

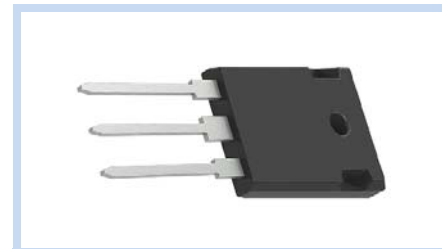
Insulated Gate Bipolar Transistor 650V 115A 395W TO-247

MIG65N115T247

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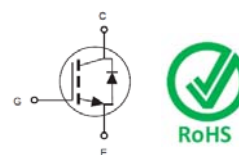
FEATURE

- Trench Gate and Field Stop Processes IGBT
- Low $V_{CE(sat)}$ and High Switching Speed
- Positive $V_{CE(sat)}$ Temperature Coefficient
- Soft and Fast Recover Antiparallel Diode
- Application: Uninterruptible Power Supplies, Solar Converters, Welding Machine, and Motor Drives, etc.



MECHANICAL DATA

- Case: TO-247 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}	± 20	V
Collector Current – Continuous	I_C	$T_c=25^\circ\text{C}$	115
		$T_c=100^\circ\text{C}$	75
Collector Current – Pulsed	I_{CM}	tp limited by T_{Jmax}	A
Diode Forward Current – Continuous	I_F	$T_c=25^\circ\text{C}$	115
		$T_c=100^\circ\text{C}$	75
Diode Forward Current – Pulsed	I_{FM}	300	A
IGBT Max. Power Dissipation	P_D	395	W
FWD Max. Power Dissipation		306	W/°C
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	29	°C/W
Thermal Resistance Junction to Case for IGBT	$R_{\theta JC}$	0.38	°C/W
Thermal Resistance Junction to Case for Diode	$R_{\theta JC}$	0.49	°C/W
Operating Junction Temperature Range	T_J	-40 to 175	°C
Storage Temperature Range	T_{STG}	-55 to 150	°C

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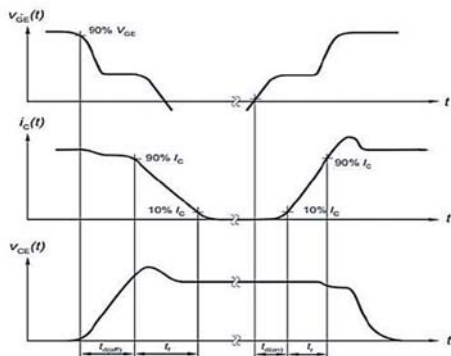
ELECTRICAL CHARACTERISTICS

Static Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=0.5mA$	BV_{CES}	650	--	--	V
Zero Gate Voltage Collector Current	$V_{CS}=650V, V_{GE}=0V$	I_{CES}	--	--	200	μA
Gate-Body Leakage Current, Forward	$V_{GE}=20V, V_{CS}=0V$	I_{GESF}	--	--	200	nA
Gate-Body Leakage Current, Reverse	$V_{GE}=-20V, V_{CS}=0V$	I_{GESR}	--	--	-200	nA
Collector-Emitter Saturation Voltage	$V_{GE}=20V, I_C=75A$	$V_{CE(SAT)}$	--	1.82	2.25	V
Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=250\mu A$	$V_{GE(th)}$	5	--	6.6	V
Diode Forward Voltage	$I_F=75A$	V_F	--	1.5	3	V
Dynamic Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Total Gate Charge	$V_{CC}=520V, V_{GE}=15V, I_C=75A$	Q_g	--	330	--	nC
Gate-Emitter Charge		Q_{ge}	--	90	--	
Gate-Collector Charge		Q_{gc}	--	117	--	
Input Capacitance	$V_{CE}=30V, V_{GE}=0V, F=1MHz$	C_{ies}	--	8910	--	pF
Output Capacitance		C_{oes}	--	200	--	
Reverse Transfer Capacitance		C_{res}	--	70	--	
Switching Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Turn-On Delay Time	$V_{CC}=400V, V_{GE}=15V, R_G=10\Omega$ $I_C=75A, T_C=25^\circ C,$ Inductive Load	$T_{d(on)}$	--	82	--	ns
Rise Time		T_r	--	30	--	
Turn-Off Delay Time		$T_{d(off)}$	--	145	--	
Fall Time		T_f	--	85	--	
Turn-On Switching Loss		E_{on}	--	5	--	
Turn-Off Switching Loss	E_{off}	--	2.2	--		
Turn-On Delay Time	$V_{CC}=400V, V_{GE}=15V, R_G=10\Omega$ $I_C=75A, T_C=175^\circ C,$ Inductive Load	$T_{d(on)}$	--	75	--	ns
Rise Time		T_r	--	30	--	
Turn-Off Delay Time		$T_{d(off)}$	--	165	--	
Fall Time		T_f	--	100	--	
Turn-On Switching Loss		E_{on}	--	5	--	
Turn-Off Switching Loss	E_{off}	--	3	--		
Reverse Recovery Time	$I_F=75A, di_F/dt = 100A/\mu s$	t_{rr}	--	68	--	ns
Reverse Recovery Charge		Q_{rr}	--	0.15	--	μC
Peak Reverse Recovery Current		I_{rr}	--	15	--	A

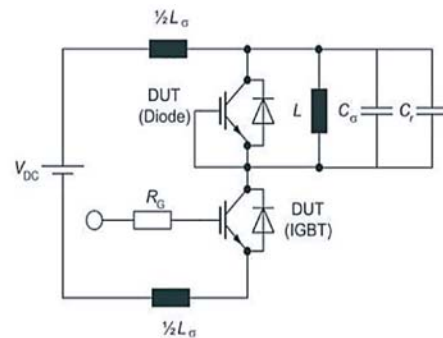
Note:

1. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$

Switching Time Waveform



Switching Test Circuit

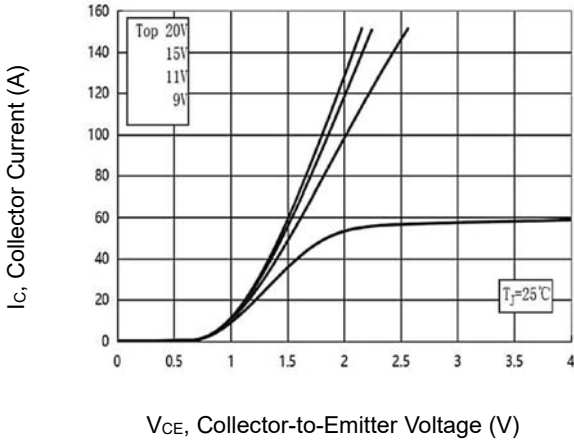


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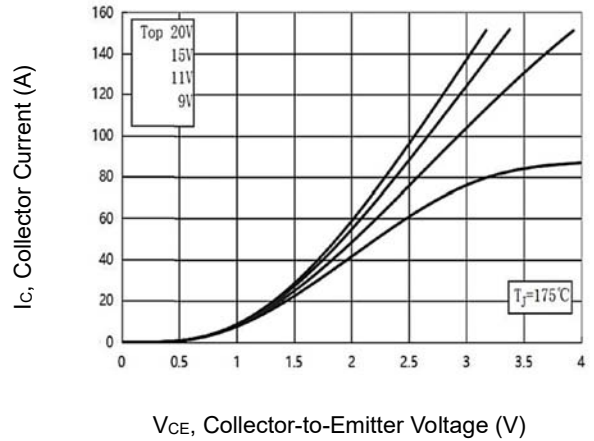
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CHARACTERISTIC CURVES

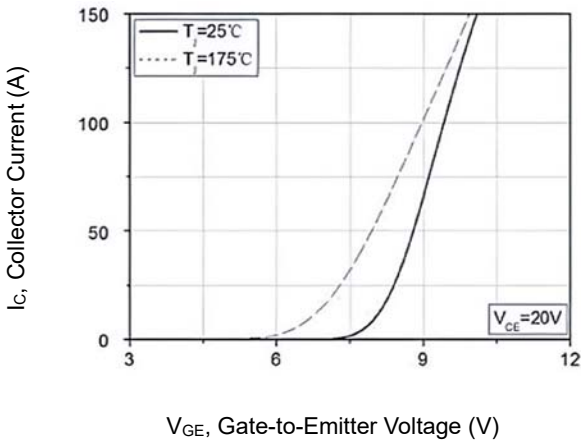
Output Characteristics



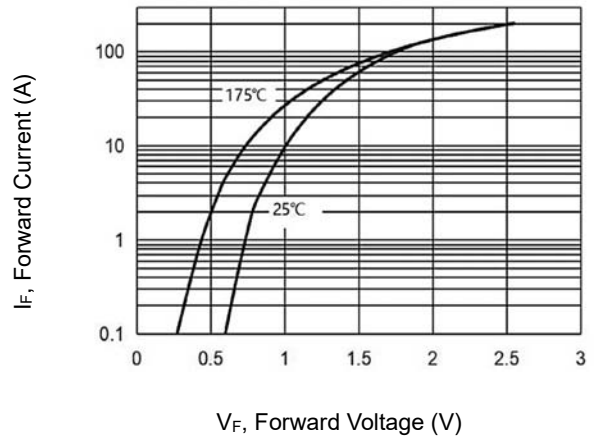
Output Characteristics



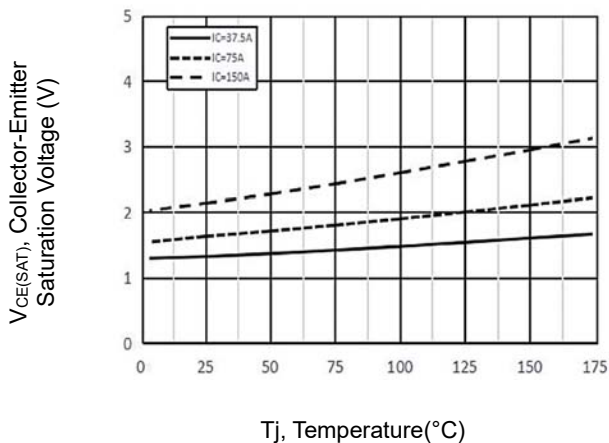
Transfer Characteristics



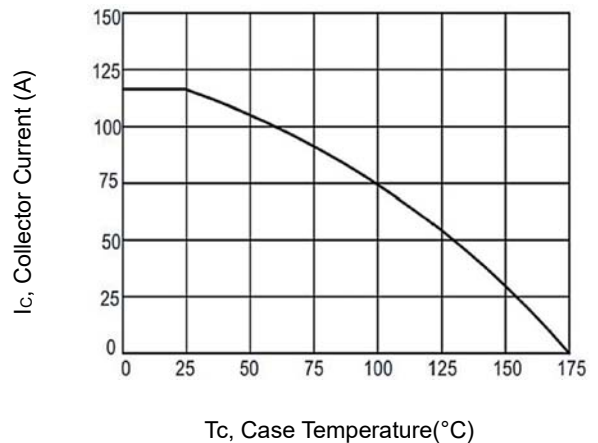
Diode Forward Characteristics



Collector-Emitter Saturation Voltage vs Tj



Collector Current vs. Tc, Case Temperature



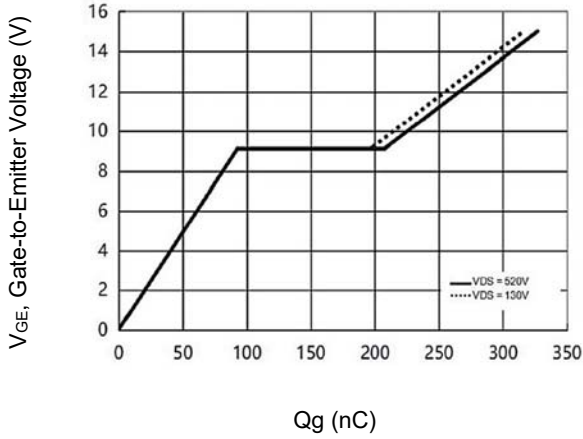
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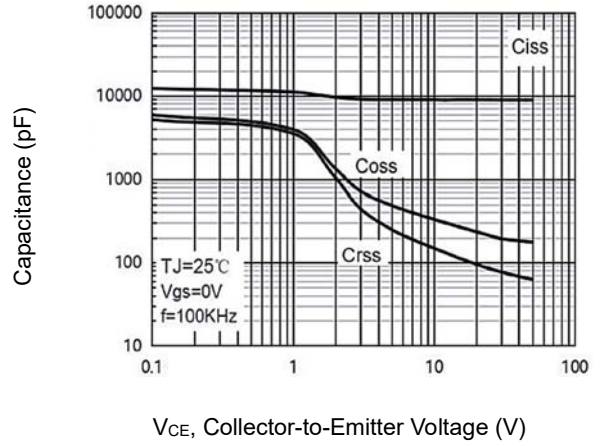
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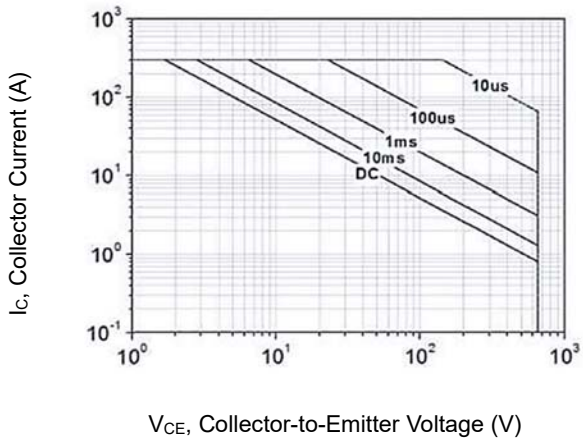
Gate-Charge Characteristics



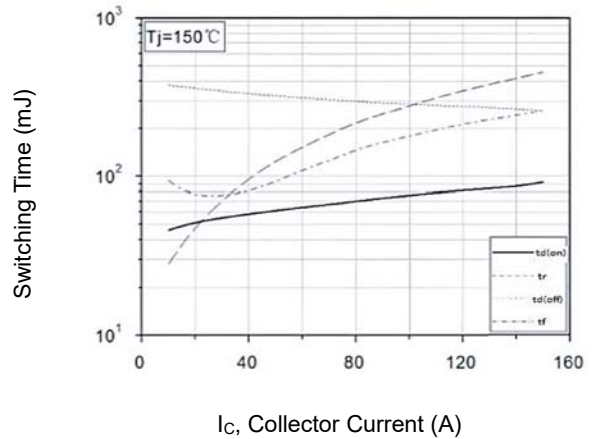
Capacitance Characteristics



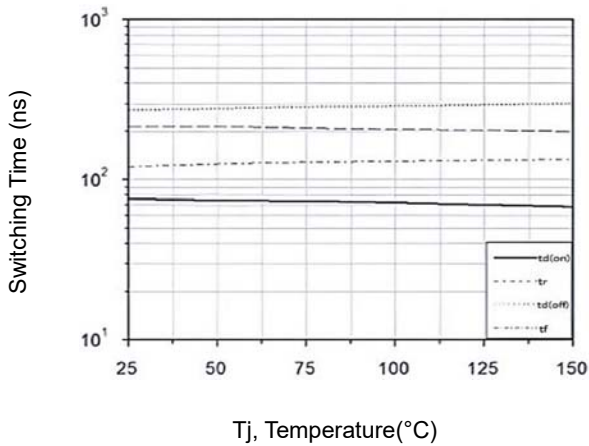
Forward Bias Safe Operating Area



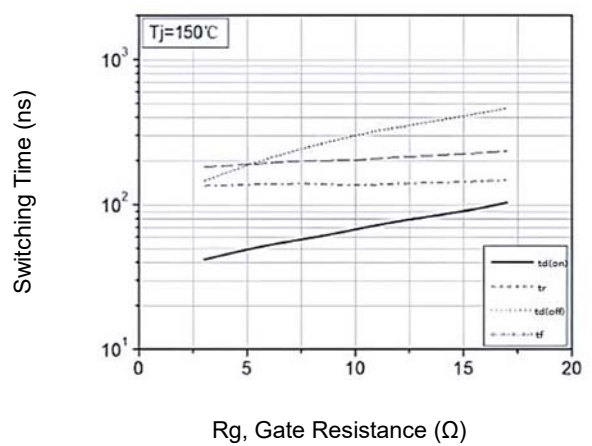
Switching Time vs Collector Current



Switching Time vs Tj, Temperature



Switching Time vs Gate Resistances



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DIMENSIONS

Unit: mm

TO-247	Min	Max
A	4.83	5.21
A1	2.31	2.51
A2	1.90	2.16
b	1.14	1.40
b1	1.91	2.20
c	0.55	0.75
D	20.80	21.34
D1	4.32	5.10
E	15.70	16.13
e	5.45	
e1	10.90	
L	19.80	20.57
L1	3.81	4.32
P	3.50	3.70
Q	5.59	6.20

