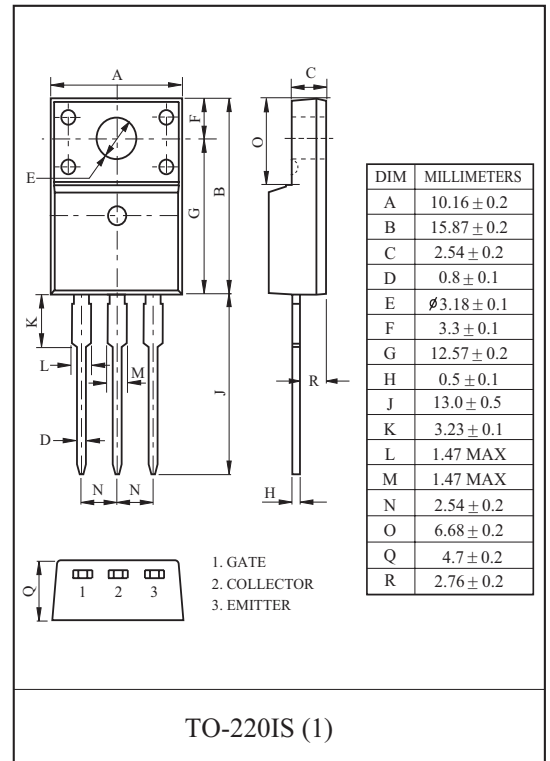


General Description

KEC NPT Trench IGBTs offer low switching losses, high energy efficiency and high avalanche ruggedness as well as short circuit ruggedness. It is designed for hard switching applications.

FEATURES

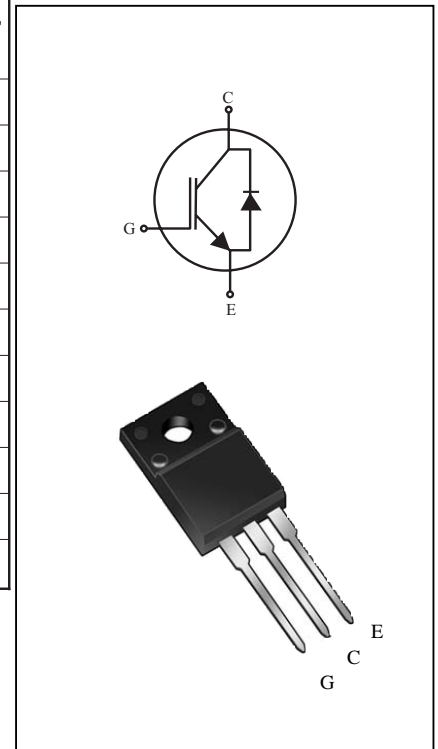
- High speed switching
- High system efficiency
- Short Circuit Withstand Times 5us(@T_C=100)
- Extremely enhanced avalanche capability



MAXIMUM RATING (Ta=25)

CHARACTERISTIC	SYMBOL	RATING		UNIT
		TO-220IS(1)	TO-220AB	
Collector-Emitter Voltage	V _{CES}	600		V
Gate-Emitter Voltage	V _{GES}	± 20		V
Collector Current	@T _C =25	15	30	A
	@T _C =100	7.5	15	A
Pulsed Collector Current	I _{CM} ⁽¹⁾	60		A
Diode Continuous Forward Current	@T _C =25	I _F ⁽¹⁾ 30		A
Diode Maximum Forward Current	I _{FM} ⁽¹⁾	60		A
Maximum Power Dissipation	@T _C =25	41.6	138	W
	@T _C =100	17	55	W
Maximum Junction Temperature	T _j	150		
Storage Temperature Range	T _{stg}	-55 to + 150		

(1) : Pulse width limited by maximum junction temperature.



THERMAL CHARACTERISTIC

CHARACTERISTIC	SYMBOL	MAX.		UNIT
		TO-220IS(1)	TO-220AB	
Thermal Resistance, Junction to Case (IGBT)	R _{thJC}	3.0	0.9	/W
Thermal Resistance, Junction to Case (DIODE)	R _{thJCD}	3.6	2.8	/W
Thermal Resistance, Junction to Ambient	R _{thJA}	62.5	62.5	/W

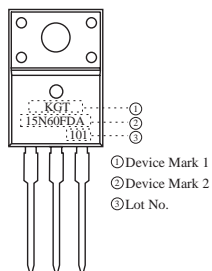
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ELECTRICAL CHARACTERISTICS (Ta=25)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Static							
Collector-Emitter Breakdown Voltage	BV_{CES}	$V_{GE}=0V, I_C=250\mu A$	600	-	-	V	
Collector Cut-off Current	I_{CES}	$V_{GE}=0V, V_{CE}=600V$	-	-	250	μA	
Gate Leakage Current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$	-	-	± 100	nA	
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=2mA$	4.5	5.7	7.0	V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=15A$	-	1.7	1.95	V	
		$V_{GE}=15V, I_C=15A, T_C=125$	-	2.0	-	V	
		$V_{GE}=15V, I_C=30A, T_C=25$	-	2.3	-	V	
Dynamic							
Total Gate Charge	Q_g	$V_{CC}=300V, V_{GE}=15V, I_C=15A$	-	70	-	nC	
Gate-Emitter Charge	Q_{ge}		-	10	-	nC	
Gate-Collector Charge	Q_{gc}		-	35	-	nC	
Turn-On Delay Time	$t_{d(on)}$	$V_{CC}=300V, I_C=15A, V_{GE}=15V, R_G=10$ Inductive Load, $T_C=25$	-	30	-	ns	
Rise Time	t_r		-	20	-	ns	
Turn-Off Delay Time	$t_{d(off)}$		-	90	-	ns	
Fall Time	t_f		-	35	-	ns	
Turn-On Switching Loss	E_{on}		-	0.18	-	mJ	
Turn-Off Switching Loss *Note(1)	E_{off}		-	0.25	-	mJ	
Total Switching Loss	E_{ts}		-	0.43	-	mJ	
Turn-On Delay Time	$t_{d(on)}$		$V_{CC}=300V, I_C=15A, V_{GE}=15V, R_G=10$ Inductive Load, $T_C=125$	-	35	-	ns
Rise Time	t_r			-	25	-	ns
Turn-Off Delay Time	$t_{d(off)}$			-	95	-	ns
Fall Time	t_f	-		70	-	ns	
Turn-On Switching Loss	E_{on}	-		0.28	-	mJ	
Turn-Off Switching Loss *Note(1)	E_{off}	-		0.4	-	mJ	
Total Switching Loss	E_{ts}	-		0.7	-	mJ	
Input Capacitance	C_{ies}	$V_{CE}=30V, V_{GE}=0V, f=1MHz$	-	1270	-	pF	
Output Capacitance	C_{oes}		-	90	-	pF	
Reverse Transfer Capacitance	C_{res}		-	45	-	pF	
Short Circuit Withstand Time	t_{sc}		$V_{CC}=300V, V_{GE}=15V, T_C=100$	5	-	-	μs

*Notes(1) Energy loss include tail current and diode reverse recovery.

Marking



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ELECTRICAL CHARACTERISTIC OF DIODE

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Diode Forward Voltage	V_F	$I_F = 15A$	$T_C = 25$	-	1.6	2.3	V
			$T_C = 125$	-	1.3	-	
Diode Reverse Recovery Time	t_{rr}	$I_F = 15A$ $di/dt = 800A/\mu s$	$T_C = 25$	-	45	80	ns
			$T_C = 125$	-	70	-	
Diode Peak Reverse Recovery Current	I_{rr}	$I_F = 15A$ $di/dt = 800A/\mu s$	$T_C = 25$	-	12	25	A
			$T_C = 125$	-	22	-	
Diode Reverse Recovery Charge	Q_{rr}	$I_F = 15A$ $di/dt = 800A/\mu s$	$T_C = 25$	-	300	1200	nC
			$T_C = 125$	-	1000	-	

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Fig 1. Saturation Voltage Characteristics

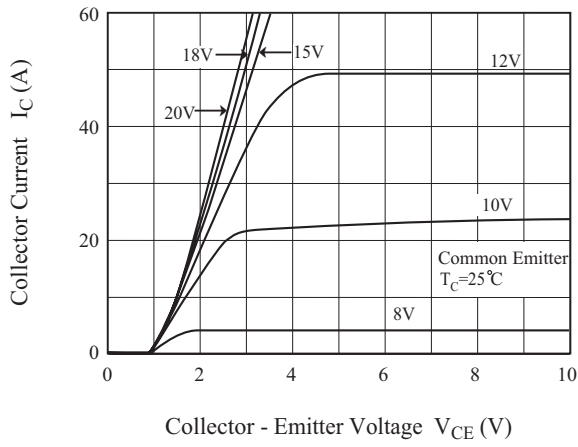


Fig 2. Saturation Voltage Characteristics

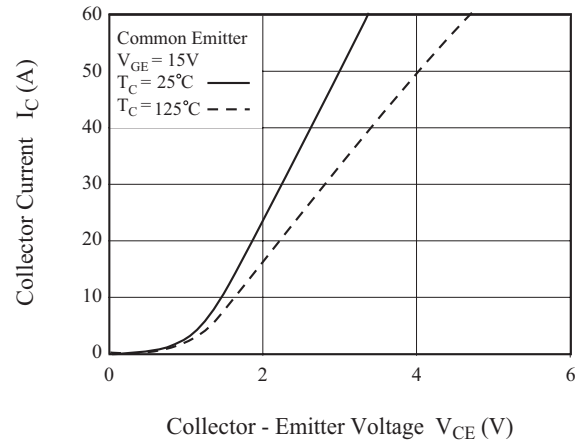


Fig 3. Saturation Voltage vs. Case Temperature

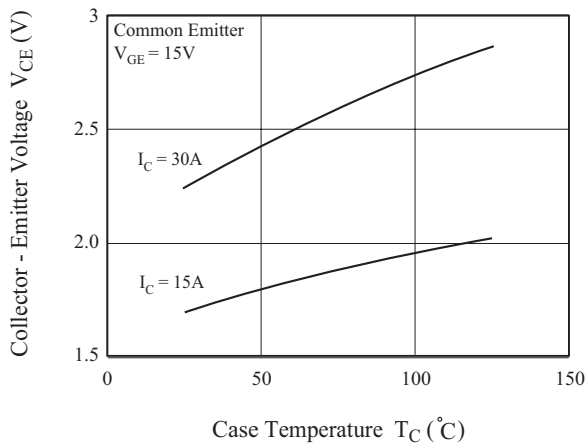


Fig 4. Saturation Voltage vs. V_{GE}

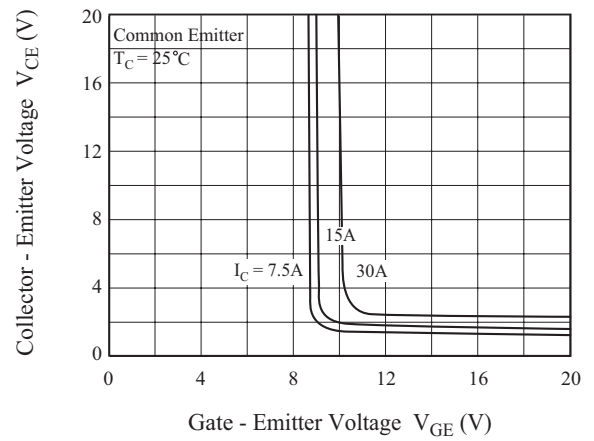


Fig 5. Saturation Voltage vs. V_{GE}

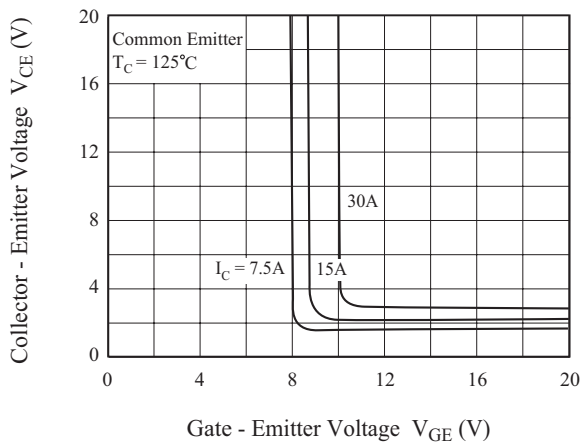
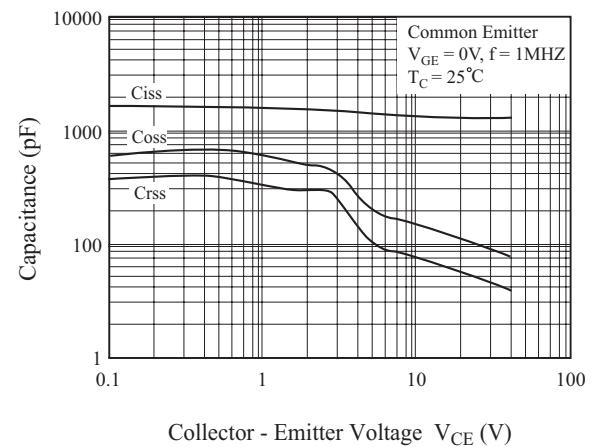


Fig 6. Capacitance Characteristics



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Fig 7. Turn-On Characteristics vs. Gate Resistance

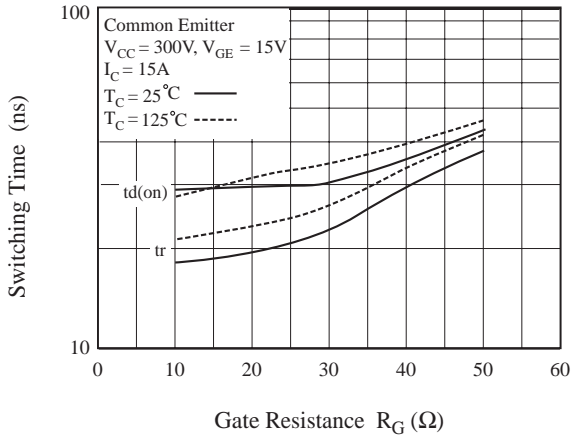


Fig 8. Turn-Off Characteristics vs. Gate Resistance

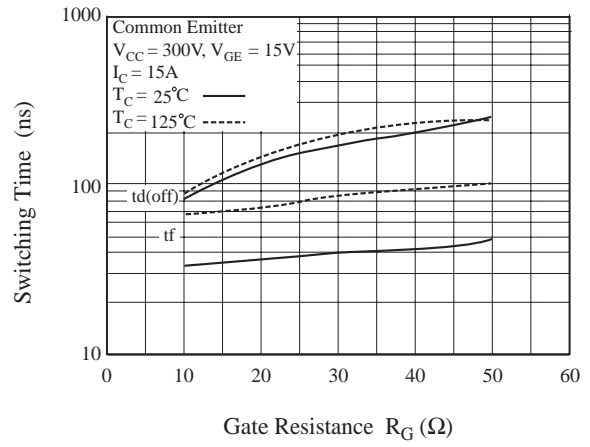


Fig 9. Turn-On Characteristics vs. Collector Current

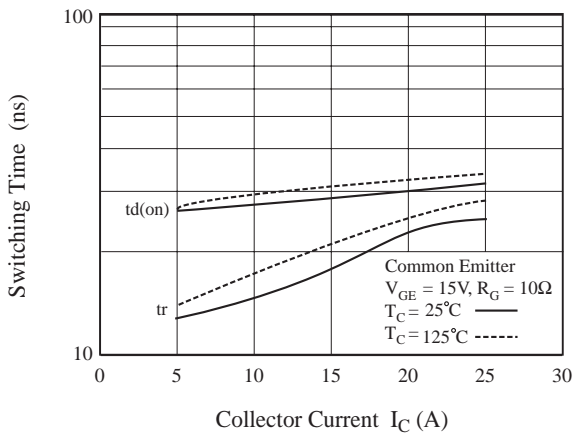


Fig 10. Turn-Off Characteristics vs. Collector Current

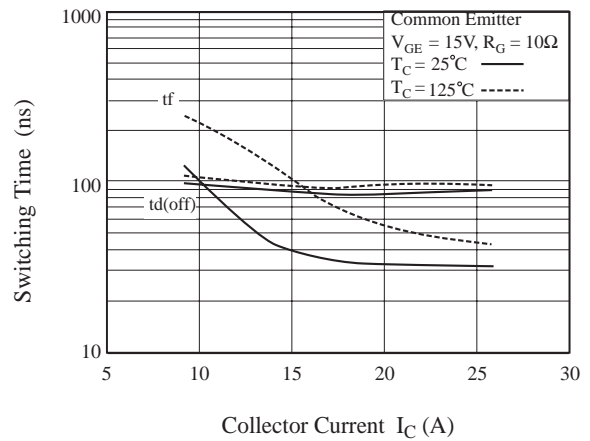


Fig 11. Switching Loss vs. Gate Resistance

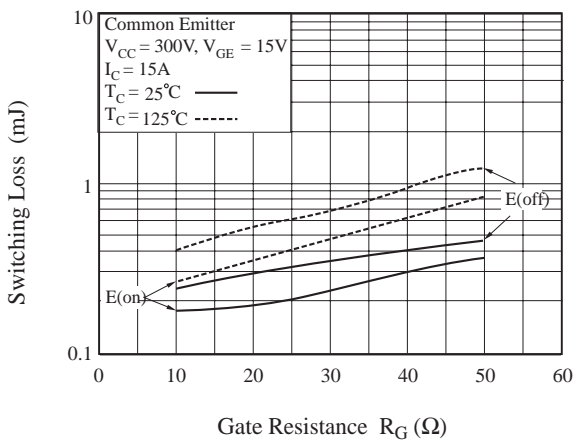
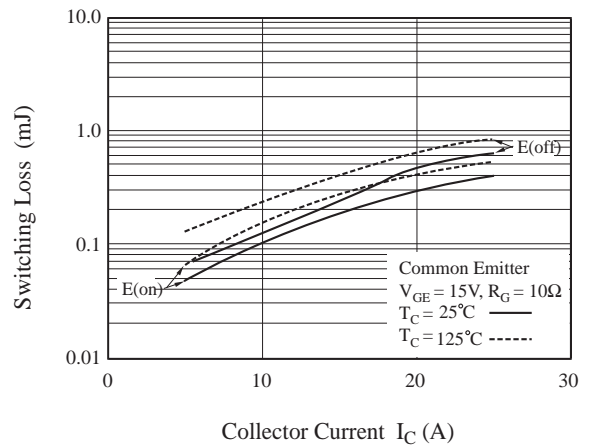


Fig 12. Switching Loss vs. Collector Current



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Fig 13. Gate Charge Characteristics

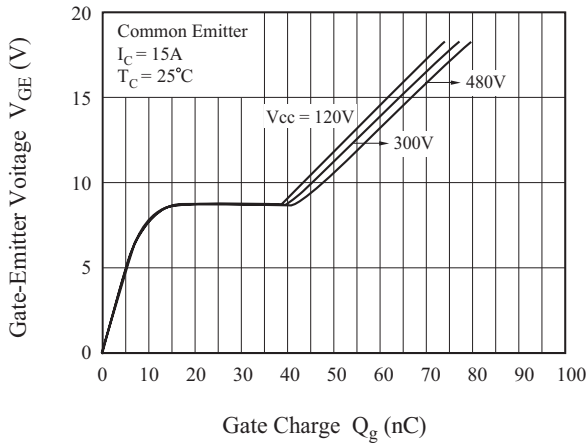


Fig 14. SOA Characteristics

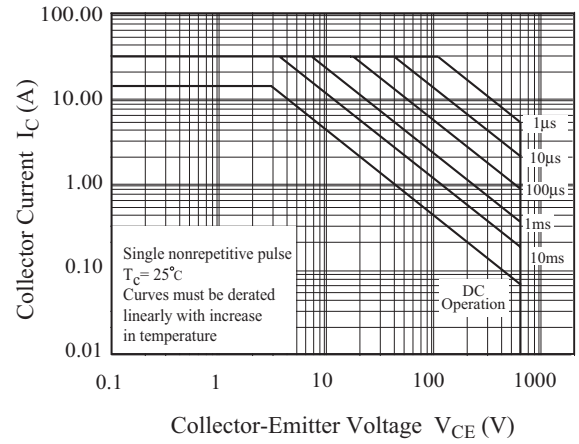


Fig 15. Turn-Off SOA

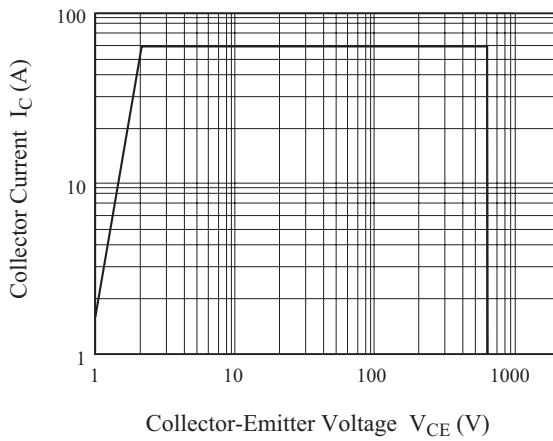
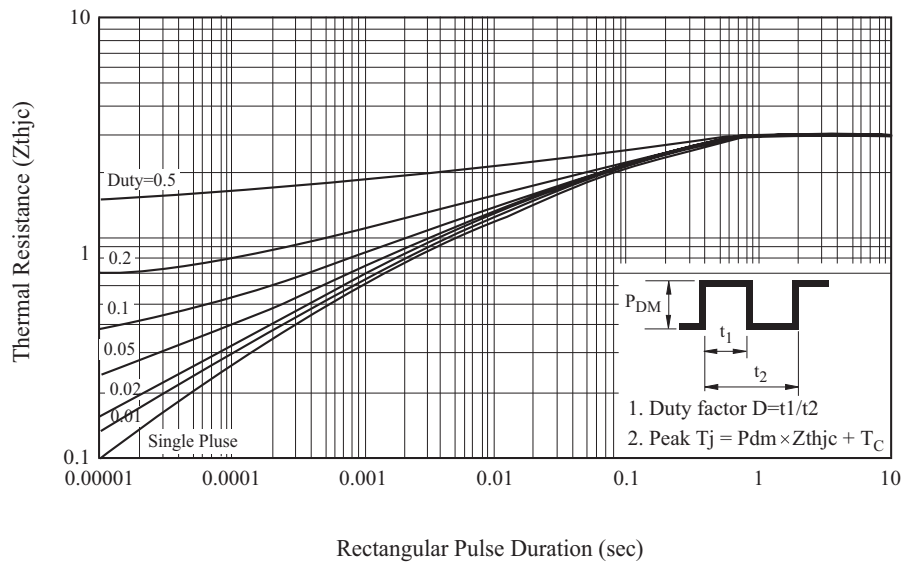


Fig 16. Transient Thermal Impedance of IGBT



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Fig 17. Collector Current vs Case Temperature

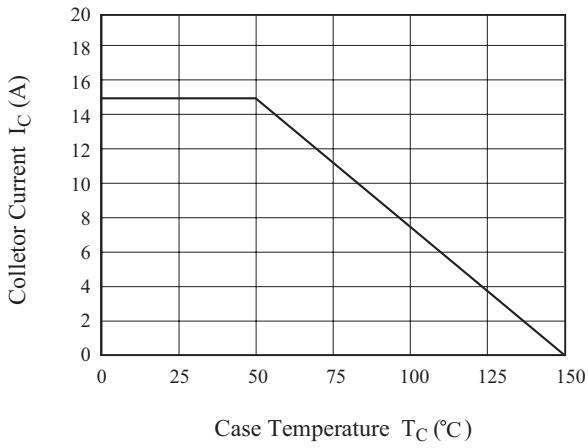


Fig 18. Collector Dissipation vs Case Temperature

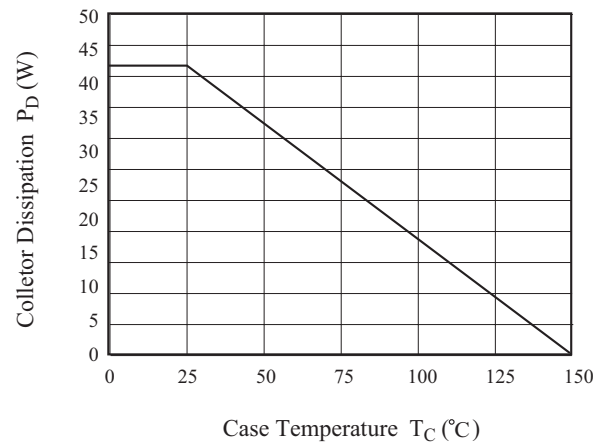


Fig 19. Forward Characteristics

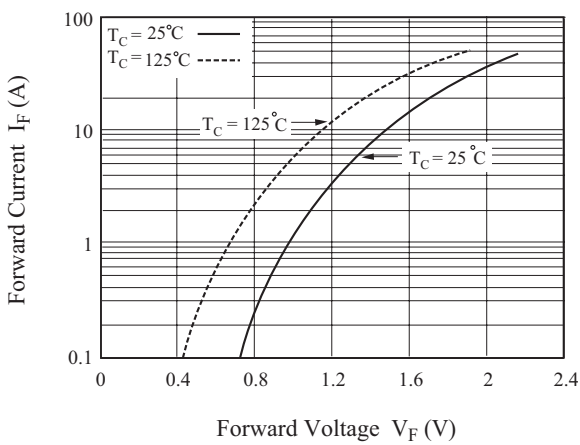


Fig 20. Reverse Recovery Current

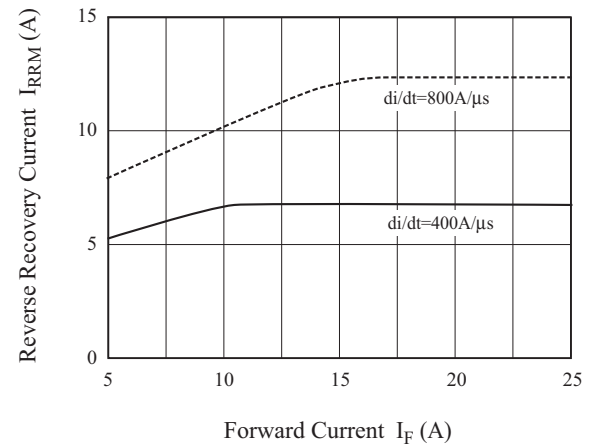


Fig 21. Reverse Recovery Time

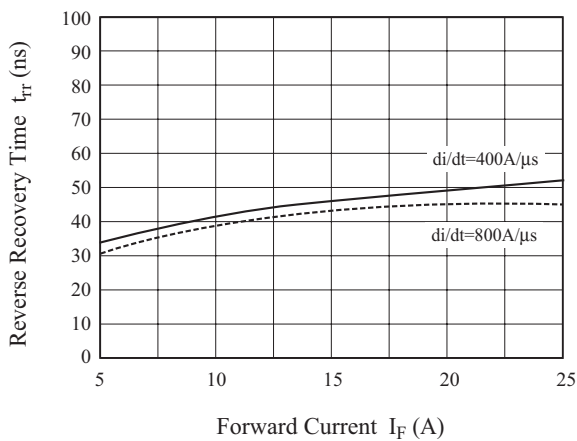


Fig 22. Switching Test Circuit

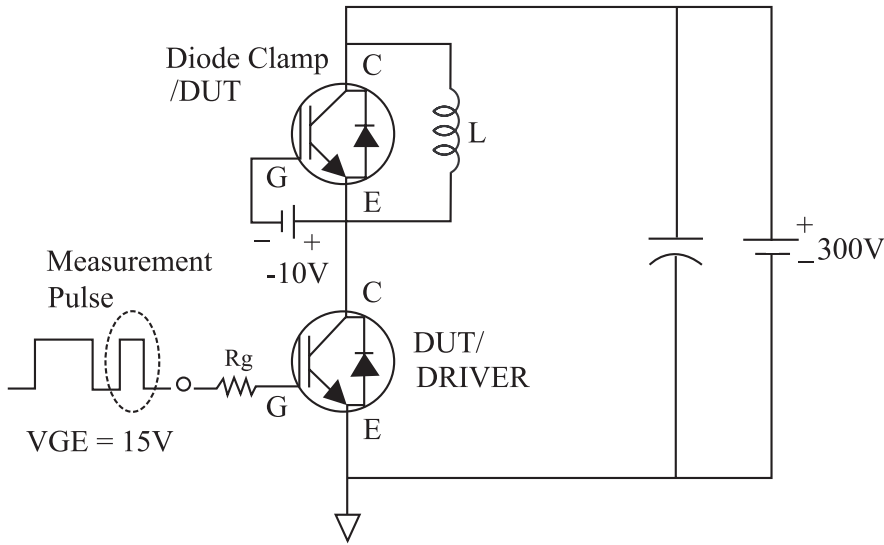


Fig 23. Definition Switching Time & Loss

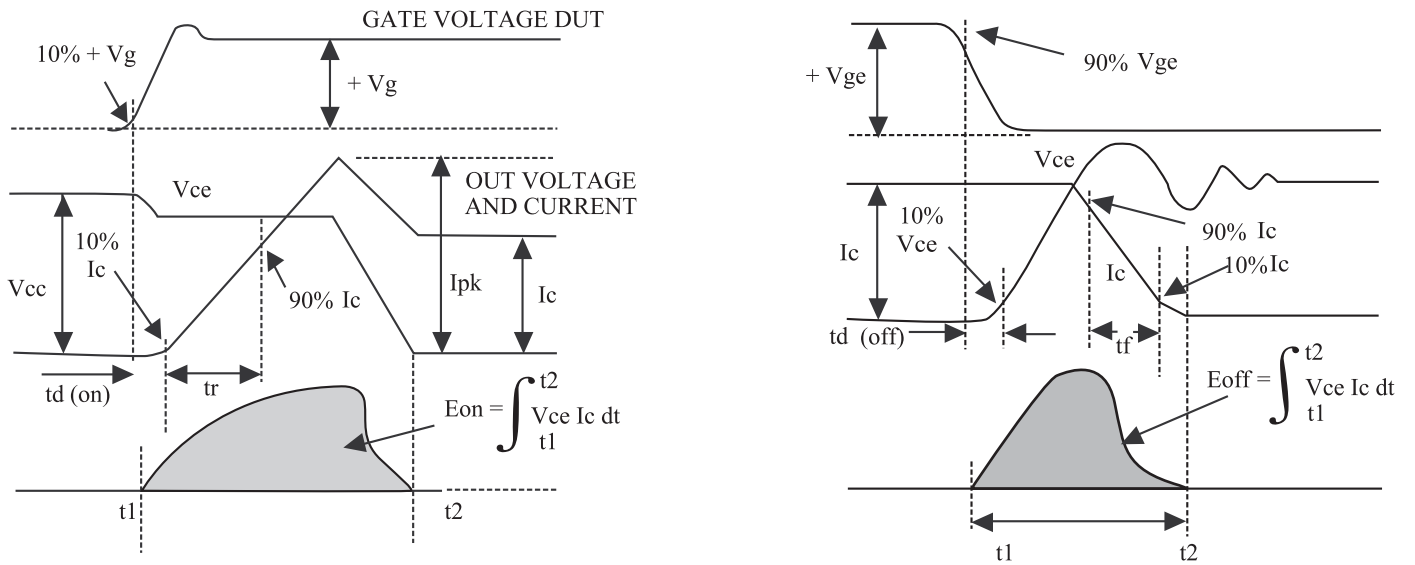


Fig 24. Definition Diode Switching Time

