Jan 2014

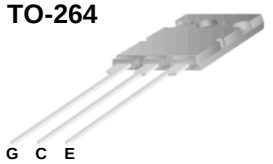
SemiHow
Know-How for Semiconductor

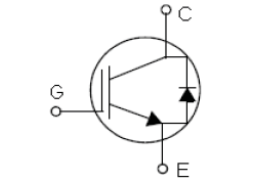
HIL40N120VF
1200V Field Stop Trench IGBT

V_{CES} = 1200 V
I_C = 40 A
$V_{CE(sat)\ typ}$ = 2.0 V

Employing Field Stop technology, CO-PAK, IGBT with FRD. 1200V/40A planar gate IGBTs provide low Conduction, switching losses and very good ruggedness.

TO-264





Applications

Induction Heating, UPS, welding converters and general purpose inverters.

Absolute Maximum Ratings

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1200	V
I_C	Collector Current – Continuous (T_C = 25℃)	64	A
	Collector Current – Continuous (T_C = 100℃)	40	A
I_{CM}	Collector Current – Pulsed (Note 1)	160	A
V_{GES}	Gate-Emitter Voltage	±20	V
t_{SC}	Short circuit withstand time (V_{GE}=15V, V_{CC}=600V, T_C=125℃)	10	μs
P_D	Power Dissipation (T_C = 25℃)	500	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +150	℃
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	300	℃

Notes.
1. Pulse width limited by max junction temperature

Thermal Resistance Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$(IGBT)	Junction-to-Case	--	0.25	℃/W
$R_{\theta JC}$(Diode)	Junction-to-Case	--	0.7	
$R_{\theta JA}$	Junction-to-Ambient	--	25	

Package Marking and Odering Information

Device Marking	Week Marking	Package	Packing	Quantity	RoHS Status
HIL40N120VF	YWWX	TO-264	Tube	25	Pb Free
HIL40N120VF	YWWXg	TO-264	Tube	25	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 = 1.5 mA		4.0	--	6.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 40 A	T_C = 25℃	--	2.0	2.6	V
			T_C = 125℃	--	2.5	3.2	
Off Characteristics							
BV_{CES}	Collector-Emitter Breakdown Voltage	V_{GE} = 0 V, I_C = 250 μA		1200	--	--	V
I_{CES}	Zero Gate Voltage Collector Current	V_{CE} = 1200 V, V_{GE} = 0 V		--	--	1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±20 V, V_{CE} = 0 V		--	--	±250	nA
Dynamic Characteristics							
C_{iss}	Input Capacitance	V_{CE} = 30 V, V_{GE} = 0 V, f = 1.0 MHz		--	6680	8680	pF
C_{oss}	Output Capacitance			--	295	380	pF
C_{rss}	Reverse Transfer Capacitance			--	76	100	pF
Switching Characteristics							
$t_{d(on)}$	Turn-On Time	V_{CC} = 600 V, I_C = 40 A, R_G = 10 Ω, V_{GE} = 15V Inductive load, T_C = 25℃		--	50	--	ns
t_r	Turn-On Rise Time			--	65	--	ns
$t_{d(off)}$	Turn-Off Delay Time			--	295	--	ns
t_f	Turn-Off Fall Time			--	85	--	ns
E_{on}	Turn-On Switching Loss			--	2.3	--	mJ
E_{off}	Turn-Off Switching Loss			--	2.2	--	mJ
E_{ts}	Total Switching Loss			--	4.5	--	mJ
$t_{d(on)}$	Turn-On Time	V_{CC} = 600 V, I_C = 40 A, R_G = 10 Ω, V_{GE} = 15V Inductive load, T_C = 125℃		--	90	--	ns
t_r	Turn-On Rise Time			--	70	--	ns
$t_{d(off)}$	Turn-Off Delay Time			--	415	--	ns
t_f	Turn-Off Fall Time			--	165	--	ns
E_{on}	Turn-On Switching Loss			--	2.65	--	mJ
E_{off}	Turn-Off Switching Loss			--	3.2	--	mJ
E_{ts}	Total Switching Loss			--	5.85	--	mJ
Q_g	Total Gate Charge	V_{CC} = 600V, I_C = 40 A, V_{GE} = 15 V		--	225	290	nC
Q_{ge}	Gate-Emitter Charge			--	55	--	nC
Q_{gc}	Gate-Collector Charge			--	90	--	nC
$I_{C(SC)}$	Short Circuit Collector Current	V_{CC} = 600 V, t_{SC} ≤ 10s, V_{GE} = 15V, T_C = 25℃		--	310	--	A

Electrical Characteristics of the Diode

V_{FM}	Diode Forward Voltage	I_F = 40 A, V_R = 600 V di_F/dt = 200 A/μs, T_C = 25℃	--	2.6	--	V
t_{rr}	Diode Reverse Recovery Time		--	400	--	ns
I_{rr}	Diode Peak Reverse Recovery Current		--	7.7	--	A
Q_{rr}	Diode Reverse Recovery Charge		--	1000	--	μC
V_{FM}	Diode Forward Voltage	I_F = 40 A, V_R = 600 V di_F/dt = 200 A/μs, T_C = 125℃	--	3.2	--	V
t_{rr}	Diode Reverse Recovery Time		--	470	--	ns
I_{rr}	Diode Peak Reverse Recovery Current		--	8.0	--	A
Q_{rr}	Diode Reverse Recovery Charge		--	1600	--	μC

Typical Characteristics

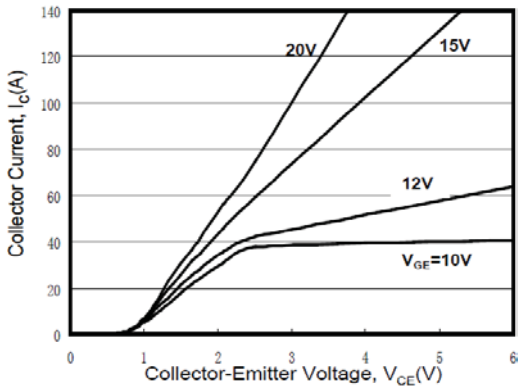


Figure 1. Typical Output Characteristics

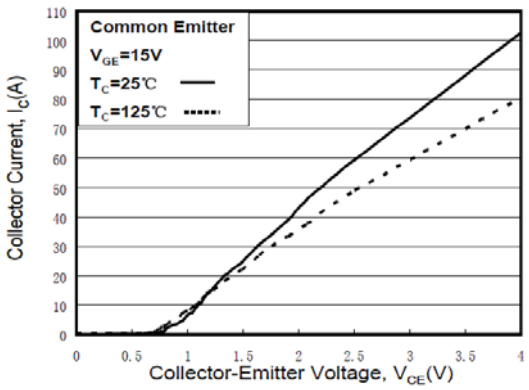


Figure 2. Typical Saturation Voltage Characteristics

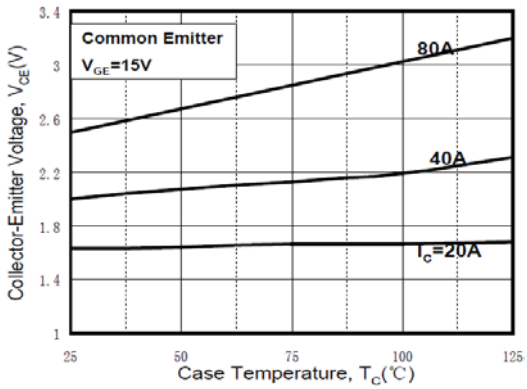


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

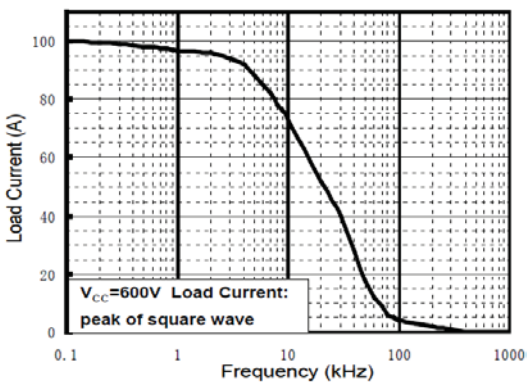


Figure 4. Load Current vs. Frequency

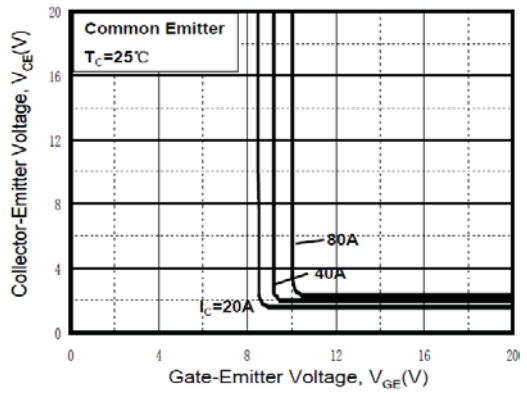


Figure 5. Saturation Voltage vs. V_{GE}

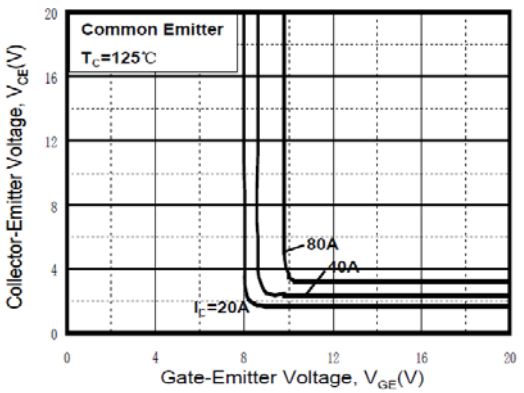


Figure 6. Saturation Voltage vs. V_{GE}

Typical Characteristics

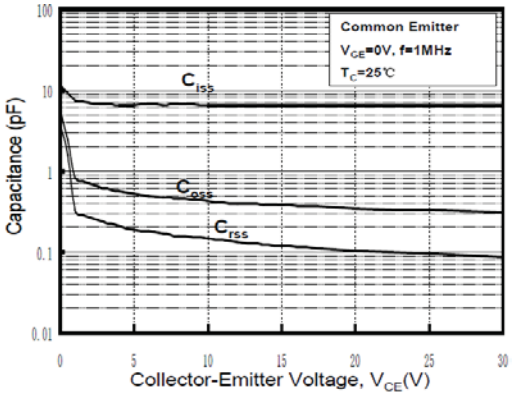


Figure 7. Capacitance Characteristics

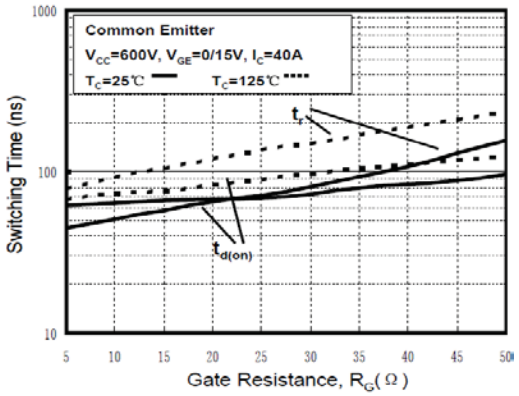


Figure 8. Turn-On Characteristics vs. Gate Resistance

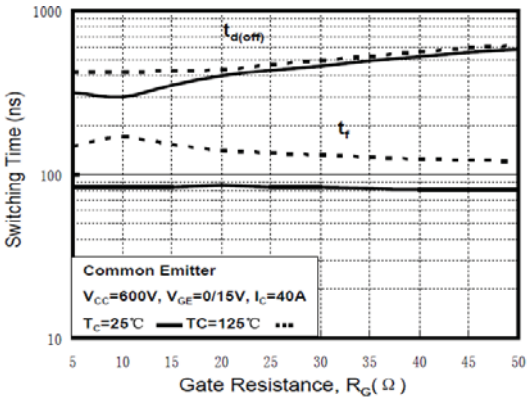


Figure 9. Turn-Off Characteristics vs. Gate Resistance

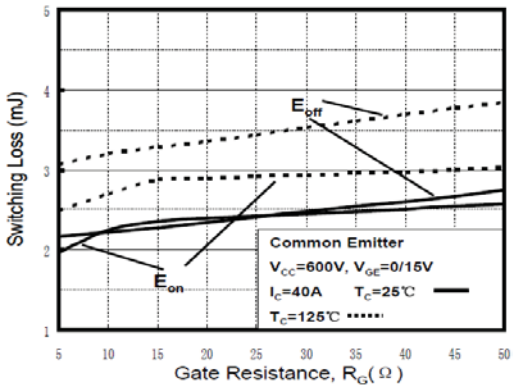


Figure 10. Switching Loss vs. Gate Resistance

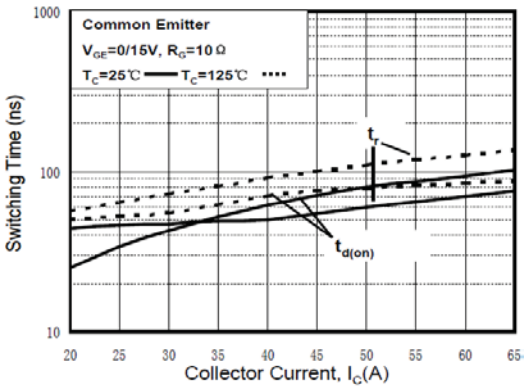


Figure 11. Turn-On Characteristics vs. Collector Current

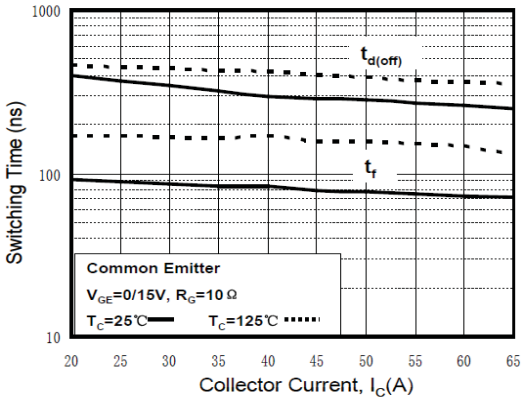


Figure 12. Turn-Off Characteristics vs. Collector Current

Typical Characteristics

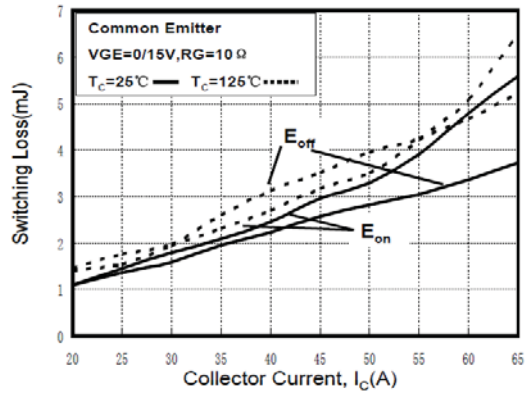


Figure 13. Switching Loss vs. Collector Current

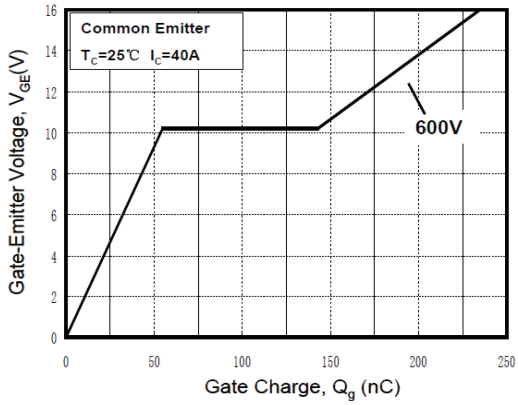


Figure 14. Gate Charge Characteristics

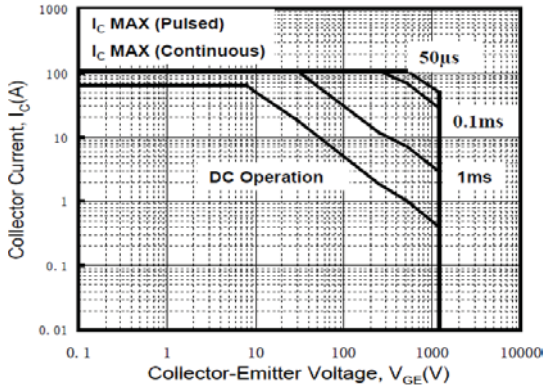


Figure 15. SOA Characteristics

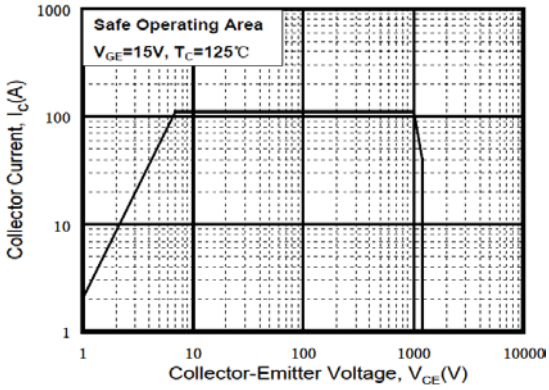


Figure 16. Turn-Off SOA

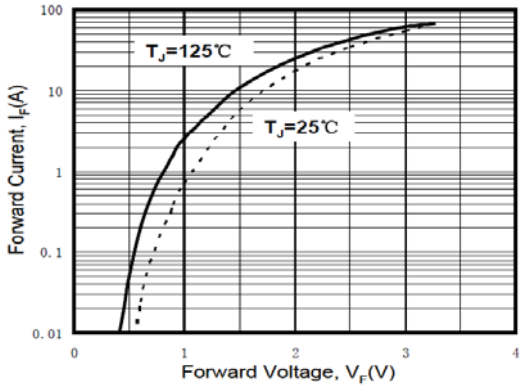


Figure 17. Forward Characteristics

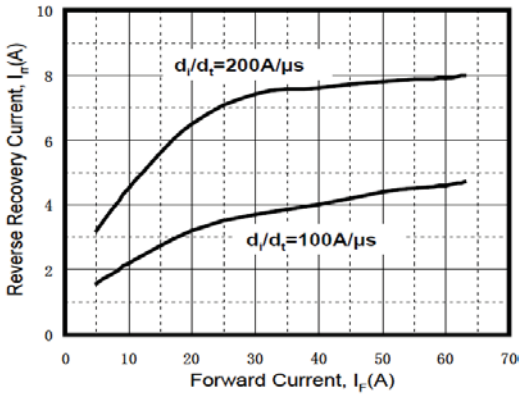


Figure 18. Reverse Recovery Current

Typical Characteristics

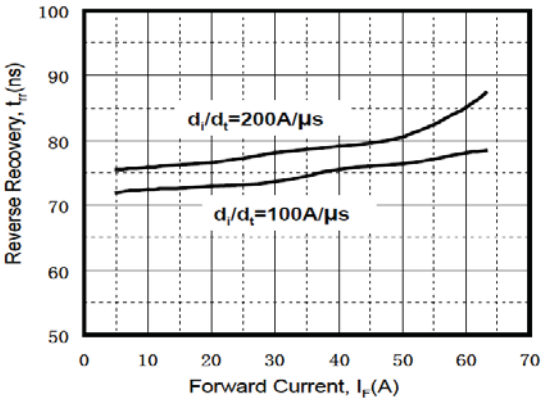


Figure 19. Stored Charge

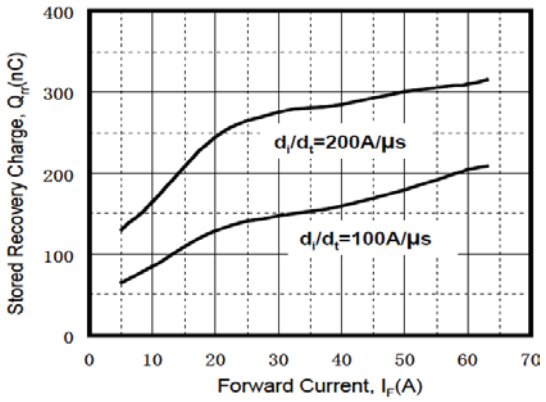


Figure 20. Reverse Recovery Time

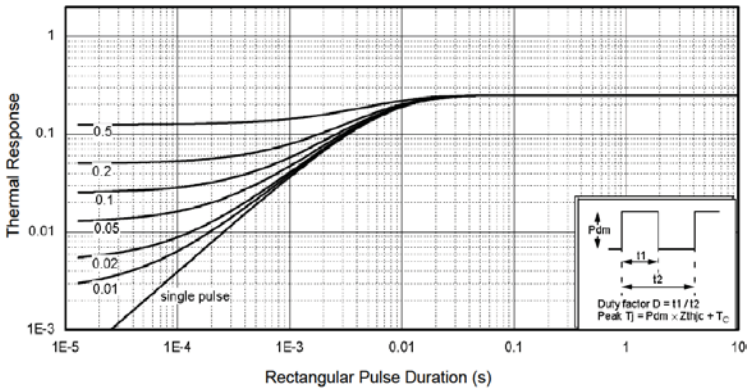


Figure 21. Transient Thermal Impedance of IGBT

Package Dimension

TO-264