



ELECTRICAL SPECIFICATIONS ($T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted)							
	PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Inverter IGBT	Reverse bias safe operating area	RBSOA	$T_J = 150\text{ }^\circ\text{C}$, $I_C = 40\text{ A}$ $R_G = 22\ \Omega$, $V_{GE} = 15\text{ V to }0$	Fullsquare			
	Short circuit safe operating area	SCSOA	$T_J = 150\text{ }^\circ\text{C}$ $V_{CC} = 960\text{ V}$, $V_P = 1200\text{ V}$ $R_G = 22\ \Omega$, $V_{GE} = 15\text{ V to }0\text{ V}$	10	-	-	μs
	Diode peak reverse recovery current	I_{rr}	$T_J = 125\text{ }^\circ\text{C}$ $V_{CC} = 600\text{ V}$, $I_F = 10\text{ A}$, $L = 1\text{ mH}$ $R_G = 22\ \Omega$, $V_{GE} = 15\text{ V}$	-	22	-	A
	Diode forward voltage drop	V_{FM}	$I_F = 10\text{ A}$	-	2.02	2.50	V
$I_F = 20\text{ A}$			-	2.53	3.35		
$I_F = 10\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$			-	2.13	2.63		
$I_F = 20\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$			-	2.81	3.57		
Input rectifier	Maximum forward voltage drop	V_{FM}	$I_F = 10\text{ A}$	-	-	1.12	
	Maximum reverse leakage current	I_{RM}	$T_J = 25\text{ }^\circ\text{C}$, $V_R = 1600\text{ V}$	-	-	0.05	mA
			$T_J = 150\text{ }^\circ\text{C}$, $V_R = 1600\text{ V}$	-	-	1.0	
	Forward slope resistance	r_T	$T_J = 150\text{ }^\circ\text{C}$	-	-	18.1	m Ω
Conduction threshold voltage	$V_{F(TO)}$	-		-	0.78	V	
Brake IGBT	Collector to emitter breakdown voltage	$BV_{(CES)}$	$V_{GE} = 0\text{ V}$, $I_C = 500\ \mu\text{A}$	1200	-	-	V
	Temperature coefficient of breakdown voltage	$\Delta V_{(BR)CES}/\Delta T_J$	$V_{GE} = 0\text{ V}$, $I_C = 1\text{ mA}$ ($25\text{ }^\circ\text{C to }125\text{ }^\circ\text{C}$)	-	1.33	-	V/ $^\circ\text{C}$
	Collector to emitter voltage	$V_{CE(on)}$	$I_C = 10\text{ A}$, $V_{GE} = 15\text{ V}$	-	2.68	3.03	V
			$I_C = 20\text{ A}$, $V_{GE} = 15\text{ V}$	-	3.68	4.55	
			$I_C = 10\text{ A}$, $V_{GE} = 15\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$	-	3.19	3.61	
			$I_C = 20\text{ A}$, $V_{GE} = 15\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$	-	4.52	5.17	
	Gate threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$, $I_C = 250\ \mu\text{A}$	4.0	-	6.0	
	Threshold voltage temperature coefficient	$\Delta V_{GE(th)}/\Delta T_J$	$V_{CE} = V_{GE}$, $I_C = 1\text{ mA}$ ($25\text{ }^\circ\text{C to }125\text{ }^\circ\text{C}$)	-	-9.7	-	mV/ $^\circ\text{C}$
	Zero gate voltage collector current	I_{CES}	$V_{GE} = 0\text{ V}$, $V_{CE} = 1200\text{ V}$	-	-	100	μA
			$V_{GE} = 0\text{ V}$, $V_{CE} = 1200\text{ V}$, $T_J = 125\text{ }^\circ\text{C}$	-	750	-	
	Gate to emitter leakage current	I_{GES}	$V_{GE} = \pm 20\text{ V}$	-	-	± 200	nA
	Total gate charge (turn-on)	Q_G	$I_C = 10\text{ A}$ $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$	-	48	72	nC
	Gate to emitter charge (turn-on)	Q_{GE}		-	8	15	
	Gate to collector charge (turn-on)	Q_{GC}		-	22	33	
	Turn-on switching loss	E_{ON}	$I_C = 10\text{ A}$, $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$, $R_G = 22\ \Omega$ $L = 1\text{ mH}$, $T_J = 25\text{ }^\circ\text{C}^{(1)}$	-	0.96	1.44	mJ
	Turn-off switching loss	E_{OFF}		-	0.46	0.77	
	Total switching loss	E_{TOT}		-	1.42	2.14	
Turn-on switching loss	E_{ON}	$I_C = 10\text{ A}$, $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$, $R_G = 22\ \Omega$ $L = 1\text{ mH}$, $T_J = 125\text{ }^\circ\text{C}^{(1)}$	-	1.25	1.88	mJ	
Turn-off switching loss	E_{OFF}		-	0.69	0.95		
Total switching loss	E_{TOT}		-	1.94	2.830		
Turn-on delay time	$t_{d(on)}$	$I_C = 10\text{ A}$, $V_{CC} = 600\text{ V}$ $V_{GE} = 15\text{ V}$, $R_G = 22\ \Omega$ $L = 1\text{ mH}$, $T_J = 125\text{ }^\circ\text{C}$	-	86	130	ns	
Rise time	t_r		-	21	32		
Turn-off delay time	$t_{d(off)}$		-	118	180		
Fall time	t_f		-	274	410		



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	PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Brake IGBT	Input capacitance	C_{ies}	$V_{GE} = 0\text{ V}$	-	750	1150	pF
	Output capacitance	C_{oes}	$V_{CC} = 30\text{ V}$	-	190	290	
	Reverse transfer capacitance	C_{res}	$f = 1\text{ MHz}$	-	20	35	
	Reverse bias safe operating area	RBSOA	$T_J = 125\text{ }^\circ\text{C}$, $I_C = 40\text{ A}$ $R_G = 22\text{ }\Omega$, $V_{GE} = 15\text{ V to }0$	Fullsquare			
	Short circuit safe operating area	SCSOA	$T_J = 150\text{ }^\circ\text{C}$ $V_{CC} = 960\text{ V}$, $V_P = 1200\text{ V}$ $R_G = 22\text{ }\Omega$, $V_{GE} = 15\text{ V to }0$	10	-	-	μs
Brake Diode	Diode peak reverse recovery current	I_{rr}	$T_J = 125\text{ }^\circ\text{C}$; $V_{CC} = 600\text{ V}$, $I_F = 10\text{ A}$, $L = 1\text{ mH}$; $R_G = 22\text{ }\Omega$, $V_{GE} = 15\text{ V}$	-	22	-	A
	Diode forward voltage drop	V_{FM}	$I_F = 10\text{ A}$	-	2.02	2.5	V
			$I_F = 20\text{ A}$	-	2.53	3.35	
			$I_F = 10\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$	-	2.13	2.63	
			$I_F = 20\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$	-	2.81	3.57	
NTC	Resistance	R	$T_J = 25\text{ }^\circ\text{C}$	-	5000	-	Ω
			$T_J = 100\text{ }^\circ\text{C}$	-	493.3	-	
	B value	B	$T_J = 25\text{ }^\circ\text{C}/50\text{ }^\circ\text{C}$	-	3375	-	K

Note

(1) Energy losses include “tail” and diode reverse recovery