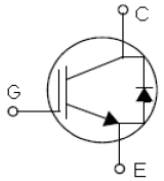
Dec 2013

SemiHow
Know-How for Semiconductor

HIH20N60BP
600V PT IGBT

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

TO-3P



FEATURES

- Low $V_{CE(sat)}$
- Maximum Junction Temperature 150℃
- Short Circuit Withstand Time 5μs
- 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℃)	40	A
	Collector Current – Continuous (T_C = 100℃)	20	A
I_{CM}	Collector Current – Pulsed (Note 1)	60	A
I_F	Diode Forward Current – Continuous (T_C = 25℃)	40	A
	Diode Forward Current – Continuous (T_C = 100℃)	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}=15V, V_{CC}=400V, T_C=150℃)	5	μA
P_D	Power Dissipation (T_C = 25℃)	192	W
T_J	Operating Temperature Range	-40 to +150	℃
T_{STG}	Storage Temperature Range	-55 to +150	℃
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	260	℃

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	℃/W
$R_{\theta JC}$(Diode)	Junction-to-Case	--	0.97	
$R_{\theta JA}$	Junction-to-Ambient	--	40	

Package Marking and Odering Information

Device Marking	Week Marking	Package	Packing	Quantity	RoHS Status
HIH20N60BP	YWWX	TO-3P	Tube	30	Pb Free
HIH20N60BP	YWWXg	TO-3P	Tube	30	Halogen Free

Electrical Characteristics of the IGBT T_C=25 °C unless otherwise specified

Symbol	Parameter	Test Conditions		Min	Typ	Max	Units
On Characteristics							
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	V_{CE} = V_{GE}, I_C = 800 μA		4.4	5.7	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 20 A	T_C = 25℃	--	2.2	2.6	V
			T_C = 125℃	--	2.2	2.7	
Off Characteristics							
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0 V, I_C = 1 mA		600	--	--	V
I_{CES}	Zero Gate Voltage Collector Current	V_{CE} = 600 V, V_{GE} = 0 V		--	--	100	μA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±20 V, V_{CE} = 0 V		--	--	±100	nA
Dynamic Characteristics							
C_{iss}	Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 1.0 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 V, I_C = 20 A, R_G = 20 Ω, V_{GE} = -10/15V Inductive load, T_C = 25℃		--	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 V, I_C = 20 A, R_G = 20 Ω, V_{GE} = -10/15V Inductive load, T_C = 125℃		--	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} = 480V, I_C = 20 A, V_{GE} = 15 V		--	70	--	nC
L_E	Internal Emitter Inductance			--	13	--	nH
$I_{C(SC)}$	Short Circuit Collector Current	V_{CC} = 400 V, t_{SC} ≤ 5s, V_{GE} = 15V, T_C = 25℃		--	120	--	A

Electrical Characteristics of the Diode

V_{FM}	Diode Forward Voltage	I_F = 20 A, V_{GE} = 0 V	T_C = 25℃	--	2.3	--	V
			T_C = 125℃	--	1.9	--	
t_{rr}	Diode Reverse Recovery Time	I_F = 20 A, V_R = 300 V, di_F/dt = 200 A/μs, T_C = 25℃		--	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	--	A/μs
E_{rec}	Diode Reverse Recovery Energy			--	0.13	--	mJ
t_{rr}	Diode Reverse Recovery Time	I_F = 20 A, V_R = 300 V, di_F/dt = 200 A/μs, T_C = 125℃		--	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	--	A/μs
E_{rec}	Diode Reverse Recovery Energy			--	0.30	--	mJ

Typical Characteristics

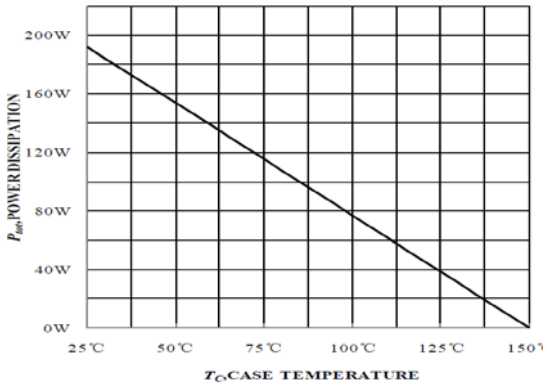


Figure 1. Power dissipation as a function of case temperature(T_j≤150℃)

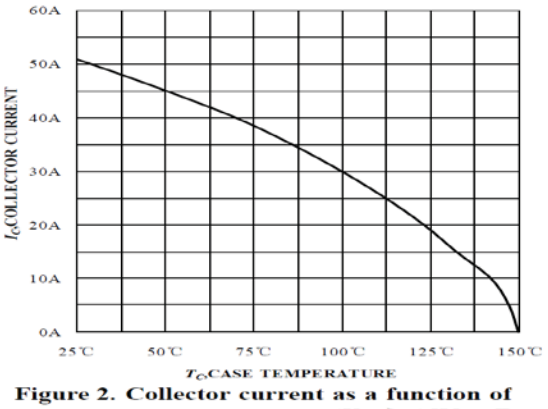


Figure 2. Collector current as a function of case temperature(V_{GE}≥15V， T_j ≤150℃)

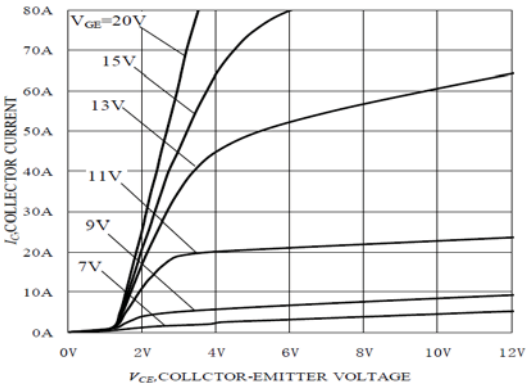


Figure 3. Typical output characteristic (T_j=25℃)

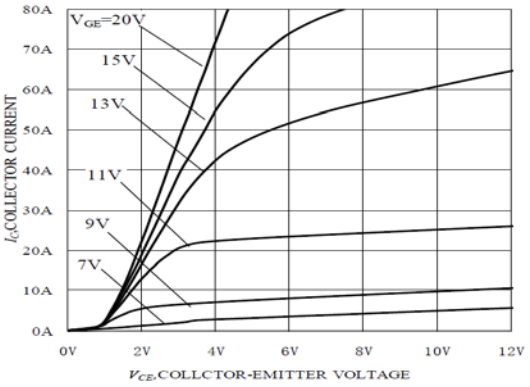


Figure 4. Typical output characteristic (T_j=125℃)

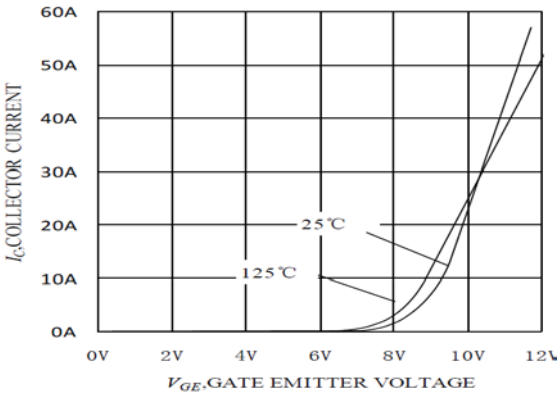


Figure 5. Typical transfer characteristic (V_{CE}=20V)

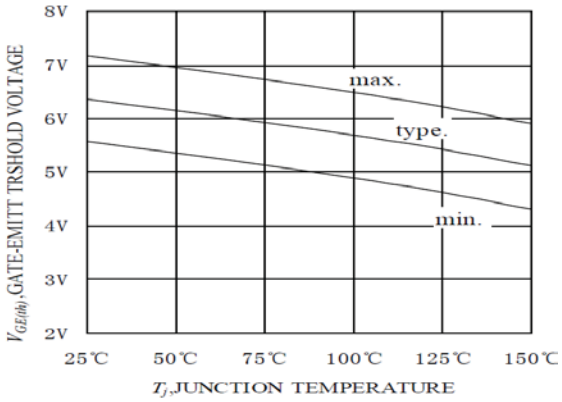


Figure 6. Gate-emitter threshold voltage as a function of junction temperature (I_C=0.8mA)

Typical Characteristics

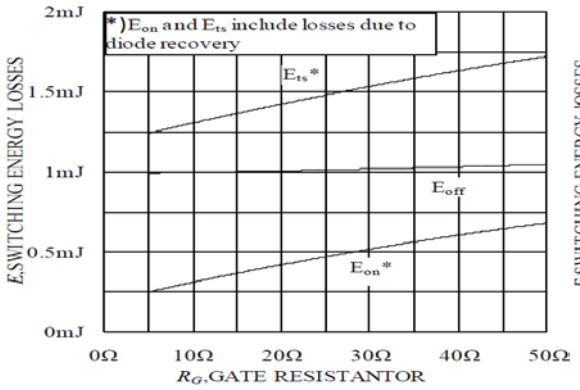


Figure 7. Typical swithching energy losses as a function of gate resistor
(inductive load, T_j=150℃, V_{CE}=300V, V_{GE}=-10/15V, I_C=20A)

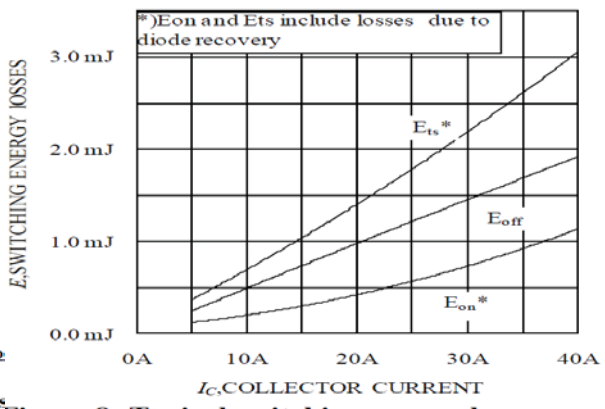


Figure 8. Typical switching energy losses as a function of collector current
(inductive load, T_j=150℃, V_{CE}=300V, V_{GE}=-10/15V, R_G=20Ω)

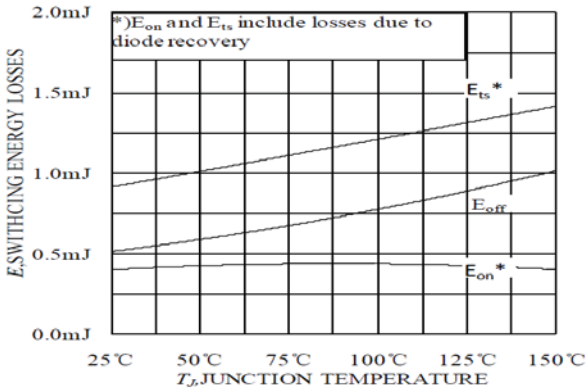


Figure 9. Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE}=15V)

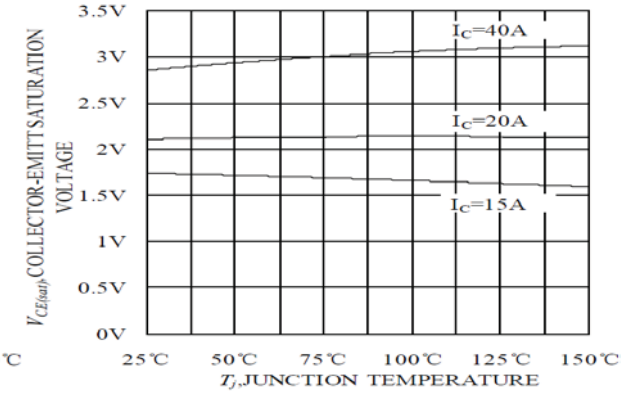


Figure 10 Typical collector-emitter saturation voltage as a function of junction temperature
(V_{GE}=15V)

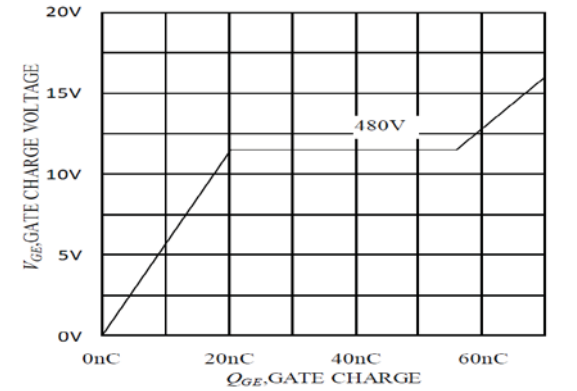


Figure 11 Typical gate charge
(I_C=20A)

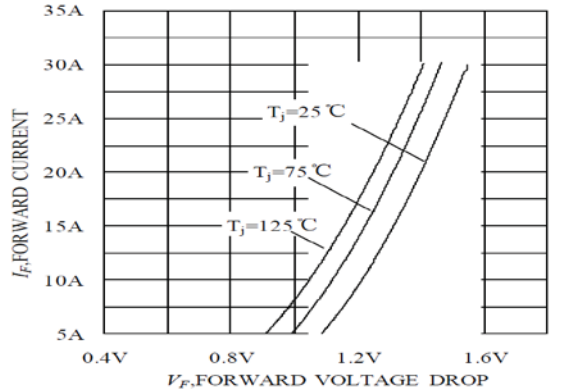


Figure 12 Forward Characteristics
(I_C=20A)

Typical Characteristics

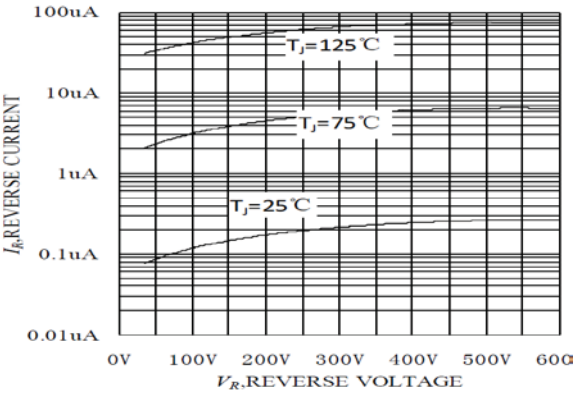


Figure 13 Reverse Current (I_C=20A)

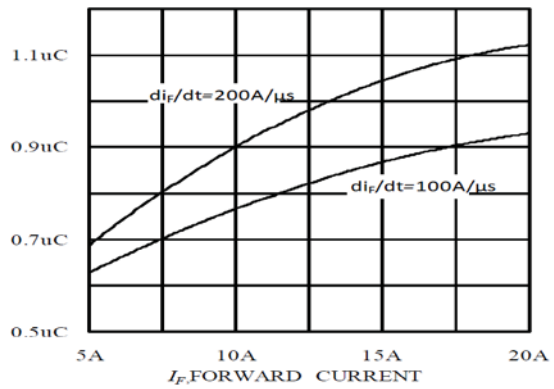


Figure 14 Stored Charge

Package Dimension

TO-3P