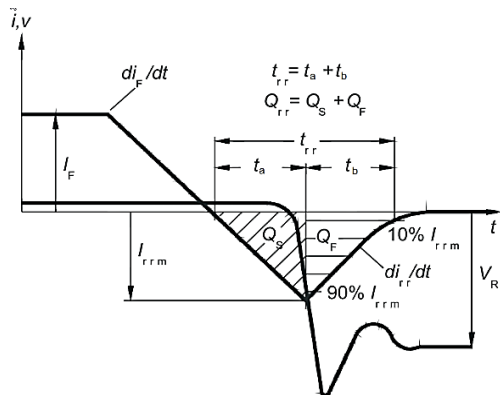


Transient Thermal Resistance



**TEST CONDITION**

**Diode Switching Characteristics**



**Switching Test Circuit**

