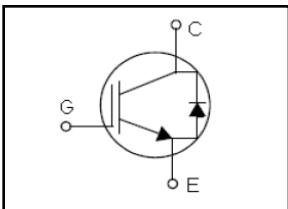
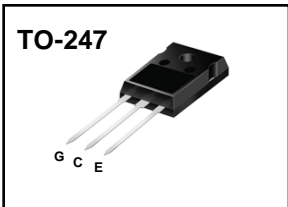


HIA20N60BP

600V PT IGBT

$V_{CES} = 600\text{ V}$
$I_C = 20\text{ A}$
$V_{CE(sat) typ} = 2.2\text{ V}$



FEATURES

- Low $V_{CE(sat)}$
- Maximum Junction Temperature 150°C
- Short Circuit Withstand Time 5 μ s
- Designed for Operation Between 1-20KHz
- Very tight Parameter Distribution
- High Ruggedness, Temperature stable behavior

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	600	V
I_C	Collector Current – Continuous ($T_C = 25^\circ\text{C}$)	40	A
	Collector Current – Continuous ($T_C = 100^\circ\text{C}$)	20	A
I_{CM}	Collector Current – Pulsed (Note 1)	60	A
I_F	Diode Forward Current – Continuous ($T_C = 25^\circ\text{C}$)	40	A
	Diode Forward Current – Continuous ($T_C = 100^\circ\text{C}$)	20	A
I_{FM}	Diode Current – Pulsed (Note 1)	60	A
V_{GES}	Gate-Emitter Voltage	± 20	V
t_{SC}	Short circuit withstand time ($V_{GE}=15\text{V}$, $V_{CC}=400\text{V}$, $T_C=150^\circ\text{C}$)	5	μA
P_D	Power Dissipation ($T_C = 25^\circ\text{C}$)	192	W
T_J	Operating Temperature Range	-40 to +150	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	260	$^\circ\text{C}$

Notes.

1. Pulse width limited by max junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}(IGBT)$	Junction-to-Case	--	0.65	$^\circ\text{C}/\text{W}$
$R_{\theta JC}(\text{Diode})$	Junction-to-Case	--	0.97	
$R_{\theta JA}$	Junction-to-Ambient	--	40	

Package Marking and Oding Information

Device Marking	Week Marking	Package	Packing	Quantity	RoHS Status
HIA20N60BP	YWWX	TO-247	Tube	30	Pb Free
HIA20N60BP	YWWXg	TO-247	Tube	30	Halogen Free

Electrical Characteristics of the IGBT $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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On Characteristics

$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$V_{CE} = V_{GE}, I_C = 800 \mu\text{A}$	4.4	5.7	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15 \text{ V},$ $I_C = 20 \text{ A}$	--	2.2	2.6	V
		$T_C = 125^\circ\text{C}$	--	2.2	2.7	

Off Characteristics

BV_{CES}	Collector-Emitter Breakdown Voltage	$V_{GE} = 0 \text{ V}, I_C = 1 \text{ mA}$	600	--	--	V
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE} = 600 \text{ V}, V_{GE} = 0 \text{ V}$	--	--	100	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE} = \pm 20 \text{ V}, V_{CE} = 0 \text{ V}$	--	--	± 100	nA

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V},$ $f = 1.0 \text{ MHz}$	--	882	--	pF
C_{oss}	Output Capacitance		--	98	--	pF
C_{rss}	Reverse Transfer Capacitance		--	55	--	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Time	$V_{CC} = 300 \text{ V}, I_C = 20 \text{ A},$ $R_G = 20 \Omega, V_{GE} = -10/15\text{V}$ Inductive load, $T_C = 25^\circ\text{C}$	--	48	--	ns
t_r	Turn-On Rise Time		--	67	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	74	--	ns
t_f	Turn-Off Fall Time		--	130	--	ns
E_{on}	Turn-On Switching Loss		--	0.39	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.49	--	mJ
E_{ts}	Total Switching Loss		--	0.78	--	mJ
$t_{d(on)}$	Turn-On Time	$V_{CC} = 300 \text{ V}, I_C = 20 \text{ A},$ $R_G = 20 \Omega, V_{GE} = -10/15\text{V}$ Inductive load, $T_C = 125^\circ\text{C}$	--	38	--	ns
t_r	Turn-On Rise Time		--	45	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	77	--	ns
t_f	Turn-Off Fall Time		--	299	--	ns
E_{on}	Turn-On Switching Loss		--	0.42	--	mJ
E_{off}	Turn-Off Switching Loss		--	0.91	--	mJ
E_{ts}	Total Switching Loss		--	1.33	--	mJ
Q_g	Total Gate Charge	$V_{CC} = 480\text{V}, I_C = 20 \text{ A},$ $V_{GE} = 15 \text{ V}$	--	70	--	nC
L_E	Internal Emitter Inductance		--	13	--	nH
$I_{C(SC)}$	Short Circuit Collector Current	$V_{CC} = 400 \text{ V}, t_{SC} \leq 5\text{s},$ $V_{GE} = 15\text{V}, T_C = 25^\circ\text{C}$	--	120	--	A

Electrical Characteristics of the Diode

V_{FM}	Diode Forward Voltage	$I_F = 20\text{ A}$, $V_{GE} = 0\text{ V}$	$T_C = 25^\circ\text{C}$	--	2.3	--	V
			$T_C = 125^\circ\text{C}$	--	1.9	--	
t_{rr}	Diode Reverse Recovery Time	$I_F = 20\text{ A}$, $V_R = 300\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$, $T_C = 25^\circ\text{C}$		--	115	--	ns
I_{rr}	Diode Peak Reverse Recovery Current			--	10	--	A
Q_{rr}	Diode Reverse Recovery Charge			--	0.94	--	μC
di_{rr}/dt	Diode Peak rate of fall of Reverse Recovery Current during t_b			--	50	--	$\text{A}/\mu\text{s}$
E_{rec}	Diode Reverse Recovery Energy			--	0.13	--	mJ
t_{rr}	Diode Reverse Recovery Time	$I_F = 20\text{ A}$, $V_R = 300\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$, $T_C = 125^\circ\text{C}$		--	230	--	ns
I_{rr}	Diode Peak Reverse Recovery Current			--	20	--	A
Q_{rr}	Diode Reverse Recovery Charge			--	1.86	--	μC
di_{rr}/dt	Diode Peak rate of fall of Reverse Recovery Current during t_b			--	46	--	$\text{A}/\mu\text{s}$
E_{rec}	Diode Reverse Recovery Energy			--	0.30	--	mJ

Typical Characteristics

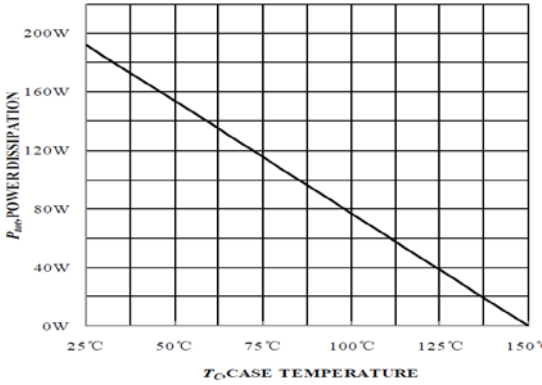


Figure 1. Power dissipation as a function of case temperature ($T_j \leq 150^\circ\text{C}$)

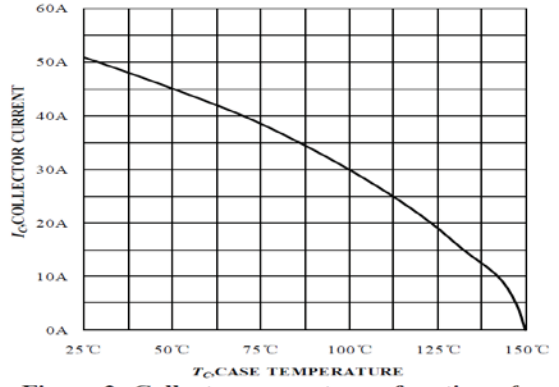


Figure 2. Collector current as a function of case temperature ($V_{GE} \geq 15\text{V}$, $T_j \leq 150^\circ\text{C}$)

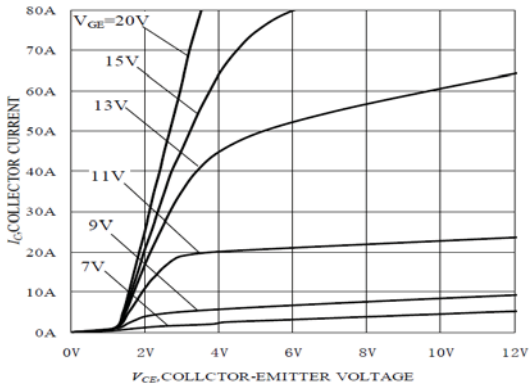


Figure 3. Typical output characteristic ($T_j = 25^\circ\text{C}$)

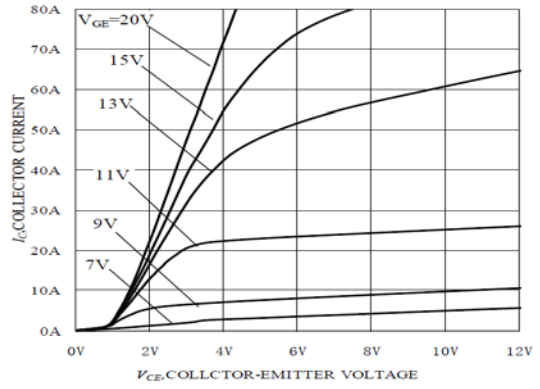


Figure 4. Typical output characteristic ($T_j = 125^\circ\text{C}$)

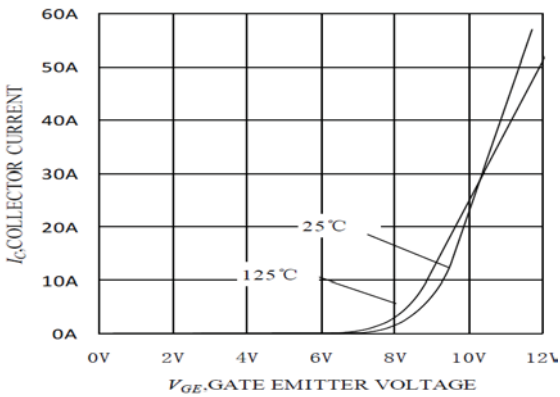


Figure 5. Typical transfer characteristic ($V_{CE} = 20\text{V}$)

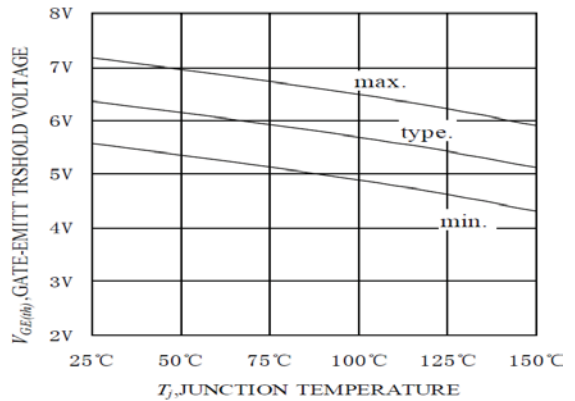


Figure 6. Gate-emitter threshold voltage as a function of junction temperature ($I_C = 0.8\text{mA}$)

Typical Characteristics

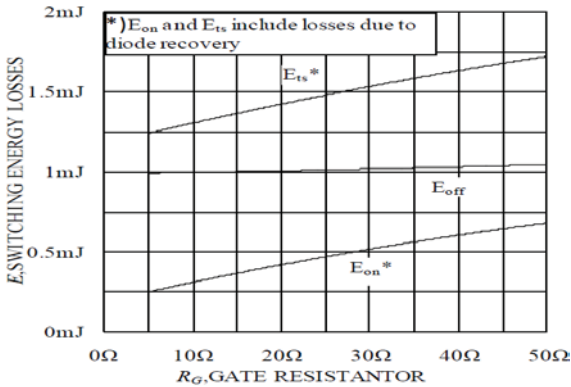


Figure 7. Typical switching energy losses as a function of gate resistor (inductive load, $T_j=150^{\circ}\text{C}$, $V_{CE}=300\text{V}$, $V_{GE}=-10/15\text{V}$, $I_C=20\text{A}$)

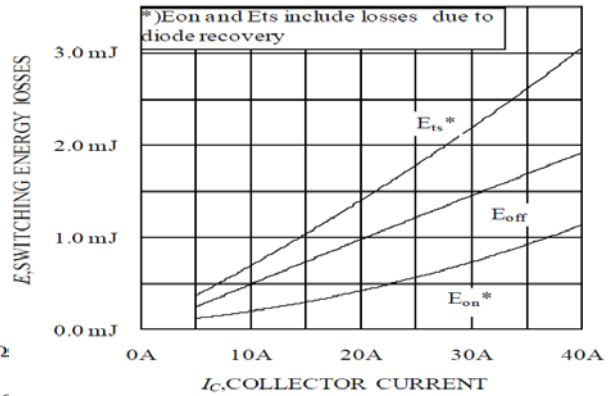


Figure 8. Typical switching energy losses as a function of collector current (inductive load, $T_j=150^{\circ}\text{C}$, $V_{CE}=300\text{V}$, $V_{GE}=-10/15\text{V}$, $R_G=20\Omega$)

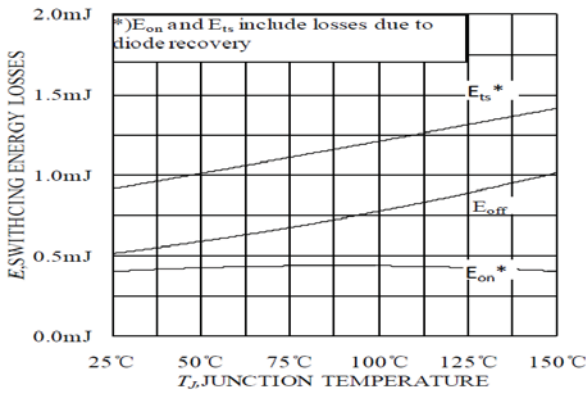


Figure 9. Typical collector-emitter saturation voltage as a function of junction temperature ($V_{GE}=15\text{V}$)

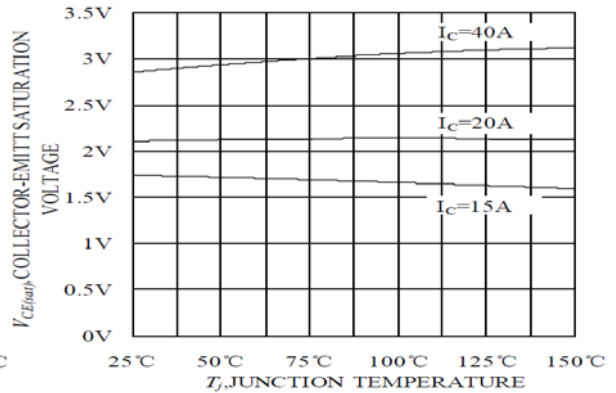


Figure 10 Typical collector-emitter saturation voltage as a function of junction temperature ($V_{GE}=15\text{V}$)

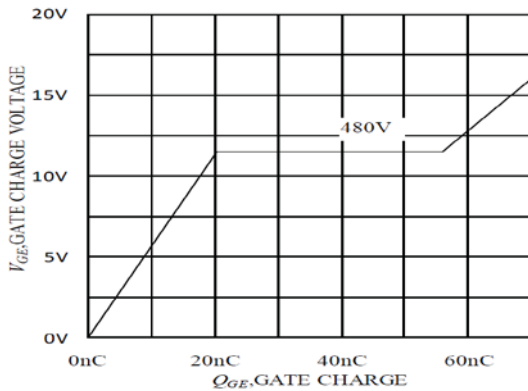


Figure 11 Typical gate charge ($I_C=20\text{A}$)

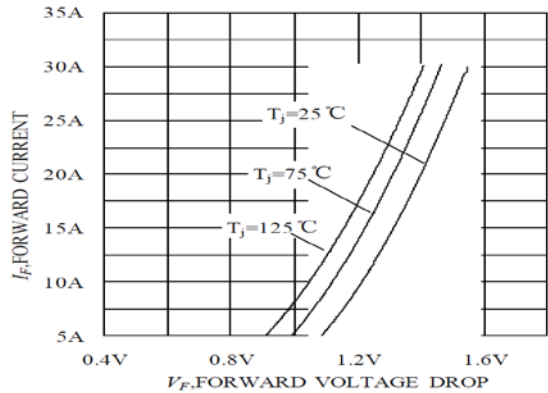


Figure 12 Forward Characteristics ($I_C=20\text{A}$)

Typical Characteristics

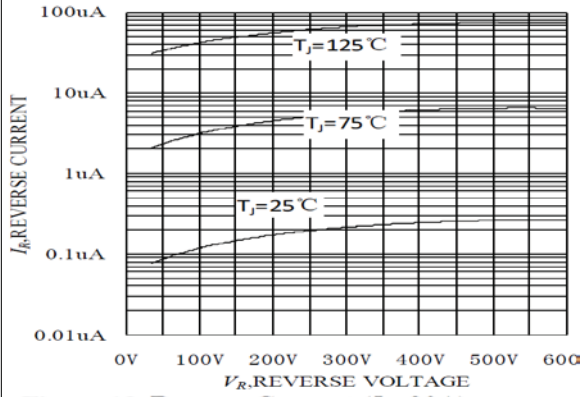


Figure 13 Reverse Current ($I_C=20A$)

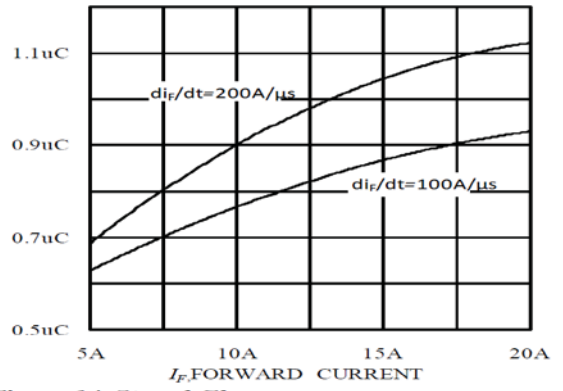


Figure 14 Stored Charge

Package Dimension

TO-247

