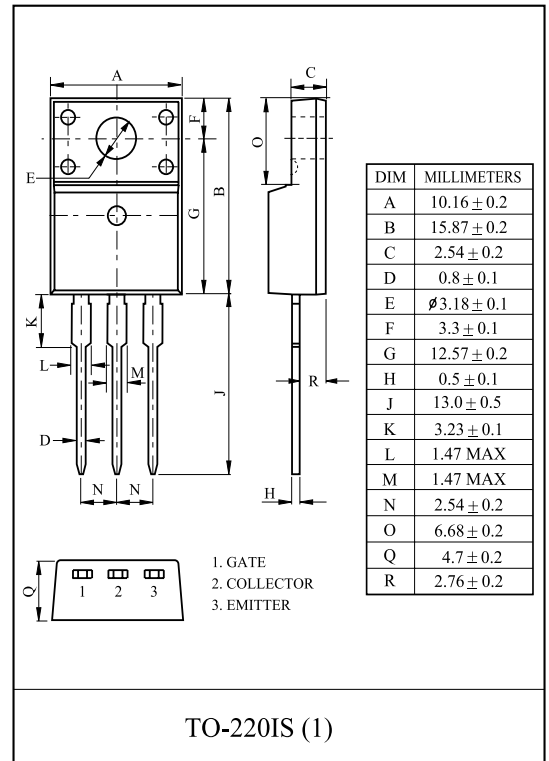


## General Description

KEC Field Stop Trench IGBTs offer low switching losses, high energy efficiency and short circuit ruggedness. It is designed for applications such as motor control, uninterrupted power

## FEATURES

- High speed switching
- High ruggedness, temperature stable behavior
- Short Circuit Withstand Times 5us(@T<sub>C</sub>=100 )
- Extremely enhanced avalanche capability

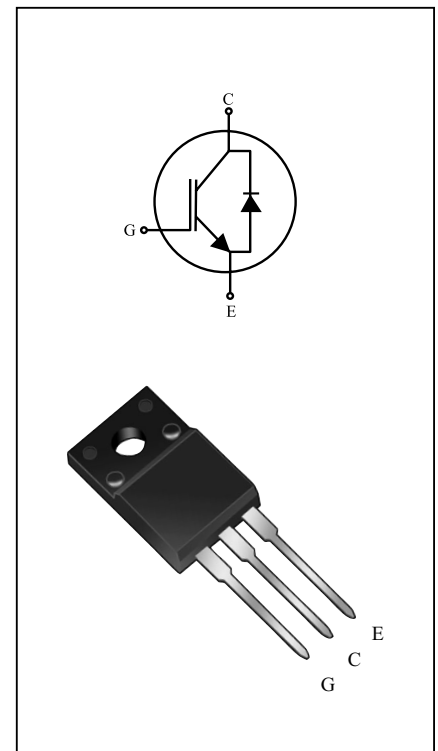


## MAXIMUM RATING (Ta=25 )

CHARACTERISTIC		SYMBOL	RATING	UNIT
Collector-Emitter Voltage		V <sub>CES</sub>	600	V
Gate-Emitter Voltage		V <sub>GES</sub>	± 20	V
Collector Current	@T <sub>c</sub> =25	I <sub>C</sub>	15	A
	@T <sub>c</sub> =100		7.5	A
Pulsed Collector Current		I <sub>CM</sub> *	30	A
Diode Continuous Forward Current	@T <sub>c</sub> =25	I <sub>F</sub>	15	A
Diode Maximum Forward Current		I <sub>FM</sub> *	45	A
Maximum Power Dissipation	@T <sub>c</sub> =25	P <sub>D</sub>	50	W
	@T <sub>c</sub> =100		20	W
Maximum Junction Temperature		T <sub>j</sub>	150	
Storage Temperature Range		T <sub>stg</sub>	-55 to + 150	

## THERMAL CHARACTERISTIC

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Junction to Case (IGBT)	R <sub>thJC</sub>	2.5	/W
Thermal Resistance, Junction to Case (DIODE)	R <sub>thJCD</sub>	3.6	/W
Thermal Resistance, Junction to Ambient	R <sub>thJA</sub>	62.5	/W



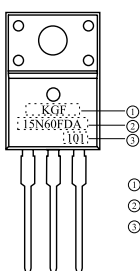
# KGF15N60FDA

## 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	$\mu A$	
Gate Leakage Current	$I_{GES}$	$V_{CE}=0V, V_{GE}=\pm 20V$	-	-	$\pm 100$	nA	
Gate Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=2mA$	4.5	5.5	7.0	V	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=15A$	-	1.65	2.1	V	
		$V_{GE}=15V, I_C=30A, T_C=25$	-	2.2	-	V	
		$V_{GE}=15V, I_C=15A, T_C=125$	-	1.95	-	V	
Dynamic							
Total Gate Charge	$Q_g$	$V_{CC}=300V, V_{GE}=15V, I_C=15A$	-	60	-	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, $T_C=25$ (Note 1)	-	25	-	ns	
Rise Time	$t_r$		-	15	-	ns	
Turn-Off Delay Time	$t_{d(off)}$		-	95	-	ns	
Fall Time	$t_f$		-	35	-	ns	
Turn-On Switching Loss	$E_{on}$		-	0.2	0.26	mJ	
Turn-Off Switching Loss *Note(1)	$E_{off}$		-	0.15	0.2	mJ	
Total Switching Loss	$E_{ts}$		-	0.35	0.46	mJ	
Turn-On Delay Time	$t_{d(on)}$		$V_{CC}=300V, I_C=15A, V_{GE}=15V, R_G=10$ Inductive Load, $T_C=125$ (Note 1)	-	30	-	ns
Rise Time	$t_r$			-	20	-	ns
Turn-Off Delay Time	$t_{d(off)}$			-	100	-	ns
Fall Time	$t_f$	-		60	-	ns	
Turn-On Switching Loss	$E_{on}$	-		0.25	-	mJ	
Turn-Off Switching Loss *Note(1)	$E_{off}$	-		0.25	-	mJ	
Total Switching Loss	$E_{ts}$	-		0.5	-	mJ	
Input Capacitance	$C_{ies}$	$V_{CE}=30V, V_{GE}=0V, f=1MHz$	-	1250	1650	pF	
Output Capacitance	$C_{oes}$		-	90	-	pF	
Reverse Transfer Capacitance	$C_{res}$		-	50	-	pF	
Short Circuit Withstand Time	$t_{sc}$		$V_{CC}=300V, V_{GE}=15V, T_C=100$	5	-	-	$\mu s$

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

### Marking



- ① Device Mark 1
- ② Device Mark 2
- ③ Lot No.

# KGF15N60FDA

## ELECTRICAL CHARACTERISTIC OF DIODE

CHARACTERISTIC	SYMBOL	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Diode Forward Voltage	$V_F$	$I_F = 15A$	$T_C = 25$	-	1.65	2.3	V
			$T_C = 125$	-	1.7	-	
Diode Reverse Recovery Time	$t_{rr}$	$I_F = 15A$	$T_C = 25$	-	55	-	ns
			$T_C = 125$	-	70	-	
Diode Peak Reverse Recovery Current	$I_{rr}$	$I_F = 15A$ $di/dt = 600A/\mu s$	$T_C = 25$	-	11.5	-	A
			$T_C = 125$	-	12.5	-	
Diode Reverse Recovery Charge	$Q_{rr}$	$I_F = 15A$ $di/dt = 600A/\mu s$	$T_C = 25$	-	0.35	-	$\mu C$
			$T_C = 125$	-	0.50	-	

# KGF15N60FDA

Fig 1. Saturation Voltage Characteristics

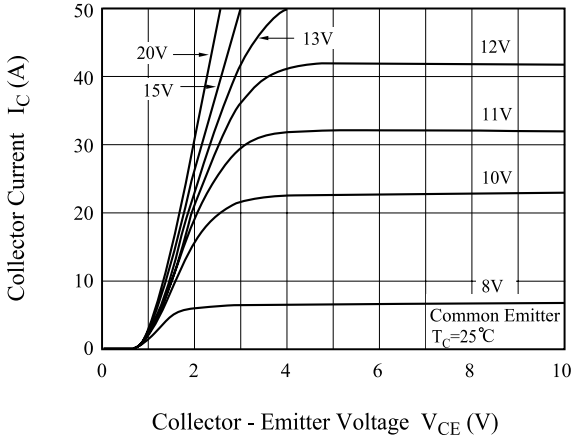


Fig 2. Saturation Voltage Characteristics

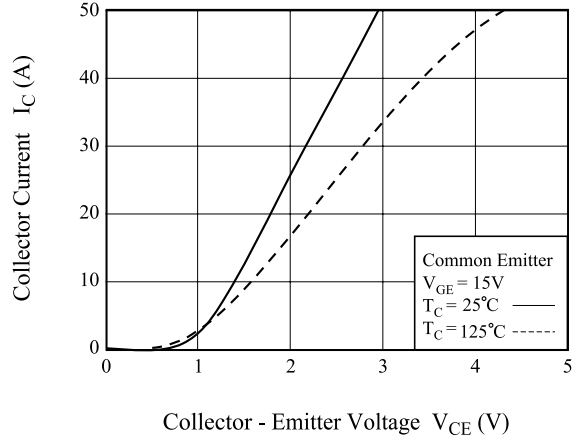


Fig 3. Saturation Voltage vs. Case Temperature

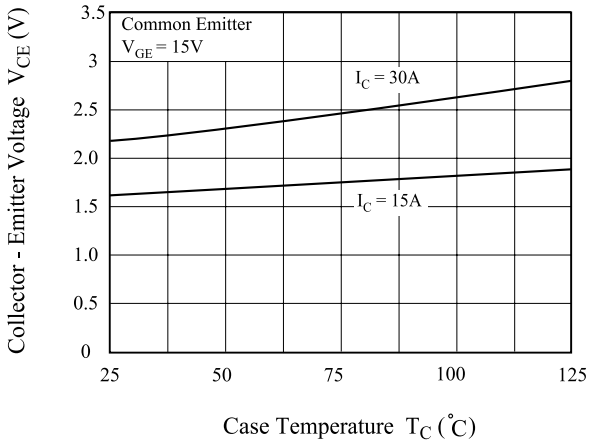


Fig 4. Saturation Voltage vs.  $V_{GE}$

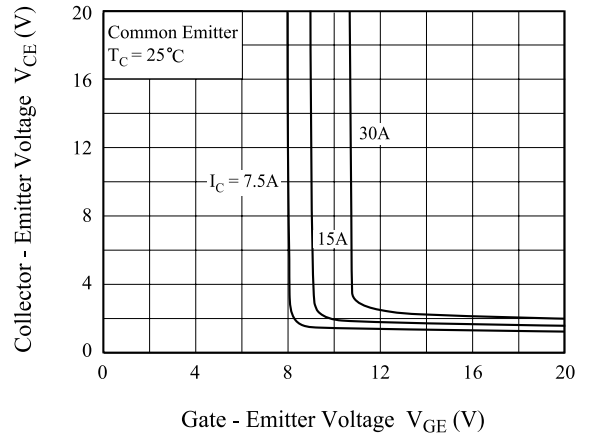


Fig 5. Saturation Voltage vs.  $V_{GE}$

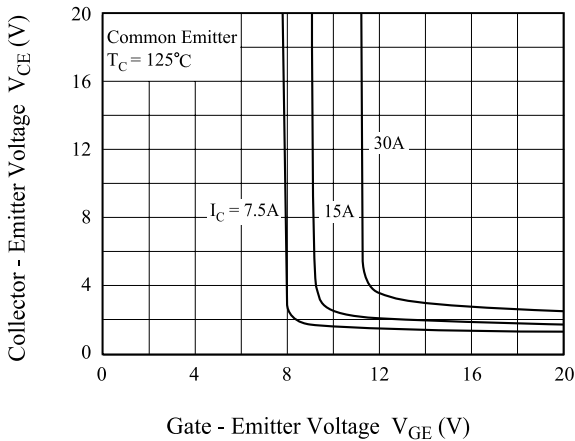


Fig 6. Capacitance Characteristics

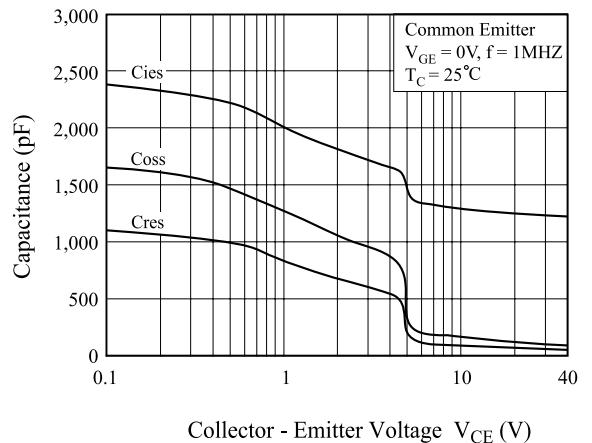


Fig 7. Turn-On Characteristics vs. Gate Resistance

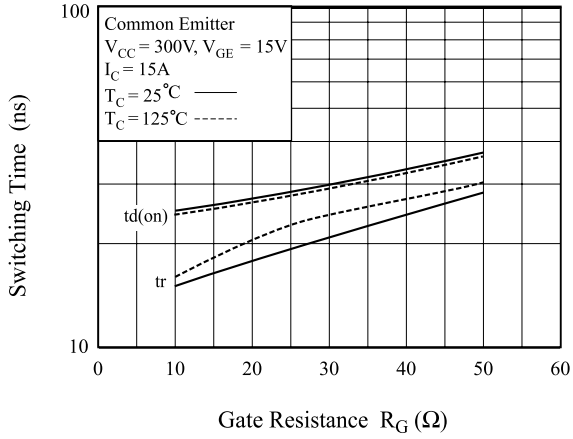


Fig 8. Turn-Off Characteristics vs. Gate Resistance

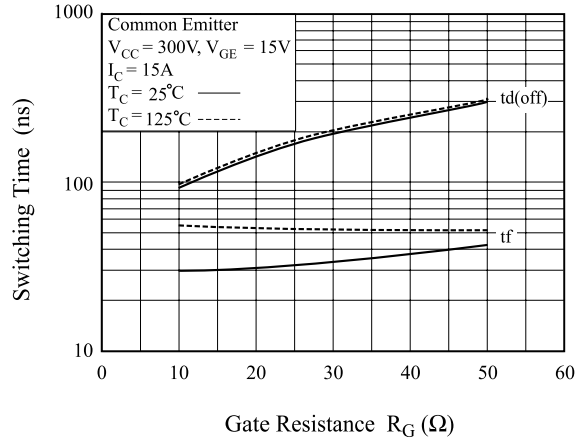


Fig 9. Switching Loss vs. Gate Resistance

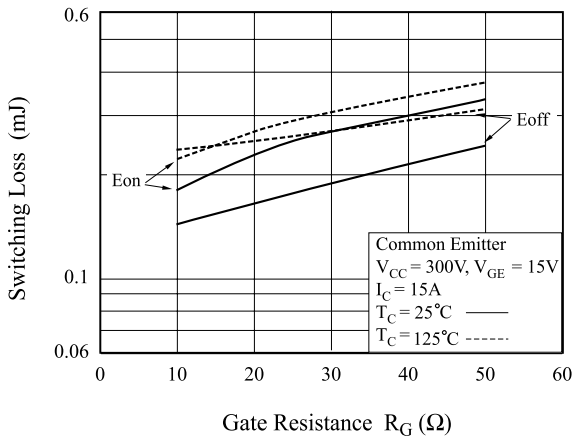


Fig 10. Turn-On Characteristics vs. Collector Current

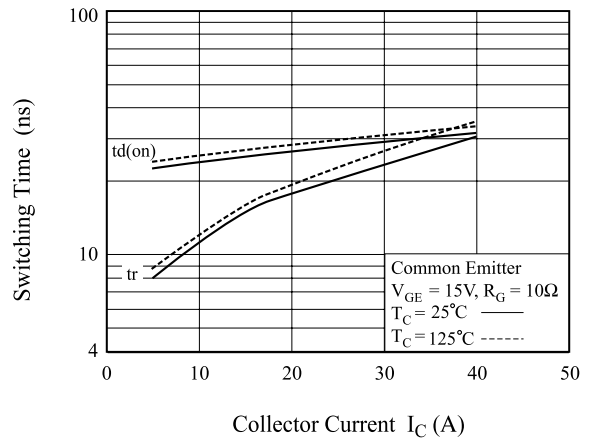


Fig 11. Turn-Off Characteristics vs. Collector Current

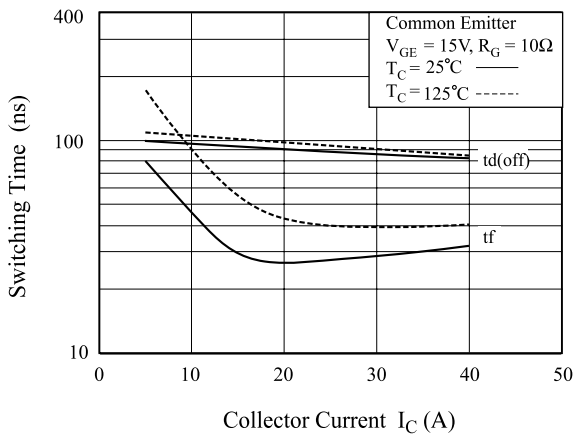
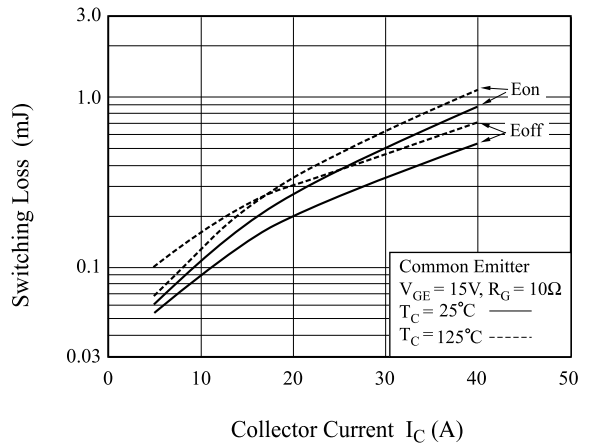


Fig 12. Switching Loss vs. Collector Current



# KGF15N60FDA

Fig 13. Gate Charge Characteristics

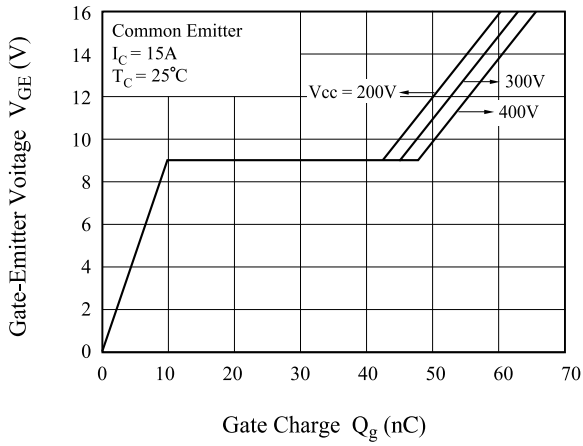


Fig 14. SOA Characteristics

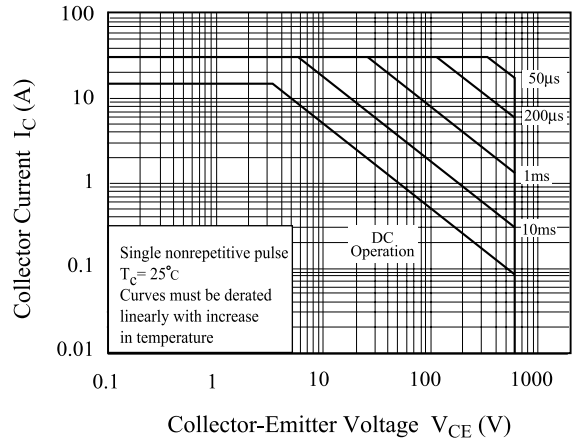


Fig 15. Turn-Off SOA

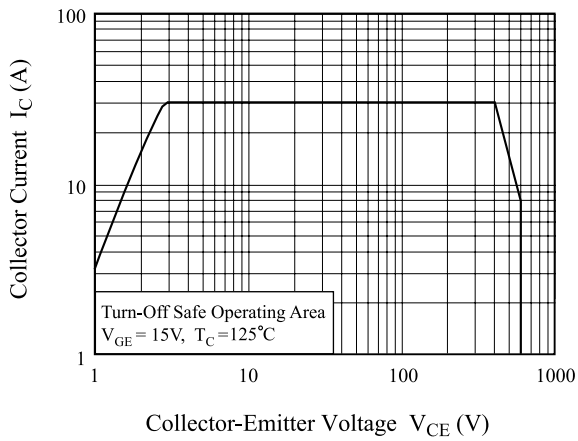
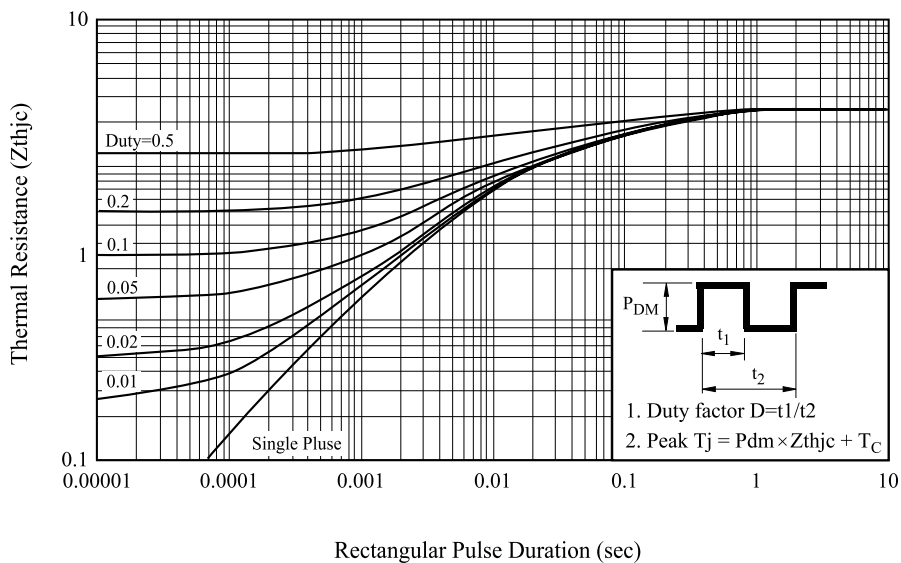


Fig 16. Transient Thermal Impedance of IGBT



# KGF15N60FDA

Fig 17. Forward Characteristics

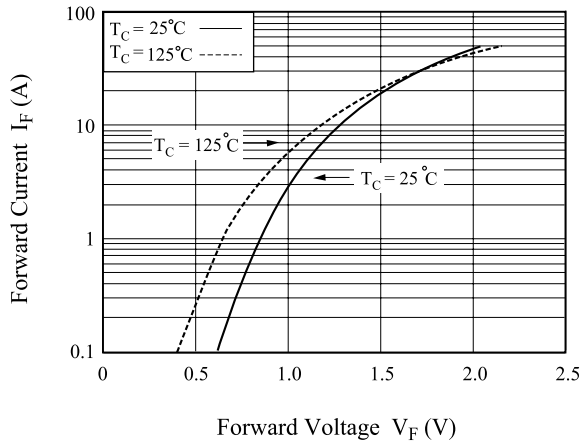


Fig 18. Reverse Recovery Current

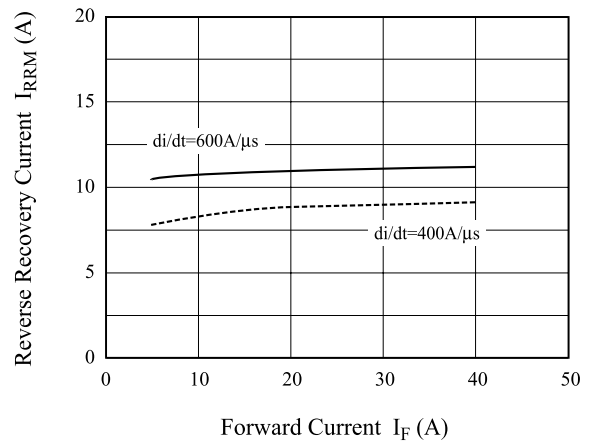
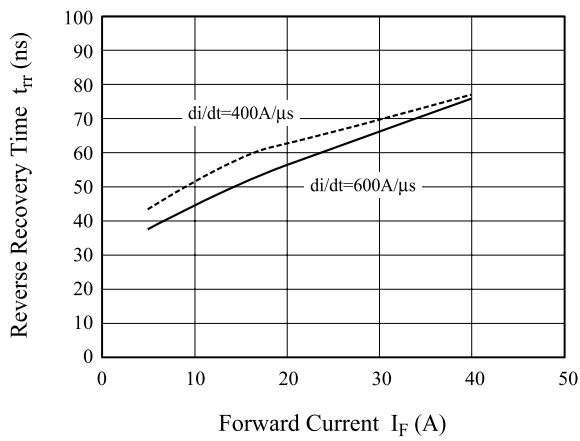


Fig 19. Reverse Recovery Time



# KGF15N60FDA

Fig 20. Switching Test Circuit

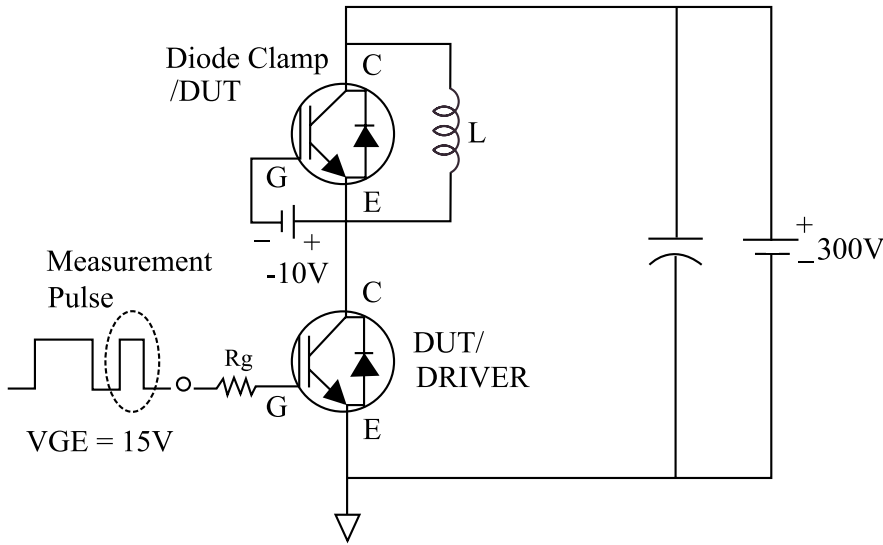


Fig 21. Definition Switching Time & Loss

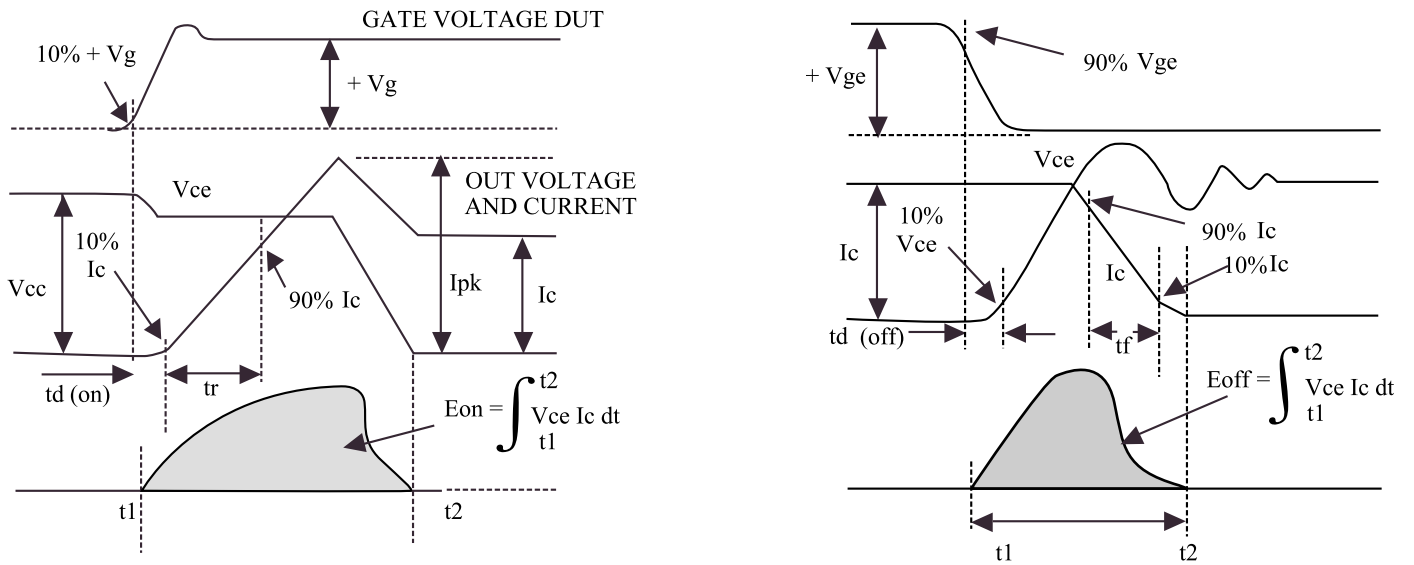


Fig 22. Definition Diode Switching Time

