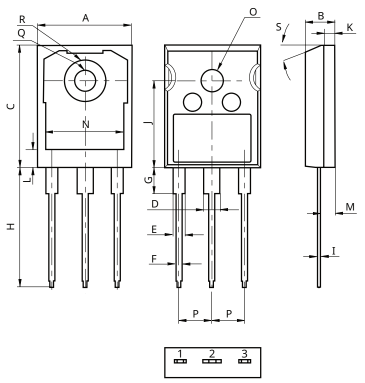
1200V, 25A Field Stop Trench IGBTs

KGF25N120KDA

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 supplies(UPS), general inverters.

PACKAGE DIMENSION(TO-247)

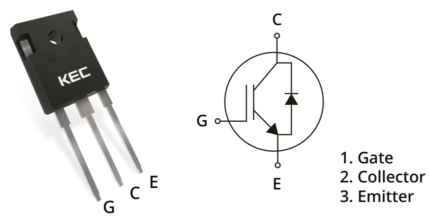


DIM	MILLIMETERS
A	15.90 ± 0.30
B	5.00 ± 0.20
C	20.85 ± 0.30
D	3.00 ± 0.20
E	2.00 ± 0.20
F	1.20 ± 0.20
G	Max. 4.50
H	20.10 ± 0.70
I	0.60 ± 0.02
J	14.70 ± 0.20
K	2.00 ± 0.10
L	3.19 ± 0.20
M	2.40 ± 0.20
N	13.26
O	ϕ3.70 ± 0.20
P	5.45 ± 0.30
Q	ϕ3.60 ± 0.20
R	ϕ7.19 ± 0.10
S	20˚

FEATURES

- High Speed Switching
- High Ruggedness, Temperature Stable Behavior
- 1200V Breakdown Voltage
- Maximum Junction Temperature : 150°C
- Short Circuit Withstand Times > 10μs@T_{Jstart}
- Extremely Enhanced Avalanche Capability

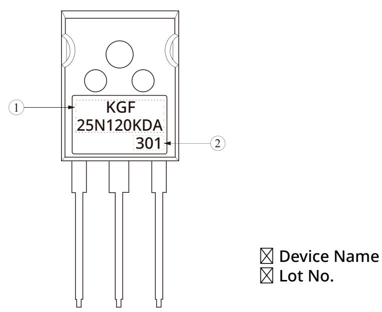
PIN CONFIGURATION



APPLICATIONS

- Motor Drives
- E-Tools
- General Inverters
- Industrial SMPS
- Sewing Machine

MARKING CODE



ORDERING INFORMATION

PART NUMBER	QTY per Tube	QTY per Carton Box
KGF25N120KDA	30 pcs	1,800 pcs

MAXIMUM RATING (T_J=25℃, unless otherwise specified)

CHARACTERISTICS		SYMBOL	VALUES	UNIT
Collector-Emitter Voltage, T_J≥25°C		V_{CES}	1200	V
Gate-Emitter Voltage		V_{GES}	±20	V
Transient Gate-Emitter Voltage @ tp≤0.5μs, D<0.001			±30	
Collector Current, limited by T_{Jmax}	@T_C=25℃	I_C	50	A
	@T_C=100℃		25	
Pulsed Collector Current, T_C=25°C (Note 1)		I_{CM}	75	A
Pulsed Collector Current, T_C=25°C		I_{LM}	75	A
DIODE Continuous Forward Current, limited by T_{Jmax}	@T_C=25℃ (Note 2)	I_F	50	A
	@T_C=100℃		25	
DIODE Pulsed Forward Current, T_C=25°C		I_{FM}	75	A
Short Circuit Withstand Time @ V_{CC}=600V, V_{GE}=15V, T_{Jstart}=25°C		t_{SC}	10	μs
Maximum Power Dissipation	@T_C=25℃	P_D	198	W
	@T_C=100℃		79	W
Operating Junction Temperature		T_J	150	°C
Storage Temperature Range		T_{stg}	-55 ~ +150	°C

Note 1) Pulse width limited by T_{Jmax}
Note 2) Value limited by bondwire

THERMAL CHARACTERISTICS

CHARACTERISTICS	SYMBOL	CONDITIONS	VALUES			UNIT
			MIN.	TYP.	MAX.	
Thermal Resistance, Junction to Case (IGBT)	R_{thJC}	-	-	-	0.63	°C/W
Thermal Resistance, Junction to Case (DIODE)		-	-	-	0.96	°C/W
Thermal Resistance, Junction to Ambient	R_{thJA}	-	-	-	40	°C/W

ELECTRICAL CHARACTERISTICS OF IGBT (T_J= 25℃, unless otherwise specified)

CHARACTERISTICS	SYMBOL	CONDITIONS	VALUES			UNIT
			MIN.	TYP.	MAX.	
Static						
Collector-Emitter Breakdown Voltage	BV_{CES}	V_{GE}=0V, I_C=1mA	1200	-	-	V
Collector Cut-off Current	I_{CES}	V_{GE}=0V, V_{CE}=1200V	-	-	1.0	mA
Gate Leakage Current	I_{GES}	V_{CE}=0V, V_{GE}=±20V	-	-	±100	nA
Gate Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=25mA	4.5	5.8	7.0	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	V_{GE}=15V, I_C=25A	-	1.95	2.3	V
		V_{GE}=15V, I_C=25A, T_J=T_{Jmax}	-	2.3	-	V
Dynamic						
Total Gate Charge	Q_g	V_{CC}=600V, I_C=25A, V_{GE}=15V	-	200	-	nC
Gate-Emitter Charge	Q_{ge}		-	28.9	-	nC
Gate-Collector Charge	Q_{gc}		-	102.6	-	nC
Input Capacitance	C_{ies}	V_{CE}=30V, V_{GE}=0V, f=1MHz	-	3,300	-	pF
Output Capacitance	C_{oes}		-	120	-	pF
Reverse Transfer Capacitance	C_{res}		-	75	-	pF
Switching						
Turn-on Delay Time	$t_{d(on)}$	V_{CC}=600V, I_C=25A, V_{GE}=15V, R_G=10Ω Inductive Load, T_J=25°C (Note 3)	-	37	-	ns
Rise Time	t_r		-	29.3	-	ns
Turn-off Delay Time	$t_{d(off)}$		-	248	-	ns
Fall Time	t_f		-	35.6	-	ns
Turn-on Switching Loss	E_{on}		-	1.93	-	mJ
Turn-off Switching Loss	E_{off}		-	0.64	-	mJ
Total Switching Loss	E_{ts}		-	2.57	-	mJ
Turn-on Delay Time	$t_{d(on)}$	V_{CC}=600V, I_C=25A, V_{GE}=15V, R_G=10Ω Inductive Load, T_J=T_{Jmax} (Note 3)	-	36.9	-	ns
Rise Time	t_r		-	28.7	-	ns
Turn-off Delay Time	$t_{d(off)}$		-	281	-	ns
Fall Time	t_f		-	127	-	ns
Turn-on Switching Loss	E_{on}		-	2.02	-	mJ
Turn-off Switching Loss	E_{off}		-	1.21	-	mJ
Total Switching Loss	E_{ts}		-	3.23	-	mJ

Note 3) Energy loss include tail current and DIODE reverse recovery

ELECTRICAL CHARACTERISTICS OF DIODE

CHARACTERISTICS	SYMBOL	CONDITIONS	VALUES			UNIT
			MIN.	TYP.	MAX.	
Forward Voltage	V_F	I_F=25A	-	2.3	2.7	V
		I_F=25A, T_J=T_{Jmax}	-	2.0	-	
Reverse Recovery Time	t_{rr}	V_{CC}=600V I_F=25A dI_F/dt=200A/μs T_J=25°C	-	385	-	ns
Peak Reverse Recovery Current	I_{RRM}		-	12.9	-	A
Reverse Recovery Charge	Q_{rr}		-	1.74	-	μC
Reverse Recovery Energy	E_{REC}		-	520	-	μJ
Reverse Recovery Time	t_{rr}	V_{CC}=600V I_F=25A dI_F/dt=200A/μs T_J=T_{Jmax}	-	707	-	ns
Peak Reverse Recovery Current	I_{RRM}		-	17	-	A
Reverse Recovery Charge	Q_{rr}		-	4.4	-	μC
Reverse Recovery Energy	E_{REC}		-	1,670	-	μJ

Fig1. Power Dissipation as a Function of Case Temperature

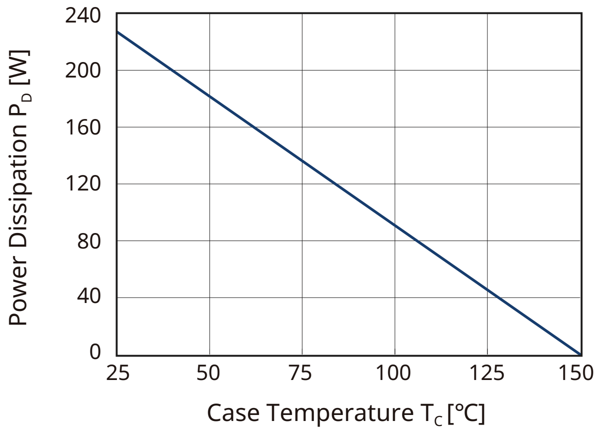


Fig2. Typical Output Characteristic (I_C vs V_{CE})@T_J=25°C

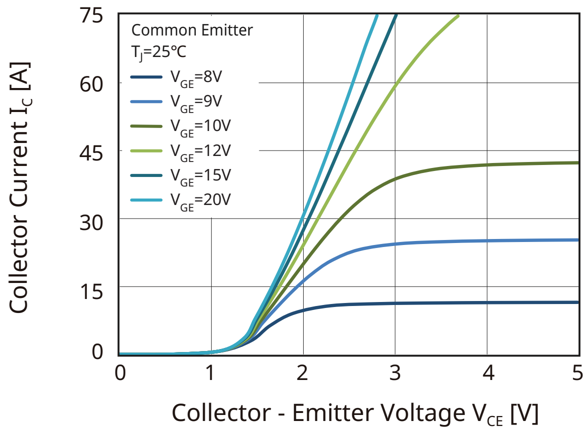


Fig3. Typical Output Characteristic (I_C vs V_{CE})@T_J=T_{Jmax}

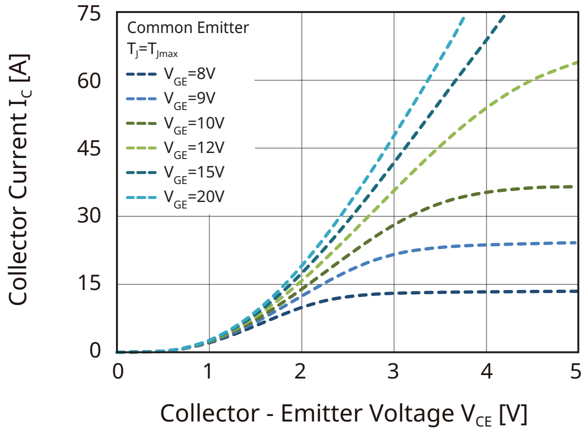


Fig4. Typical Saturation Voltage Characteristic (I_C vs V_{CE})

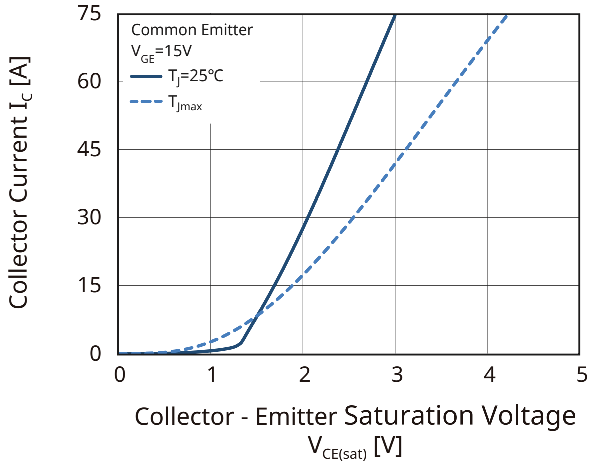


Fig5. Typical Collector-Emitter Saturation Voltage as a Function of Junction Temperature

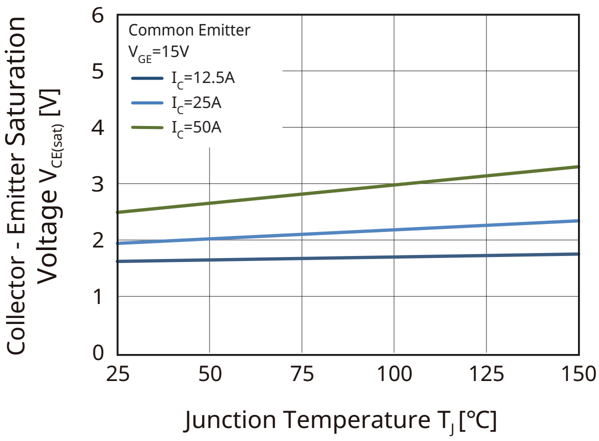


Fig6. Typical Gate-Emitter Threshold Voltage as a Function of Junction Temperature

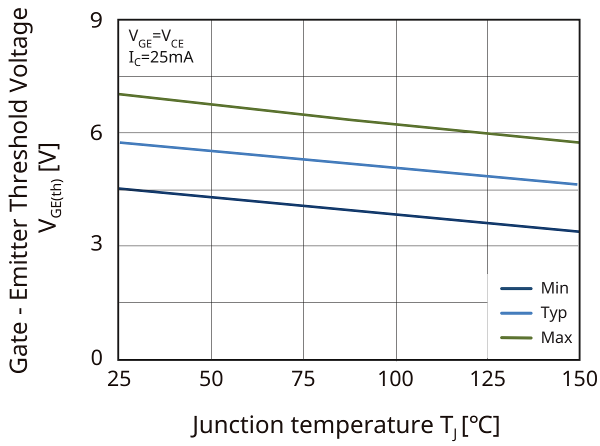


Fig7. Typical Collector-Emitter Saturation Voltage as a Function of Gate-Emitter Voltage

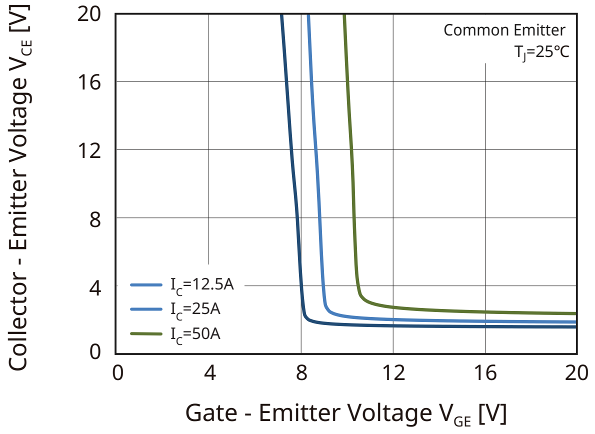


Fig8. Typical Collector-Emitter Saturation Voltage as a Function of Gate-Emitter Voltage

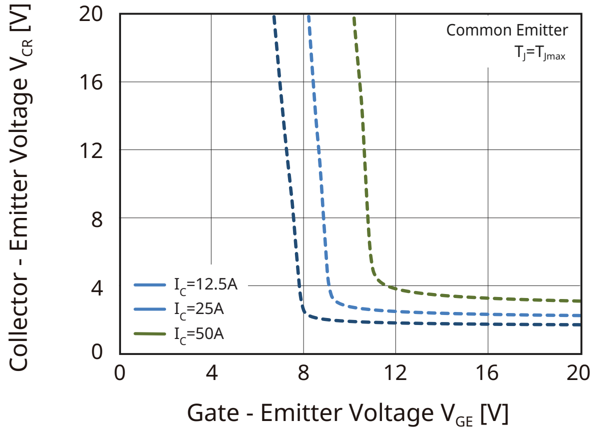


Fig9. Typical Capacitance as a Function of Collector-Emitter Voltage

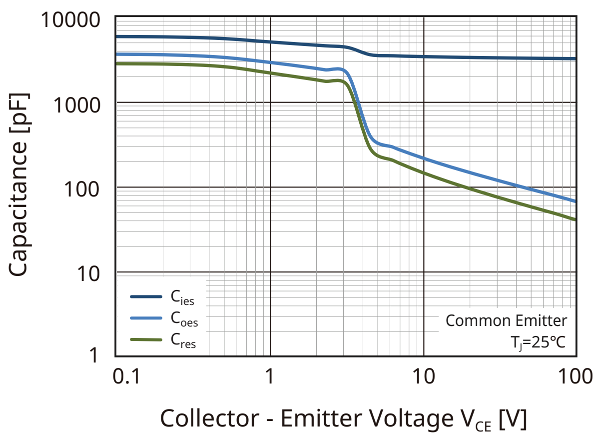


Fig10. Typical Gate Charge

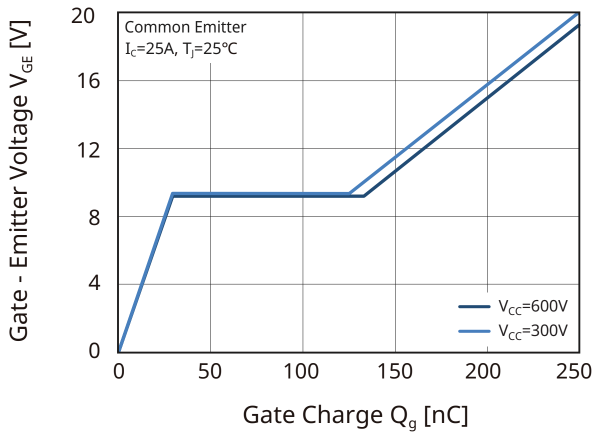


Fig11. Typical Turn-on Characteristics as a Function of Gate Resistance

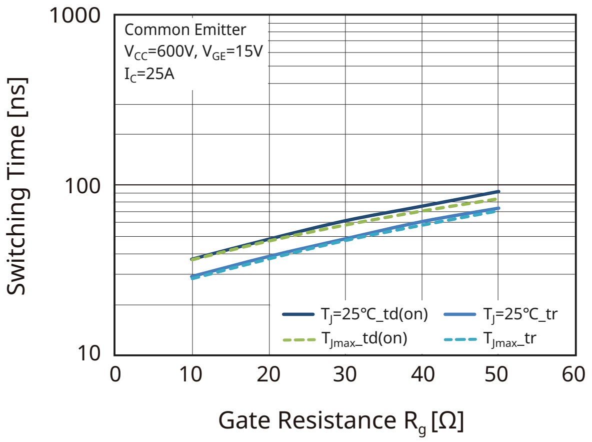


Fig12. Typical Turn-off Characteristics as a Function of Gate Resistance

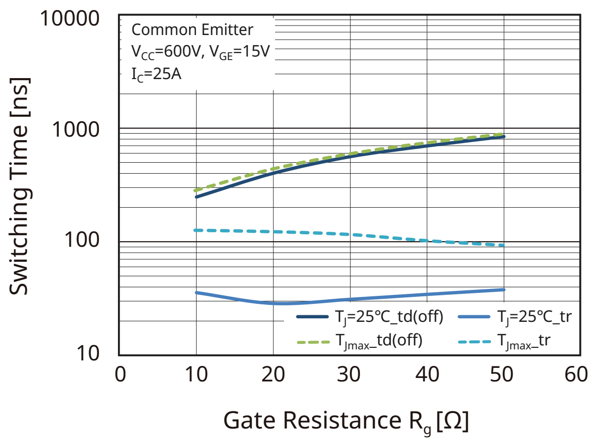


Fig13. Typical Switching Energy Losses as a Function of Gate Resistance

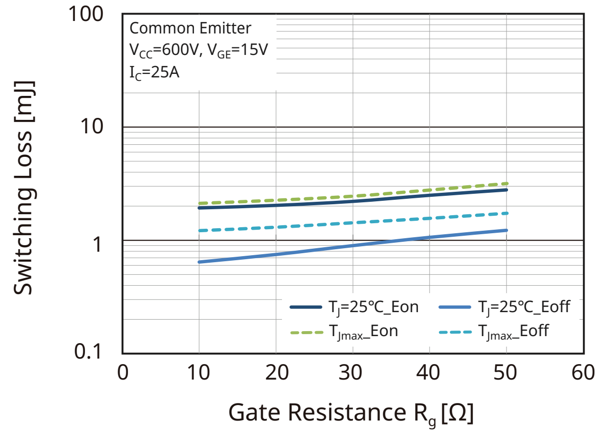


Fig14. Typical Turn-on Characteristics as a Function of Collector Current

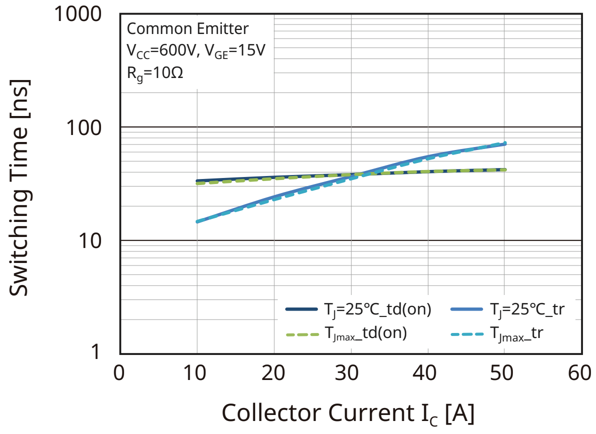


Fig15. Typical Turn-off Characteristics as a Function of Collector Current

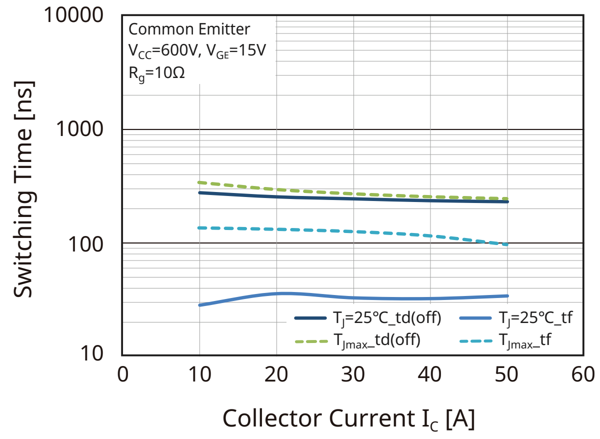


Fig16. Typical Switching Energy Losses as a Function of Collector Current

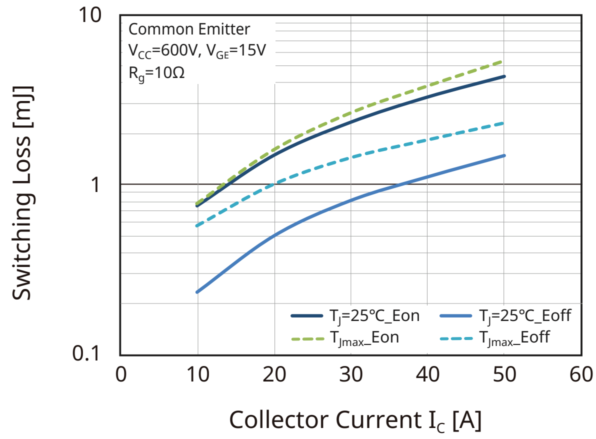


Fig17. Typical DIODE Forward Current as a Function of Forward Voltage

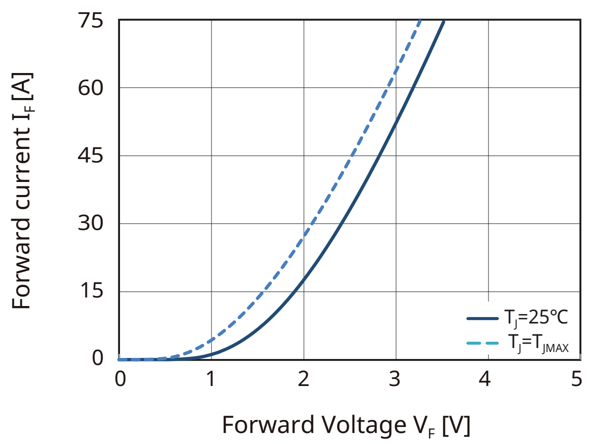


Fig18. Typical DIODE Forward Voltage as a Function of Junction Temperature

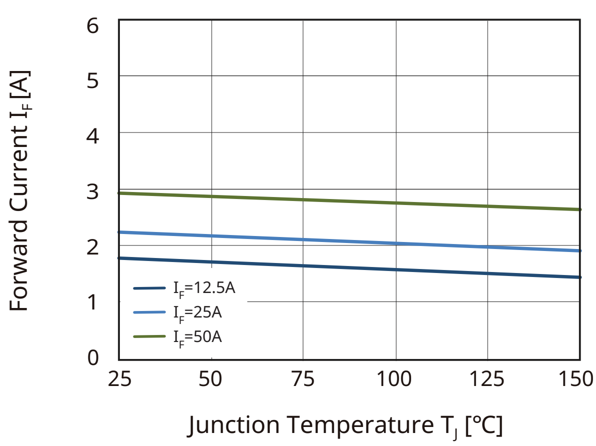


Fig19. Typical Reverse Recovery Time as a Function of DIODE Current Slope

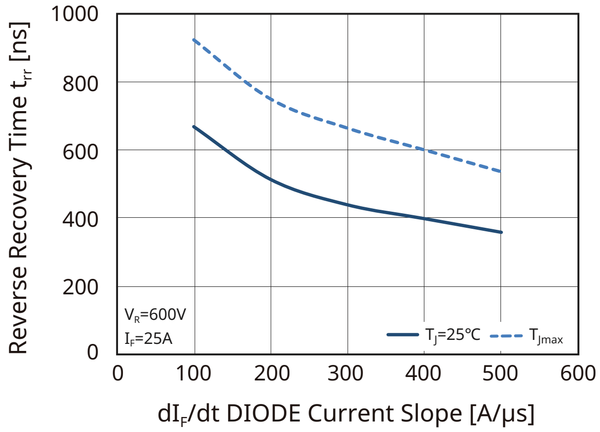


Fig20. Typical Reverse Recovery Current as a Function of DIODE Current Slope

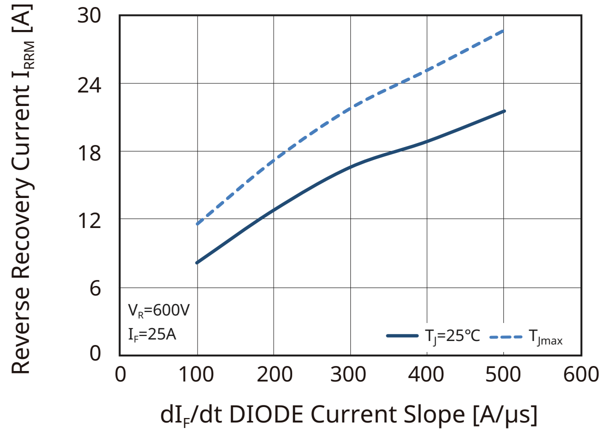


Fig21. Typical Reverse Recovery Charge as a Function of DIODE Current Slope

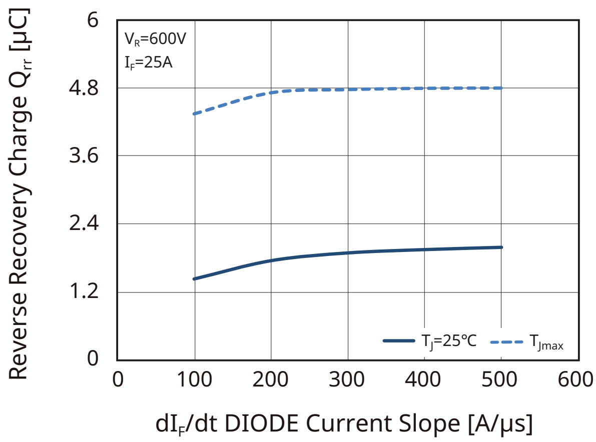


Fig22. Typical Reverse Recovery Energy as a Function of DIODE Current Slope

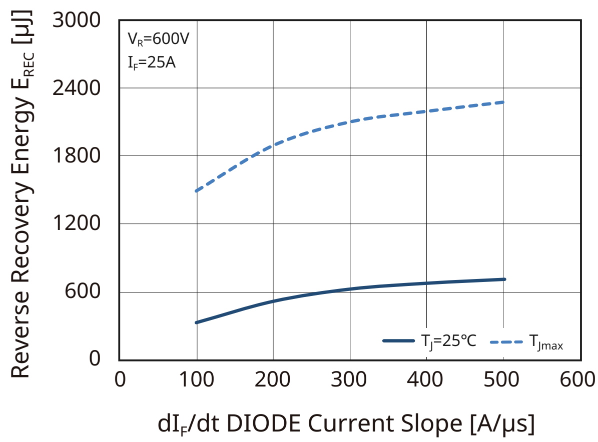


Fig23. Typical Reverse Recovery Time as a Function of DIODE Forward Current

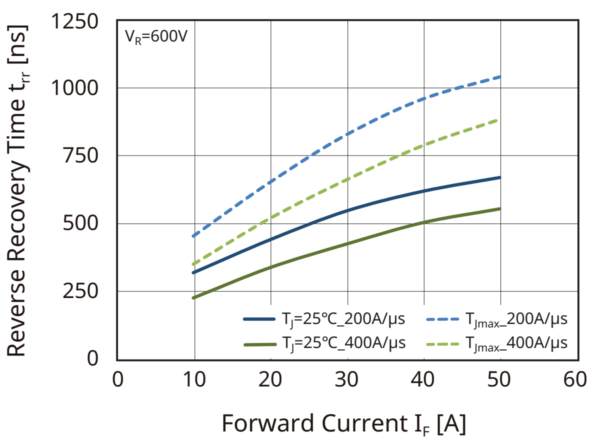


Fig24. Typical Reverse Recovery Current as a Function of DIODE Forward Currente

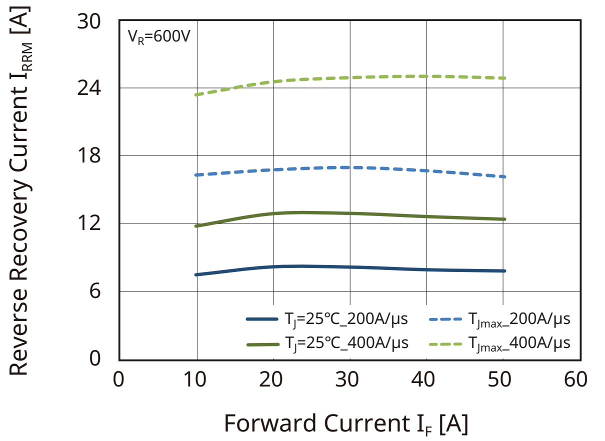


Fig25. Typical Reverse Recovery Charge as a Function of DIODE Forward Current

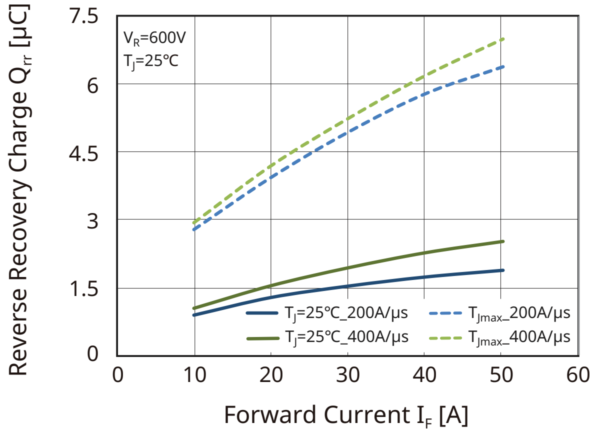


Fig26. Typical Reverse Recovery Energy as a Function of DIODE Forward Current

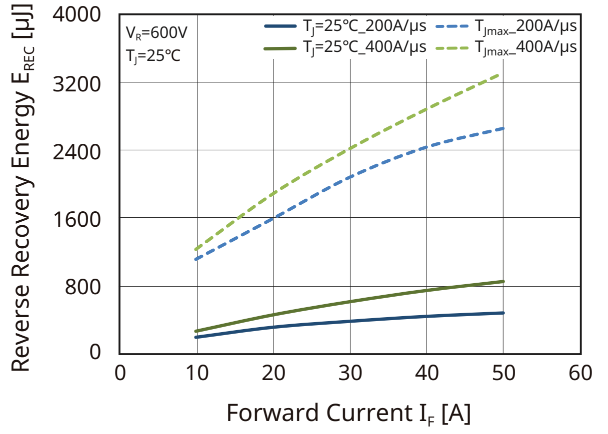


Fig27. Typical DIODE Current Slope as a Function of Gate Resistance

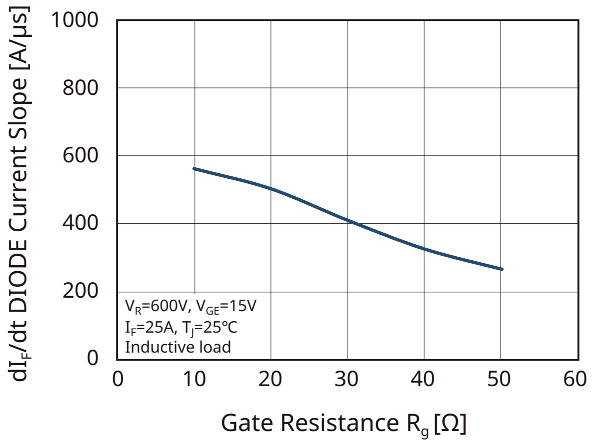


Fig28. Forward Bias Safe Operating Area

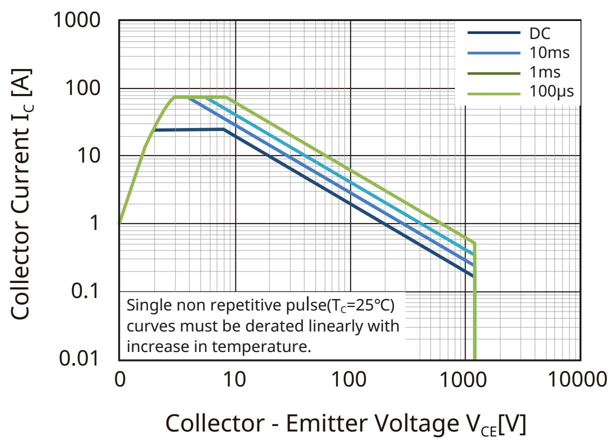
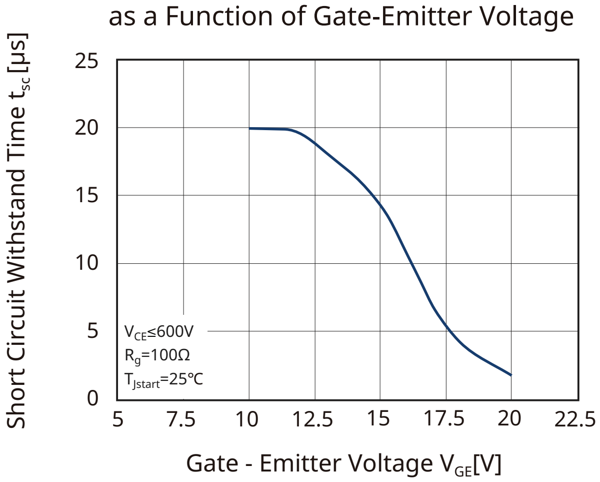


Fig29. Short Circuit Withstand Time as a Function of Gate-Emitter Voltage



*At V_{GE}=10V, t_{sc} is limited by equipment performance.

Fig30. Short Circuit Collector Current as a Function of Gate-Emitter Voltage

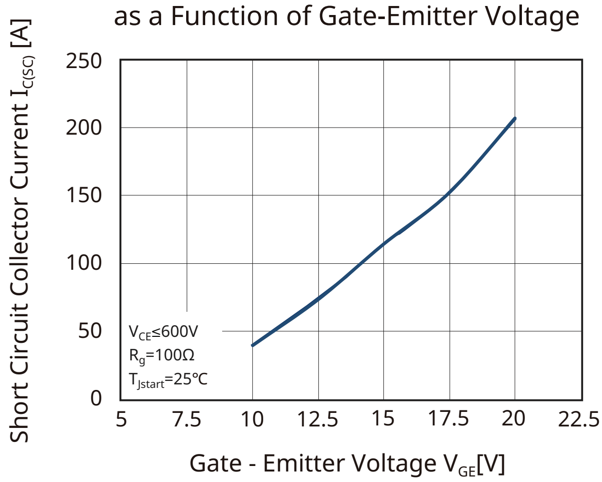


Fig31. Transient Thermal Impedance of IGBT

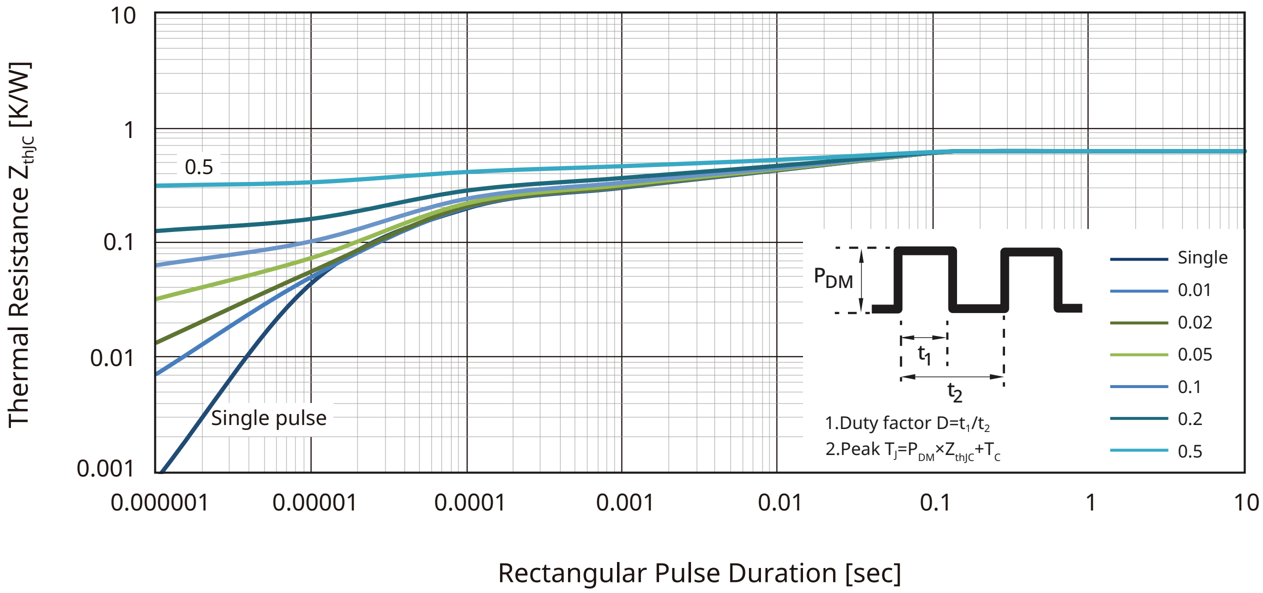
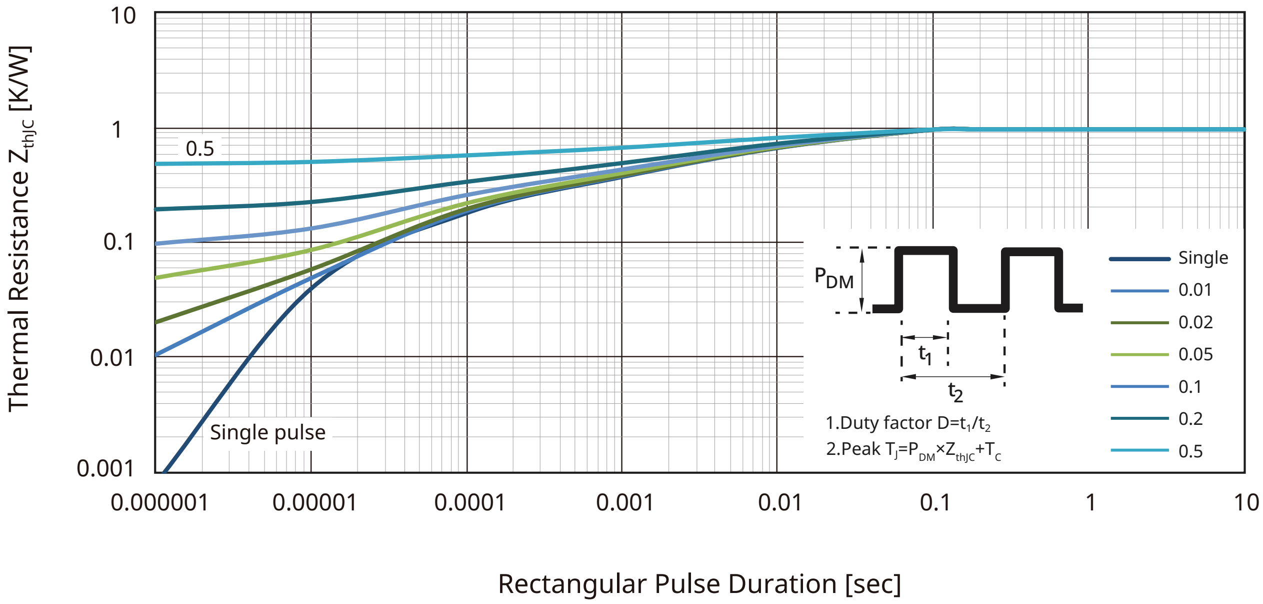


Fig32. Transient Thermal Impedance of DIODE



■ Condition

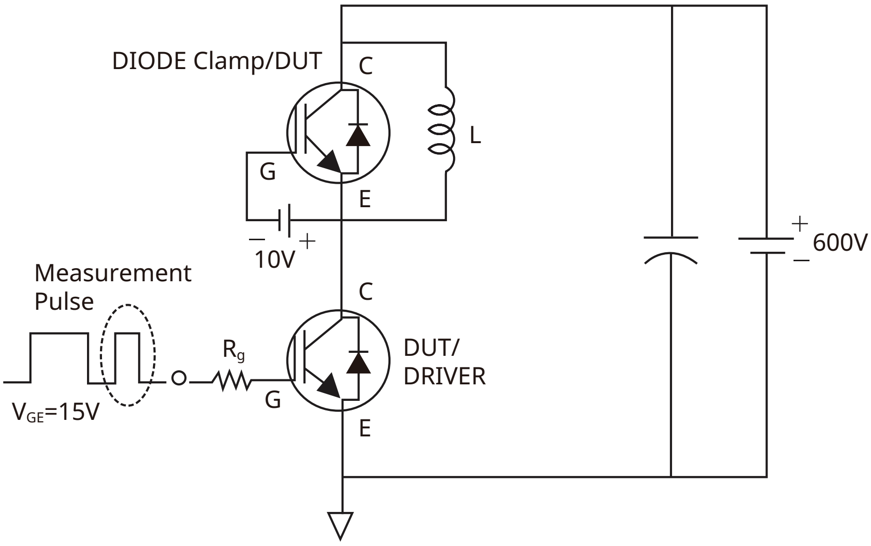


Figure a. Switching Test Circuit

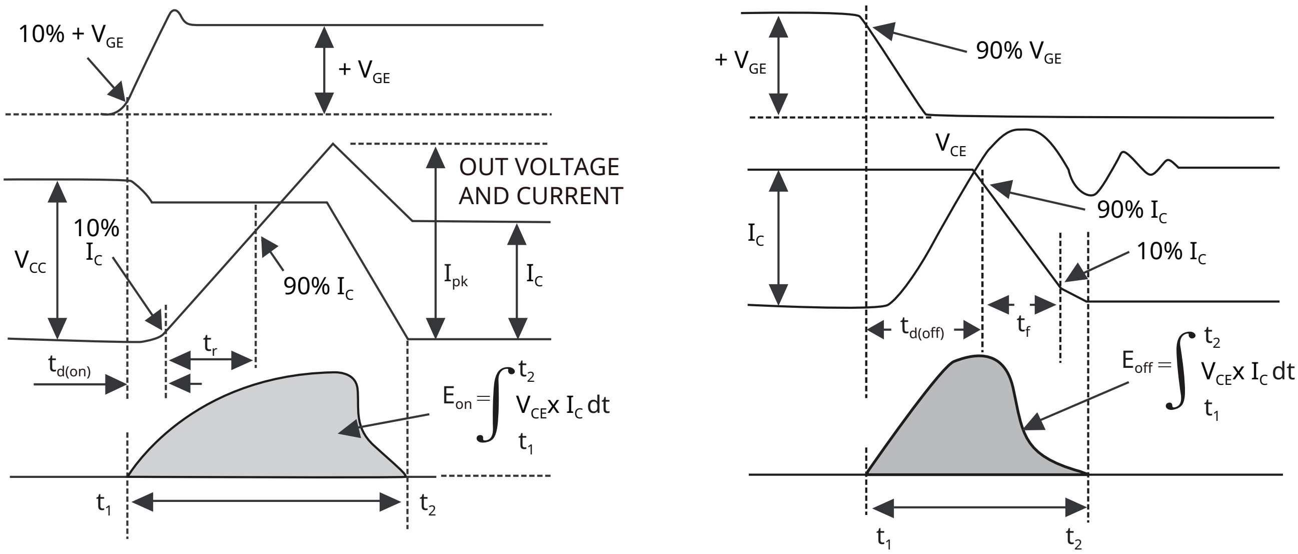


Figure b. Definition Switching Time & Losses

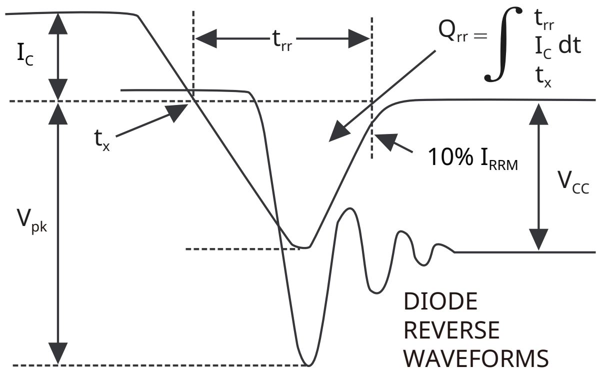
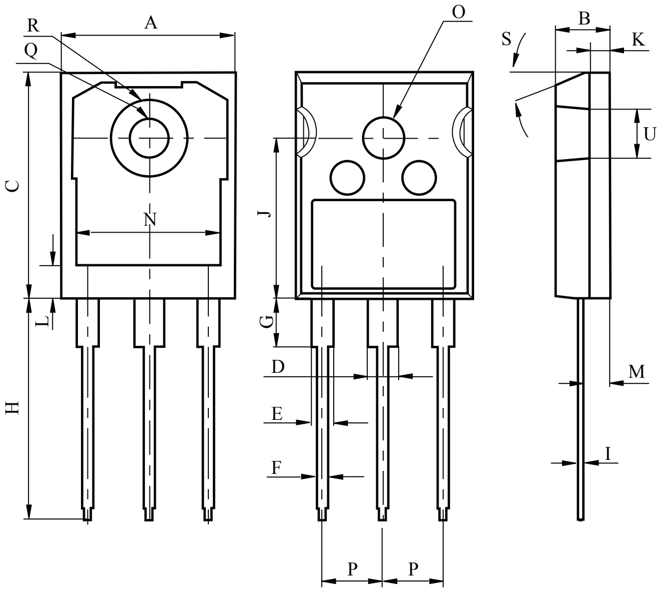


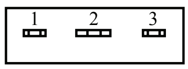
Figure c. Definition of DIODE Switching Characteristics

PACKAGE INFORMATION(TO-247)



DIM	MILLIMETERS
A	15.90 ± 0.30
B	5.00 ± 0.20
C	20.85 ± 0.30
D	3.00 ± 0.20
E	2.00 ± 0.20
F	1.20 ± 0.20
G	Max. 4.50
H	20.10 ± 0.70
I	0.60 ± 0.02
J	14.70 ± 0.20
K	2.00 ± 0.10
L	3.19 ± 0.20
M	2.40 ± 0.20
N	13.26
O	ϕ3.70 ± 0.20
P	5.45 ± 0.30
Q	ϕ3.60 ± 0.20
R	ϕ7.19 ± 0.10
S	20°
U	4.57

1. Gate
2. Collector
3. Emitter



PRECAUTION ON USING KEC PRODUCTS

1. The products described in this data are intended to be used in general-purpose electronic equipment. (Office equipment, telecommunication equipment, measuring equipment, home appliances)

2. When you intend to use these products with equipment or device which require an extremely high of reliability and special applications (such as automobile, air travel aerospace, transportation equipment, life support, system and safety devices) in which special quality and reliability and the failure or malfunction of products may directly jeopardize or harm the human body or damage to property and any application other than the standard application intended, please be sure to consult with our sales representative in advance.

3. On designing your application, please use product within the ranges guaranteed by KEC for maximum rating, operating supply voltage range, heat radiation characteristics and other characteristics. User shall be responsible for failure or damage when used beyond the guaranteed ranges.

4. The technical information described in this data is limited to showing representative characteristics and applied circuit examples of the products and it does not constitute the warranting of industrial property, the granting of relative rights, or the granting of any license.

5. What are described in the data may be changed without any prior notice to reflect new technical development. Please confirm that you have received the latest product standards or specification before final design, purchase or use.

6. Although KEC is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors. Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. KEC shall have no responsibility for any damages arising out of the use of our Products beyond the rating specified by KEC.

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