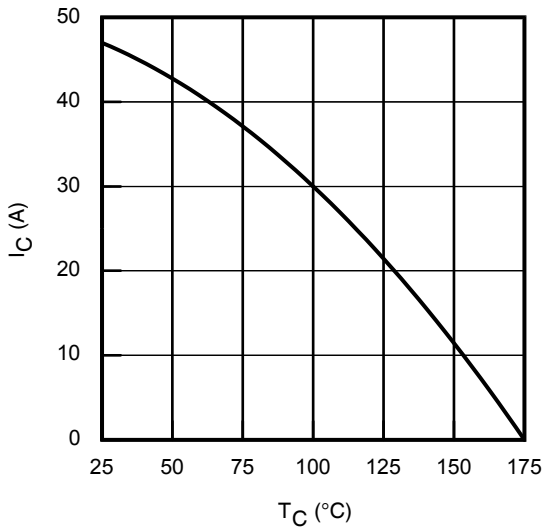


**Switching Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

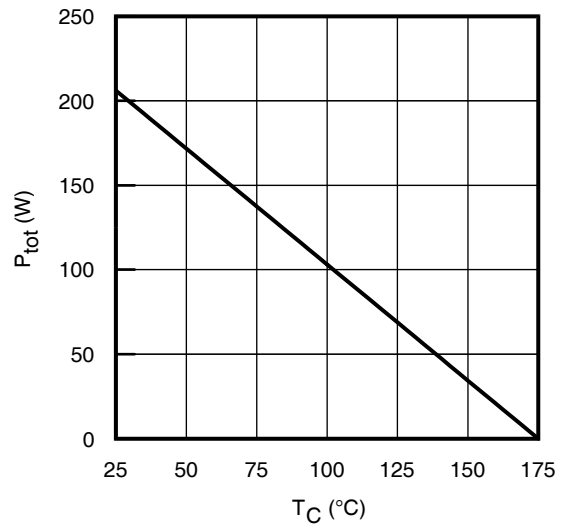
	Parameter	Min.	Typ.	Max	Units	Conditions
$Q_g$	Total Gate Charge	—	35	—	nC	$I_C = 18\text{A}$ $V_{GE} = 15\text{V}$ $V_{CC} = 400\text{V}$
$Q_{ge}$	Gate-to-Emitter Charge	—	10	—		
$Q_{gc}$	Gate-to-Collector Charge	—	15	—		
$E_{on}$	Turn-On Switching Loss	—	95	—	$\mu\text{J}$	$I_C = 18\text{A}$ , $V_{CC} = 400\text{V}$ , $V_{GE} = 15\text{V}$ $R_G = 22\Omega$ , $L = 200\mu\text{H}$ , $L_S = 150\text{nH}$ , $T_J = 25^\circ\text{C}$
$E_{off}$	Turn-Off Switching Loss	—	350	—		
$E_{total}$	Total Switching Loss	—	445	—		
$t_{d(on)}$	Turn-On delay time	—	40	—	ns	Energy losses include tail & diode reverse recovery ⑤
$t_r$	Rise time	—	25	—		
$t_{d(off)}$	Turn-Off delay time	—	105	—		
$t_f$	Fall time	—	25	—		
$E_{on}$	Turn-On Switching Loss	—	285	—		
$E_{off}$	Turn-Off Switching Loss	—	570	—	$\mu\text{J}$	$I_C = 18\text{A}$ , $V_{CC} = 400\text{V}$ , $V_{GE} = 15\text{V}$ $R_G = 22\Omega$ , $L = 200\mu\text{H}$ , $L_S = 150\text{nH}$ , $T_J = 175^\circ\text{C}$
$E_{total}$	Total Switching Loss	—	855	—		
$t_{d(on)}$	Turn-On delay time	—	40	—		
$t_r$	Rise time	—	25	—	ns	Energy losses include tail & diode reverse recovery ⑤
$t_{d(off)}$	Turn-Off delay time	—	120	—		
$t_f$	Fall time	—	40	—		
$C_{ies}$	Input Capacitance	—	1040	—	pF	$V_{GE} = 0\text{V}$ $V_{CC} = 30\text{V}$ $f = 1.0\text{MHz}$
$C_{oes}$	Output Capacitance	—	87	—		
$C_{res}$	Reverse Transfer Capacitance	—	32	—		
RBSOA	Reverse Bias Safe Operating Area	FULL SQUARE				$T_J = 175^\circ\text{C}$ , $I_C = 72\text{A}$ $V_{CC} = 480\text{V}$ , $V_p \leq 600\text{V}$ $R_G = 22\Omega$ , $V_{GE} = +20\text{V to } 0\text{V}$
SCSOA	Short Circuit Safe Operating Area	5.0	—	—	$\mu\text{s}$	$V_{CC} = 400\text{V}$ , $V_p \leq 600\text{V}$ $R_G = 22\Omega$ , $V_{GE} = +15\text{V to } 0\text{V}$
$E_{rec}$	Reverse Recovery Energy of the Diode	—	260	—	$\mu\text{J}$	$T_J = 175^\circ\text{C}$
$t_{rr}$	Diode Reverse Recovery Time	—	100	—	ns	$V_{CC} = 400\text{V}$ , $I_F = 18\text{A}$ , $V_{GE} = 15\text{V}$ , $R_G = 22\Omega$ , $L = 200\mu\text{H}$ , $L_S = 150\text{nH}$
$I_{rr}$	Peak Reverse Recovery Current	—	23	—	A	

**Notes:**

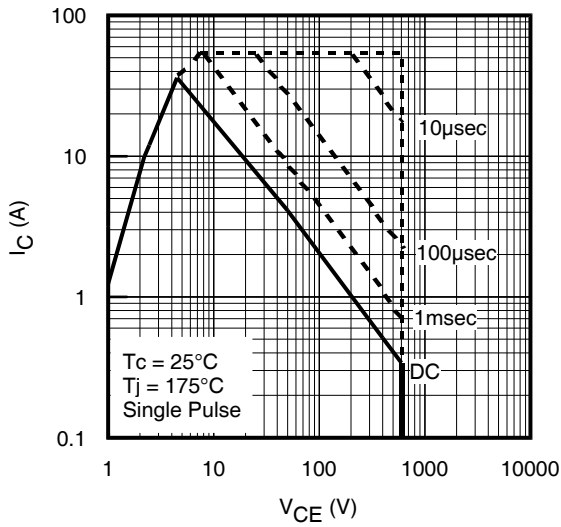
- ① Limited by maximum junction temperature. Not applicable for Full-Pak package: current value limited by  $R_{\theta JC}$ .
- ②  $R_{\theta}$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .
- ③ Refer to AN-1086 for guidelines for measuring  $V_{(BR)CES}$  safely.
- ④ Pulse width limited 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  $V_{CC} = 80\% (V_{CES})$ ,  $V_{GE} = 20\text{V}$ ,  $L = 100\mu\text{H}$ ,  $R_G = 22\Omega$ .



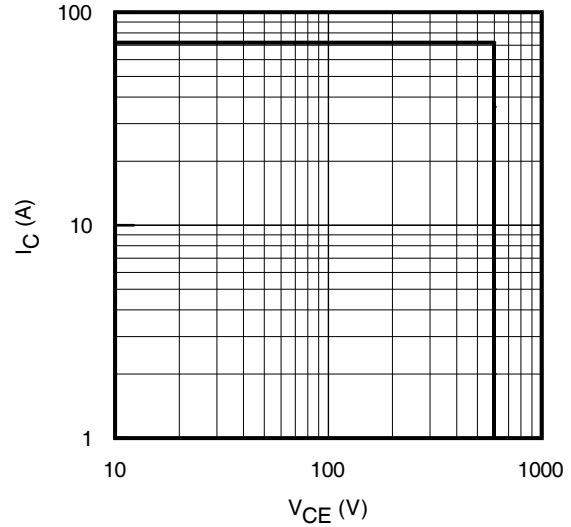
**Fig. 1** - Maximum DC Collector Current vs. Case Temperature



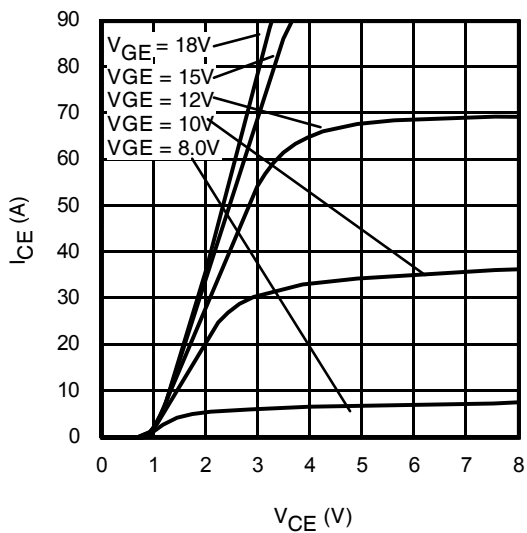
**Fig. 2** - Power Dissipation vs. Case Temperature



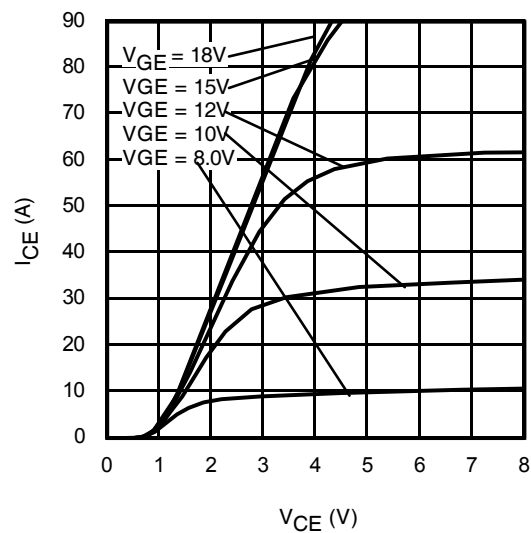
**Fig. 3** - Forward SOA  
 $T_C = 25^\circ\text{C}$ ;  $T_J \leq 175^\circ\text{C}$ ;  $V_{GE} = 15\text{V}$



**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  
 $T_J = 25^\circ\text{C}$ ;  $t_p = 80\mu\text{s}$