

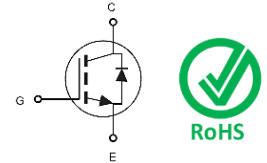
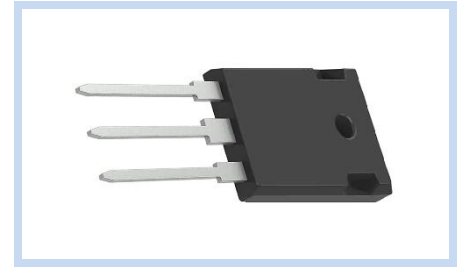
Insulated Gate Bipolar Transistor 1200V 157W TO-247

MIG120N20T247

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FEATURE

- Low Saturation Collector-to-Emitter Voltage
- Positive Temperature Coefficient
- Including Fast and Soft Recovery Anti-Parallel FWD
- High Short Circuit Capability
- Application: Inverter for Motor Drive, AC and DC Servo Drive Amplifier, Uninterruptible Power Supply



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}	1200	V
Gate-to-Emitter Voltage		V _{GE}	±20	V
Collector Current – Continuous	T _C =25°C	I _C	20	A
	T _C =100°C		10	
Collector Current – Pulsed		I _{CM}	40	A
Diode Current – Continuous	T _C =25°C	I _F	20	A
	T _C =100°C		10	
Diode Current– Pulsed	tp limited by T _{Jmax}	I _{FM}	40	A
Maximum Power Dissipation	T _J =175°C	P _D	157	W
Thermal Resistance Junction to Case for Diode		R _{θJC}	1.7	°C/W
Thermal Resistance Junction to Case for IGBT			0.95	
Short Circuit Withstand Time	V _{GE} =15V, V _{CC} =900V, V _{CEM} ≤1200V	t _{sc}	10	µs
Operating Junction Temperature Range		T _J	-40 to 175	°C
Storage Temperature Range		T _{STG}	-55 to 150	°C
Maximum Temperature for Soldering	Wave Soldering 1.6mm (0.063in.) from Case for 10s	T _L	260	°C

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ELECTRICAL CHARACTERISTICS

Static Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Collector-Emitter Breakdown Voltage	$V_{GE}=0V, I_C=250\mu A$	BV_{CES}	1200	--	--	V
Collector-Emitter Leakage Current	$V_{CE}=1200V, V_{GE}=0V$	I_{CES}	--	--	0.25	mA
	$V_{CE}=1200V, V_{GE}=0V, T_J=150^\circ C$		--	--	5	
Gate-Emitter Leakage Current	$V_{GE}=\pm 20V, V_{CE}=0V$	I_{GES}	--	--	400	nA
Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=10A$	$V_{CE(SAT)}$	--	1.85	2.2	V
	$V_{GE}=15V, I_C=10A, T_J=125^\circ C$		--	2.15	--	
	$V_{GE}=15V, I_C=10A, T_J=150^\circ C$		--	2.25	--	
Gate Threshold Voltage	$V_{GE}=V_{GE}, I_C=500\mu A$	$V_{GE(th)}$	5.0	5.8	6.6	V
Diode Forward Voltage	$I_F=10A$	V_F	--	2.4	--	V
	$I_F=10A, T_J=125^\circ C$		--	2.1	--	
	$I_F=10A, T_J=150^\circ C$		--	2.1	--	
Dynamic Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Total Gate Charge	$V_{CC}=960V, V_{GE}=15V, I_C=10A$	Q_g	--	80	--	nC
Input Capacitance	$V_{CE}=25V, V_{GE}=0V, F=1MHz$	C_{ies}	--	750	--	pF
Reverse Transfer Capacitance		C_{res}	--	35	--	
Short Circuit Collector Current	$V_{GE}=15V, V_{CC}=900V, t_{SC}\leq 10\mu s, T_J\leq 150^\circ C$	$I_{C(SC)}$	--	50	--	A
Switching Characteristics	Conditions	Symbol	Min	Typ.	Max	Unit
Turn-On Delay Time	$V_{CC}=600V, V_{GE}=-15V \text{ to } 15V, R_G=47\Omega, I_C=10A$	$T_{d(on)}$	--	85	--	nS
Rise Time		T_r	--	50	--	
Turn-Off Delay Time		$T_{d(off)}$	--	262	--	
Fall Time		T_f	--	140	--	
Turn-On Switching Loss		E_{on}	--	0.98	--	mJ
Turn-Off Switching Loss		E_{off}	--	0.48	--	
Turn-On Delay Time	$V_{CC}=600V, V_{GE}=-15V \text{ to } 15V, R_G=47\Omega, I_C=10A, T_J=125^\circ C$	$T_{d(on)}$	--	90	--	nS
Rise Time		T_r	--	60	--	
Turn-Off Delay Time		$T_{d(off)}$	--	285	--	
Fall Time		T_f	--	150	--	
Turn-On Switching Loss		E_{on}	--	1.33	--	mJ
Turn-Off Switching Loss		E_{off}	--	0.9	--	
Turn-On Delay Time	$V_{CC}=600V, V_{GE}=-15V \text{ to } 15V, R_G=47\Omega, I_C=10A, T_J=150^\circ C$	$T_{d(on)}$	--	95	--	nS
Rise Time		T_r	--	65	--	
Turn-Off Delay Time		$T_{d(off)}$	--	308	--	
Fall Time		T_f	--	160	--	
Turn-On Switching Loss		E_{on}	--	1.68	--	mJ
Turn-Off Switching Loss		E_{off}	--	1.05	--	
Reverse Recovery Current	$I_F=10A, di/dt = -500A/\mu s, V_R=600V,$	I_{rr}	--	12.5	--	A
Reverse Recovery Charge		Q_{rr}	--	0.9	--	μC
Reverse Recovery Energy		E_{rec}	--	0.25	--	mJ
Reverse Recovery Current	$I_F=10A, di/dt = -500A/\mu s, V_R=600V, T_J=125^\circ C$	I_{rr}	--	14.4	--	A
Reverse Recovery Charge		Q_{rr}	--	1.7	--	μC
Reverse Recovery Energy		E_{rec}	--	0.5	--	mJ
Reverse Recovery Current	$I_F=10A, di/dt = -500A/\mu s, V_R=600V, T_J=150^\circ C$	I_{rr}	--	15.3	--	A
Reverse Recovery Charge		Q_{rr}	--	2.0	--	μC
Reverse Recovery Energy		E_{rec}	--	0.58	--	mJ

Note:

1. $T_J = 25^\circ C$ unless otherwise noted

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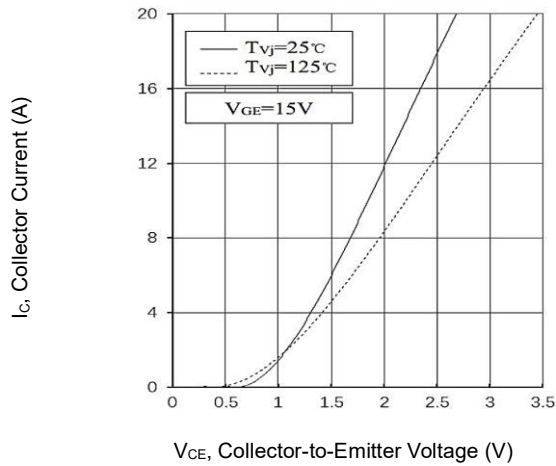
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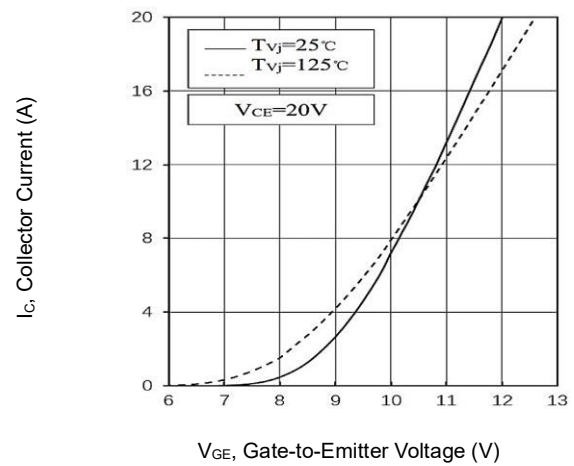
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CHARACTERISTIC CURVES

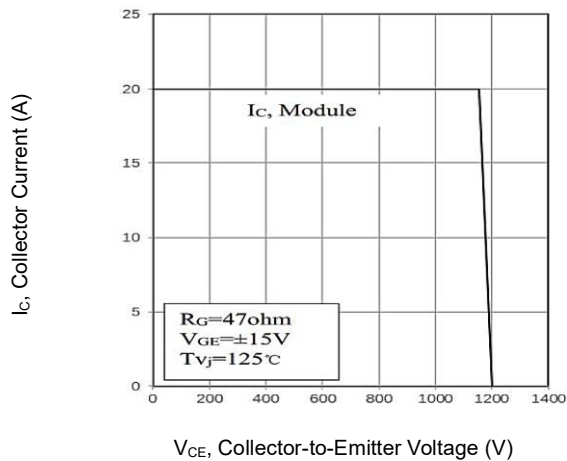
Output Characteristics



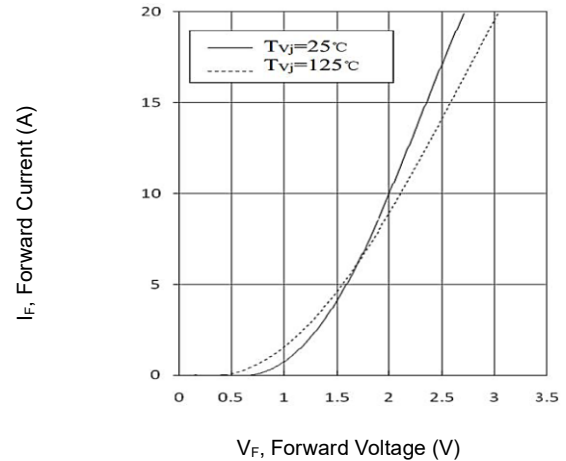
Transfer Characteristics



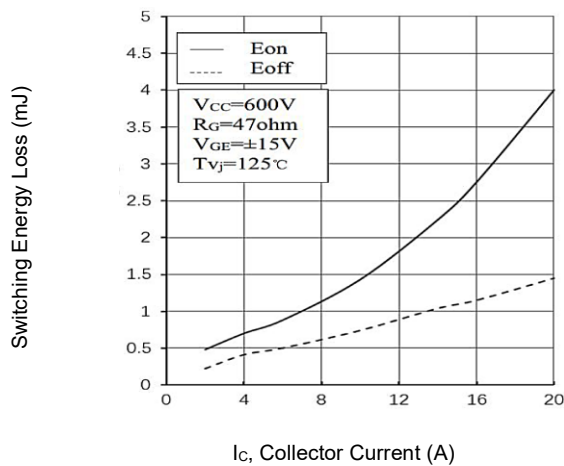
Forward Bias Safe Operating Area



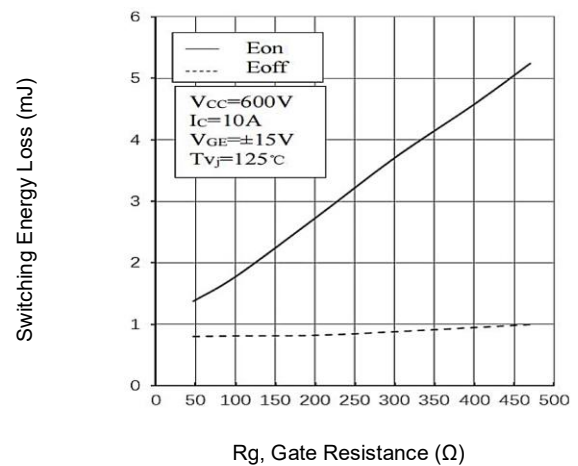
Diode Forward Characteristics



Switching Energy Loss vs Collector Current



Switching Energy Loss vs Gate Resistances



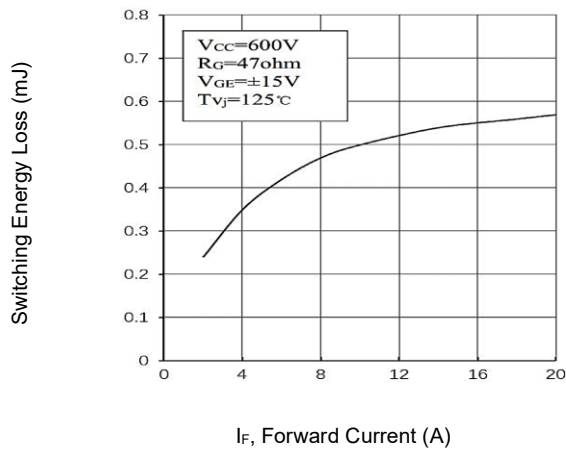
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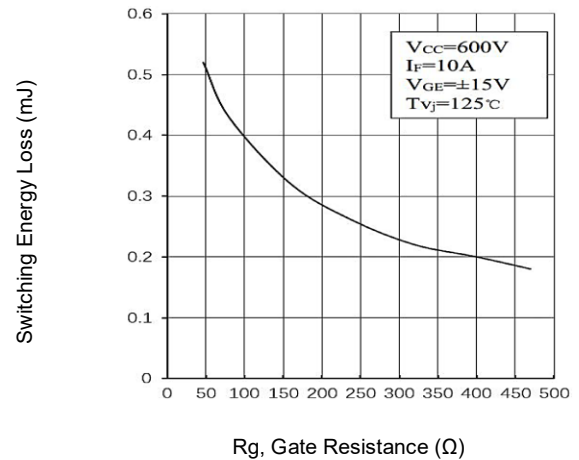
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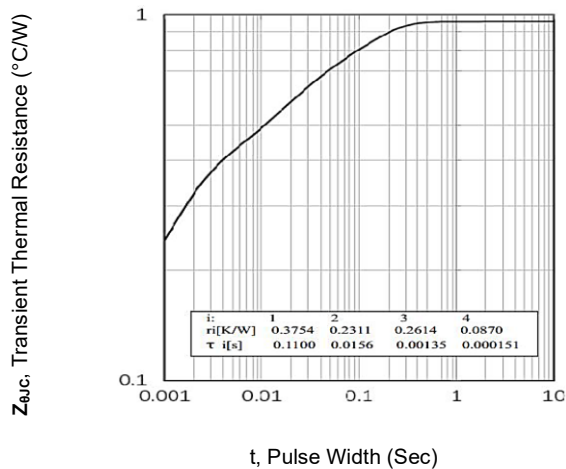
Reverse Recovery Energy Loss vs Forward Current



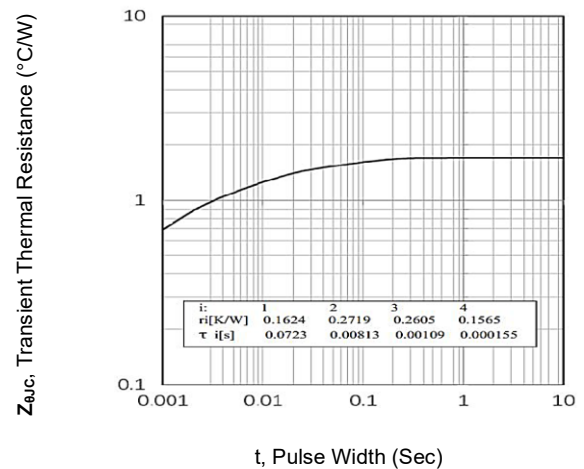
Reverse Recovery Energy Loss vs Gate Resistances



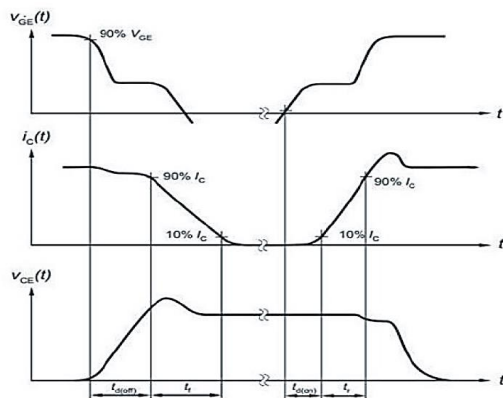
IGBT Transient Thermal Impedance



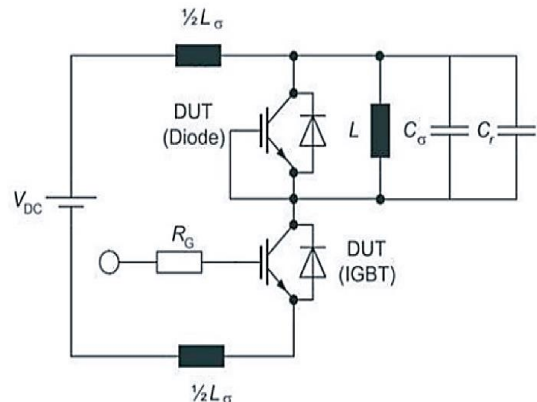
Diode Transient Thermal Impedance



Switching Time Waveform



Switching Test Circuit



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DIMENSIONS

Item	Min (mm)	Max (mm)
A	4.80	5.25
A1	1.50	2.50
A2	2.10	2.60
b	1.00	1.40
b1	2.80	3.40
b2	1.80	2.42
c	0.50	0.70
D	20.80	21.30
D1	3.80	5.30
E	15.50	16.20
e	5.45	
e1	10.90	
L	20.80	21.30
L1	3.90	4.50
P	3.65	5.50
Q	5.30	6.30

Note: 1: Gate(G), 2: Collector(C), 3:Emitter (E).

