

Switching Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max	Units	Conditions
Q_g	Total Gate Charge	—	25	—	nC	$I_C = 12\text{A}$ $V_{GE} = 15\text{V}$ $V_{CC} = 400\text{V}$
Q_{ge}	Gate-to-Emitter Charge	—	7.0	—		
Q_{gc}	Gate-to-Collector Charge	—	11	—		
E_{on}	Turn-On Switching Loss	—	75	—	μJ	$I_C = 12\text{A}$, $V_{CC} = 400\text{V}$, $V_{GE} = 15\text{V}$ $R_G = 22\Omega$, $L = 200\mu\text{H}$, $L_S = 150\text{nH}$, $T_J = 25^\circ\text{C}$
E_{off}	Turn-Off Switching Loss	—	225	—		
E_{total}	Total Switching Loss	—	300	—		
$t_{d(on)}$	Turn-On delay time	—	31	—	ns	Energy losses include tail & diode reverse recovery ⑤
t_r	Rise time	—	17	—		
$t_{d(off)}$	Turn-Off delay time	—	83	—		
t_f	Fall time	—	24	—		
E_{on}	Turn-On Switching Loss	—	185	—	μJ	$I_C = 12\text{A}$, $V_{CC} = 400\text{V}$, $V_{GE} = 15\text{V}$ $R_G = 22\Omega$, $L = 200\mu\text{H}$, $L_S = 150\text{nH}$, $T_J = 175^\circ\text{C}$
E_{off}	Turn-Off Switching Loss	—	355	—		
E_{total}	Total Switching Loss	—	540	—		
$t_{d(on)}$	Turn-On delay time	—	30	—	ns	Energy losses include tail & diode reverse recovery ⑤
t_r	Rise time	—	18	—		
$t_{d(off)}$	Turn-Off delay time	—	102	—		
t_f	Fall time	—	41	—		
C_{ies}	Input Capacitance	—	765	—	pF	$V_{GE} = 0\text{V}$ $V_{CC} = 30\text{V}$ $f = 1.0\text{MHz}$
C_{oes}	Output Capacitance	—	52	—		
C_{res}	Reverse Transfer Capacitance	—	23	—		
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				$T_J = 175^\circ\text{C}$, $I_C = 48\text{A}$ $V_{CC} = 480\text{V}$, $V_p \leq 600\text{V}$ $R_G = 22\Omega$, $V_{GE} = +20\text{V}$ to 0V
SCSOA	Short Circuit Safe Operating Area	5.0	—	—	μs	$V_{CC} = 400\text{V}$, $V_p \leq 600\text{V}$ $R_G = 22\Omega$, $V_{GE} = +15\text{V}$ to 0V
E_{rec}	Reverse Recovery Energy of the Diode	—	280	—	μJ	$T_J = 175^\circ\text{C}$
t_{rr}	Diode Reverse Recovery Time	—	68	—	ns	$V_{CC} = 400\text{V}$, $I_F = 12\text{A}$, $V_{GE} = 15\text{V}$, $R_g = 22\Omega$, $L = 200\mu\text{H}$, $L_S = 150\text{nH}$
I_{rr}	Peak Reverse Recovery Current	—	19	—	A	

Notes:

- ① Limited by maximum junction temperature. Not applicable for Full-Pak package: current value limited by $R_{\theta JC}$.
- ② R_{θ} is measured at T_J of approximately 90°C .
- ③ Refer to AN-1086 for guidelines for measuring $V_{(BR)CES}$ safely.
- ④ Pulse width limited by maximum junction temperature.
- ⑤ Values influenced by parasitic L and C in measurement.
- ⑥ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994. <http://www.irf.com/technical-info/appnotes/an-994.pdf>
- ⑦ $V_{CC} = 80\%$ (V_{CES}), $V_{GE} = 20\text{V}$, $L = 100\mu\text{H}$, $R_G = 22\Omega$.

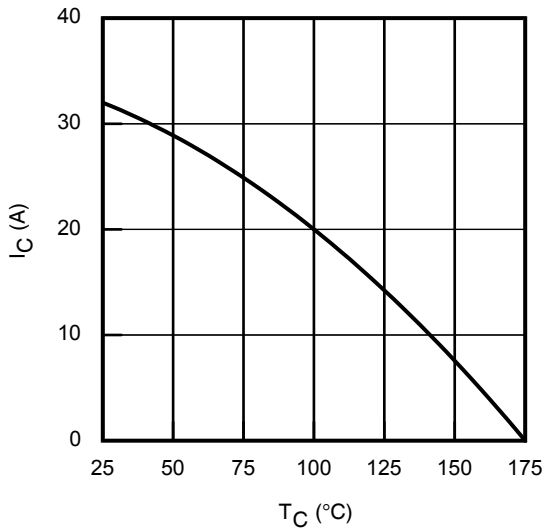


Fig. 1 - Maximum DC Collector Current vs. Case Temperature

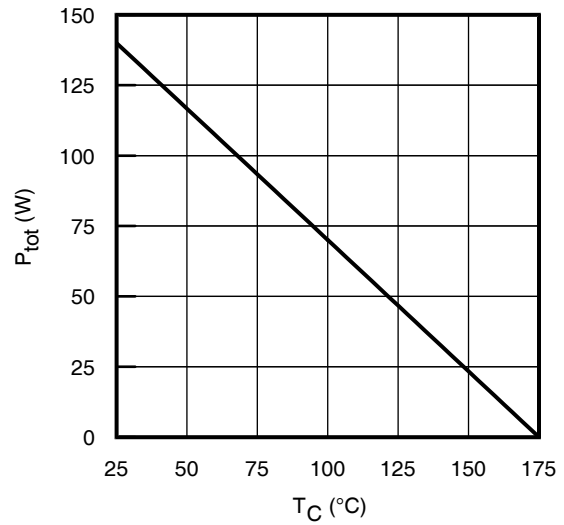


Fig. 2 - Power Dissipation vs. Case Temperature

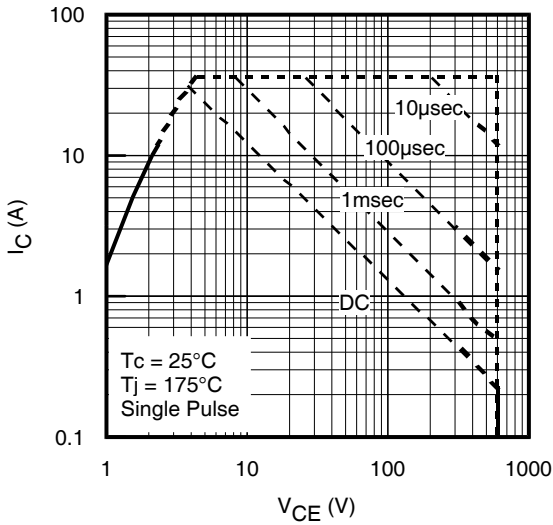


Fig. 3 - Forward SOA
 $T_C = 25^\circ\text{C}$; $T_J \leq 175^\circ\text{C}$; $V_{GE} = 15\text{V}$

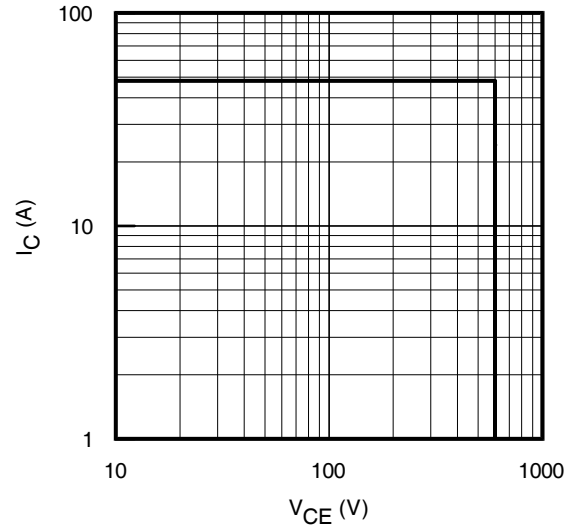


Fig. 4 - Reverse Bias SOA
 $T_J = 175^\circ\text{C}$; $V_{GE} = 20\text{V}$

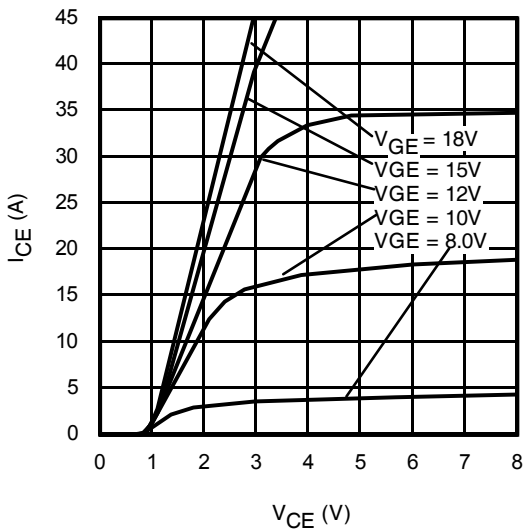


Fig. 5 - Typ. IGBT Output Characteristics
 $T_J = -40^\circ\text{C}$; $t_p = 80\mu\text{s}$

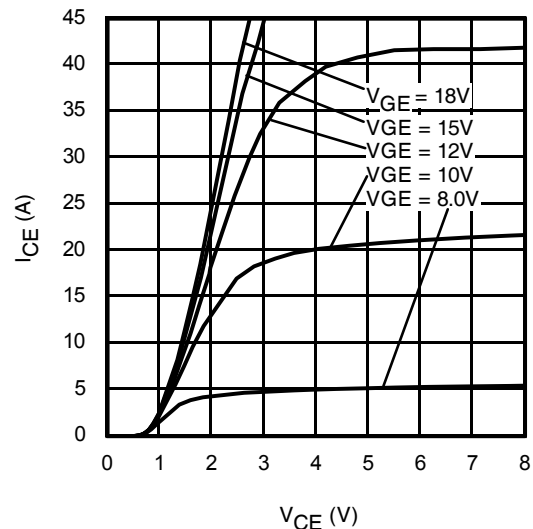


Fig. 6 - Typ. IGBT Output Characteristics
 $T_J = 25^\circ\text{C}$; $t_p = 80\mu\text{s}$