Insulated Gate Bipolar Transistor (Ultrafast IGBT), 90 A

SOT-227

FEATURES

- NPT Gen 5 IGBT technology
- Square RBSOA
- HEXFRED® low Q_{rr}, low switching energy
- Positive $V_{CE(on)}$ temperature coefficient
- Fully isolated package
- Very low internal inductance (≤ 5 nH typical)
- Industry standard outline
- UL approved file E78996
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

BENEFITS

- Designed for increased operating efficiency in power conversion: UPS, SMPS, welding, induction heating
- Easy to assemble and parallel
- Direct mounting on heatsink
- Plug-in compatible with other SOT-227 packages
- Low EMI, requires less snubbing

PRIMARY CHARACTERISTICS	
V_{CES}	1200 V
I_C DC	90 A at 90 °C
$V_{CE(on)}$ typical at 75 A, 25 °C	3.3 V
Speed	8 kHz to 30 kHz
Package	SOT-227
Circuit configuration	Single switch with AP diode

ABSOLUTE MAXIMUM RATINGS				
PARAMETER	SYMBOL	TEST CONDITIONS	MAX.	UNITS
Collector to emitter voltage	V_{CES}		1200	V
Continuous collector current	I_C	T_C = 25 °C	149	A
		T_C = 90 °C	90	
Pulsed collector current	I_{CM}		200	
Clamped inductive load current	I_{LM}		200	
Diode continuous forward current	I_F	T_C = 25 °C	76	
		T_C = 90 °C	46	
Gate to emitter voltage	V_{GE}		± 20	V
Power dissipation, IGBT	P_D	T_C = 25 °C	862	W
		T_C = 90 °C	414	
Power dissipation, diode	P_D	T_C = 25 °C	357	
		T_C = 90 °C	171	
Isolation voltage	V_{ISOL}	Any terminal to case, t = 1 min	2500	V

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Collector to emitter breakdown voltage	$V_{BR(CES)}$	V_{GE} = 0 V, I_C = 250 µA	1200	-	-	V
Collector to emitter voltage	$V_{CE(on)}$	V_{GE} = 15 V, I_C = 75 A	-	3.3	3.8	
		V_{GE} = 15 V, I_C = 75 A, T_J = 125 °C	-	3.6	3.9	
		V_{GE} = 15 V, I_C = 75 A, T_J = 150 °C	-	3.7	-	
Gate threshold voltage	$V_{GE(th)}$	V_{CE} = V_{GE}, I_C = 250 µA	4	5	6	
		V_{CE} = V_{GE}, I_C = 250 µA, T_J = 125 °C	-	3.2	-	
Temperature coefficient of threshold voltage	$V_{GE(th)}/\Delta T_J$	V_{CE} = V_{GE}, I_C = 1 mA (25 °C to 125 °C)	-	-12	-	mV/°C
Collector to emitter leakage current	I_{CES}	V_{GE} = 0 V, V_{CE} = 1200 V	-	7	250	µA
		V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 125 °C	-	1.4	10	mA
		V_{GE} = 0 V, V_{CE} = 1200 V, T_J = 150 °C	-	6.5	20	
Forward voltage drop, diode	V_{FM}	V_{GE} = 0 V, I_F = 75 A	-	3.4	5.0	V
		V_{GE} = 0 V, I_F = 75 A, T_J = 125 °C	-	3.2	5.2	
		V_{GE} = 0 V, I_F = 75 A, T_J = 150 °C	-	3.05	-	
Gate to emitter leakage current	I_{GES}	V_{GE} = ± 20 V	-	-	± 250	nA

SWITCHING CHARACTERISTICS (T_J = 25 °C unless otherwise specified)							
PARAMETER	**SYMBOL**	**TEST CONDITIONS**		**MIN.**	**TYP.**	**MAX.**	**UNITS**
Total gate charge (turn-on)	Q_g	I_C = 50 A, V_{CC} = 600 V, V_{GE} = 15 V		-	690	-	nC
Gate to emitter charge (turn-on)	Q_{ge}			-	65	-	
Gate to collector charge (turn-on)	Q_{gc}			-	250	-	
Turn-on switching loss	E_{on}	I_C = 75 A, V_{CC} = 600 V, V_{GE} = 15 V, R_g = 5 Ω, L = 500 µH, T_J = 25 °C	Energy losses include tail and diode recovery Diode used HFA16PB120	-	1.2	-	mJ
Turn-off switching loss	E_{off}			-	2.1	-	
Total switching loss	E_{tot}			-	3.3	-	
Turn-on delay time	$t_{d(on)}$			-	250	-	ns
Rise time	t_r			-	38	-	
Turn-off delay time	$t_{d(off)}$			-	280	-	
Fall time	t_f			-	90	-	
Turn-on switching loss	E_{on}	I_C = 75 A, V_{CC} = 600 V, V_{GE} = 15 V, R_g = 5 Ω, L = 500 µH, T_J = 125 °C		-	1.7	-	mJ
Turn-off switching loss	E_{off}			-	4.08	-	
Total switching loss	E_{tot}			-	5.78	-	
Turn-on delay time	$t_{d(on)}$			-	245	-	ns
Rise time	t_r			-	48	-	
Turn-off delay time	$t_{d(off)}$			-	280	-	
Fall time	t_f			-	140	-	
Reverse bias safe operating area	RBSOA	T_J = 150 °C, I_C = 200 A, R_g = 22 Ω, V_{GE} = 15 V to 0 V, V_{CC} = 900 V, V_P = 1200 V, L = 500 µH		Fullsquare			
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/µs, V_R = 200 V		-	140	-	ns
Diode peak reverse current	I_{rr}			-	13	-	A
Diode recovery charge	Q_{rr}			-	860	-	nC
Diode reverse recovery time	t_{rr}	I_F = 50 A, dI_F/dt = 200 A/µs, V_R = 200 V, T_J = 125 °C		-	210	-	ns
Diode peak reverse current	I_{rr}			-	19	-	A
Diode recovery charge	Q_{rr}			-	1880	-	nC