

NCE15GD135P

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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



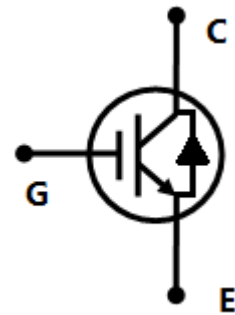
G C E

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
I_F	Diode Continuous Forward Current @ $T_C=100^{\circ}C$	15	
I_{FM}	Diode Maximum Forward Current	90	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
Off Characteristics						
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
On Characteristics						
$V_{GE(th)}$	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
Dynamic Characteristics						
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
Switching Characteristics						
$t_{d(on)}$	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



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Electrical Characteristics of Diode $T_C=25^{\circ}\text{C}$

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{FM}	Diode Forward Voltage	$I_F=15\text{A}$	25°C	1.4	1.8	V
			125°C	1.42		V
t_{rr}	Diode Reverse Recovery Time	$I_F=15\text{A},$ $di/dt=200\text{A}/\mu\text{s}$	25°C	575		ns
			125°C	577		ns
I_{rr}	Diode Peak Reverse Recovery Current		25°C	30		A
			125°C	37		A
Q_{rr}	Diode Reverse Recovery Charge		25°C	8.7		μC
			125°C	10.7		μC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

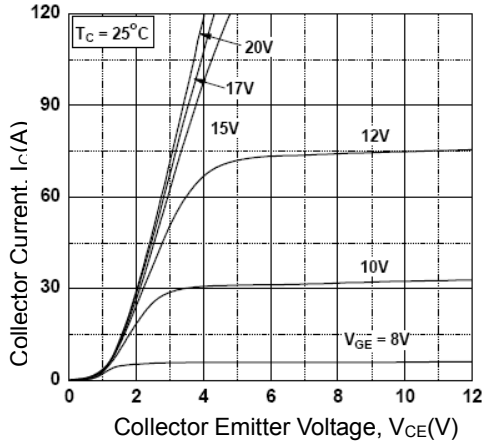


Figure 2. Typical Saturation Voltage Characteristics

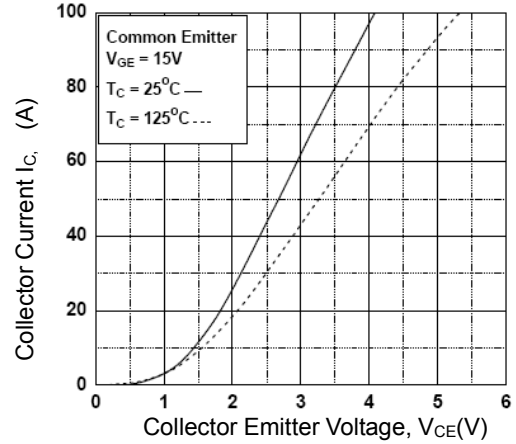


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

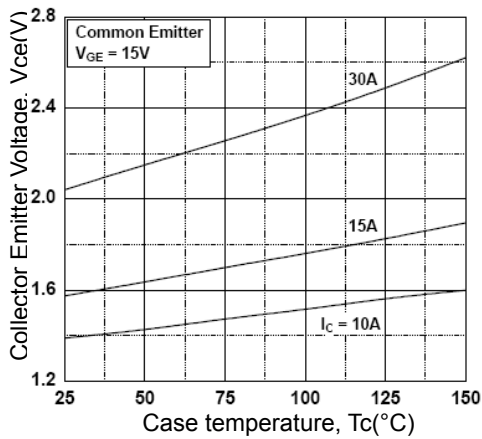


Figure 4. Saturation Voltage vs. V_GE

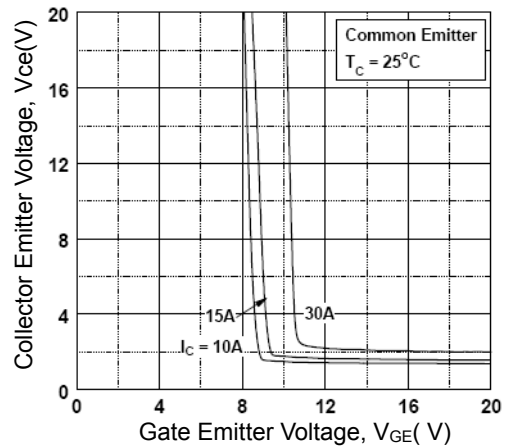


Figure 5. Saturation Voltage vs. V_GE

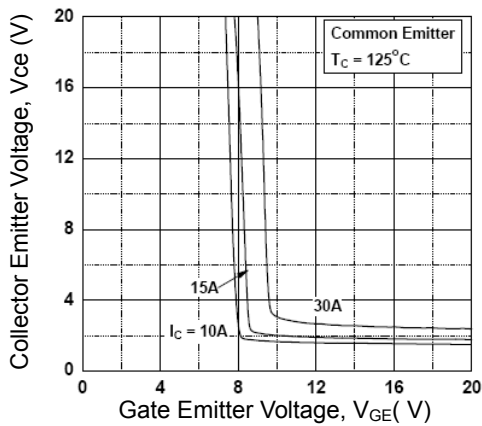
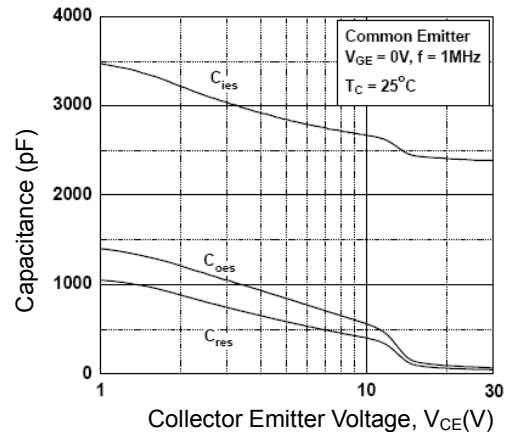


Figure 6. Capacitance Characteristics



Typical Performance Characteristics (Continued)

Figure 7. Turn-on Characteristics vs. Gate Resistance

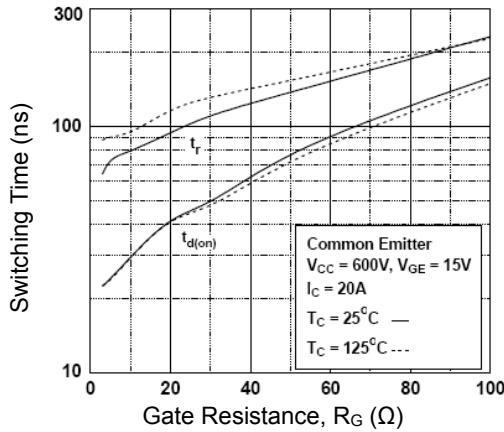


Figure 8. Turn-off Characteristics vs. Gate Resistance

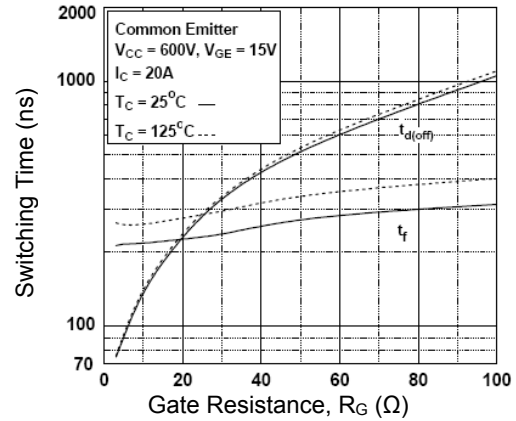


Figure 9. Switching Loss vs. Gate Resistance

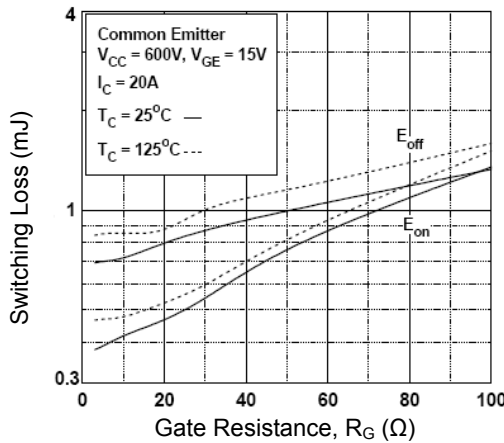


Figure 10. Turn-on Characteristics vs. Collector Current

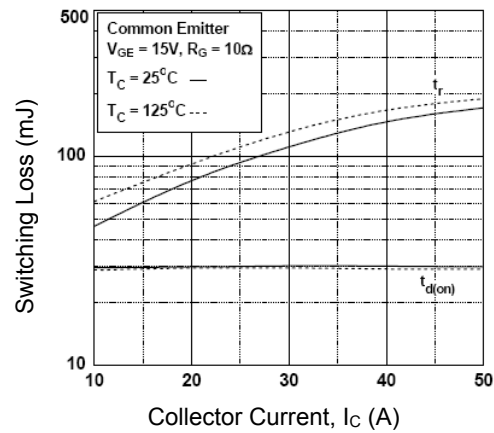


Figure 11. Turn-Off Characteristics vs. Collector Current

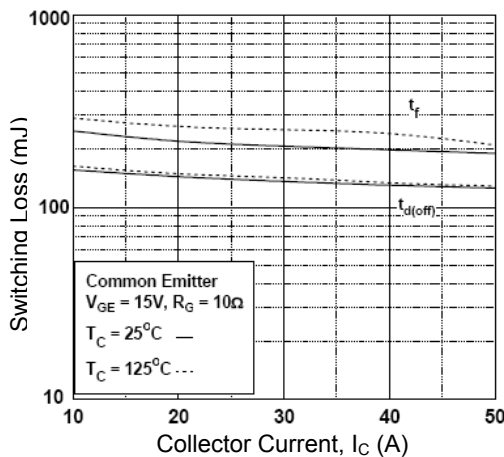
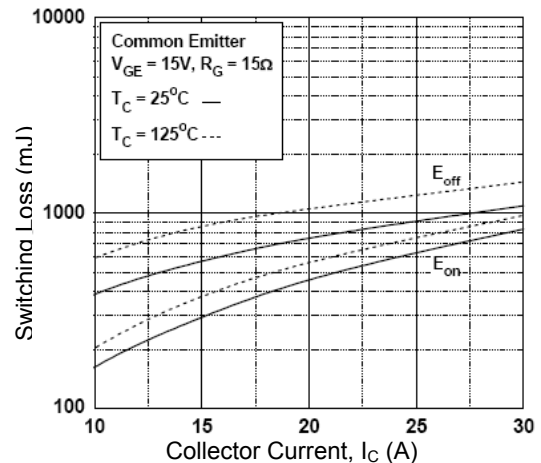


Figure 12. Switching Loss vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Gate Charge Characteristics

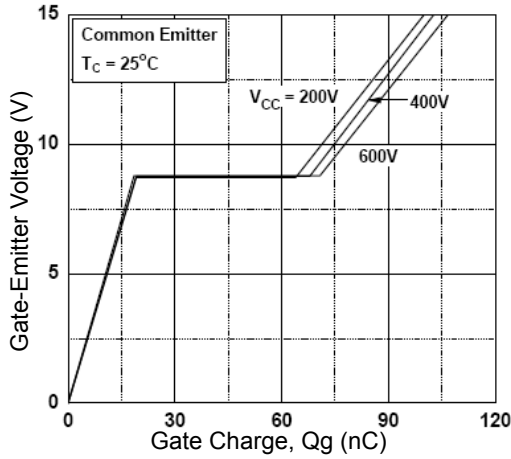


Figure 14. SOA Characteristics

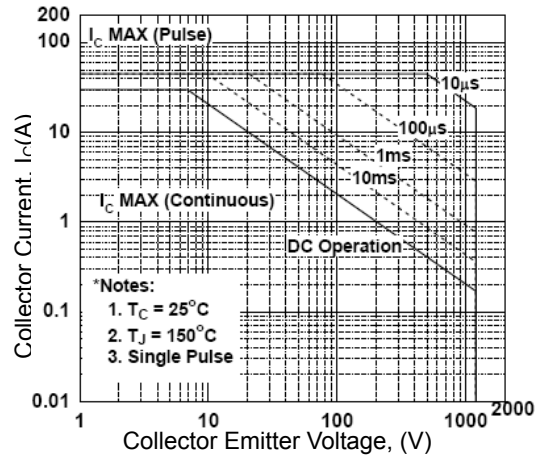


Figure 15. Turn-Off SOA

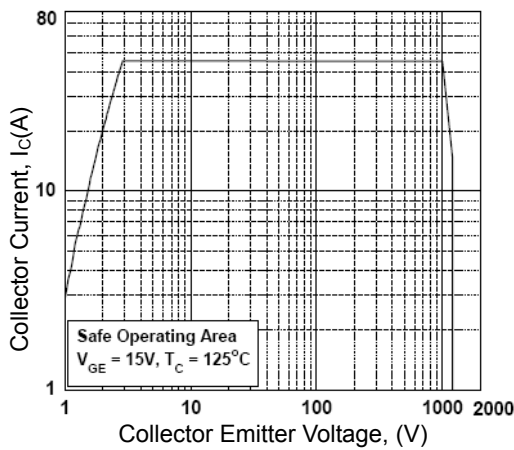
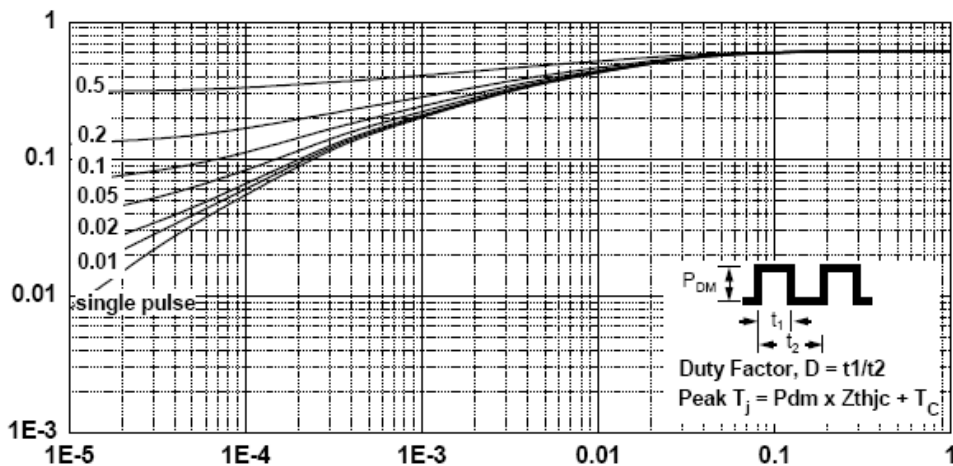
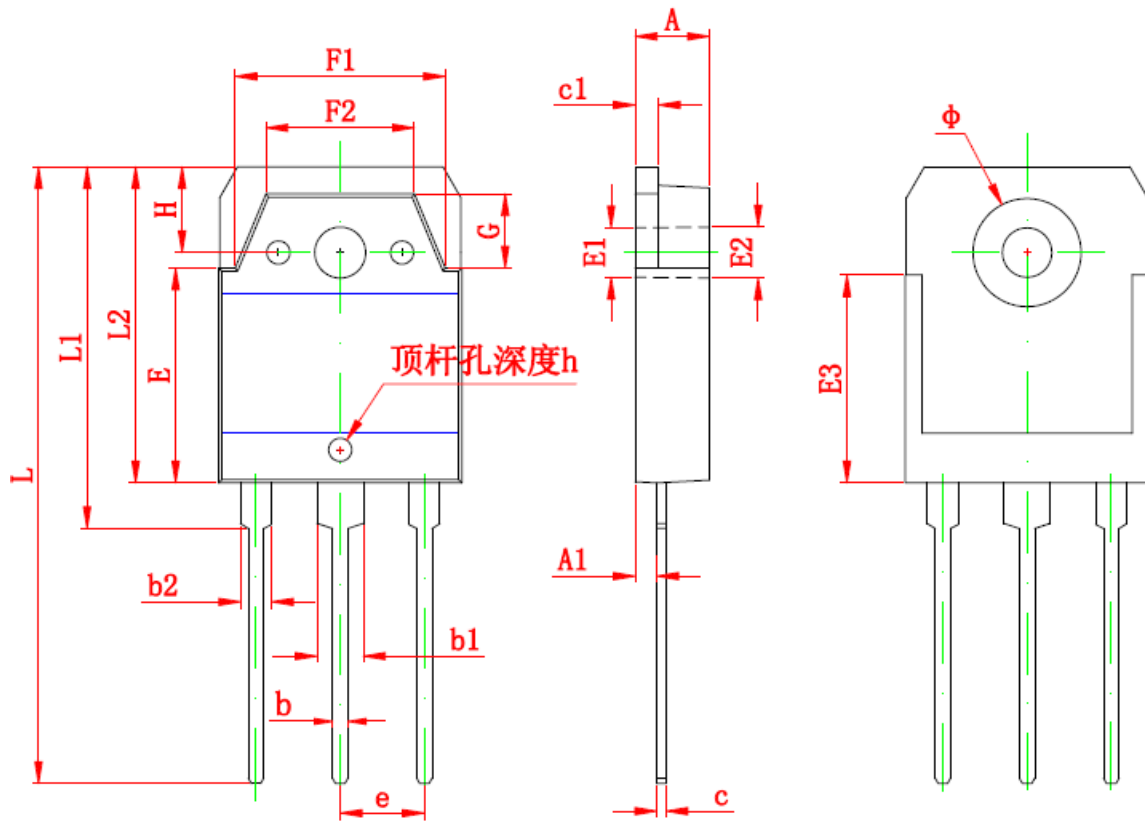


Figure 16. Transient Thermal Impedance of IGBT



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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