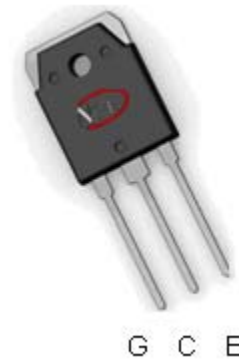


## NCE15G135P

1350V, 15A, Trench NPT IGBT

### Features

- Trench NPT( Non Punch Through) IGBT
- High speed switching
- Low saturation voltage:  $V_{CE(sat)}=2.0V@I_C=15A$
- High input impedance

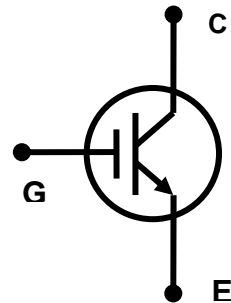


### Applications

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

### General Description

Using advanced Trench NPT technology, NCE's 1350V 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	1350	V
$V_{GES}$	Gate to Emitter Voltage	+/-30	V
$I_C$	Continuous Collector Current @ $T_C=25^{\circ}C$	30	A
	Continuous Collector Current @ $T_C=100^{\circ}C$	15	A
$I_{CM}(1)$	Pulsed Collector Current	45	A
$P_D$	Maximum Power Dissipation @ $T_C=25^{\circ}C$	220	W
	Maximum Power Dissipation @ $T_C=100^{\circ}C$	88	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

## Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Units
$R_{\square JC}$	Thermal Resistance, Junction to Case	-	0.57	$^{\circ}C/W$
$R_{JA}$	Thermal Resistance, Junction to Ambient	-	40	$^{\circ}C/W$

## Electrical Characteristics of the IGBT $T_C=25^{\circ}C$

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
<b>Off Characteristics</b>						
$BV_{CES}$	Collector to Emitter Breakdown Voltage	$V_{GE}=0V, I_C=1mA$	1350	-	-	V
$I_{CES}$	Collector Cut-Off Current	$V_{CE}=V_{CES}, V_{GE}=0V$	-	-	1	mA
$I_{GES}$	G-E Leakage Current	$V_{GE}=V_{GES}, V_{CE}=0V$	-	-	+/-250	nA
<b>On Characteristics</b>						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C=15mA, V_{CE}=V_{GE}$	4.0	5.5	7.0	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=15A, V_{GE}=15V$ $T_C=25^{\circ}C$	-	2	2.5	V
		$I_C=15A, V_{GE}=15V$ $T_C=125^{\circ}C$	-	2.15	-	V
<b>Dynamic Characteristics</b>						
$C_{ies}$	Input Capacitance	$V_{CE}=30V, V_{GE}=0V,$ $f=1MHz$	-	2350	-	pF
$C_{oes}$	Output Capacitance		-	70	-	pF
$C_{res}$	Reverse Transfer Capacitance		-	45	-	pF
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=15A,$ $R_G=10\Omega, V_{GE}=15V,$ Resistive Load, $T_C=25^{\circ}C$	-	33	-	ns
$t_r$	Rise Time		-	80	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	160	-	ns
$t_f$	Fall Time		-	255	330	ns
$E_{on}$	Turn-On Switching Loss		-	0.3	-	mJ
$E_{off}$	Turn-Off Switching Loss		-	0.58	0.74	mJ
$E_{ts}$	Total Switching Loss		-	0.88	-	mJ
$t_{d(on)}$	Turn-On Delay Time	$V_{CC}=600V, I_C=15A,$ $R_G=10\Omega, V_{GE}=15V,$ Resistive Load, $T_C=125^{\circ}C$	-	30	-	ns
$t_r$	Rise Time		-	115	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	170	-	ns
$t_f$	Fall Time		-	390	-	ns
$E_{on}$	Turn-On Switching Loss		-	0.38	-	mJ
$E_{off}$	Turn-Off Switching Loss		-	0.89	-	mJ
$E_{ts}$	Total Switching Loss		-	1.27	-	mJ
$Q_g$	Total Gate Charge	$V_{CC}=600V, I_C=15A,$ $V_{GE}=15V$	-	100	-	nC
$Q_{ge}$	Gate to Emitter Charge		-	19	-	nC
$Q_{gc}$	Gate to Collector Charge		-	45	-	nC

## Typical Performance Characteristics

Figure 1. Typical Output Characteristics

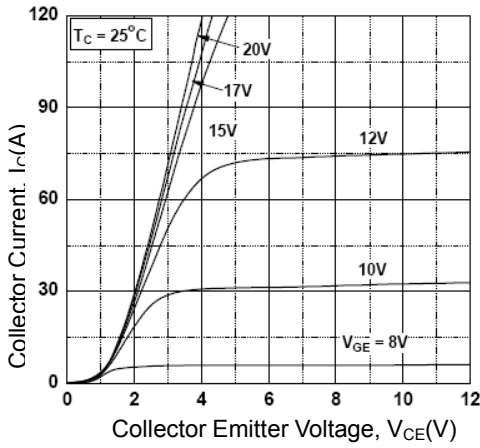


Figure 2. Typical Saturation Voltage Characteristics

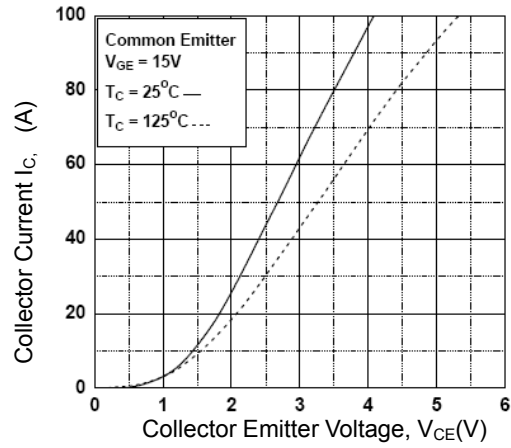


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

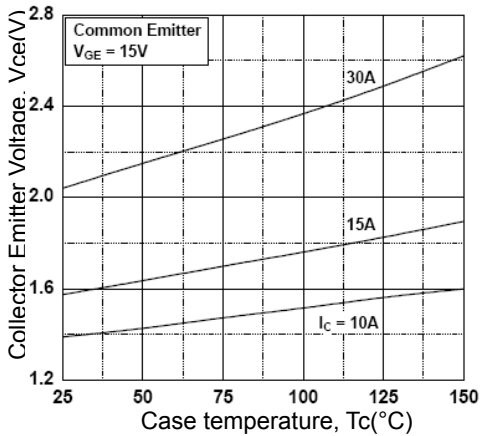


Figure 4. Saturation Voltage vs. Vge

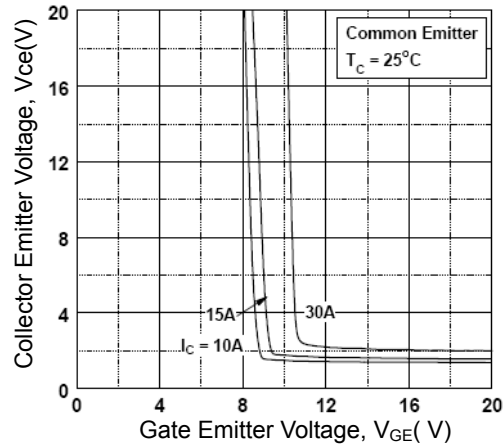


Figure 5. Saturation Voltage vs. Vge

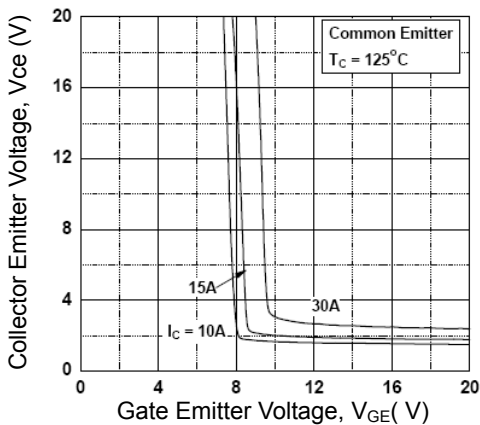
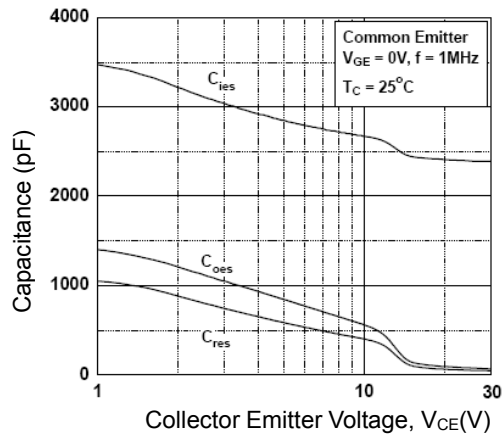
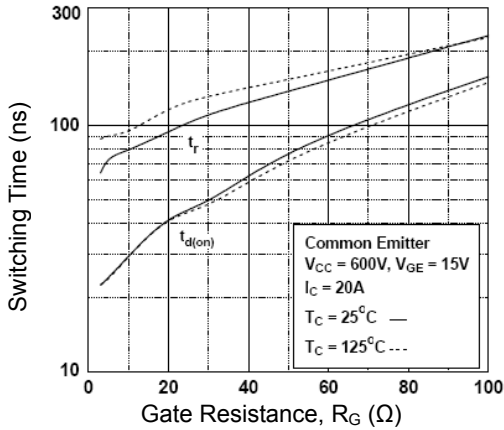


Figure 6. Capacitance Characteristics

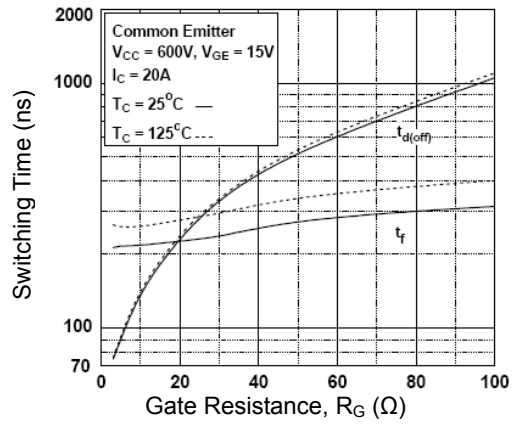


## Typical Performance Characteristics (Continued)

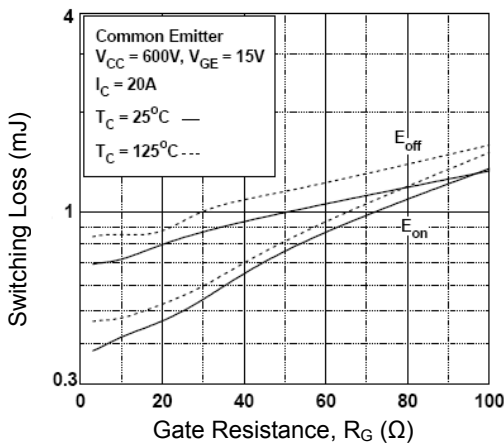
**Figure 7. Turn-on Characteristics vs. Gate Resistance**



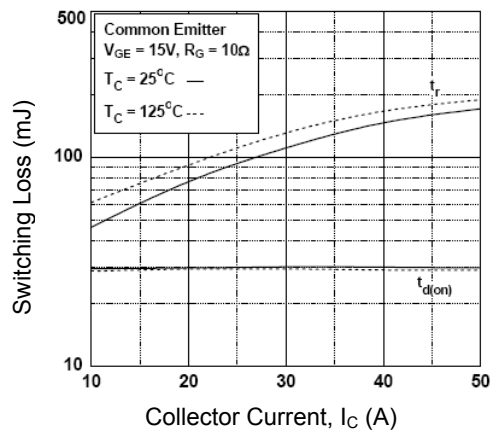
**Figure 8. Turn-off Characteristics vs. Gate Resistance**



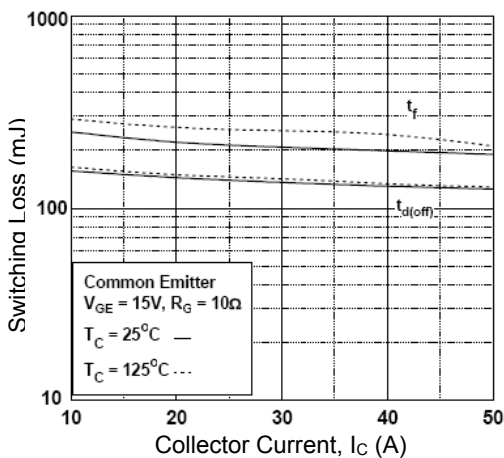
**Figure 9. Switching Loss vs. Gate Resistance**



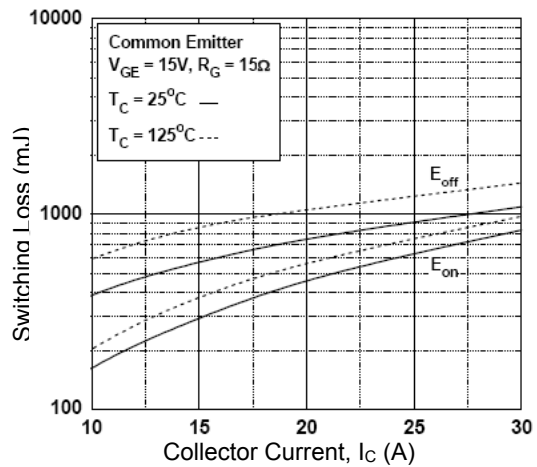
**Figure 10. Turn-on Characteristics vs. Collector Current**



**Figure 11. Turn-Off Characteristics vs. Collector Current**



**Figure 12. Switching Loss vs. Collector Current**



## Typical Performance Characteristics (Continued)

Figure 13. Gate Charge Characteristics

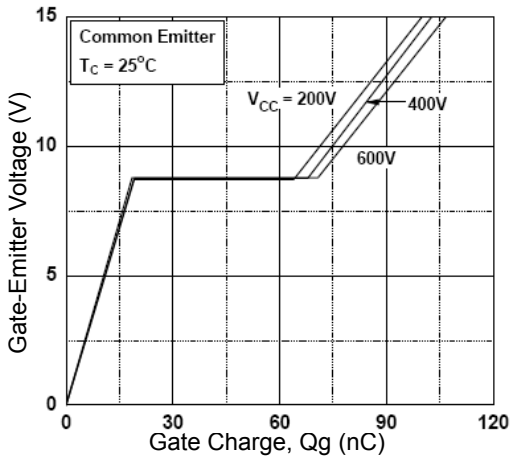


Figure 14. SOA Characteristics

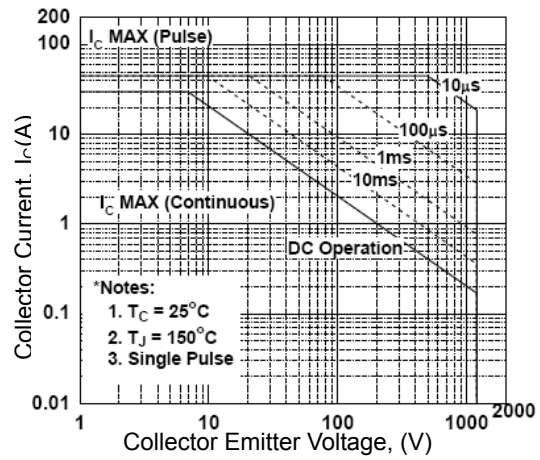


Figure 15. Turn-Off SOA

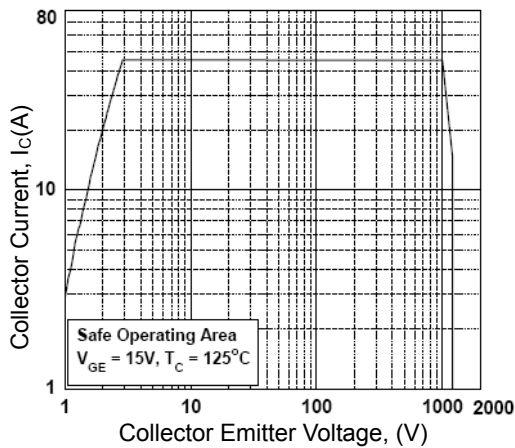
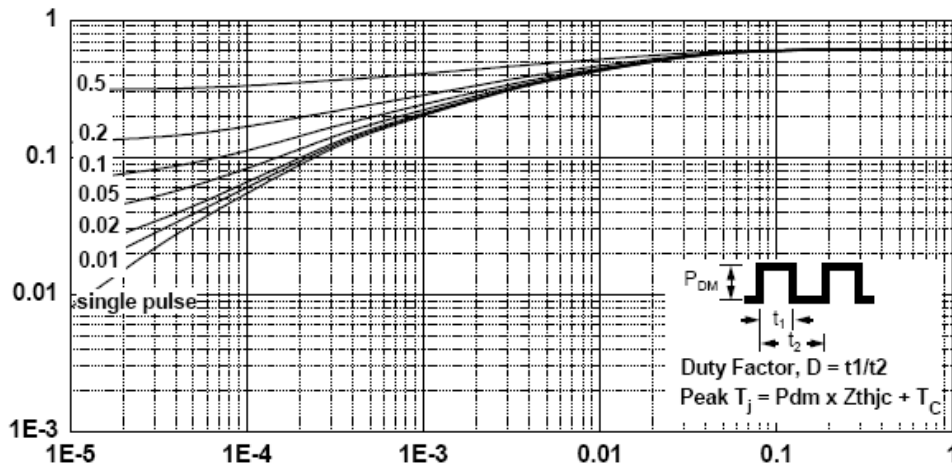
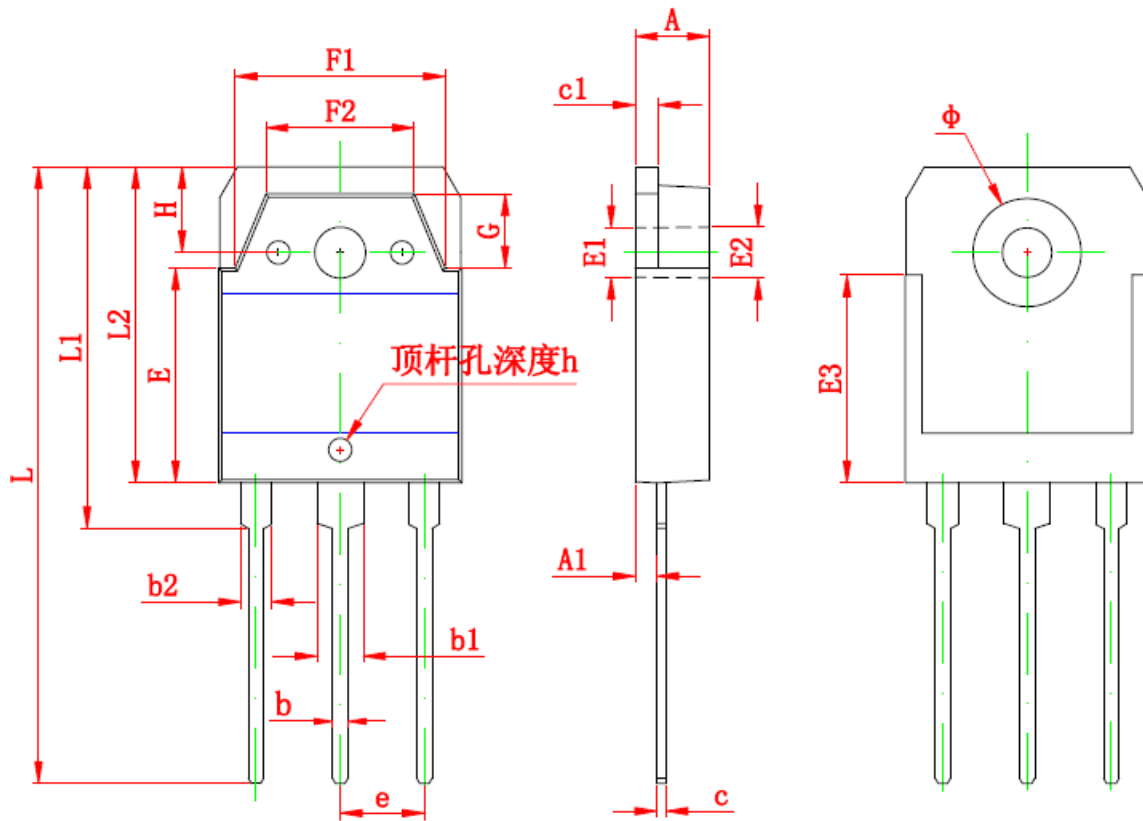


Figure 16. Transient Thermal Impedance of IGBT



## TO-3P Mechanical Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.600	5.000	0.181	0.197
A1	1.200	1.600	0.047	0.063
b	0.800	1.200	0.031	0.047
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	1.450	1.650	0.057	0.065
D	15.450	15.850	0.606	0.622
E	13.700	14.100	0.539	0.555
E1	3.200 REF		0.126 REF	
E2	3.300 REF		0.130 REF	
E3	13.450 REF		0.530 REF	
F1	13.400	13.800	0.528	0.543
F2	9.400	9.800	0.370	0.386
L	39.900	40.300	1.571	1.587
L1	23.200	23.600	0.913	0.929
L2	20.300	20.600	0.799	0.811
Φ	6.900	7.100	0.272	0.280
G	5.150	5.550	0.203	0.219
e	5.450 TYP		0.215 TYP	
H	5.000 REF		0.197 REF	
h	0.000	0.300	0.000	0.012



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