Table 3. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
HALF BRIDGE IGBT CHARACTERISTICS						
Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 1200 V	I_{CES}	–	–	300	μA
Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 80 A, T_J = 25°C	$V_{CE(sat)}$	–	2.50	2.85	V
	V_{GE} = 15 V, I_C = 80 A, T_J = 150°C		–	2.15	–	
Gate−Emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 1.5 mA	$V_{GE(TH)}$	–	5.45	6.4	V
Gate Leakage Current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	300	nA
Turn−on Delay Time	T_J = 25°C V_{CE} = 350 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	37	–	ns
Rise Time		t_r	–	23	–	
Turn−off Delay Time		$t_{d(off)}$	–	190	–	
Fall Time		t_f	–	30	–	
Turn−on Switching Loss per Pulse		E_{on}	–	320	–	μJ
Turn−off Switching Loss per Pulse		E_{off}	–	680	–	
Turn−on Delay Time	T_J = 125°C V_{CE} = 350 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	30	–	ns
Rise Time		t_r	–	25	–	
Turn−off Delay Time		$t_{d(off)}$	–	230	–	
Fall Time		t_f	–	90	–	
Turn−on Switching Loss per Pulse		E_{on}	–	500	–	μJ
Turn−off Switching Loss per Pulse		E_{off}	–	1300	–	
Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 10 kHz	C_{ies}	–	19400	–	pF
Output Capacitance		C_{oes}	–	400	–	
Reverse Transfer Capacitance		C_{res}	–	340	–	
Total Gate Charge	V_{CE} = 600 V, I_C = 80 A, V_{GE} = 15 V	Q_g	–	800	–	nC
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness = 100 μm, λ = 0.84 W/mK	R_{thJH}	–	0.76	–	°C/W
NEUTRAL POINT DIODE CHARACTERISTICS						
Diode Forward Voltage	I_F = 50 A, T_J = 25°C	V_F	–	2.60	2.85	V
	I_F = 50 A, T_J = 150°C		–	2.0	–	
Reverse Recovery Time	T_J = 25°C V_{CE} = 350 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	30	–	ns
Reverse Recovery Charge		Q_{rr}	–	305	–	μC
Peak Reverse Recovery Current		I_{RRM}	–	22	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	1870	–	A/μs
Reverse Recovery Energy		E_{rr}	–	77	–	μJ
Reverse Recovery Time	Tj = 125°C V_{CE} = 350 V, I_C = 40 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	34	–	ns
Reverse Recovery Charge		Q_{rr}	–	910	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	50	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	4200	–	A/μs
Reverse Recovery Energy		E_{rr}	–	200	–	μJ
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness = 100 μm, λ = 0.84 W/mK	R_{thJH}	–	1.80	–	°C/W
NEUTRAL POINT IGBT CHARACTERISTICS						
Collector−Emitter Cutoff Current	V_{GE} = 0 V, V_{CE} = 600 V	I_{CES}	–	–	200	μA
Collector−Emitter Saturation Voltage	V_{GE} = 15 V, I_C = 50 A, T_J = 25°C	$V_{CE(sat)}$	–	1.50	1.75	V
	V_{GE} = 15 V, I_C = 50 A, T_J = 150°C		–	1.60	–	
Gate−Emitter Threshold Voltage	V_{GE} = V_{CE}, I_C = 1.2 mA	$V_{GE(TH)}$	–	5.45	6.4	V
Gate Leakage Current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	200	nA

Table 3. ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
NEUTRAL POINT IGBT CHARACTERISTICS						
Turn−on Delay Time	T_J = 25°C, V_{CE} = 350 V, I_C = 40 A, V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	23	–	ns
Rise Time		t_r	–	17	–	
Turn−off Delay Time		$t_{d(off)}$	–	108	–	
Fall Time		t_f	–	31	–	
Turn−on Switching Loss per Pulse		E_{on}	–	360	–	μJ
Turn−off Switching Loss per Pulse		E_{off}	–	520	–	
Turn−on Delay Time	T_J = 125°C, V_{CE} = 350 V, I_C = 40 A, V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	27	–	ns
Rise Time		t_r	–	17	–	
Turn−off Delay Time		$t_{d(off)}$	–	130	–	
Fall Time		t_f	–	75	–	
Turn−on Switching Loss per Pulse		E_{on}	–	535	–	μJ
Turn−off Switching Loss per Pulse		E_{off}	–	865	–	
Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 10 kHz	C_{ies}	–	9400	–	pF
Output Capacitance		C_{oes}	–	280	–	
Reverse Transfer Capacitance		C_{res}	–	250	–	
Total Gate Charge	V_{CE} = 480 V, I_C = 50 A, V_{GE} = 15 V	Q_g	–	395	–	nC
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness < 100 μm, λ = 0.84 W/mK	R_{thJH}	–	1.00	–	°C/W
HALF BRIDGE DIODE CHARACTERISTICS						
Diode Forward Voltage	I_F = 40 A, T_J = 25°C	V_F	–	2.65	3.45	V
	I_F = 40 A, T_J = 150°C		–	2.15	–	
Reverse Recovery Time	T_J = 25°C, V_{CE} = 350 V, I_C = 40 A, V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	38	–	ns
Reverse Recovery Charge		Q_{rr}	–	853	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	43	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	2600	–	A/μs
Reverse Recovery Energy		E_{rr}	–	200	–	μJ
Reverse Recovery Time	T_J = 125°C, V_{CE} = 350 V, I_C = 40 A, V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	300	–	ns
Reverse Recovery Charge		Q_{rr}	–	2550	–	nC
Peak Reverse Recovery Current		I_{RRM}	–	57	–	A
Peak Rate of Fall of Recovery Current		di/dt	–	2340	–	A/μs
Reverse Recovery Energy		E_{rr}	–	390	–	μJ
Thermal Resistance − chip−to−heatsink	Thermal grease, Thickness < 100 μm, λ = 0.84 W/mK	R_{thJH}	–	1.76	–	°C/W
THERMISTOR CHARACTERISTICS						
Nominal resistance		R_{25}	−	22	−	kΩ
Nominal resistance	T = 100°C	R_{100}	−	1486	−	Ω
Deviation of R25		ΔR/R	−5		5	%
Power dissipation		P_D	−	200	−	mW
Power dissipation constant			−	2	−	mW/K
B−value	B(25/50), tolerance ±3%		−	3950	−	K
B−value	B(25/100), tolerance ±3%		−	3998	−	K

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.