

Electrical Characteristics (T_J=25°C unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV_{CES}	Collector-Emitter Breakdown Voltage	$I_C=250\mu A$, $V_{GE}=0V$, $T_J=25^\circ C$	600	-	-	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE}=15V$, $I_C=15A$, $T_J=25^\circ C$	-	1.6	1.8	V
		$T_J=125^\circ C$	-	1.85	-	
		$T_J=150^\circ C$	-	1.92	-	
V_F	Diode Forward Voltage	$V_{GE}=0V$, $I_C=15A$, $T_J=25^\circ C$	-	1.43	1.72	V
		$T_J=125^\circ C$	-	1.39	-	
		$T_J=150^\circ C$	-	1.36	-	
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$V_{CE}=V_{GE}$, $I_C=250\mu A$	-	5.6	-	V
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE}=600V$, $V_{GE}=0V$, $T_J=25^\circ C$	-	-	10	μA
		$T_J=125^\circ C$	-	-	300	
		$T_J=150^\circ C$	-	-	1500	
I_{GES}	Gate-Emitter leakage current	$V_{CE}=0V$, $V_{GE}=\pm 20V$	-	-	± 100	nA
g_{FS}	Forward Transconductance	$V_{CE}=20V$, $I_C=15A$	-	7.7	-	S
DYNAMIC PARAMETERS						
C_{ies}	Input Capacitance	$V_{GE}=0V$, $V_{CE}=25V$, $f=1MHz$	-	1290	-	pF
C_{oes}	Output Capacitance		-	97	-	pF
C_{res}	Reverse Transfer Capacitance		-	3.1	-	pF
Q_g	Total Gate Charge	$V_{GE}=15V$, $V_{CE}=480V$, $I_C=15A$	-	25.4	-	nC
Q_{ge}	Gate to Emitter Charge		-	9.5	-	nC
Q_{gc}	Gate to Collector Charge		-	8.3	-	nC
$I_{C(SC)}$	Short circuit collector current, Max. 1000 short circuits, Delay between short circuits $\geq 1.0s$	$V_{GE}=15V$, $V_{CE}=400V$, $R_G=20\Omega$	-	74	-	A
R_g	Gate resistance	$V_{GE}=0V$, $V_{CE}=0V$, $f=1MHz$	-	2.4	-	Ω
SWITCHING PARAMETERS, (Load Inductive, T_J=25°C)						
$t_{D(on)}$	Turn-On DelayTime	$T_J=25^\circ C$ $V_{GE}=15V$, $V_{CE}=400V$, $I_C=15A$, $R_G=20\Omega$, Parasitic Inductance=100nH	-	21	-	ns
t_r	Turn-On Rise Time		-	19	-	ns
$t_{D(off)}$	Turn-Off Delay Time		-	73	-	ns
t_f	Turn-Off Fall Time		-	10	-	ns
E_{on}	Turn-On Energy		-	0.42	-	mJ
E_{off}	Turn-Off Energy		-	0.11	-	mJ
E_{total}	Total Switching Energy		-	0.53	-	mJ
t_{rr}	Diode Reverse Recovery Time		-	196	-	ns
Q_{rr}	Diode Reverse Recovery Charge		-	0.48	-	μC
I_{rm}	Diode Peak Reverse Recovery Current	$T_J=25^\circ C$ $I_F=15A$, $dI/dt=200A/\mu s$, $V_{CE}=400V$	-	5.8	-	A
SWITCHING PARAMETERS, (Load Inductive, T_J=150°C)						
$t_{D(on)}$	Turn-On DelayTime	$T_J=150^\circ C$ $V_{GE}=15V$, $V_{CE}=400V$, $I_C=15A$, $R_G=20\Omega$, Parasitic Inductance=100nH	-	21	-	ns
t_r	Turn-On Rise Time		-	19	-	ns
$t_{D(off)}$	Turn-Off Delay Time		-	91	-	ns
t_f	Turn-Off Fall Time		-	8	-	ns
E_{on}	Turn-On Energy		-	0.54	-	mJ
E_{off}	Turn-Off Energy		-	0.19	-	mJ
E_{total}	Total Switching Energy		-	0.73	-	mJ
t_{rr}	Diode Reverse Recovery Time		-	235	-	ns
Q_{rr}	Diode Reverse Recovery Charge		-	1.1	-	μC
I_{rm}	Diode Peak Reverse Recovery Current	$T_J=150^\circ C$ $I_F=15A$, $dI/dt=200A/\mu s$, $V_{CE}=400V$	-	8.5	-	A

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TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

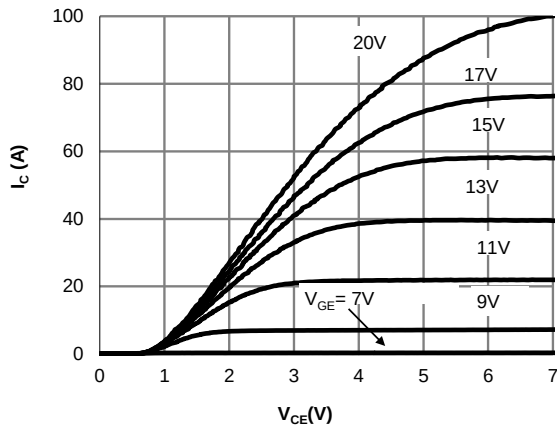


Figure 1: Output Characteristic
($T_j=25^\circ\text{C}$)

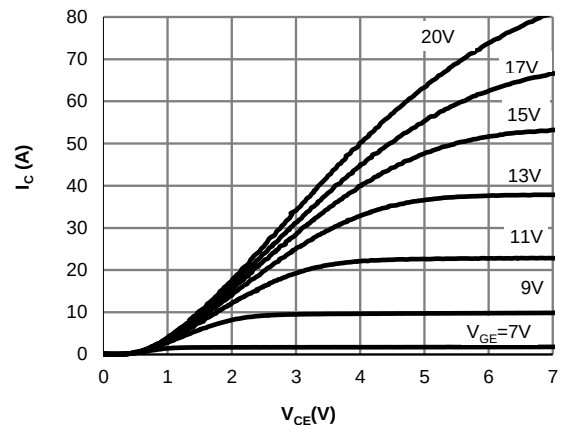


Figure 2: Output Characteristic
($T_j=150^\circ\text{C}$)

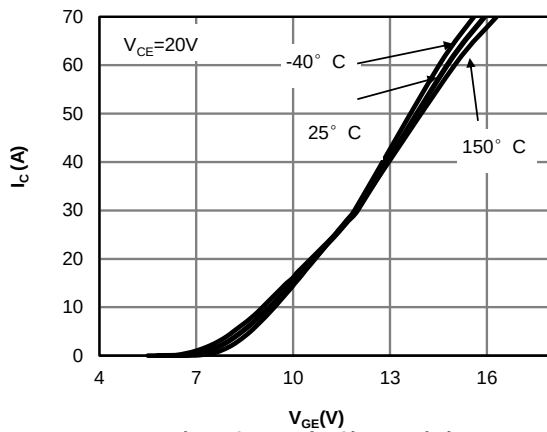


Figure 3: Transfer Characteristic

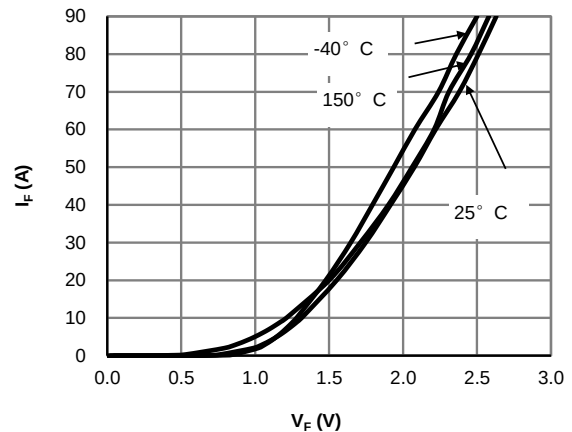


Figure 4: Diode Characteristic

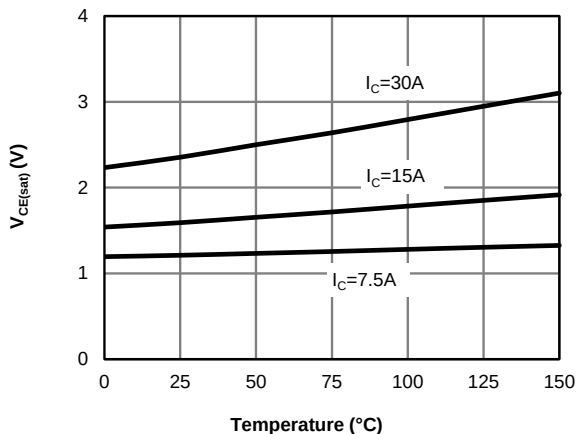


Figure 5: Collector-Emitter Saturation Voltage vs. Junction Temperature

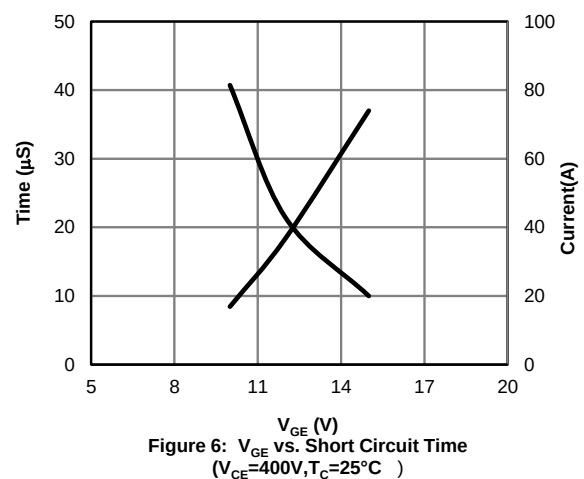


Figure 6: V_{GE} vs. Short Circuit Time
($V_{CE}=400\text{V}, T_c=25^\circ\text{C}$)

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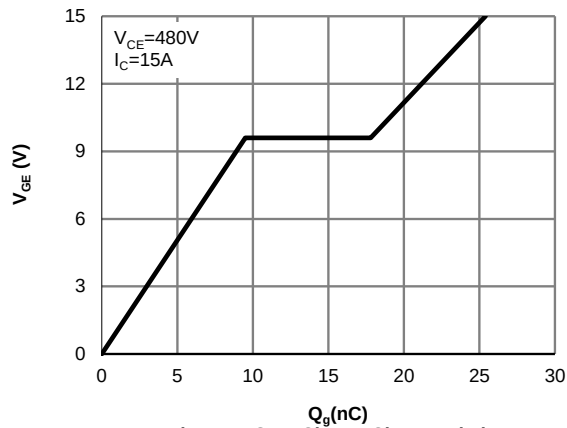


Figure 7: Gate-Charge Characteristics

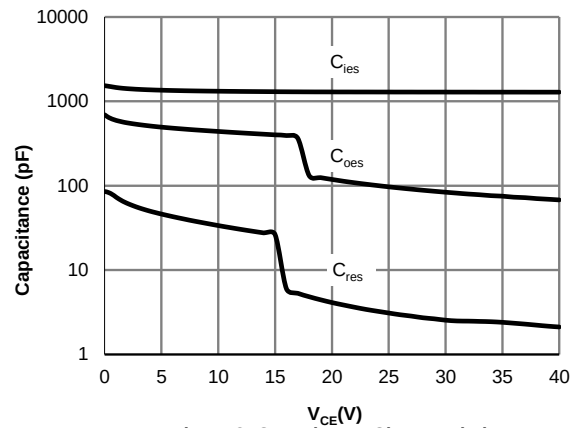


Figure 8: Capacitance Characteristic

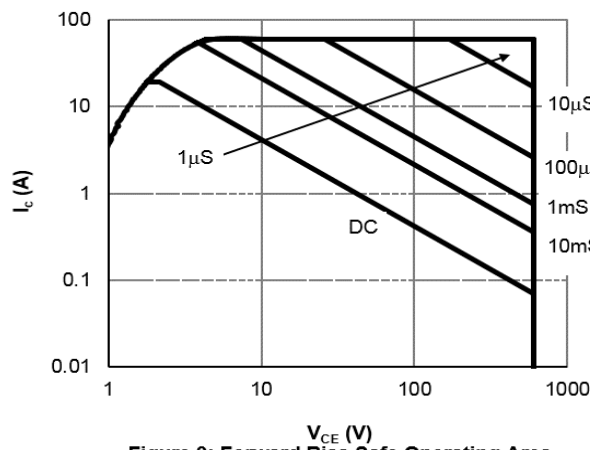


Figure 9: Forward Bias Safe Operating Area
($T_C=25^\circ\text{C}$, $V_{GE}=15\text{V}$)

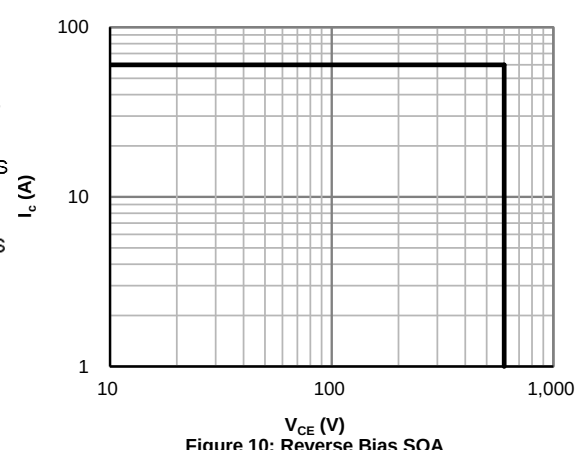


Figure 10: Reverse Bias SOA
($T_J=150^\circ\text{C}$, $V_{GE}=15\text{V}$)

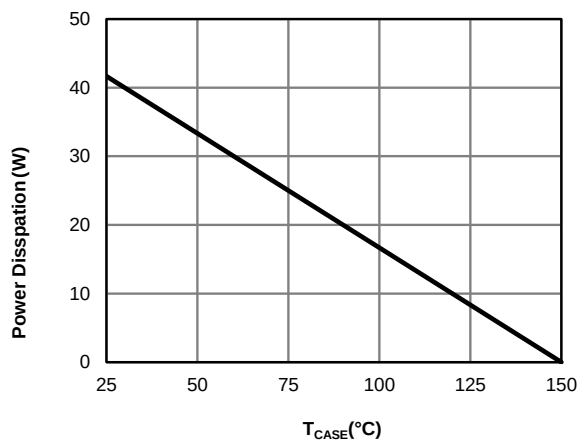
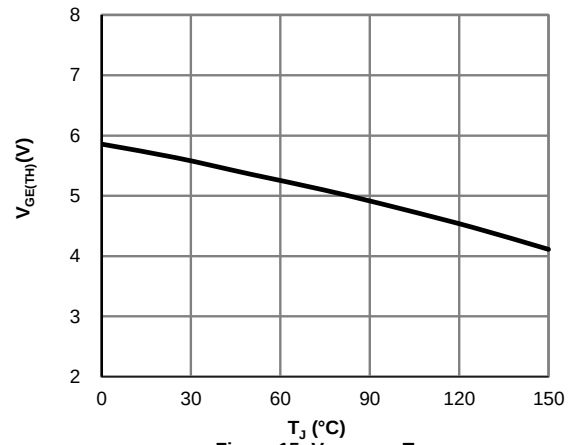
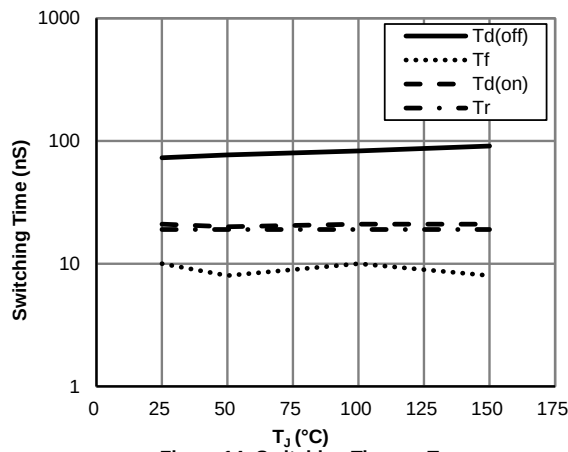
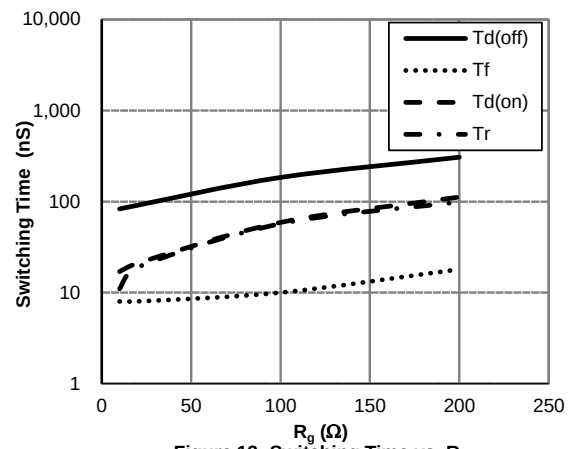
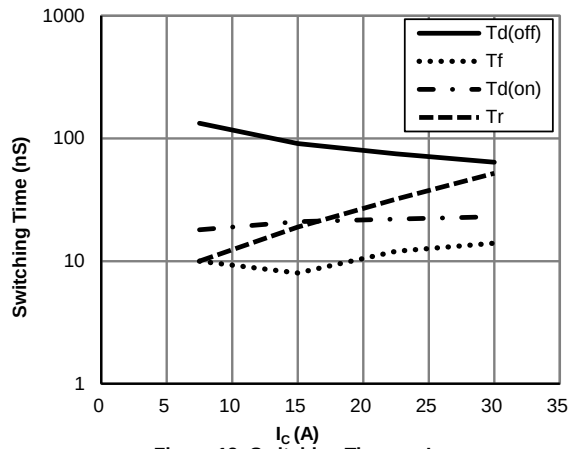


Figure 11: Power Dissipation as a Function of Case

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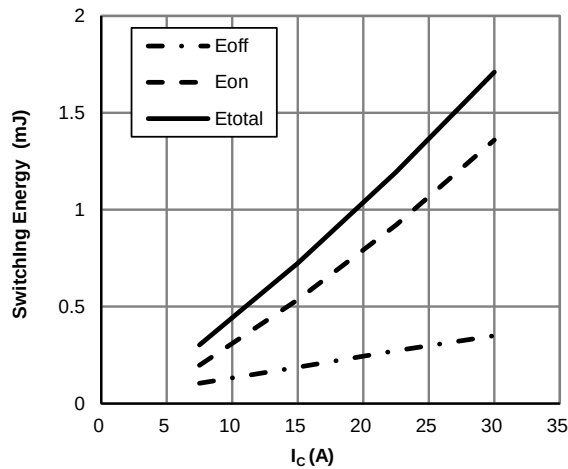


Figure 16: Switching Loss vs. I_C
($T_J=150^\circ\text{C}$, $V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $R_g=20\Omega$)

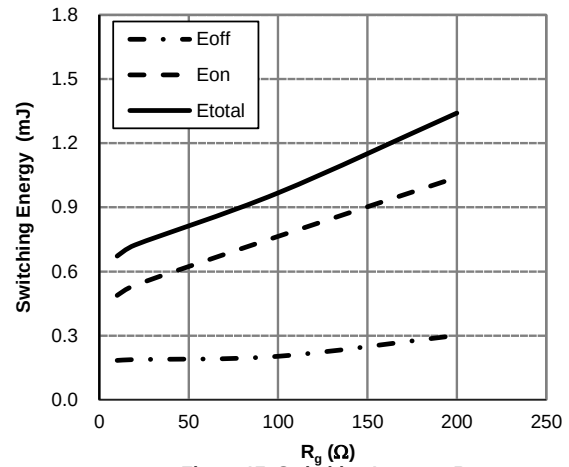


Figure 17: Switching Loss vs. R_g
($T_J=150^\circ\text{C}$, $V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $I_C=15\text{A}$)

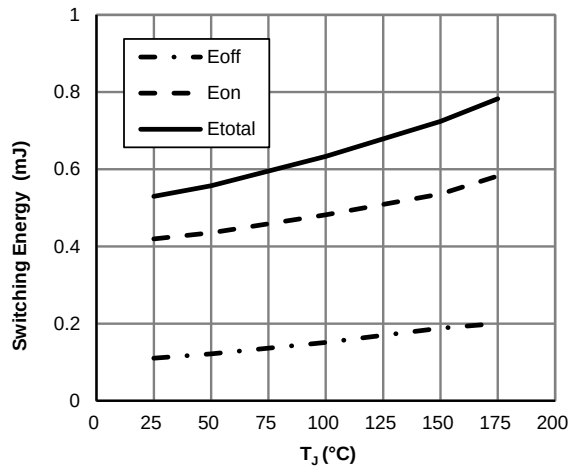


Figure 18: Switching Loss vs. T_J
($V_{GE}=15\text{V}$, $V_{CE}=400\text{V}$, $I_C=15\text{A}$, $R_g=20\Omega$)

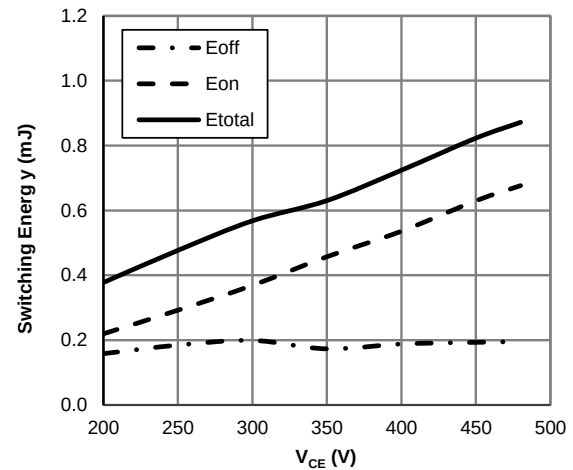


Figure 19: Switching Loss vs. V_{CE}
($T_J=150^\circ\text{C}$, $V_{GE}=15\text{V}$, $I_C=15\text{A}$, $R_g=20\Omega$)

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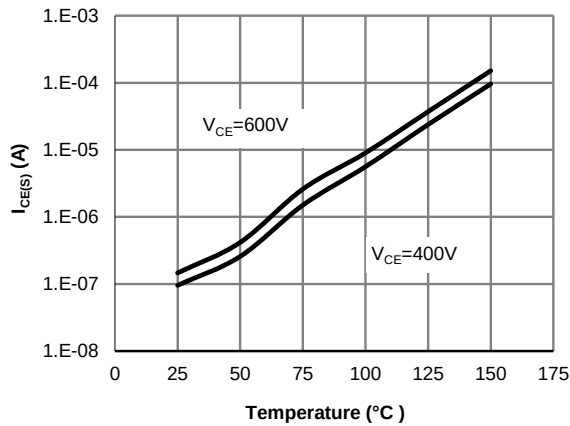


Figure 20: Diode Reverse Leakage Current vs. Junction Temperature

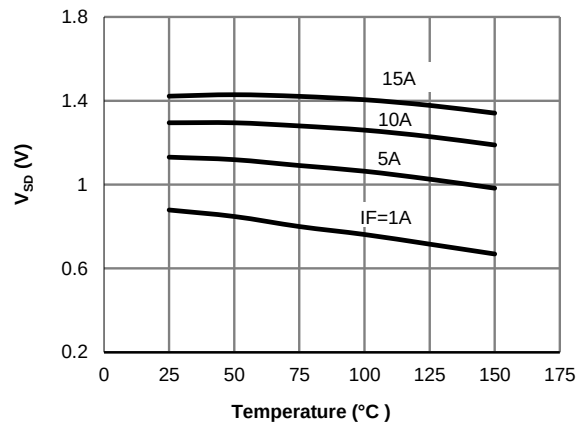


Figure 21: Diode Forward voltage vs. Junction Temperature

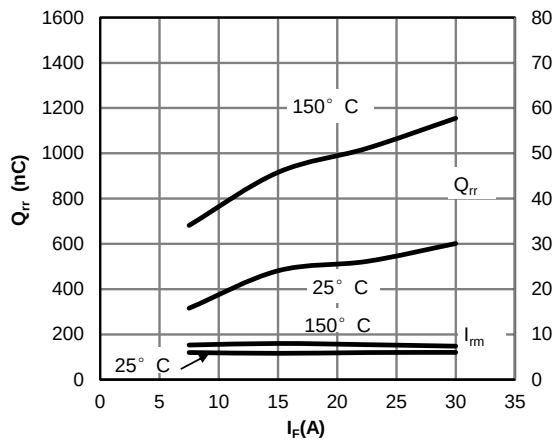


Figure 22: Diode Reverse Recovery Charge and Peak Current vs. Conduction Current
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/\mu s$)

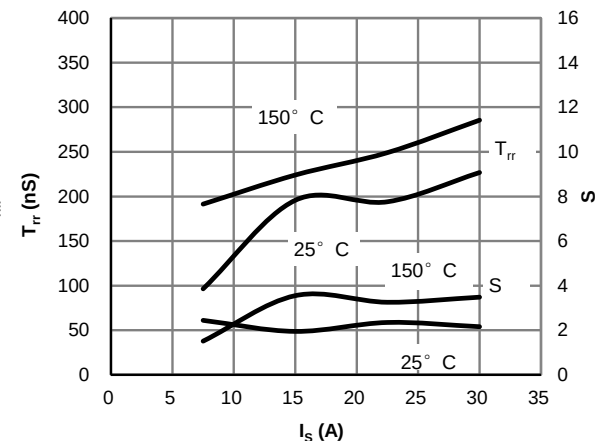


Figure 23: Diode Reverse Recovery Time and Softness Factor vs. Conduction Current
($V_{GE}=15V, V_{CE}=400V, di/dt=200A/\mu s$)

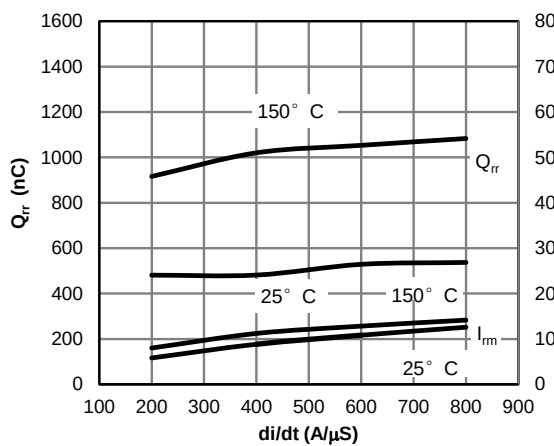


Figure 24: Diode Reverse Recovery Charge and Peak Current vs. di/dt
($V_{GE}=15V, V_{CE}=400V, I_F=15A$)

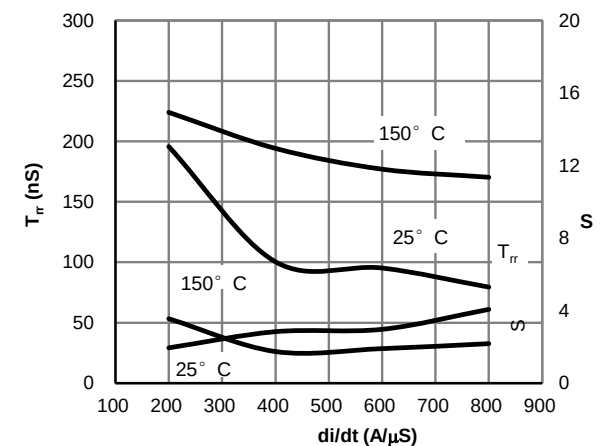
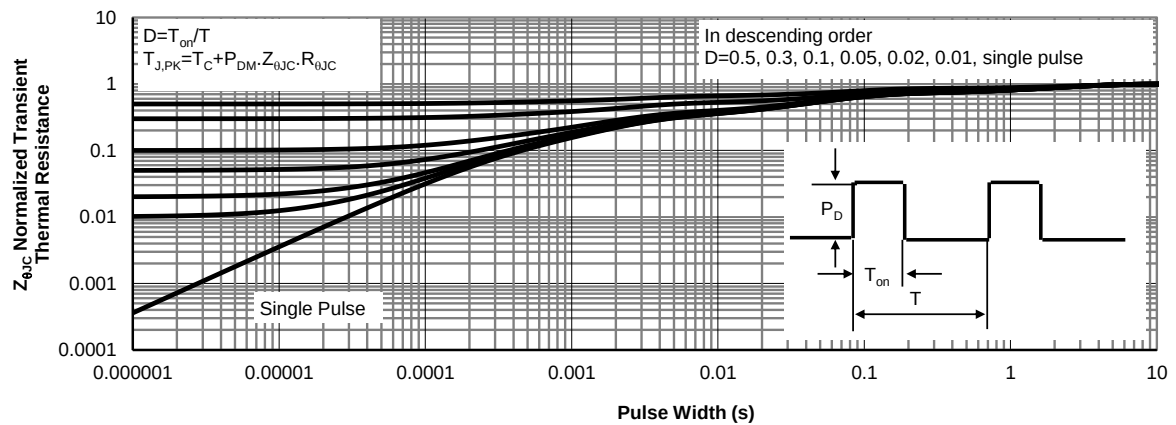
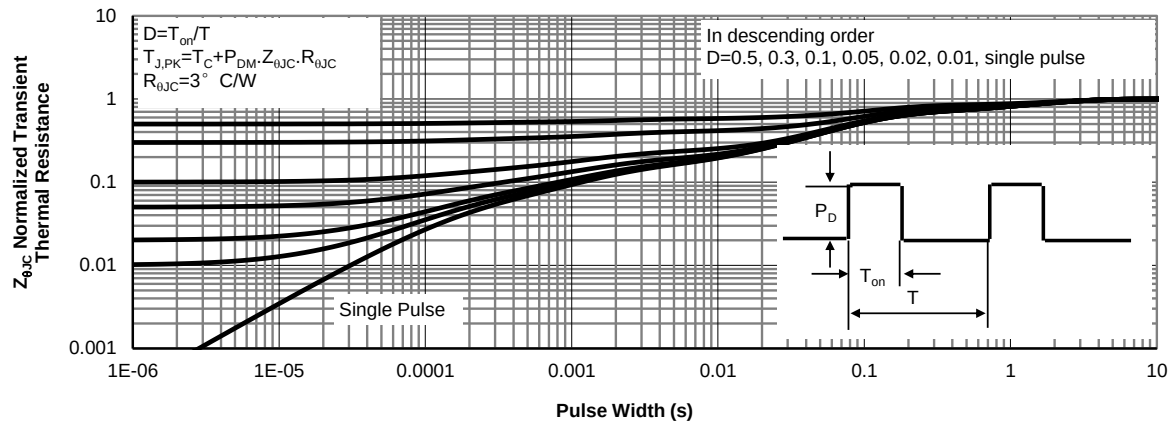
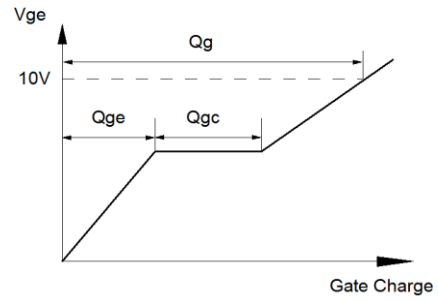
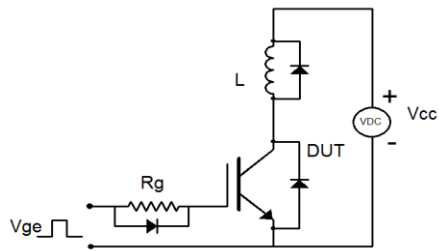


Figure 25: Diode Reverse Recovery Time and Softness Factor vs. di/dt
($V_{GE}=15V, V_{CE}=400V, I_F=15A$)

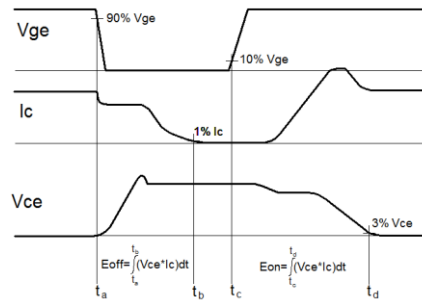
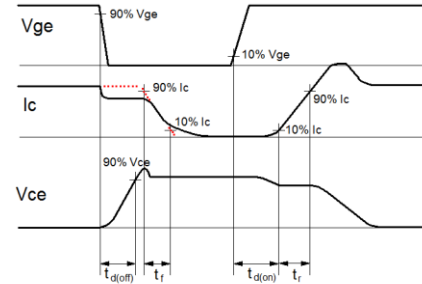
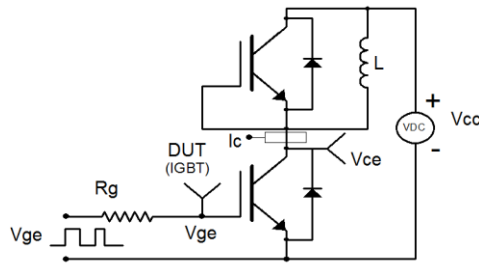
TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS



Gate Charge Test Circuit & Waveform



Inductive Switching Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

