

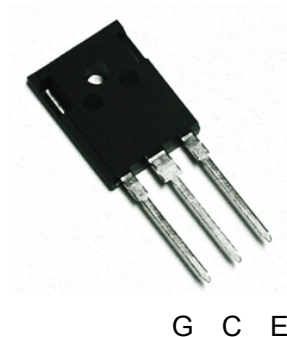
# NCE20G120T

## NCE20G120T

1200V, 20A, Trench NPT IGBT

### Features

- Trench NPT( Non Punch Through) IGBT
- High speed switching
- Low saturation voltage:  $V_{CE(sat)}=2.0V@I_C=20A$
- High input impedance

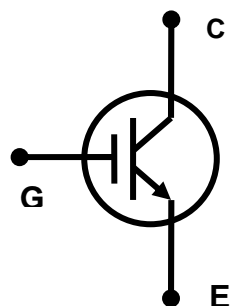


### Applications

- Inductive heating, Microwave oven, Inverter, UPS, etc.
- Soft switching applications

### General Description

Using advanced Trench NPT technology, NCE's 1200V IGBTs offers superior conduction and switching performances, and easy parallel operation with exceptional avalanche ruggedness. This device is designed for soft switching applications.



## Absolute Maximum Ratings

Symbol	Description	Ratings	Units
$V_{CES}$	Collector to Emitter Voltage	1200	V
$V_{GES}$	Gate to Emitter Voltage	+/-25	V
$I_C$	Continuous Collector Current @ $T_C=25^{\circ}C$	40	A
	Continuous Collector Current @ $T_C=100^{\circ}C$	20	A
$I_{CM(1)}$	Pulsed Collector Current	60	A
$P_D$	Maximum Power Dissipation @ $T_C=25^{\circ}C$	298	W
	Maximum Power Dissipation @ $T_C=100^{\circ}C$	119	W
$T_J$	Operating Junction Temperature	-55 to +150	$^{\circ}C$
$T_{stg}$	Storage Temperature Range	-55 to +150	$^{\circ}C$
$T_L$	Maximum Lead Temp. for soldering Purposes, 1/8" from case for 5seconds	300	$^{\circ}C$

**Notes:**

1. Repetitive rating, Pulse width limited by max. junction temperature

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## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	-	0.42	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	-	40	°C/W

## Electrical Characteristics of the IGBT T<sub>C</sub>=25°C

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
BV <sub>CES</sub>	Collector to Emitter Breakdown Voltage	V <sub>GE</sub> =0V, I <sub>C</sub> =1mA	1200	-	-	V
I <sub>CES</sub>	Collector Cut-Off Current	V <sub>CE</sub> =V <sub>CES</sub> , V <sub>GE</sub> =0V	-	-	1	mA
I <sub>GES</sub>	G-E Leakage Current	V <sub>GE</sub> =V <sub>GES</sub> , V <sub>CE</sub> =0V	-	-	+/-250	nA
<b>On Characteristics</b>						
V <sub>GE(th)</sub>	G-E Threshold Voltage	I <sub>C</sub> =20mA, V <sub>CE</sub> =V <sub>GE</sub>	4.0	-	7.0	V
V <sub>CE(sat)</sub>	Collector to Emitter Saturation Voltage	I <sub>C</sub> =20A, V <sub>GE</sub> =15V T <sub>C</sub> =25°C	-	2	2.5	V
		I <sub>C</sub> =20A, V <sub>GE</sub> =15V T <sub>C</sub> =125°C	-	2.15	-	V
<b>Dynamic Characteristics</b>						
C <sub>ies</sub>	Input Capacitance	V <sub>CE</sub> =30V, V <sub>GE</sub> =0V, f=1MHz	-	3080	-	pF
C <sub>oes</sub>	Output Capacitance		-	95	-	pF
C <sub>res</sub>	Reverse Transfer Capacitance		-	60	-	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> =600V, I <sub>C</sub> =20A, R <sub>G</sub> =10Ω, V <sub>GE</sub> =15V, Resistive Load, T <sub>C</sub> =25°C	-	30	-	ns
t <sub>r</sub>	Rise Time		-	79	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	143	-	ns
t <sub>f</sub>	Fall Time		-	217	320	ns
E <sub>on</sub>	Turn-On Switching Loss		-	0.42	-	mJ
E <sub>off</sub>	Turn-Off Switching Loss		-	0.71	1.05	mJ
E <sub>ts</sub>	Total Switching Loss		-	1.13	-	mJ
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>CC</sub> =600V, I <sub>C</sub> =20A, R <sub>G</sub> =10Ω, V <sub>GE</sub> =15V, Resistive Load, T <sub>C</sub> =125°C	-	29	-	ns
t <sub>r</sub>	Rise Time		-	93	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		-	147	-	ns
t <sub>f</sub>	Fall Time		-	259	-	ns
E <sub>on</sub>	Turn-On Switching Loss		-	0.47	-	mJ
E <sub>off</sub>	Turn-Off Switching Loss		-	0.86	-	mJ
E <sub>ts</sub>	Total Switching Loss		-	1.33	-	mJ
Q <sub>g</sub>	Total Gate Charge	V <sub>CC</sub> =600V, I <sub>C</sub> =20A, V <sub>GE</sub> =15V	-	137	-	nC
Q <sub>ge</sub>	Gate to Emitter Charge		-	23	-	nC
Q <sub>gc</sub>	Gate to Collector Charge		-	65	-	nC

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

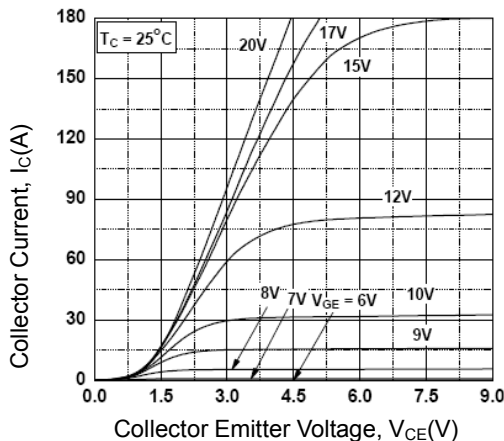


Figure 2. Typical Saturation Voltage Characteristics

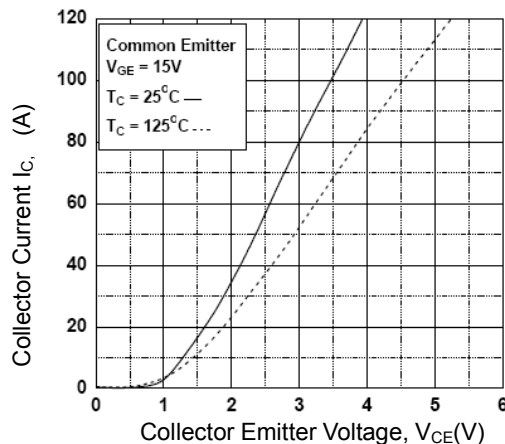


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

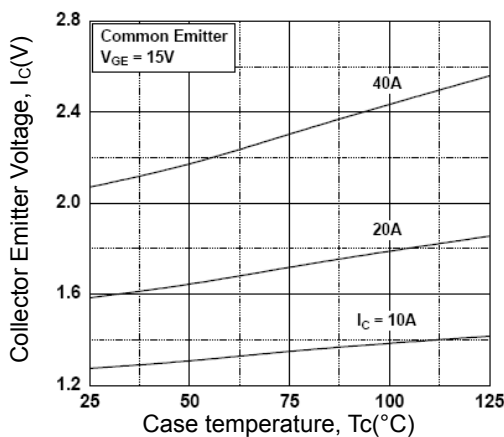


Figure 4. Saturation Voltage vs. Vge

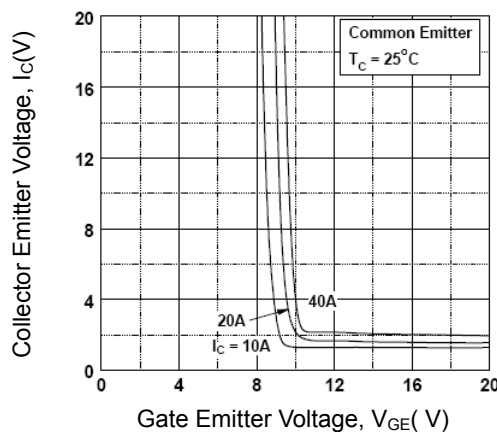


Figure 5. Saturation Voltage vs. Vge

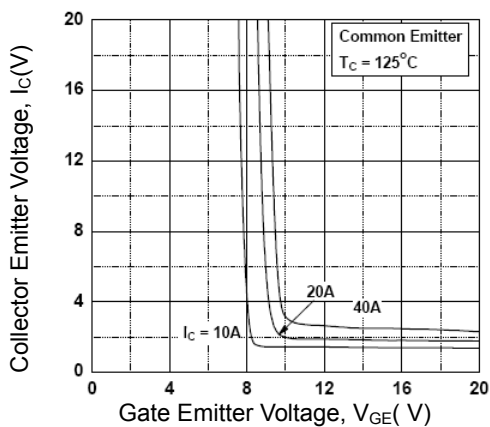
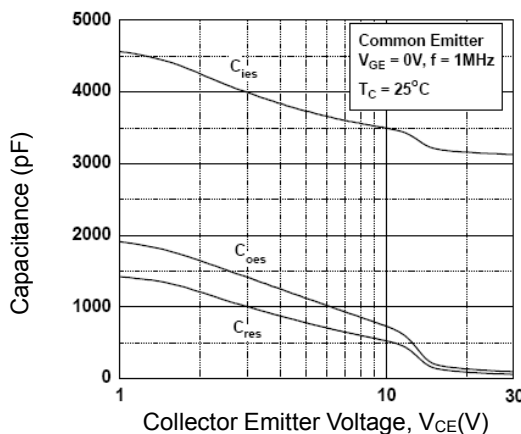


Figure 6. Capacitance Characteristics



## Typical Performance Characteristics (Continued)

Figure 8. Turn-on Characteristics vs. Gate Resistance

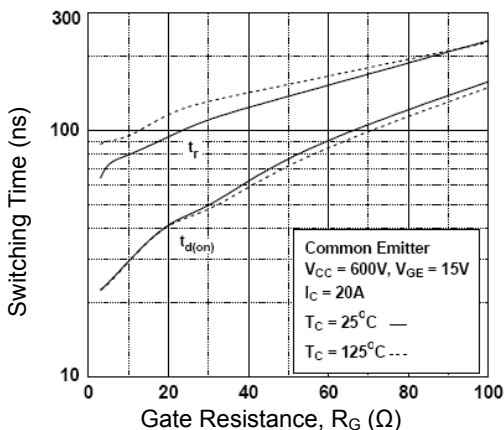


Figure 9. Turn-off Characteristics vs. Gate Resistance

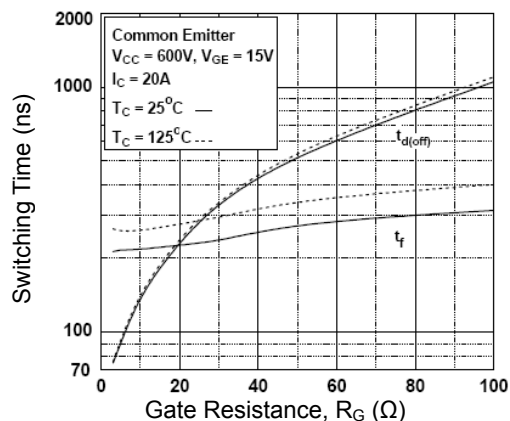


Figure 10. Switching Loss vs. Gate Resistance

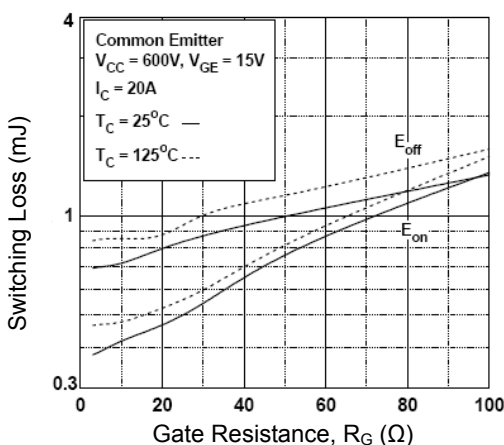


Figure 11. Turn-on Characteristics vs. Collector Current

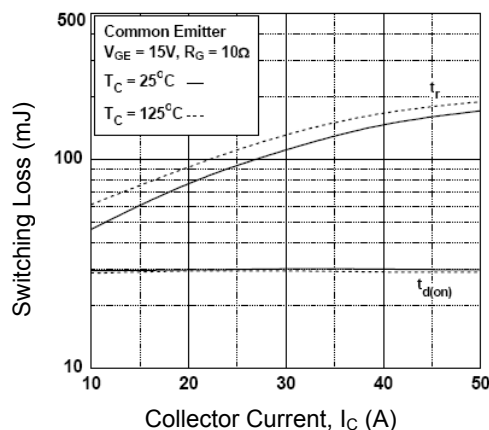


Figure 12. Turn-Off Characteristics vs. Collector Current

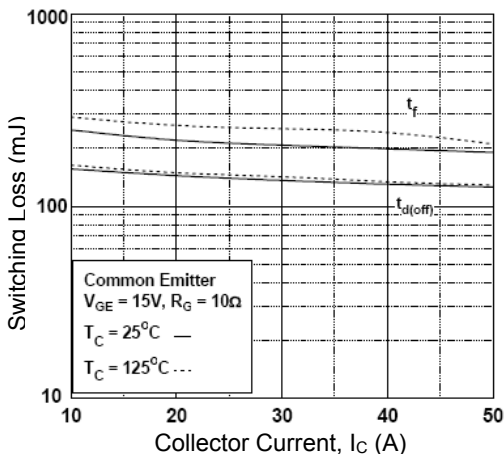
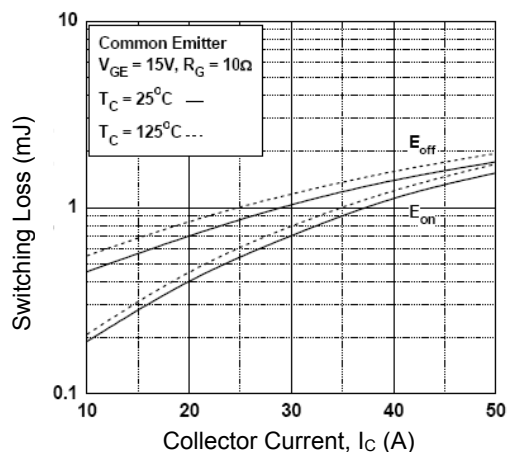


Figure 13. Switching Loss vs. Collector Current



## Typical Performance Characteristics (Continued)

Figure 14. Gate Charge Characteristics

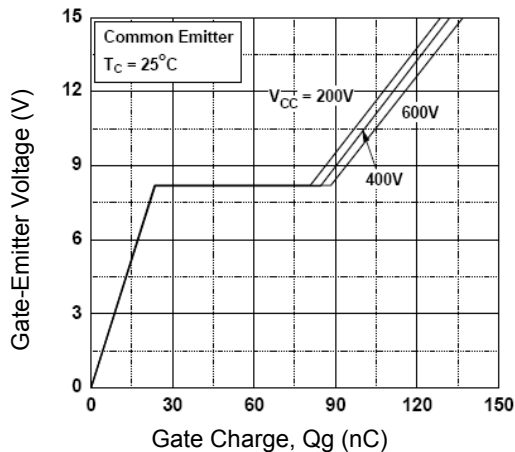


Figure 15. SOA Characteristics

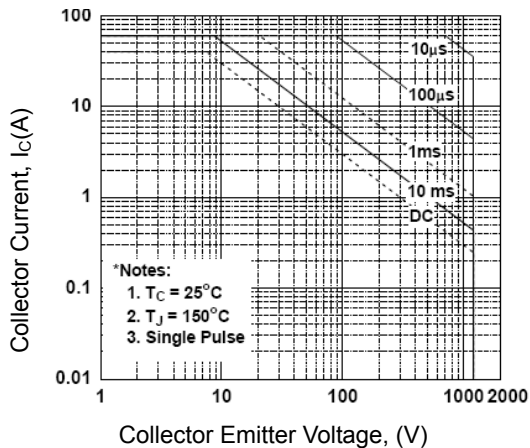


Figure 16. Turn-Off SOA

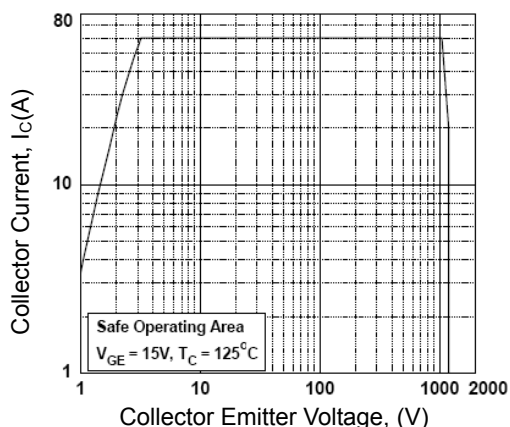
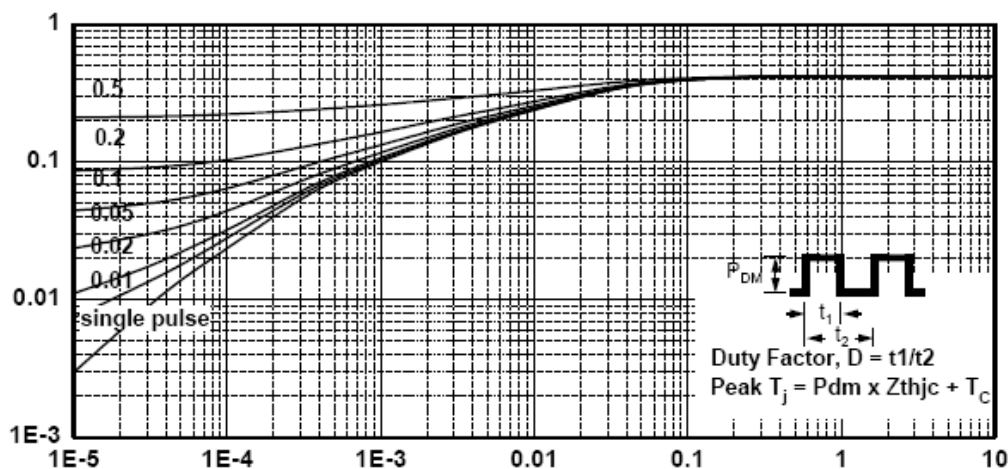


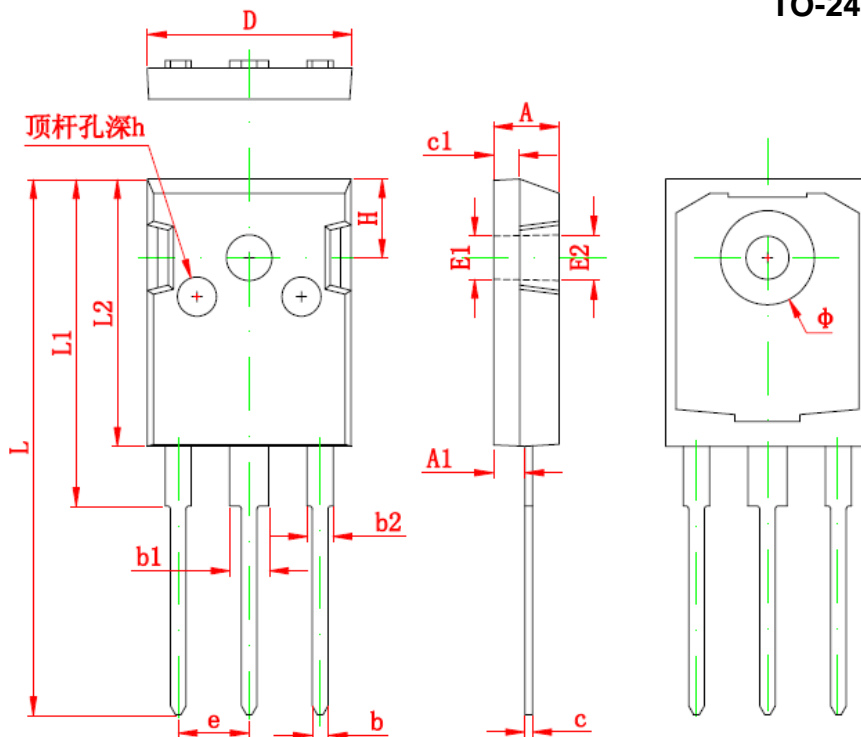
Figure 17. Transient Thermal Impedance of IGBT



# NCE20G120T

## Mechanical Dimensions (continued)

TO-247



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.850	5.150	0.191	0.200
A1	2.200	2.600	0.087	0.102
b	1.000	1.400	0.039	0.055
b1	2.800	3.200	0.110	0.126
b2	1.800	2.200	0.071	0.087
c	0.500	0.700	0.020	0.028
c1	1.900	2.100	0.075	0.083
D	15.450	15.750	0.608	0.620
E1	3.500 REF		0.138 REF	
E2	3.600 REF		0.142 REF	
L	40.900	41.300	1.610	1.626
L1	24.800	25.100	0.976	0.988
L2	20.300	20.600	0.799	0.811
$\phi$	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	
h	0.000	0.300	0.000	0.012

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