

Справочный раздел  
Интернет Портала «Радиодар»

ТЕХНИЧЕСКИЙ СПРАВОЧНИК  
«IGBT транзистор NCE10TD60B  
производства фирмы NCEPOWER»

Версия:	1
Ревизия:	1.0.0
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КУПИТЬ В  
РАДИОДАРЕ



ОПИСАНИЕ НА  
ВИКИПЕДИИ



ОБСУЖДЕНИЕ  
НА ФОРУМЕ

## 600V, 10A, Trench FS II Fast IGBT

### General Description:

Using NCE's proprietary trench design and advanced FS (Field Stop) second generation technology, the 600V Trench FSII IGBT offers superior conduction and switching performances, and easy parallel operation;

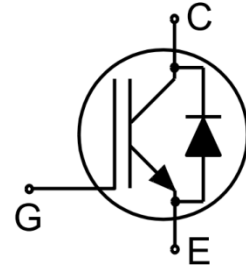
### Features

Trench FSII Technology offering

- Very low  $V_{CE(sat)}$
- High speed switching
- Positive temperature coefficient in  $V_{CE(sat)}$
- Very tight parameter distribution
- High ruggedness, temperature stable behavior

### Application

- Air Condition
- Inverters
- Motor drives



Schematic diagram

### Package Marking and Ordering Information

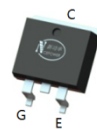
Device	Device Package	Device Marking
NCE10TD60BF	TO-220F	NCE10TD60BF
NCE10TD60B	TO-220	NCE10TD60B
NCE10TD60BD	TO-263	NCE10TD60BD



TO-220F



TO-220



TO-263

### Absolute Maximum Ratings ( $T_c=25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	TO-220/TO-263	TO-220F	Units
$V_{CES}$	Collector-Emitter Voltage	600		V
$V_{GES}$	Gate- Emitter Voltage	$\pm 30$		V
$I_C$	Collector Current	20	20*	A
	Collector Current @ $T_c = 100^\circ\text{C}$	10	10*	A
$I_{Cplus}$	Pulsed Collector Current, $t_p$ limited by $T_{jmax}$	30	30*	A
-	turn off safe operating area, $V_{CE}=600\text{V}$ , $T_j=150^\circ\text{C}$	30	30*	A
$I_F$	Diode Continuous Forward Current @ $T_c = 100^\circ\text{C}$	10	10*	A
$I_{FM}$	Diode Maximum Forward Current	30	30*	A
$P_D$	Power Dissipation @ $T_c = 25^\circ\text{C}$	83	33	W
	Power Dissipation @ $T_c = 100^\circ\text{C}$	33	13.2	W
$T_J, T_{stg}$	Operating Junction and Storage Temperature Range	-55 to +150		$^\circ\text{C}$
$T_L$	Maximum Temperature for Soldering	260		$^\circ\text{C}$
$t_{sc}$	Short circuit withstand time $V_{GE}=15.0\text{V}$ , $V_{CC} \leq 400\text{V}$ , Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{s}$ , $T_j \leq 150^\circ\text{C}$	3		us

**Thermal Characteristic**

Symbol	Parameter	Value		Units
R <sub>θJC</sub>	Thermal Resistance, Junction to case for IGBT	1.5	3.78	°C/W
R <sub>θJC</sub>	Thermal Resistance, Junction to case for Diode	2.35	4.04	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	65	78	°C/W

**Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Test Conditions	Value			Units
			Min.	Typ.	Max.	
<b>STATIC Characteristics</b>						
V <sub>(BR)CES</sub>	Collector-Emitter Breakdown Voltage	V <sub>GE</sub> =0V, I <sub>CE</sub> =1mA	600	--	--	V
I <sub>CES</sub>	Collector-Emitter Leakage Current	V <sub>GE</sub> =0V, V <sub>CE</sub> =600V	--	--	4	uA
I <sub>GES(F)</sub>	Gate to Emitter Forward Leakage	V <sub>GE</sub> =+30V, V <sub>CE</sub> =0V	--	--	100	nA
I <sub>GES(R)</sub>	Gate to Source Reverse Leakage	V <sub>GE</sub> =-30V, V <sub>CE</sub> =0V	--	--	100	nA
V <sub>CE(sat)</sub>	Collector-Emitter Saturation Voltage	I <sub>C</sub> =10A, T <sub>J</sub> =25°C	--	1.7	1.9	V
		V <sub>GE</sub> =15V, T <sub>J</sub> =100°C	--	1.9	--	V
V <sub>GE(th)</sub>	Gate Threshold Voltage	I <sub>C</sub> =1mA, V <sub>CE</sub> =V <sub>GE</sub>	4.0	5.0	6.0	V
<b>Dynamic Characteristics</b>						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> =25V, V <sub>GE</sub> =0V, f=1MHz	--	1127	--	pF
C <sub>oes</sub>	Output Capacitance		--	40	--	
C <sub>res</sub>	Reverse Transfer Capacitance		--	24	--	
Q <sub>g</sub>	Total Gate Charge	V <sub>CC</sub> =480V, I <sub>C</sub> =10A V <sub>GE</sub> =15V	--	44	--	nC
Q <sub>ge</sub>	Gate to Emitter Charge		--	10	--	
Q <sub>gc</sub>	Gate to Collector Charge		--	19	--	
I <sub>C(SC)</sub>	Short circuit collector current Max.1000 short circuits Time between short circuits: ≥1.0s	V <sub>GE</sub> =15V, V <sub>CC</sub> ≤400V, t <sub>sc</sub> ≤3us, T <sub>J</sub> ≤150°C	--	60	--	A
<b>Switching Characteristics</b>						
t <sub>d(ON)</sub>	Turn-on Delay Time	V <sub>CE</sub> =400V, I <sub>C</sub> =10A V <sub>GE</sub> =0/15V, R <sub>g</sub> =5Ω Inductive Load	--	20	--	ns
t <sub>r</sub>	Rise Time		--	15	--	
t <sub>d(OFF)</sub>	Turn-Off Delay Time		--	73	--	
t <sub>f</sub>	Fall Time		--	18	--	
E <sub>on</sub>	Turn-On Switching Loss		--	0.21	--	mJ
E <sub>off</sub>	Turn-Off Switching Loss		--	0.11	--	
E <sub>ts</sub>	Total Switching Loss		--	0.32	--	

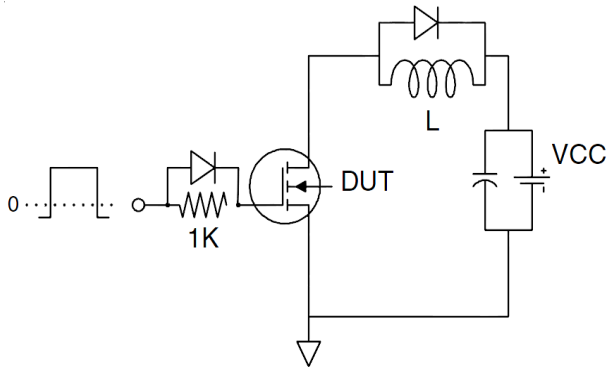
**Electrical Characteristics of the Diode (T<sub>C</sub>= 25°C unless otherwise specified):**

Symbol	Parameter	Test Conditions	Rating			Units
			Min.	Typ.	Max.	
V <sub>FM</sub>	Diode Forward Voltage	I <sub>F</sub> =10A	--	1.5	1.7	V
T <sub>rr</sub>	Reverse Recovery Time	V <sub>CC</sub> =400V, I <sub>F</sub> =10A, di/dt=200A/uS	--	158	--	ns
I <sub>RRM</sub>	Diode Peak Reverse Recovery Current		--	5.8	--	A
Q <sub>rr</sub>	Reverse Recovery Charge		--	0.5	--	uC

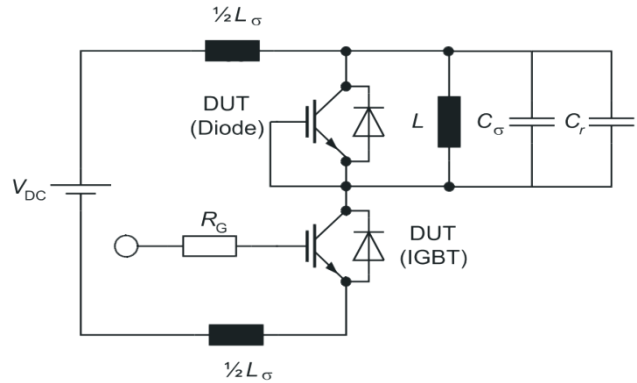
Pulse width t<sub>tp</sub>≤380μs, δ≤2%

Test Circuit

1) Gate Charge Test Circuit

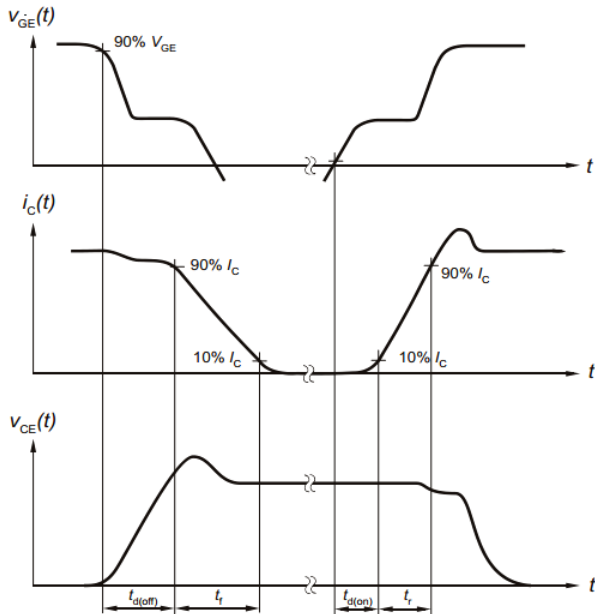


2) Switch Time Test Circuit

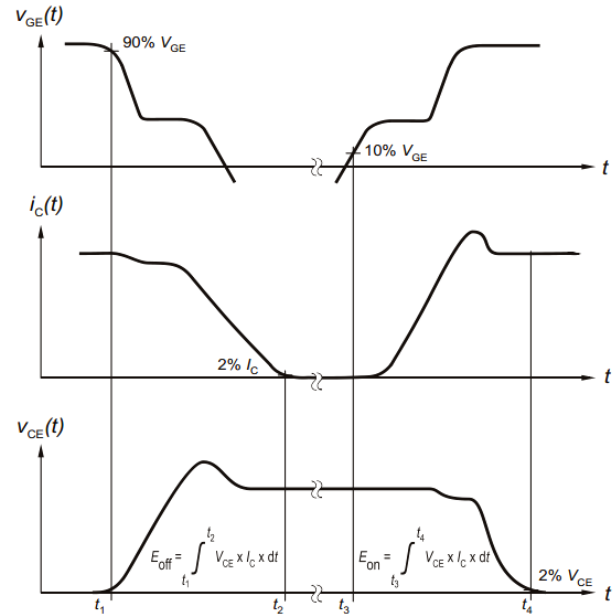


Switching characteristics

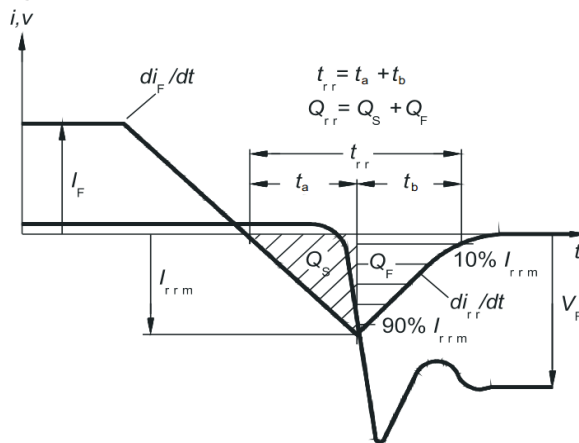
1) definition of switching times



2) definition of switching losses

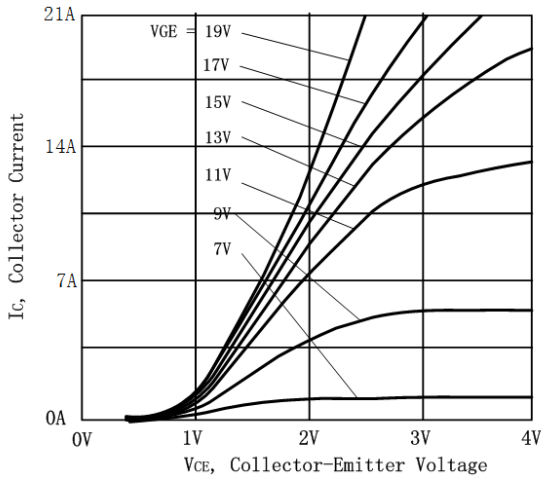


3) Definition of diode switching characteristics

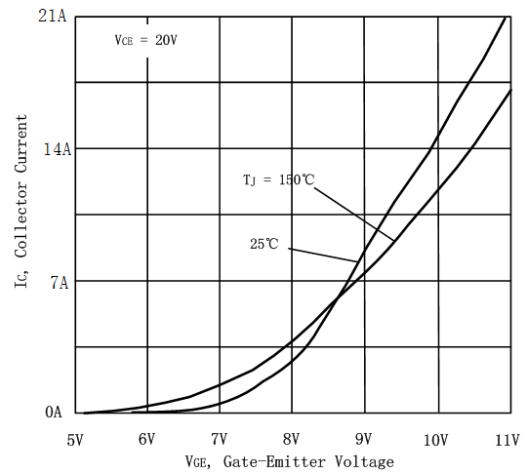


## Typical Electrical and Thermal Characteristics

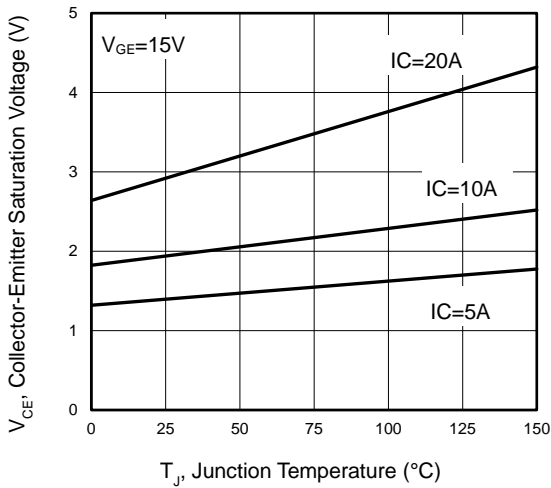
**Figure 1 Output Characteristics**



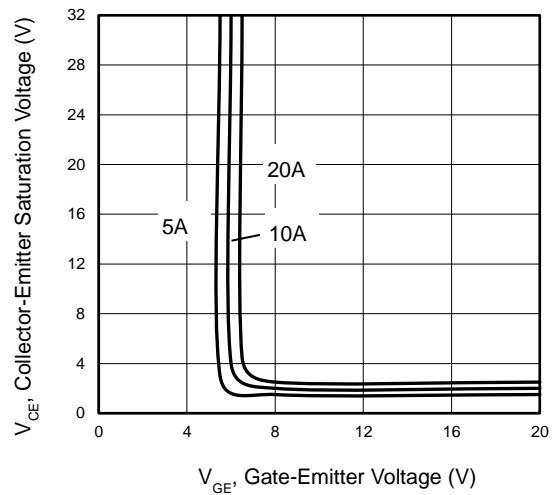
**Figure 2. Transfer Characteristics**



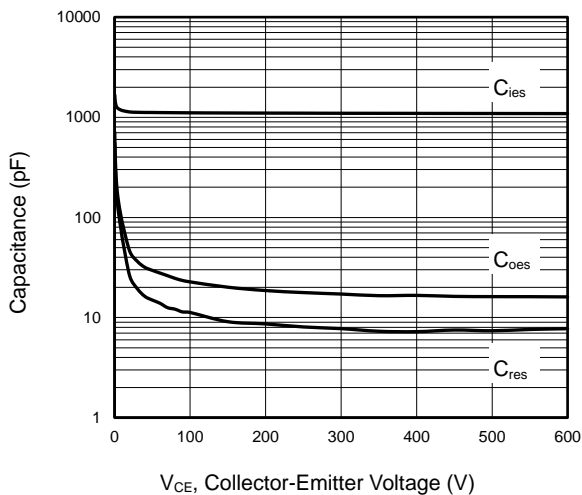
**Figure 3  $V_{CEsat}$  vs. Case Temperature**



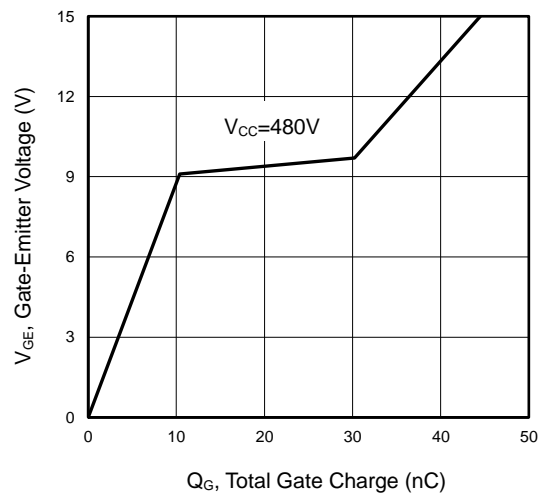
**Figure 4 Saturation Voltage vs. VGE**



**Figure 5 Capacitance Characteristics**



**Figure 6 Gate charge waveform**



Typical Electrical and Thermal Characteristics

Figure 7 Forward Characteristics

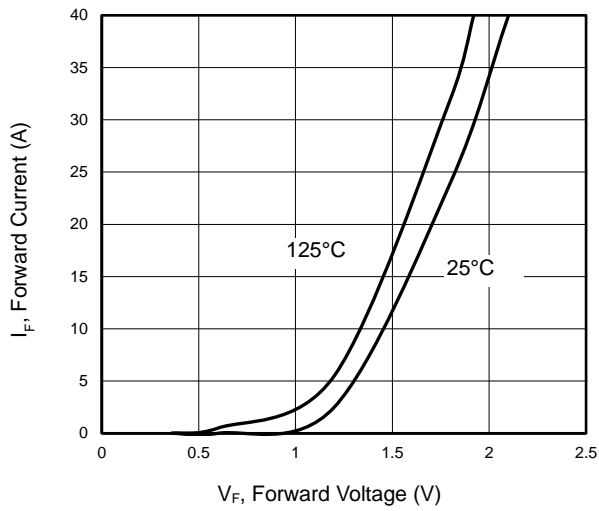


Figure 8  $V_F$  vs. temperature

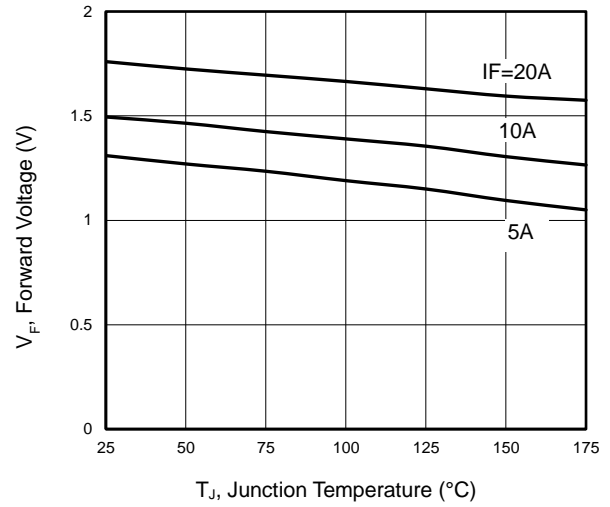


Figure 9 Typical Switching Times as a Function of Gate Resistor

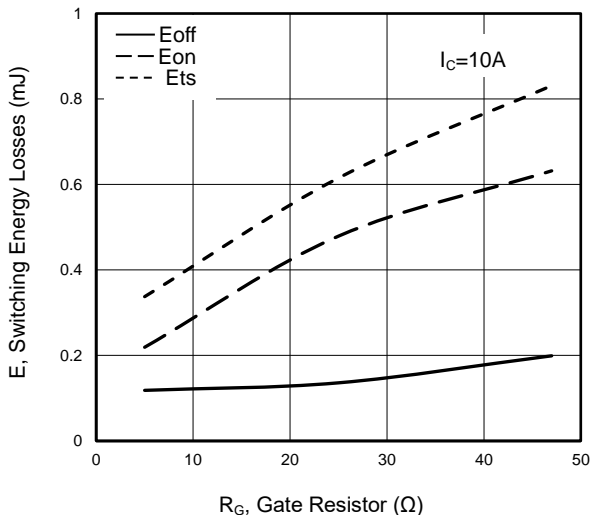


Figure 10 Typical Switching Times as a Function of Junction Temperature

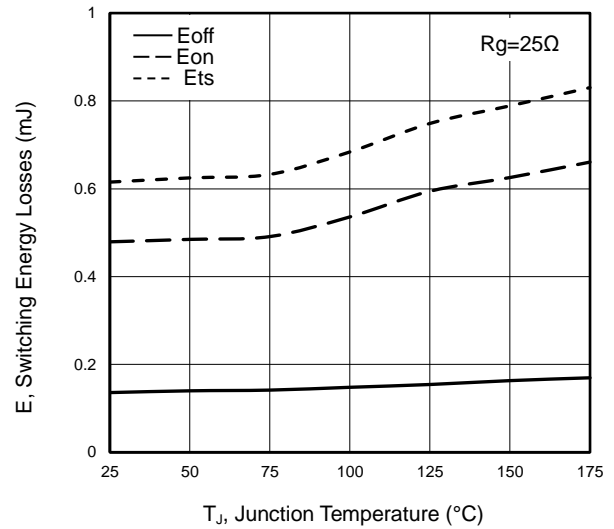


Figure 11 Gate-emitter Threshold Voltage as a Function of Junction Temperature

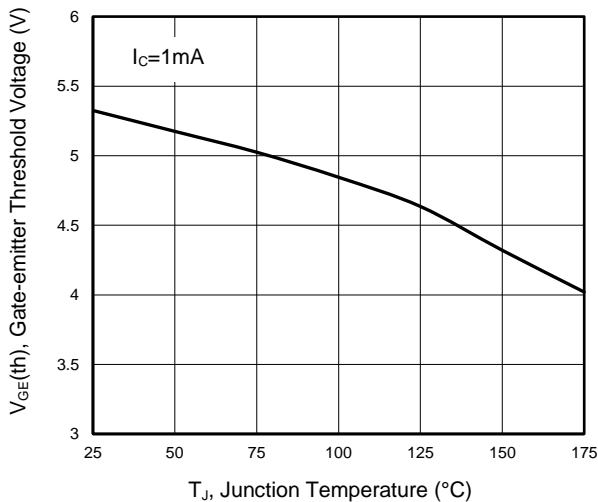
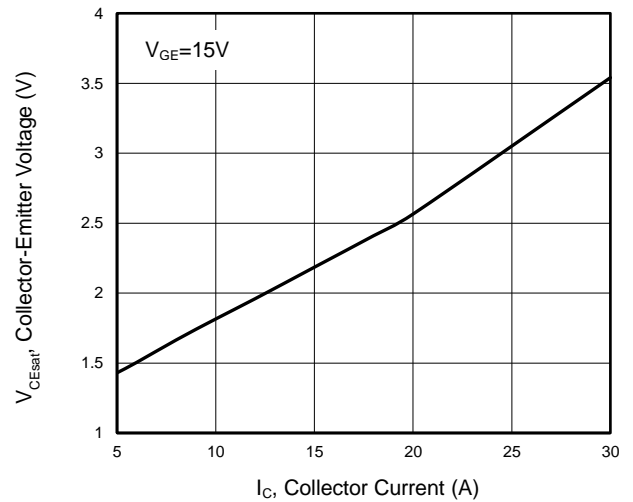
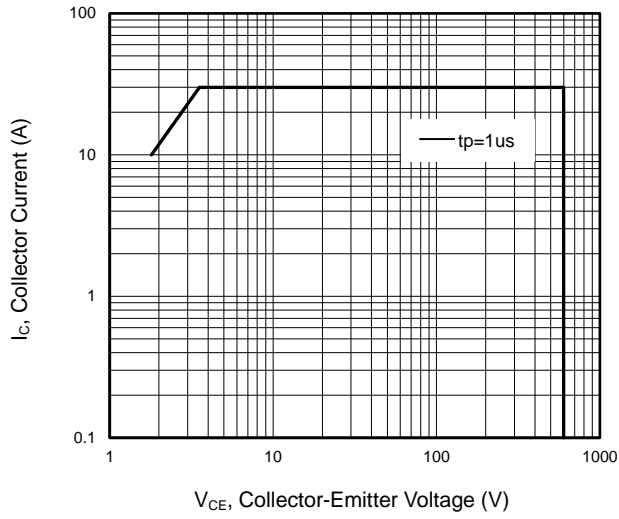


Figure 12 Typical Collector-emitter Saturation Voltage as a function of Collector Current

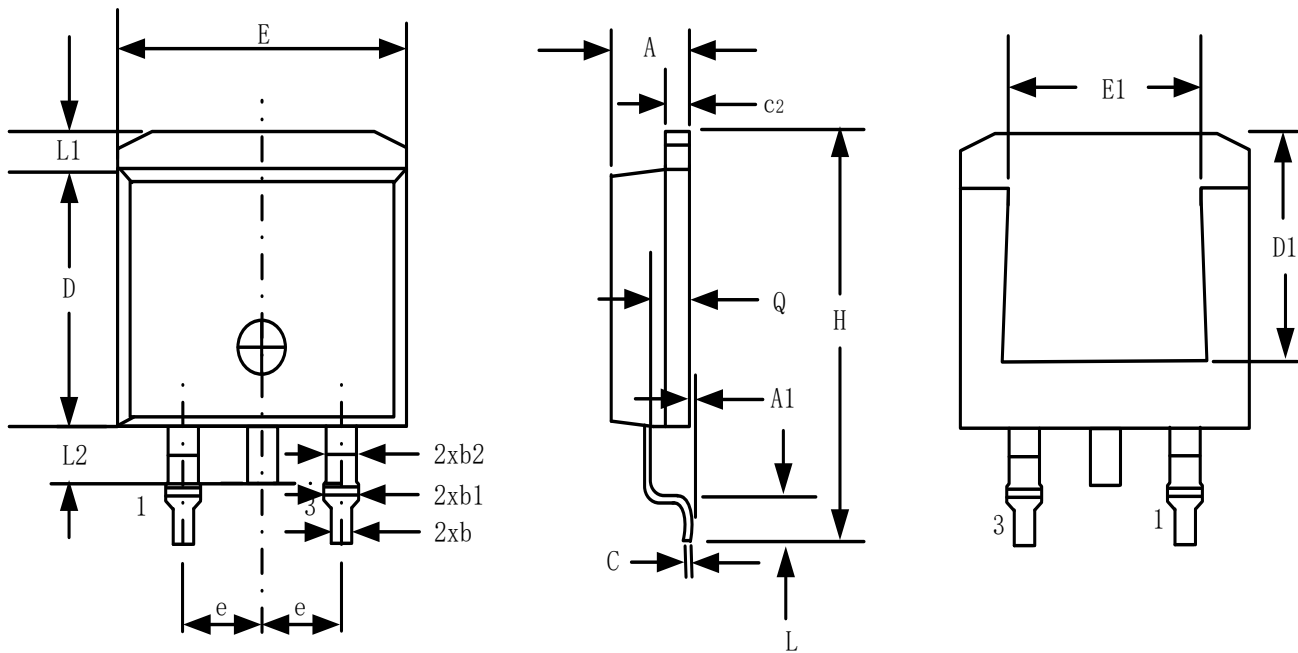


## Typical Electrical and Thermal Characteristics

Figure 13 Forward Bias Safe Operating Area



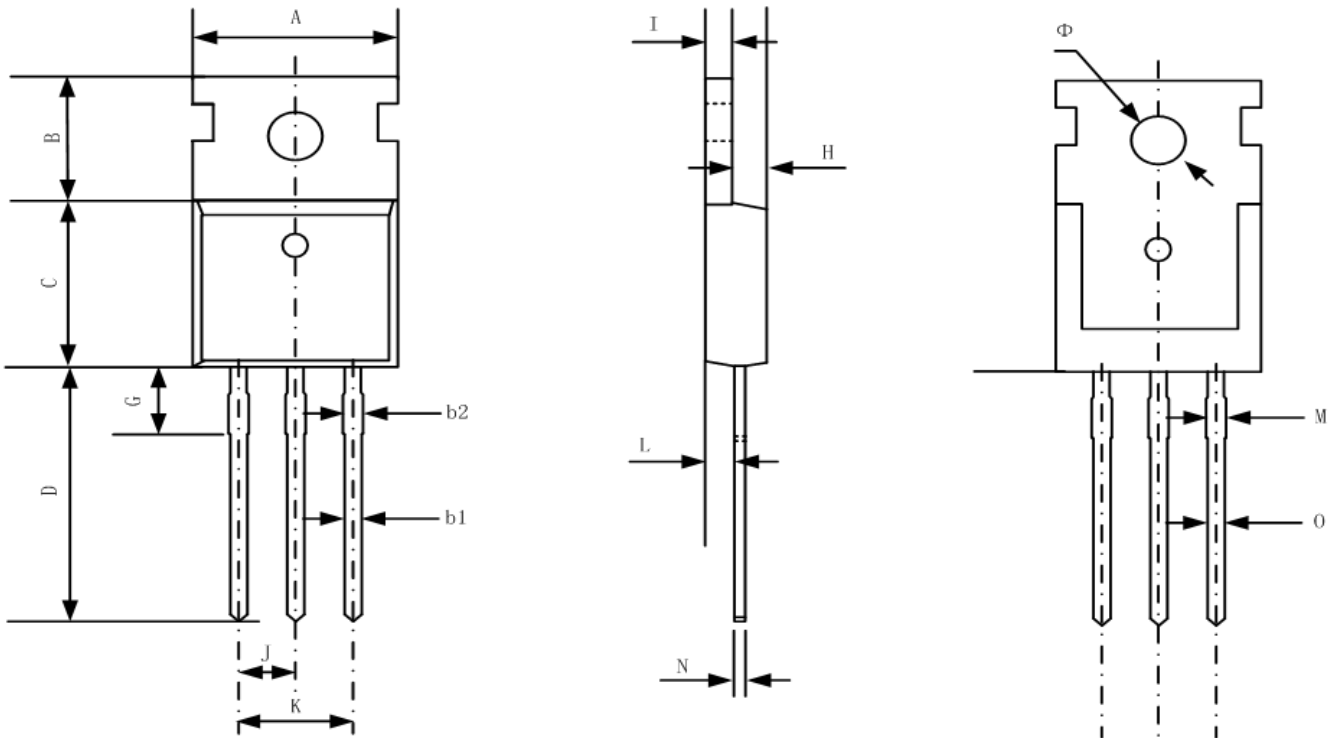
## TO-263-3L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.24	4.64	0.167	0.183
A1	0.00	0.25	0.000	0.010
b	0.70	0.90	0.028	0.035
b1	1.20	1.75	0.047	0.069
b2	1.20	1.70	0.047	0.067
C	0.40	0.60	0.016	0.024
c2	1.15	1.40	0.045	0.055
D	8.82	9.02	0.347	0.355
D1	6.86	--	0.270	--
E	9.96	10.36	0.392	0.408
E1	6.89	7.89	0.271	0.311
e	2.54 BSC		0.10 BSC	
H	14.61	15.88	0.575	0.625
L	1.78	2.79	0.070	0.110
L1	1.36 REF		0.054 REF	
L2	1.50 REF		0.059 REF	
L3	0.25 REF		0.010 REF	
Q	2.30	2.70	0.091	0.106

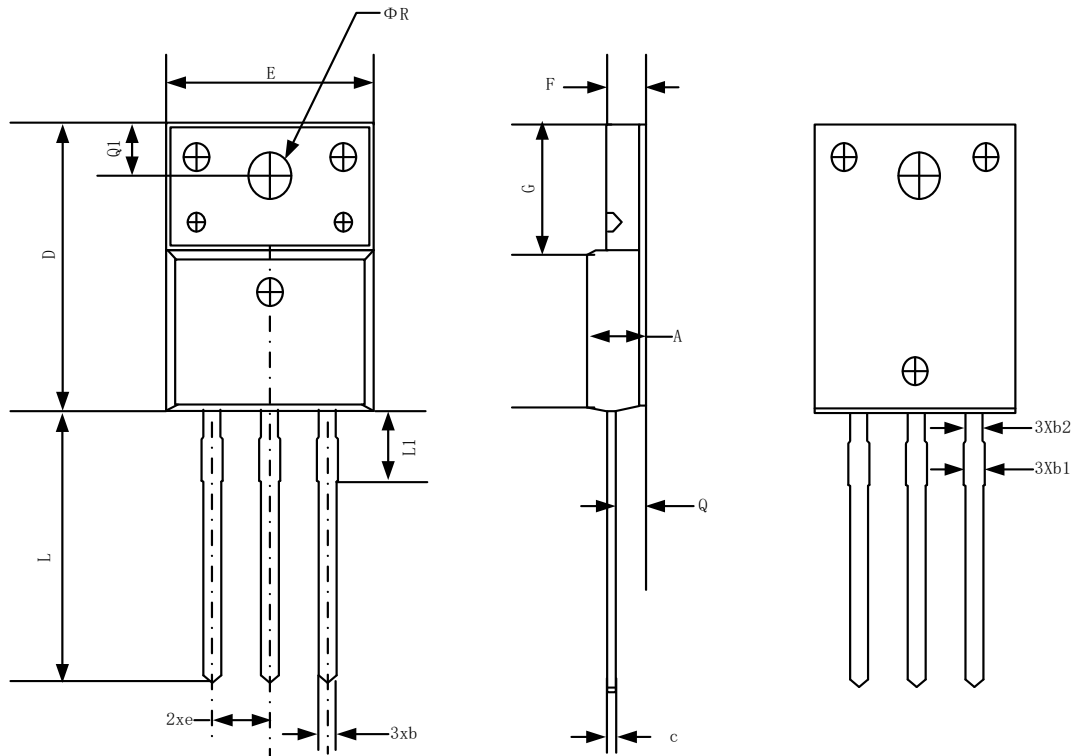


## TO-220-3L-C Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	9.70	10.20	0.38	0.40
B	6.30	6.70	0.25	0.26
C	9.00	9.47	0.35	0.37
D	12.78	13.38	0.50	0.53
G	2.65 REF		0.104 REF	
H	3.00	3.40	0.12	0.13
I	1.25	1.40	0.05	0.06
J	2.40	2.70	0.09	0.11
K	5.00	5.15	0.20	0.20
L	2.20	2.60	0.09	0.10
M	1.25	1.45	0.05	0.06
N	0.45	0.60	0.02	0.02
O	0.70	0.90	0.03	0.04
Φ	3.6 REF		0.142 REF	

## TO-220F Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.50	4.83	0.18	0.19
b	0.70	0.91	0.03	0.04
b1	1.20	1.47	0.05	0.06
b2	1.10	1.38	0.04	0.05
c	0.45	0.63	0.02	0.02
D	15.67	16.07	0.62	0.63
e	2.54 BSC		0.10 BSC	
E	9.96	10.36	0.39	0.41
F	2.34	2.74	0.09	0.11
G	6.48	6.90	0.26	0.27
L	12.68	13.30	0.50	0.52
L1	3.13	3.50	0.12	0.14
Q	2.56	2.93	0.10	0.12
Q1	3.20	3.40	0.13	0.13
$\Phi R$	3.08	3.28	0.12	0.13

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