



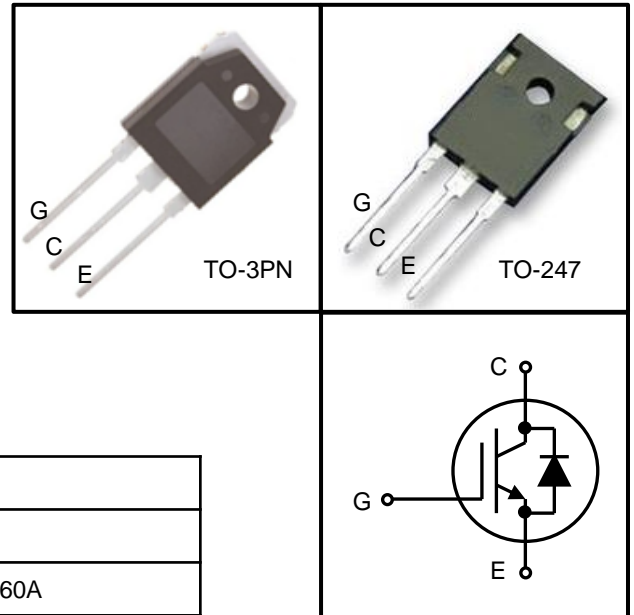
600V 40A High Speed IGBT

FEATURES

- 600V Field Stop technology
- Low saturation voltage
- High switching frequency
- Very soft , fast recovery anti-parallel diode

APPLICATIONS

- Welding converters
- Uninterruptible Power Supply
- Converters with high switching frequency



Ordering Information		
Device	Package	Marking
TGW40N60A	TO-247	TGW40N60A
TGV40N60A	TO-3PN	TGV40N60A

Absolute Maximum Ratings $T_C = 25^\circ\text{C}$, unless otherwise noted			
Parameter	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CES}	600	V
Continuous Collector Current $T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	I_C	-- 80 40	A
Pulsed Collector Current (note)	I_{Cpulse}	160	A
Gate-Emitter Voltage	V_{GES}	± 20	V
Short Circuit Withstand Time $V_{GE} = 15\text{V}$, $V_{CC} = 400\text{V}$, $T_C \leq 125^\circ\text{C}$	t_{SC}	5	μs
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	290	W
Operating Junction and Storage Temperature Range	T_J	-55~+150	$^\circ\text{C}$
Maximum Soldering Temperature, 1/8" from Case for 5s	--	300	$^\circ\text{C}$

Note : Pulse width limited by maximum junction temperature



Thermal Resistance			
Parameter	Symbol	Value	Unit
IGBT Thermal Resistance, Junction-to-Case	R_{thJC}	0.43	K/W
Thermal Resistance, Junction-to-Ambient	R_{thJA}	40	

Specifications $T_J = 25^\circ\text{C}$, unless otherwise noted						
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Static						
Collector-Emitter Breakdown Voltage	$V_{(BR)CES}$	$V_{GE} = 0V, I_C = 250\mu\text{A}$	600	--	--	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C = 40A,$ $T_J = 25^\circ\text{C},$ $T_J = 125^\circ\text{C}$	-- --	2.0 2.2	2.5 --	V
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$I_C = 0.5\text{mA}, V_{CE} = V_{GE}$	4.0	5.0	6.5	V
Zero Gate Voltage Collector Current	I_{CES}	$V_{CE} = 600V, V_{GE} = 0V,$ $T_J = 25^\circ\text{C}$	--	--	40.0	μA
Gate-Emitter Leakage Current	I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$	--	--	± 100	nA
Dynamic						
Input Capacitance	C_{iss}	$V_{CE} = 30V,$ $V_{GE} = 0V,$ $f = 1\text{MHz}$	--	4450	--	pF
Output Capacitance	C_{oss}		--	255	--	
Reverse Transfer Capacitance	C_{rss}		--	55	--	
Gate Charge	Q_g	$V_{CC} = 480V,$ $I_C = 40A,$ $V_{GE} = 15V$	--	130	--	nC
Gate-Emitter Charge	Q_{ge}		--	25	--	
Gate-Collector Charge	Q_{gc}		--	50	--	



Switching Characteristic $T_J = 25^\circ\text{C}$						
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
IGBT Characteristic						
Turn-on Delay Time	$t_{d(on)}$	$T_J = 25^\circ\text{C}$, $V_{CC} = 400\text{V}$, $I_C = 40\text{A}$, $V_{GE} = 15\text{V}$, $R_G = 10\Omega$, Inductive load	--	267	--	ns
Rise Time	t_r		--	150	--	
Turn-off Delay Time	$t_{d(off)}$		--	175	--	
Fall Time	t_f		--	67	--	
Turn-on Energy	E_{on}		--	0.72	--	mJ
Turn-off Energy	E_{off}		--	0.65	--	
Total Switching Energy	E_{ts}		--	1.37	--	
Anti-Parallel Diode Characteristic						
Diode Reverse Recovery Time	t_{rr}	$T_J = 25^\circ\text{C}$, $V_R = 300\text{V}$, $I_F = 10\text{A}$, $di_F/dt = 200\text{A}/\mu\text{s}$	--	103	--	ns
Diode Reverse Recovery Charge	Q_{rr}		--	220	--	nC
Diode Peak Reverse Recovery Current	I_{rrm}		--	4	--	A
Diode Forward Voltage	V_{FM}	IF=15A	--	1.5	--	V

Switching Characteristic $T_J = 125^\circ\text{C}$						
Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
IGBT Characteristic						
Turn-on Delay Time	$t_{d(on)}$	$T_J = 125^\circ\text{C}$, $V_{CC} = 600\text{V}$, $I_C = 40\text{A}$, $V_{GE} = 15\text{V}$, $R_G = 10\Omega$, Inductive load	--	275	--	ns
Rise Time	t_r		--	155	--	
Turn-off Delay Time	$t_{d(off)}$		--	196	--	
Fall Time	t_f		--	75	--	
Turn-on Energy	E_{on}		--	0.87	--	mJ
Turn-off Energy	E_{off}		--	0.90	--	
Total Switching Energy	E_{ts}		--	1.77	--	



Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 1. Typical Output Characteristics

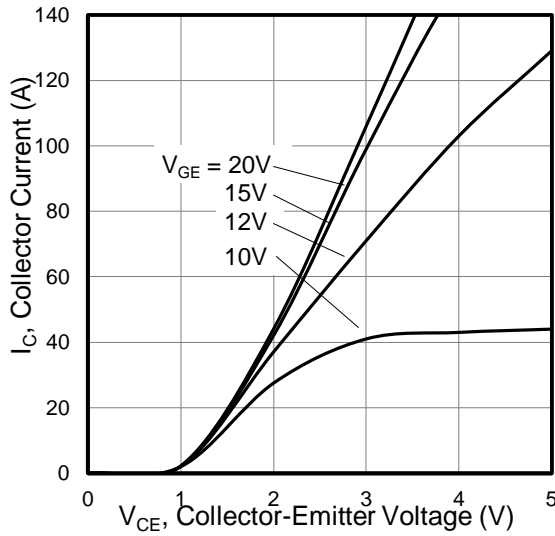


Figure 2. Typical Saturation Voltage

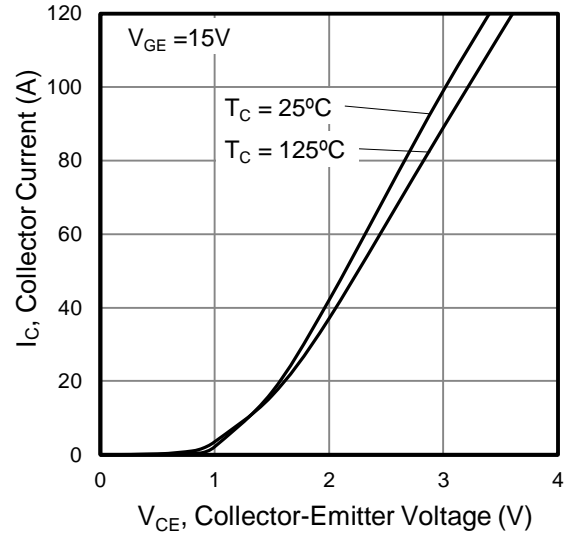


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

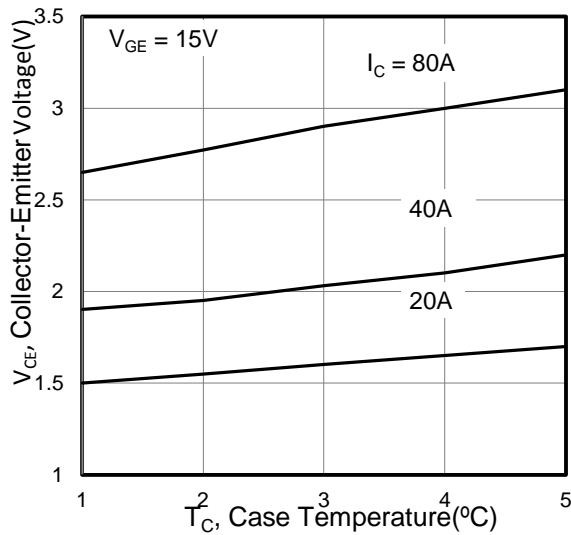


Figure 4. Collector Current vs. T_J

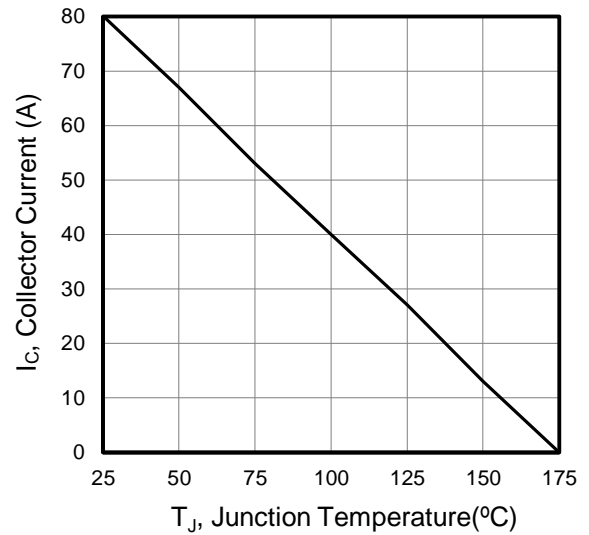


Figure 5. Saturation Voltage vs. V_{GE}

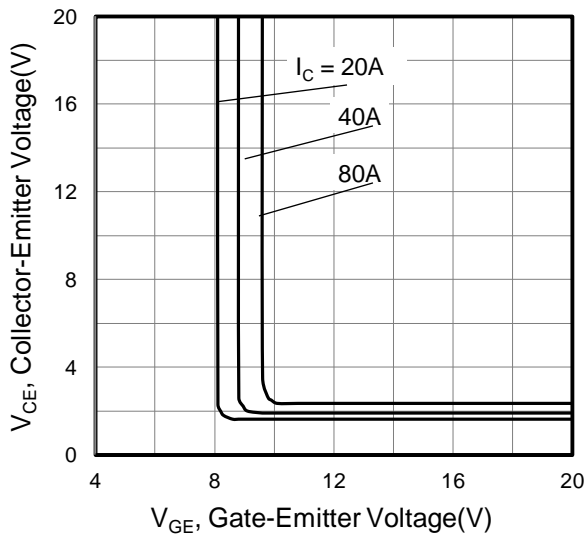
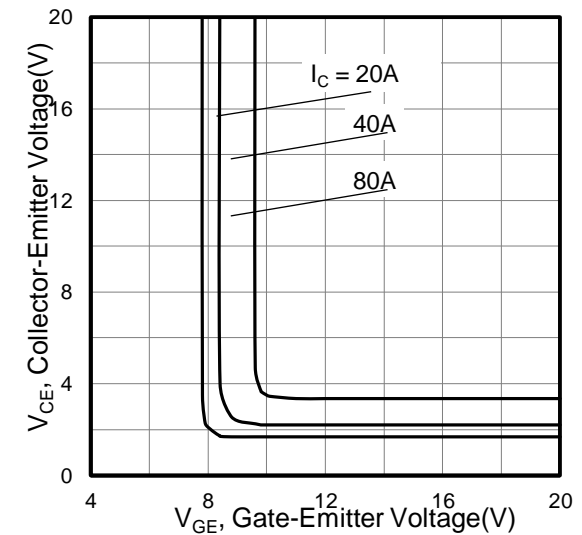


Figure 6. Saturation Voltage vs. V_{GE}





Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 7. Capacitance Characteristics

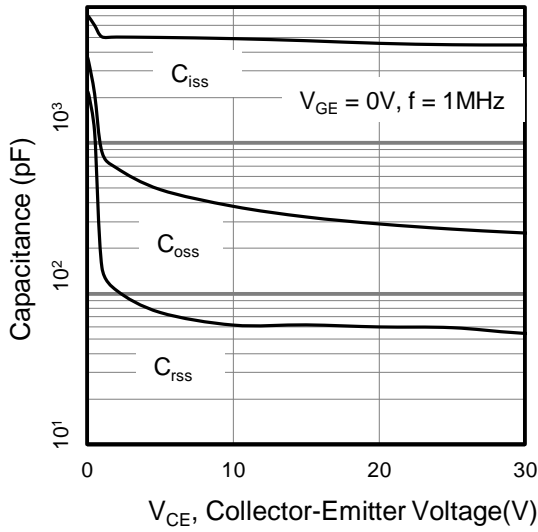


Figure 8. Turn-On Characteristics vs. R_G

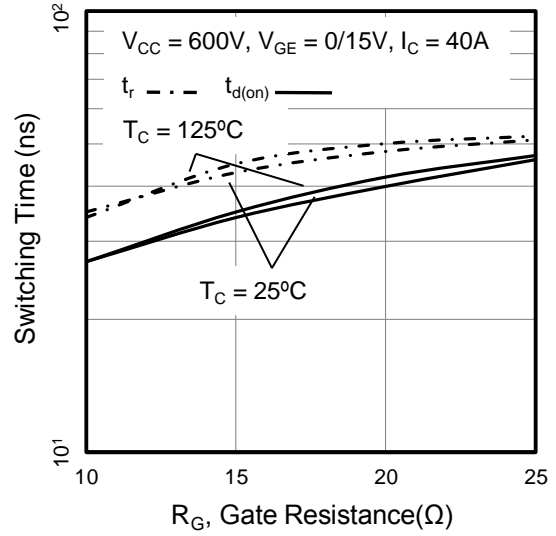


Figure 9. Turn-Off Characteristics vs. R_G

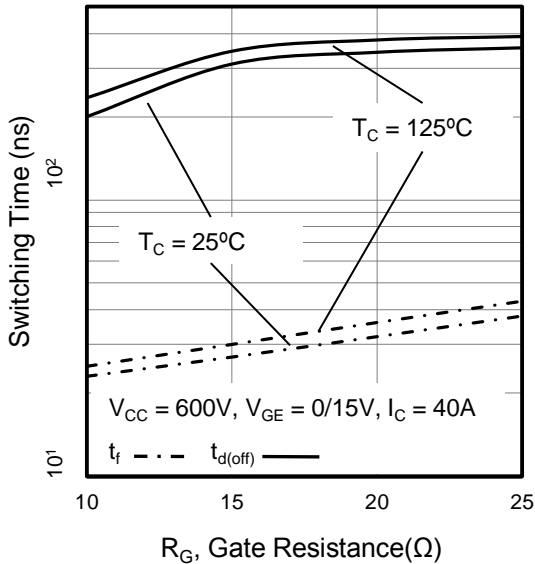


Figure 10. Switching Loss vs. R_G

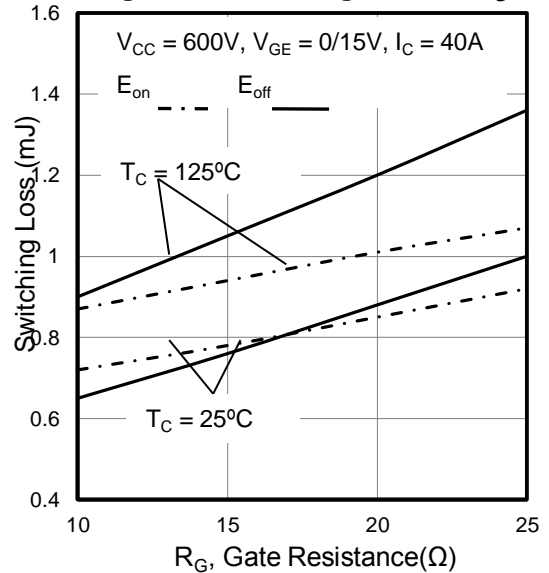


Figure 11. Turn-On Characteristics vs. I_C

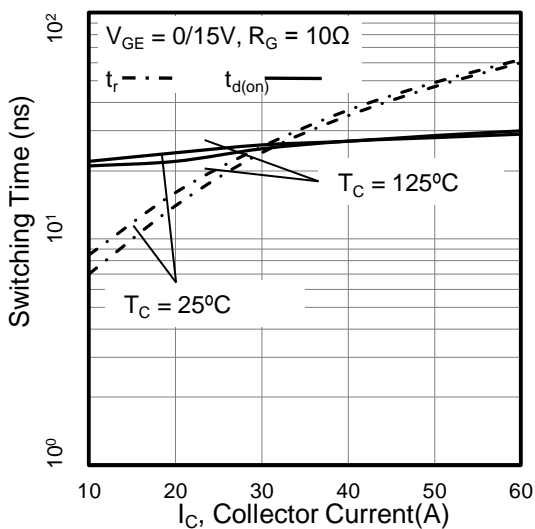
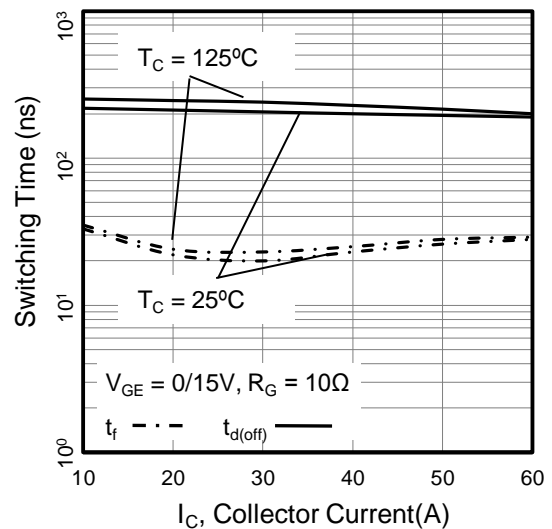


Figure 12. Turn-Off Characteristics vs. I_C





Typical Characteristics $T_J = 25^\circ\text{C}$, unless otherwise noted

Figure 13. Switching Loss vs. I_C

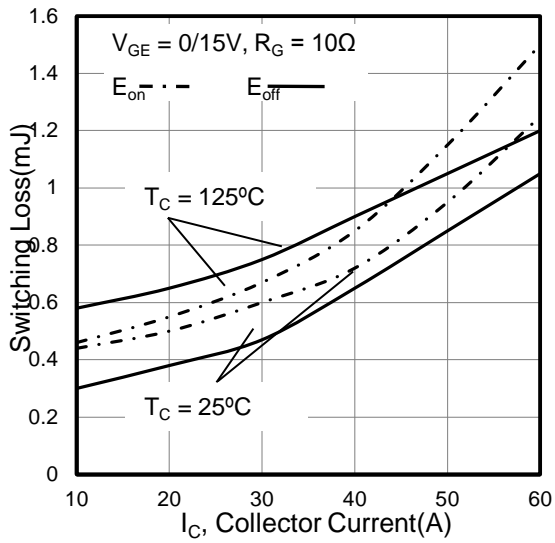


Figure 14. Gate Charge Characteristics

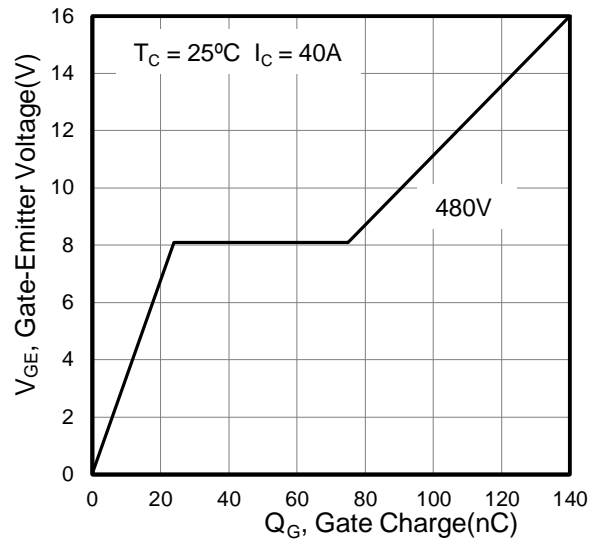


Figure 15. SOA Characteristics

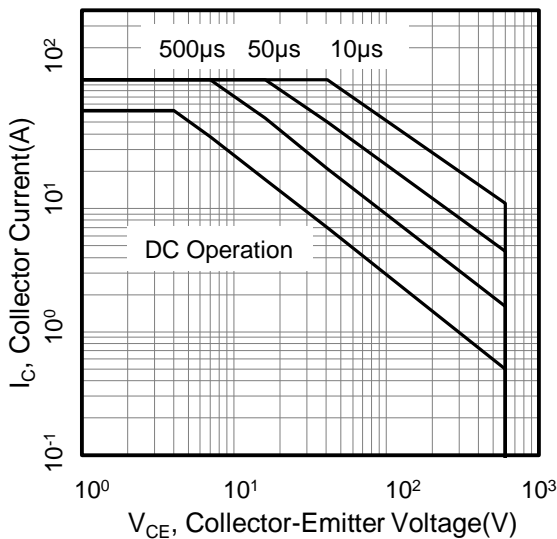


Figure 16. Turn-Off SOA

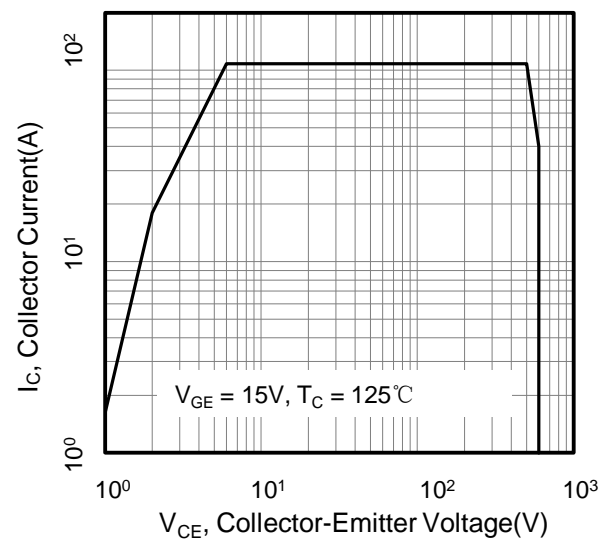


Figure 17. IGBT Transient Thermal Impedance

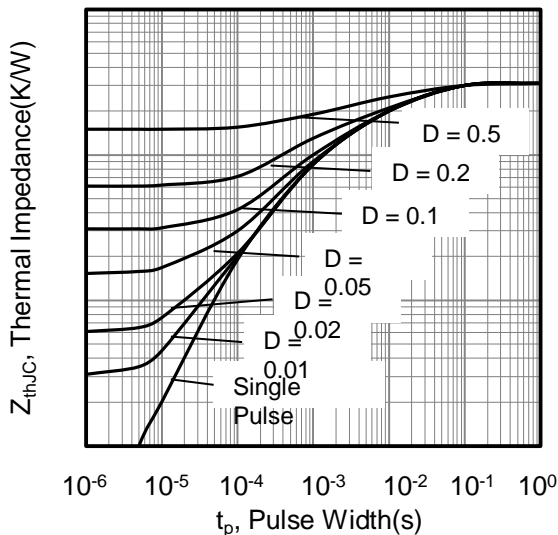




Figure A: Dynamic Test Circuit

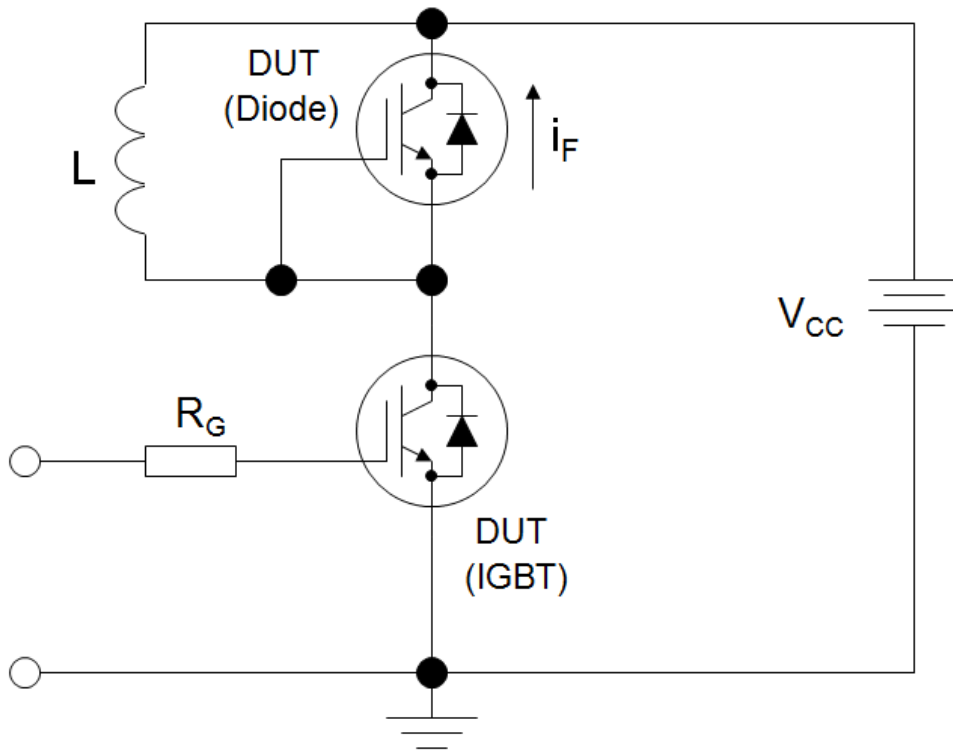


Figure B: Definition of Switching Times

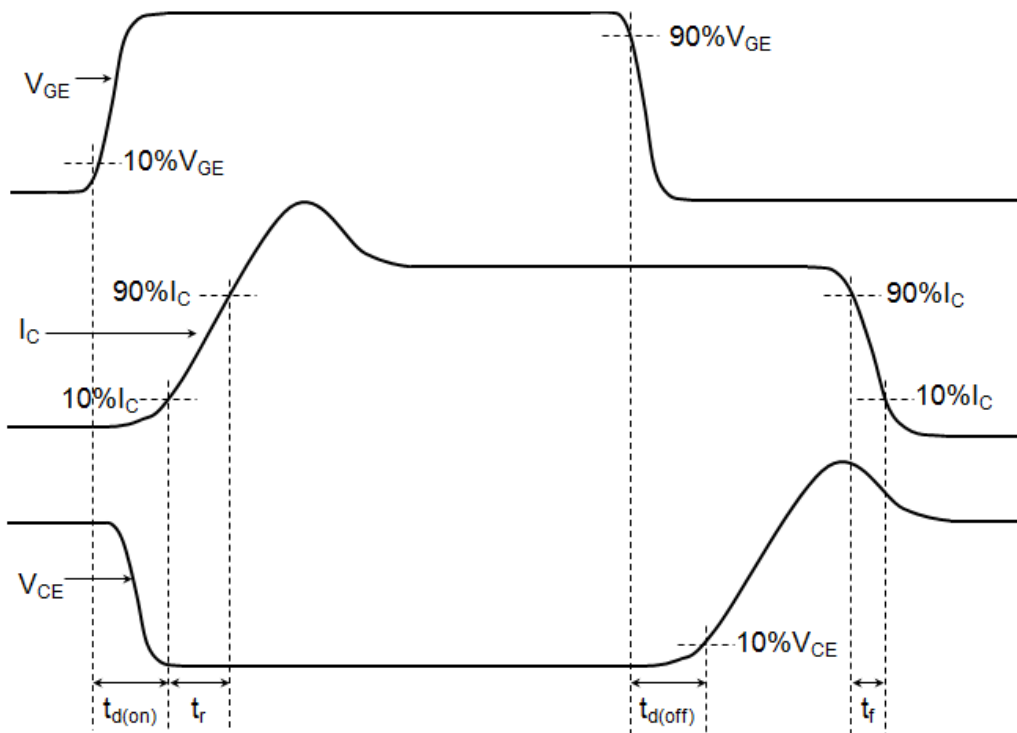




Figure C. Definition of Switching Losses

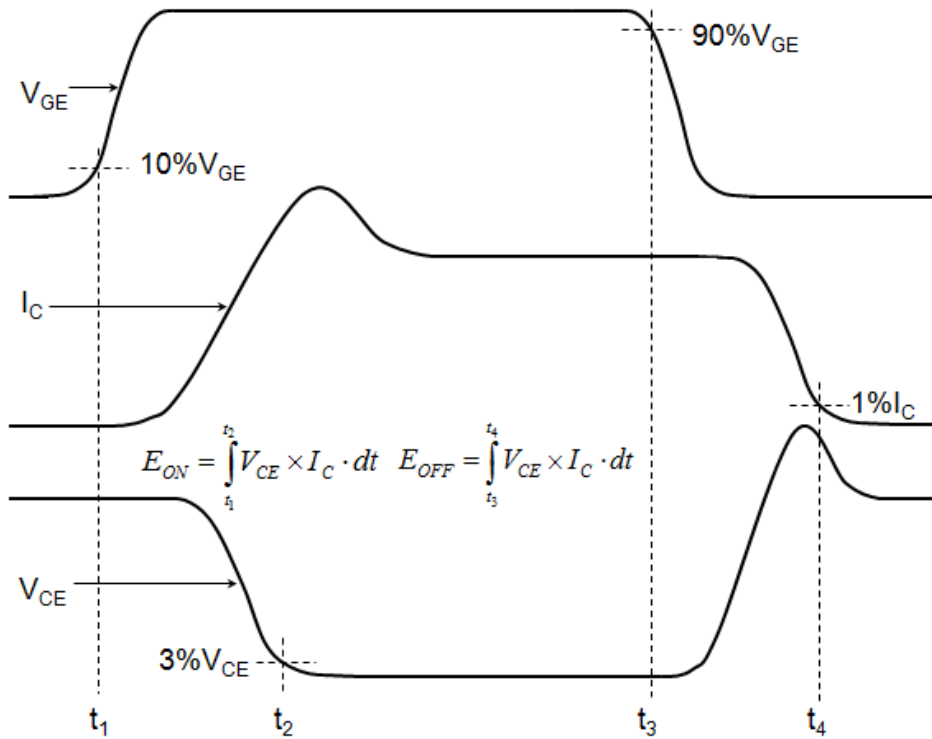
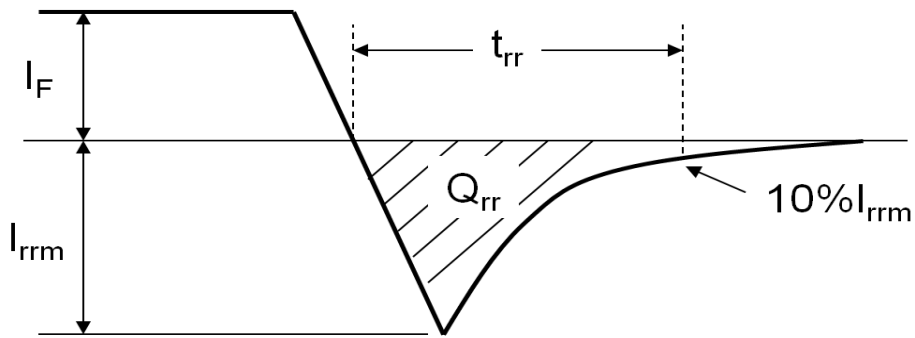
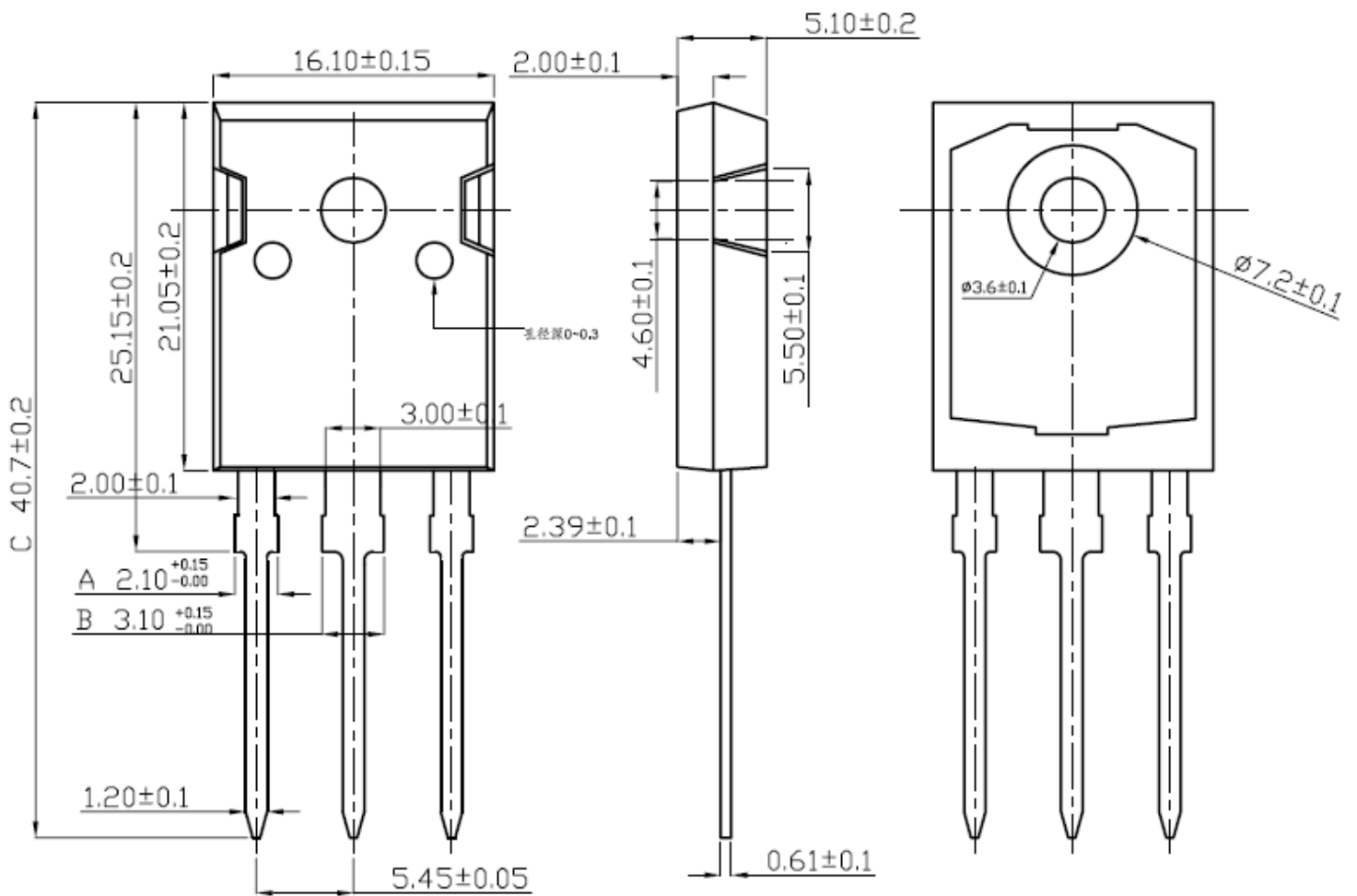


Figure D. Definition of Diodes Reverse Recovery Characteristics



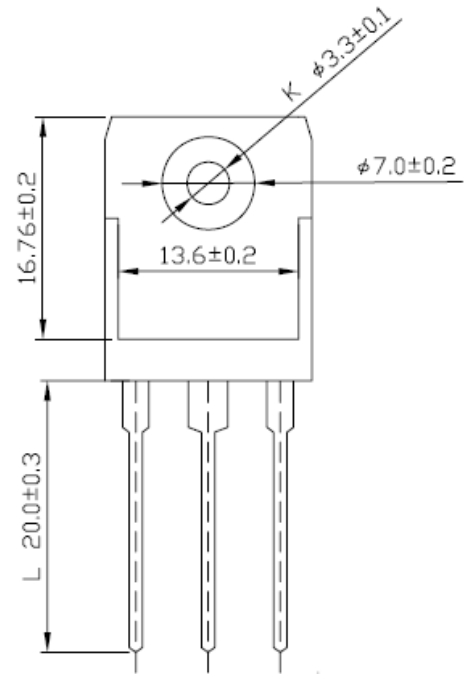
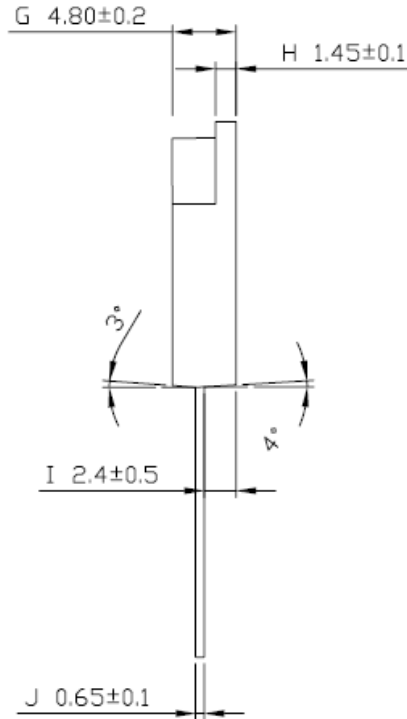
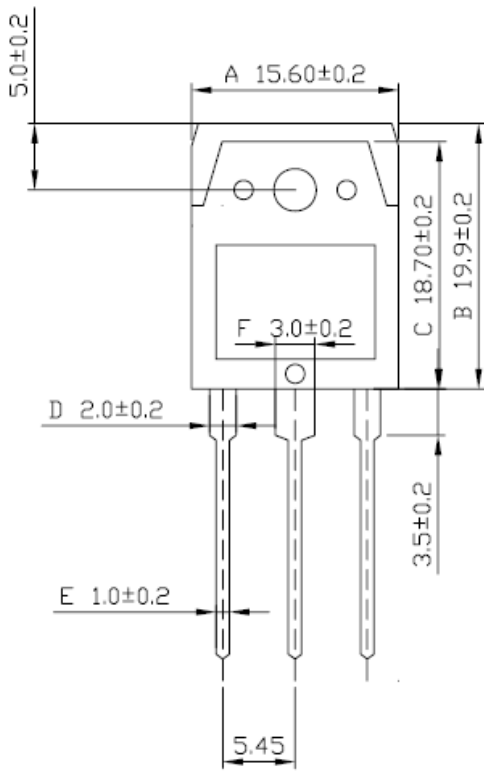


TO-247





TO-3PN





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