

NCE20ED135T

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1350V, 20A, Trench FS IGBT

Features

- Trench FS(Field Stop) IGBT
- High speed switching
- Low saturation voltage: $V_{CE(sat)}=2.0V@I_C=20A$
- High input impedance

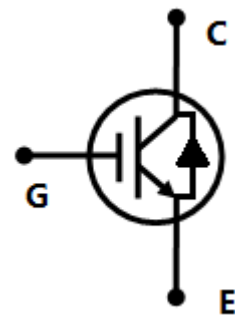


Applications

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

General Description

Using advanced Trench field stop 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 @ $T_C=25^{\circ}C$	40	A
	Continuous Collector Current @ $T_C=100^{\circ}C$	20	A
$I_{CM}(1)$	Pulsed Collector Current	60	A
I_F	Diode Continuous Forward Current @ $T_C=100^{\circ}C$	20	
I_{FM}	Diode Maximum Forward Current	60	A
P_D	Maximum Power Dissipation @ $T_C=25^{\circ}C$	340	W
	Maximum Power Dissipation @ $T_C=100^{\circ}C$	170	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	260	$^{\circ}C$

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	-	0.37	$^{\circ}C/W$
R_{JA}	Thermal Resistance, Junction to Ambient	-	40	$^{\circ}C/W$

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

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	$V_{CE}=1350V, V_{GE}=0V$	-	-	100	μA
I_{GES}	G-E Leakage Current	$V_{GE}=30V, V_{CE}=0V$	-	-	+/-100	nA
On Characteristics						
$V_{GE(th)}$	G-E Threshold Voltage	$I_C=1mA, V_{CE}=V_{GE}$	5		7	V
$V_{CE(sat)}$	Collector to Emitter Saturation Voltage	$I_C=20A, V_{GE}=15V$ $T_C=25^{\circ}C$	-	1.7	2	V
		$I_C=20A, V_{GE}=15V$ $T_C=125^{\circ}C$	-	2	-	V
Dynamic Characteristics						
C_{ies}	Input Capacitance	$V_{CE}=30V, V_{GE}=0V,$ $f=1MHz$	-	2050	-	pF
C_{oes}	Output Capacitance		-	70	-	pF
C_{res}	Reverse Transfer Capacitance		-	40	-	pF
Switching Characteristics						
$t_{d(off)}$	Turn-Off Delay Time	$V_{CC}=600V, I_C=20A,$ $R_G=10\Omega, V_{GE}=15V,$ Inductive Load, $T_C=25^{\circ}C$	-	190	-	ns
t_f	Fall Time		-	100		ns
E_{off}	Turn-Off Switching Loss		-	0.9		mJ
$t_{d(off)}$	Turn-Off Delay Time	$V_{CC}=600V, I_C=20A,$ $R_G=10\Omega, V_{GE}=15V,$ Inductive Load, $T_C=125^{\circ}C$	-	200		ns
t_f	Fall Time		-	154		ns
E_{off}	Turn-Off Switching Loss		-	1.4		mJ
Q_g	Total Gate Charge	$V_{CC}=600V, I_C=20A,$ $V_{GE}=15V$	-	190	240	nC
Q_{ge}	Gate to Emitter Charge		-	15	23	nC
Q_{gc}	Gate to Collector Charge		-	80	120	nC
Diode Characteristics						
V_{FM}	Forward Voltage	$I_F=20A, T_C=25^{\circ}C$	-	1.8	2	V
t_{rr}	Reverse Recovery Time	$I_F=20A, di/dt=200A/us$ $T_C=25^{\circ}C$	-	235	350	ns
I_{rr}	Peak Reverse Recovery Current		-	27	40	A
Q_{rr}	Reverse Recovery Charge		-	3130	4700	μC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics

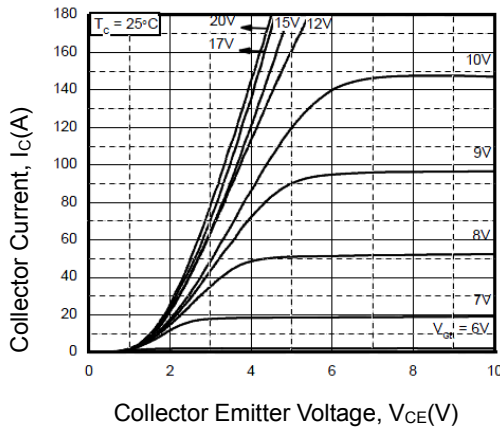


Figure 2. Typical Saturation Voltage Characteristics

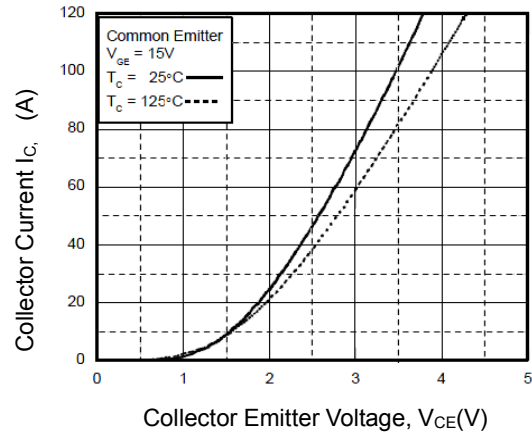


Figure 3. Saturation Voltage vs. Case Temperature at Variant Current Level

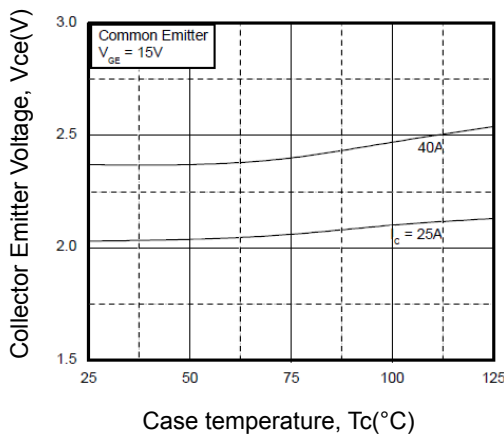


Figure 4. Saturation Voltage vs. Vge

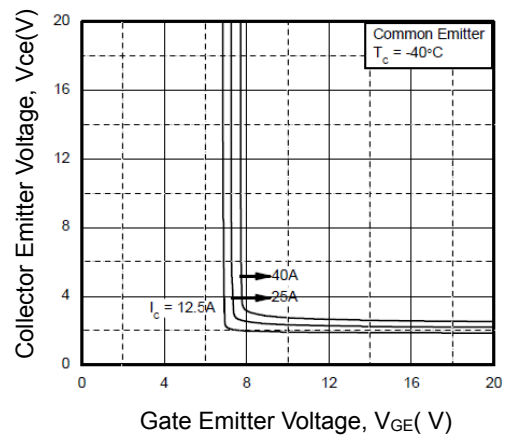


Figure 5. Saturation Voltage vs. Vge

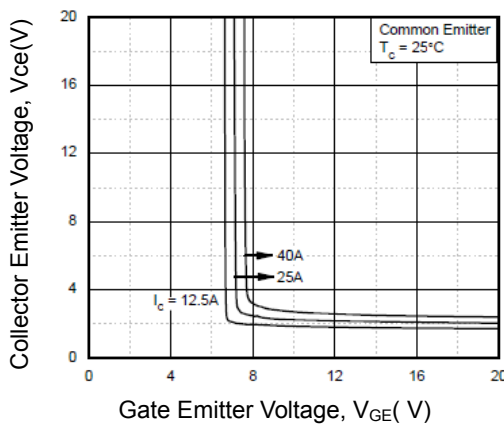
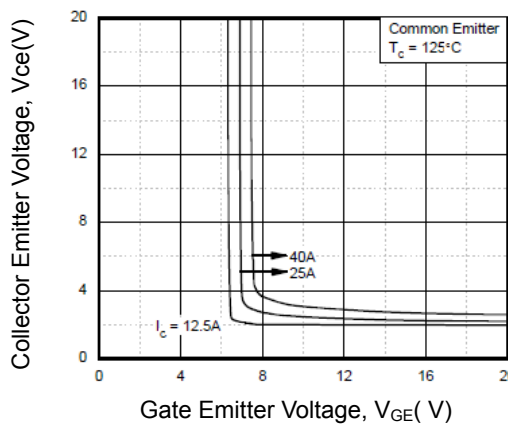


Figure 6. Saturation Voltage vs. Vge



Typical Performance Characteristics (Continued)

Figure 7. Capacitance Characteristics

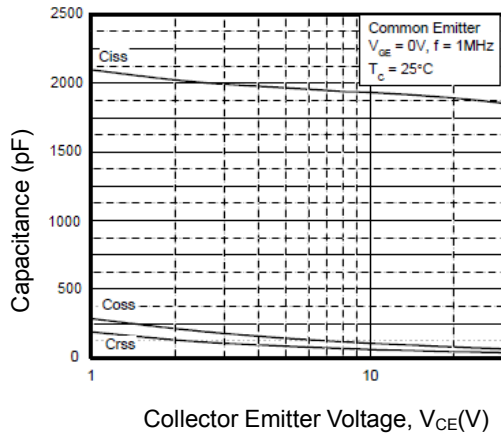


Figure 9. Turn-off Characteristics vs. Gate Resistance

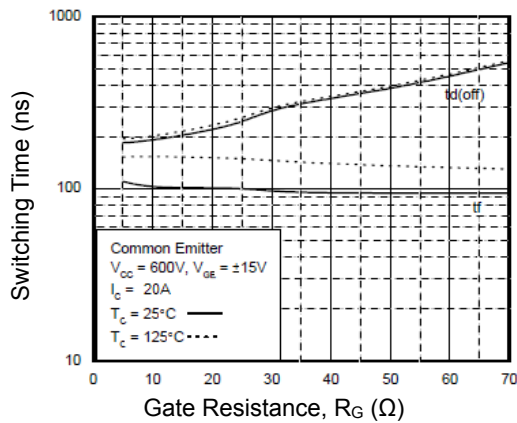


Figure 11. Turn-on Characteristics vs. Collector Current

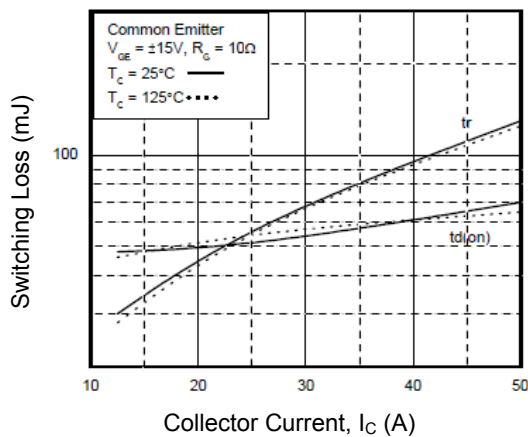


Figure 8. Turn-on Characteristics vs. Gate Resistance

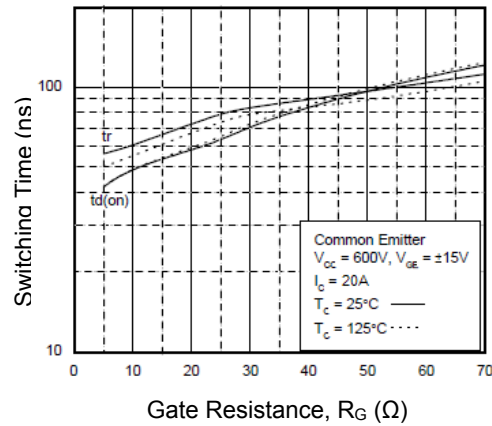


Figure 10. Switching Loss vs. Gate Resistance

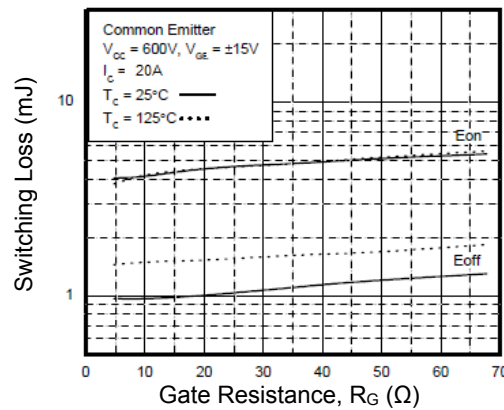
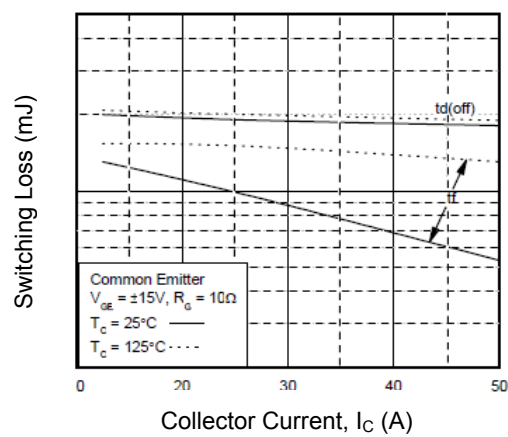


Figure 12. Turn-Off Characteristics vs. Collector Current



Typical Performance Characteristics (Continued)

Figure 13. Switching Loss vs. Collector Current

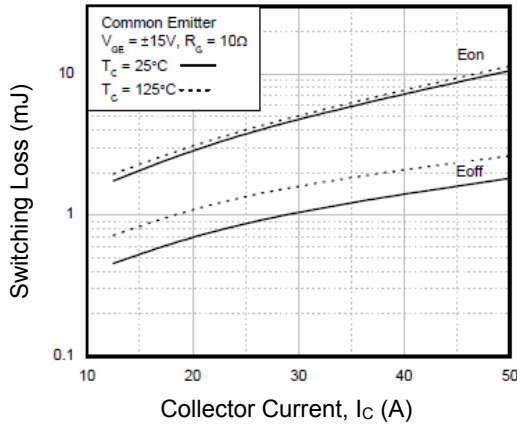


Figure 14. Gate Charge Characteristics

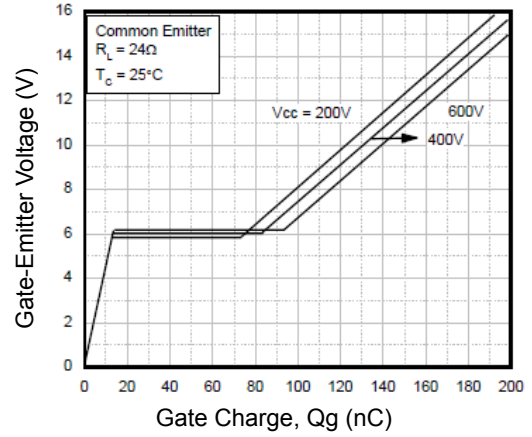


Figure 15. SOA Characteristics

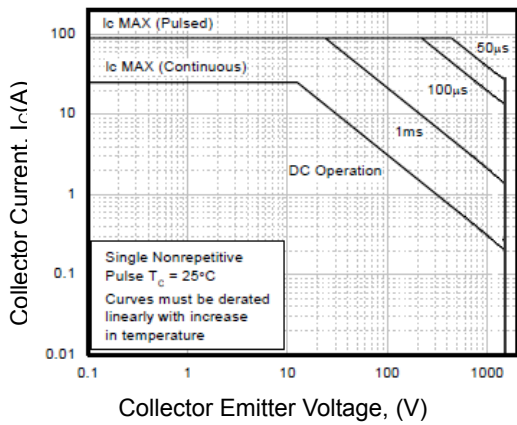


Figure 16. Turn-Off SOA

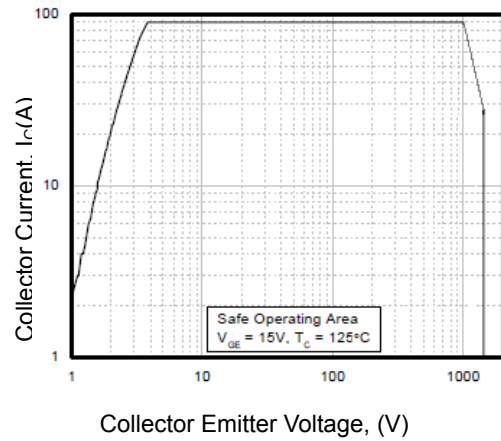
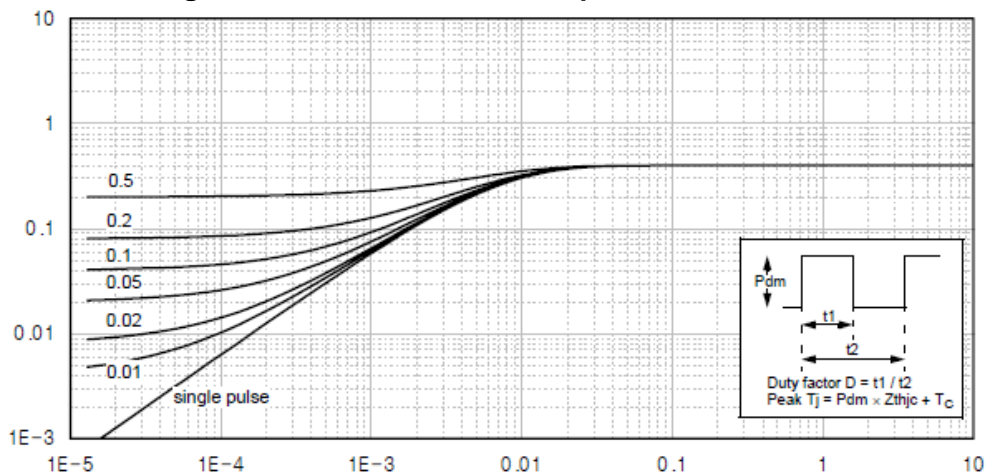
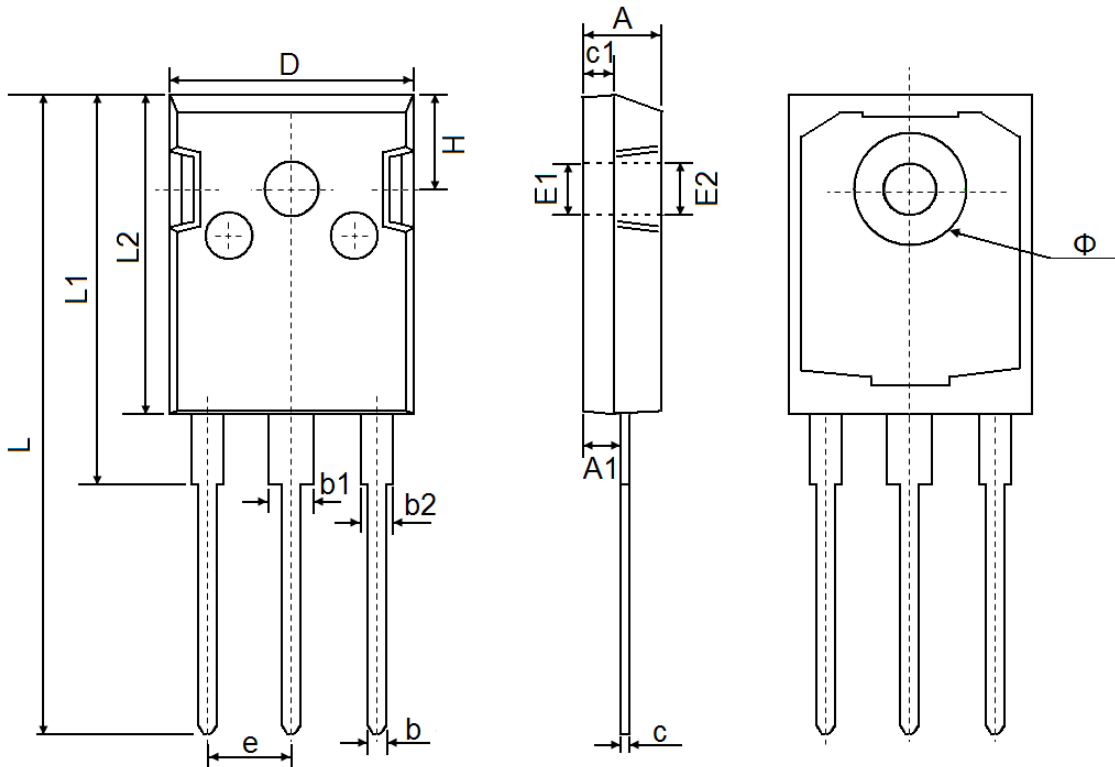


Figure 17. Transient Thermal Impedance of IGBT



TO-247 Package Information



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
Φ	7.100	7.300	0.280	0.287
e	5.450 TYP		0.215 TYP	
H	5.980 REF		0.235 REF	



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