ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
HALF BRIDGE IGBT CHARACTERISTICS						
Collector−emitter saturation voltage	V_{GE} = 15 V, I_C = 80 A, T_J = 25°C V_{GE} = 15 V, I_C = 80 A, T_J = 150°C	$V_{CE(sat)}$	1.7	2.17 2.20	2.7	V
Gate−emitter threshold voltage	V_{GE} = V_{CE}, I_C = 1.5 mA	$V_{GE(TH)}$	5.0	6.0	6.5	V
Collector−emitter cutoff current	V_{GE} = 0 V, V_{CE} = 1200 V	I_{CES}	–	–	200	μA
Gate leakage current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	1.2	μA
Turn−on delay time	T_j = 25°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	35	–	ns
Rise time		t_r	–	28	–	
Turn−off delay time		$t_{d(off)}$	–	280	–	
Fall time		t_f	–	28	–	
Turn on switching loss		E_{on}	–	0.670	–	mJ
Turn off switching loss		E_{off}	–	1.3	–	
Turn−on delay time	T_j = 150°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	80	–	ns
Rise time		t_r	–	30	–	
Turn−off delay time		$t_{d(off)}$	–	320	–	
Fall time		t_f	–	230	–	
Turn on switching loss		E_{on}	–	0.975	–	mJ
Turn off switching loss		E_{off}	–	3.00	–	
Input capacitance	V_{CE} =20 V. V_{GE} = 0 V. f = 10 KHz	C_{ies}	–	19940	–	pF
Output capacitance		C_{oes}	–	592	–	
Reverse transfer capacitance		C_{res}	–	383	–	
Gate charge total	V_{CE} = 960 V, I_C = 40 A, V_{GE} = ±15 V	Q_g	–	840	–	nC
Thermal Resistance, chip−to−heatsink	Thermal grease thickness ≤ 50 μm λ = 1 W/mK	$R_{\theta JH}$		0.65		°C/W
HALF BRIDGE DIODE CHARACTERISTICS						
Forward voltage	V_{GE} = 0 V, I_F = 50 A, T_J = 25°C V_{GE} = 0 V, I_F = 50 A, T_j = 150°C	V_F	– –	1.81 1.90	2.4 –	V
Reverse recovery time	T_j = 25°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	0.12	–	μs
Reverse recovery charge		Q_{rr}	–	4.7	–	μC
Peak reverse recovery current		I_{rrm}	–	135	–	A
Peak rate of fall of recovery current		di/dt_{max}	–	7200	–	A/μs
Reverse recovery energy		E_{rr}	–	1.37	–	mJ
Reverse recovery time	T_j = 150°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	0.14	–	μs
Reverse recovery charge		Q_{rr}	–	7.65	–	μC
Peak reverse recovery current		I_{rrm}	–	138	–	A
Peak rate of fall of recovery current		di/dt_{max}	–	4900	–	A/μs
Reverse recovery energy		E_{rr}	–	2.15	–	mJ
Thermal Resistance, chip−to−heatsink	Thermal grease thickness ≤ 50 μm λ = 1 W/mK	$R_{\theta JH}$		1.38		°C/W
NEUTRAL POINT CLAMP IGBT CHARACTERISTICS						
Collector−emitter saturation voltage	V_{GE} = 15 V, I_C = 30 A, T_J = 25°C V_{GE} = 15 V, I_C = 30 A, T_J = 150°C	$V_{CE(sat)}$	1.1	1.3 1.3	1.6	V
Gate−emitter threshold voltage	V_{GE} = V_{CE}, I_C = 1.2 mA	$V_{GE(TH)}$	5.0	5.7	6.5	V
Collector−emitter cutoff current	V_{GE} = 0 V, V_{CE} = 600 V	I_{CES}	–	–	100	μA
Gate leakage current	V_{GE} = 20 V, V_{CE} = 0 V	I_{GES}	–	–	0.60	μA

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
NEUTRAL POINT CLAMP IGBT CHARACTERISTICS						
Turn−on delay time	T_j = 25°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	46	–	ns
Rise time		t_r	–	16	–	
Turn−off delay time		$t_{d(off)}$	–	125	–	
Fall time		t_f	–	60	–	
Turn on switching loss		E_{on}	–	0.668	–	mJ
Turn off switching loss		E_{off}	–	0.76	–	
Turn−on delay time	T_j = 150°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	$t_{d(on)}$	–	48	–	ns
Rise time		t_r	–	22	–	
Turn−off delay time		$t_{d(off)}$	–	200	–	
Fall time		t_f	–	134	–	
Turn on switching loss		E_{on}	–	1.1	–	mJ
Turn off switching loss		E_{off}	–	2.5	–	
Input capacitance	V_{CE} =20 V. V_{GE} = 0 V. f = 10 KHz	C_{ies}	–	9900	–	pF
Output capacitance		C_{oes}	–	270	–	
Reverse transfer capacitance		C_{res}	–	270	–	
Gate charge total	V_{CE} = 480 V, I_C = 75 A, V_{GE} = ±15 V	Q_g	–	390	–	nC
Thermal Resistance, chip−to−heatsink	Thermal grease thickness ≤ 50 μm λ = 1 W/mK	$R_{\theta JH}$		1.35		°C/W
NEUTRAL POINT CLAMP DIODE CHARACTERISTICS						
Forward voltage	V_{GE} = 0 V, I_F = 60 A T_j = 25°C V_{GE} = 0 V, I_F = 60 A, T_j = 150°C	V_F	– –	1.7 1.8	2.0 –	V
Reverse recovery time	T_j = 25°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	0.04	–	μs
Reverse recovery charge		Q_{rr}	–	1.1	–	μC
Peak reverse recovery current		I_{rrm}	–	65	–	A
Peak rate of fall of recovery current		di/dt_{max}	–	6600	–	A/μs
Reverse recovery energy		E_{rr}	–	0.384	–	mJ
Reverse recovery time	T_j = 150°C V_{CE} = 350 V, I_C = 56 A V_{GE} = ±15 V, R_G = 4 Ω	t_{rr}	–	0.1	–	μs
Reverse recovery charge		Q_{rr}	–	3.3	–	μC
Peak reverse recovery current		I_{rrm}	–	68	–	A
Peak rate of fall of recovery current		di/dt_{max}	–	1733	–	A/μs
Reverse recovery energy		E_{rr}	–	0.74	–	mJ
Thermal Resistance, chip−to−heatsink	Thermal grease thickness ≤ 50 μm λ = 1 W/mK	$R_{\theta JH}$		1.86		°C/W
THERMISTOR CHARACTERISTICS						
Normal resistance		R		22		kΩ
Nominal resistance	T = 100°C	R		1468		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), tol ±3%				3950	K
B−value	B(25/100), tol ±3%				3998	K
NTC reference					B	

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.