1350V, 15A, Trench FS Gen.7 IGBT

General Description

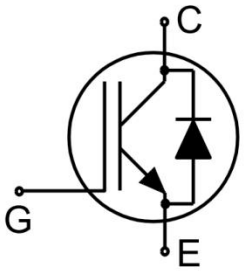
Using NCE's proprietary high density trench gate design and advanced FS (Field Stop) Gen.7 technology, the 1350V Trench Field Stop Gen.7 IGBT offers superior conduction and switching performances, and easy parallel operation;

Features

- Trench Field Stop Gen.7 Technology Offering
- Low saturation voltage: V_{CEsat} = 1.80V(Typ.) @ IC = 15 A
- High speed switching, Low switching losses
- Maximum junction temperature T_{vjmax} = 175°C
- Tighten parameter distribution
- High ruggedness, temperature stable behavior
- Pb-free lead plating; RoHS compliant

Application

- Inductive Cooking
- Soft Switching Applications



Schematic diagram

Package Marking and Ordering Information

Device	Device Package	Device Marking
NCE15ER135LP	TO-3P-3L	NCE15ER135LP

TO-3P-3L

Absolute Maximum Ratings (T_C=25°C unless otherwise noted)

Symbol	Parameter	Value	Units
V_{CES}	Collector-Emitter Voltage	1200	V
V_{GES}	Gate- Emitter Voltage	±30	V
I_C	Collector Current	30	A
	Collector Current @T_C = 100 °C	15	A
I_{Cpuls}	Pulsed Collector Current，t_p limited by T_{jmax}	45	A
-	Turn off safe operating area，V_{CE}=1350V，T_j=175°C	45	A
I_F	Diode Continuous Forward Current @T_C = 100 °C	15	A
I_{FM}	Diode Maximum Forward Current	45	A
P_D	Power Dissipation @ T_C = 25°C	155	W
	Power Dissipation @T_C = 100 °C	77	W
T_{stg}	Storage Temperature	-55 to +150	°C
T_{vj}	Operating junction temperature	-40 to +175	°C
T_L	Maximum Temperature for Soldering	260	°C

Thermal Characteristic

Symbol	Parameter	Value	Units
$R_{\theta JC}$	Thermal Resistance, Junction to case for IGBT	0.96	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction to case for Diode	1.62	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	40	°C/W

Electrical Characteristics (T_C=25°C unless otherwise noted)

Symbol	Parameter	Conditions		Value			Units
				Min.	Typ.	Max.	
Static Characteristics							
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage	V_{GE}=0V,I_{CE}=1mA		1350	--	--	V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V,V_{CE}=1350V		--	--	15	uA
$I_{GES(F)}$	Gate to Emitter Forward Leakage	V_{GE}=+30V,V_{CE}=0V		--	--	100	nA
$I_{GES(R)}$	Gate to Emitter Reverse Leakage	V_{GE}=-30V,V_{CE} =0V		--	--	100	nA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=7.5A	V_{GE}=15V, T_j=25°C	--	1.50	--	V
		I_C=15A		--	1.80	2.20	V
		I_C=7.5A	V_{GE}=15V, T_j=175°C	--	1.70	--	V
		I_C=15A		--	2.20	--	V
$V_{GE(th)}$	Gate Threshold Voltage	I_C=1mA,V_{CE}=V_{GE}		5.00	5.75	6.50	V
Dynamic Characteristics							
C_{ies}	Input Capacitance	V_{CE}=30V,V_{GE}=0V, f=1MHz		1300	1630	1900	pF
C_{oes}	Output Capacitance			--	30	--	
C_{res}	Reverse Transfer Capacitance			--	10	--	
Q_g	Total Gate Charge	V_{CE}=960V, I_C=15A, V_{GE}=15V		--	58	--	nC
Q_{ge}	Gate to Emitter Charge			--	27	--	
Q_{gc}	Gate to Collector Charge			--	16	--	
R_g	Internal Gate Resistance	F=1MHz		--	2.8	--	Ω
Switching Characteristics							
$t_{d(ON)}$	Turn-on Delay Time	V_{CE}=600V,I_C=15A, V_{GE}=0/15V, R_g=15Ω Inductive Load		--	22	--	ns
t_r	Rise Time			--	18	--	
$t_{d(OFF)}$	Turn-Off Delay Time			--	166	--	
t_f	Fall Time			--	71	--	
E_{on}	Turn-On Switching Loss			--	0.63	--	mJ
E_{off}	Turn-Off Switching Loss			--	0.44	--	
E_{ts}	Total Switching Loss			--	1.07	--	

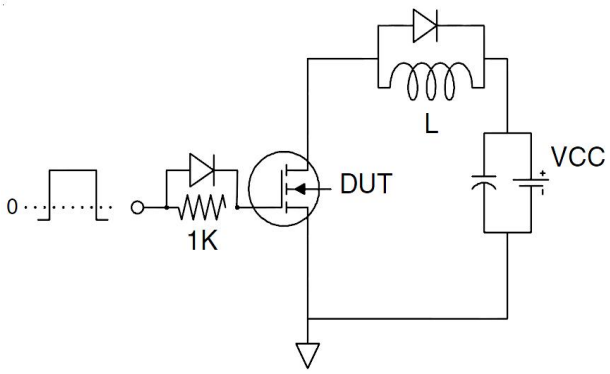
Electrical Characteristics of the Diode (T_C= 25°C unless otherwise specified)

Symbol	Parameter	Conditions		Rating			Units
				Min.	Typ.	Max.	
V_{FM}	Diode Forward Voltage	I_F=15A	T_j=25°C	--	2.5	3.0	V
T_{rr}	Reverse Recovery Time	V_R=600V,I_F=15A, R_g=15Ω,T_j=25°C		--	135	--	ns
I_{RRM}	Diode Peak Reverse Recovery Current			--	22	--	A
Q_{rr}	Reverse Recovery Charge			--	1.48	--	uC
Erec	Reverse recovery energy			--	0.06	--	mJ

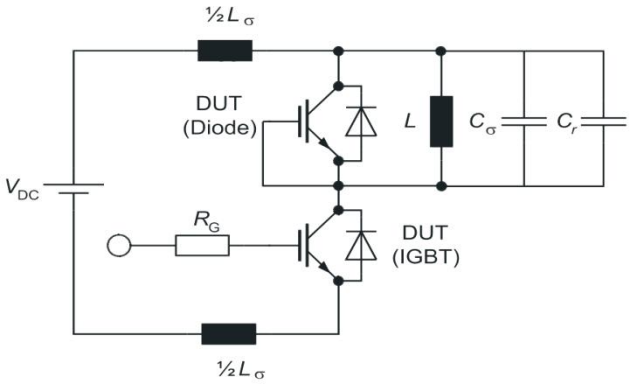
Note: For optimum lifetime and reliability, NCE recommends operating conditions that do not exceed 80% of the maximum ratings stated in this datasheet.

Test Circuit

1) Gate Charge Test Circuit

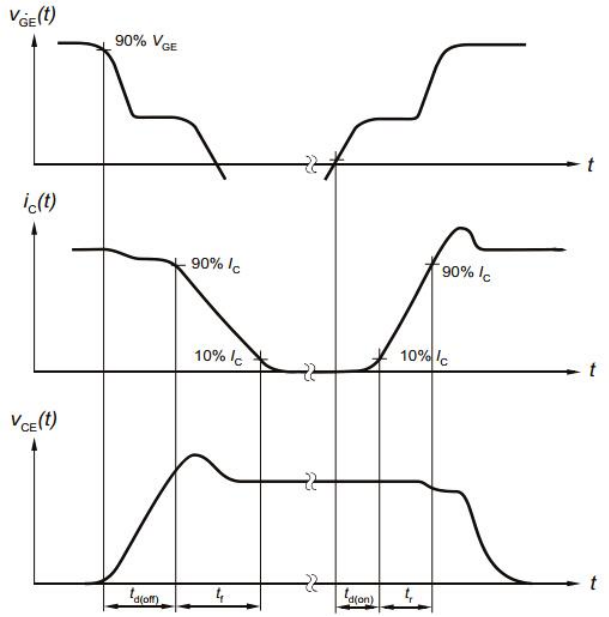


2) Switch Time Test Circuit

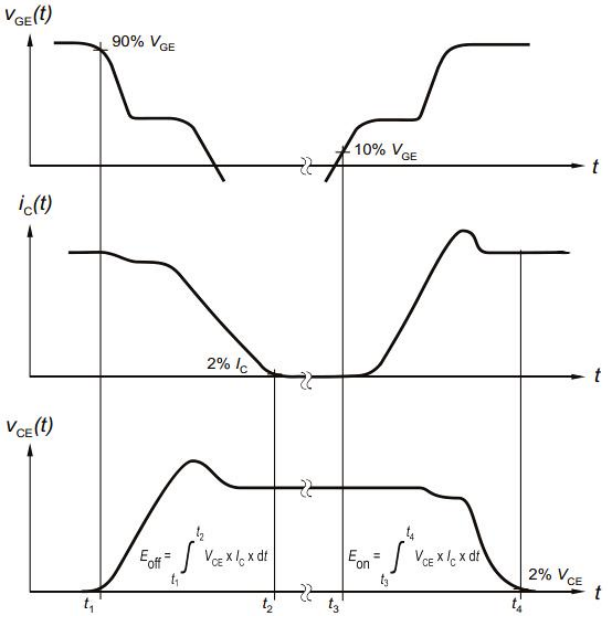


Switching characteristics

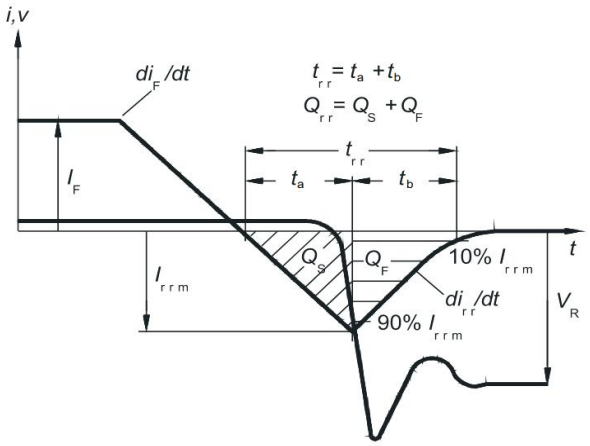
1) Definition of switching times



2) Definition of switching losses



3) Definition of diode switching characteristics



Typical Electrical and Thermal Characteristics

Figure 1 Output Characteristics

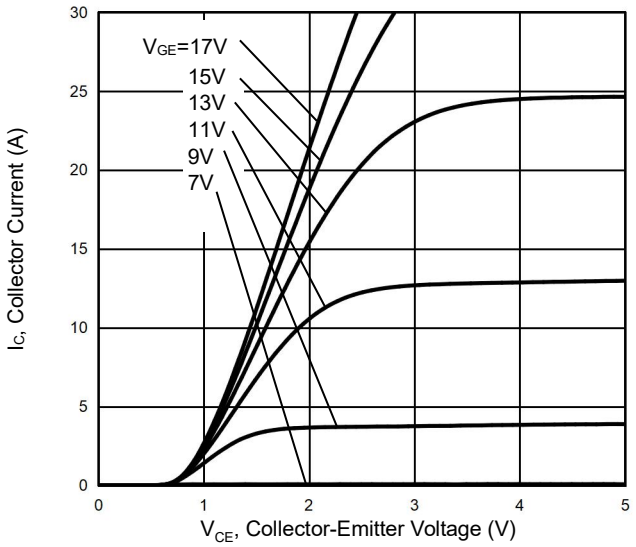


Figure 2 Transfer Characteristics

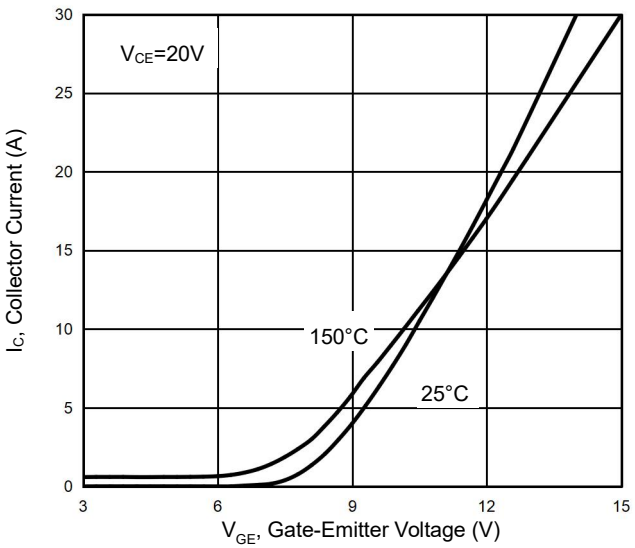


Figure 3 $V_{CE(sat)}$ vs. Case Temperature

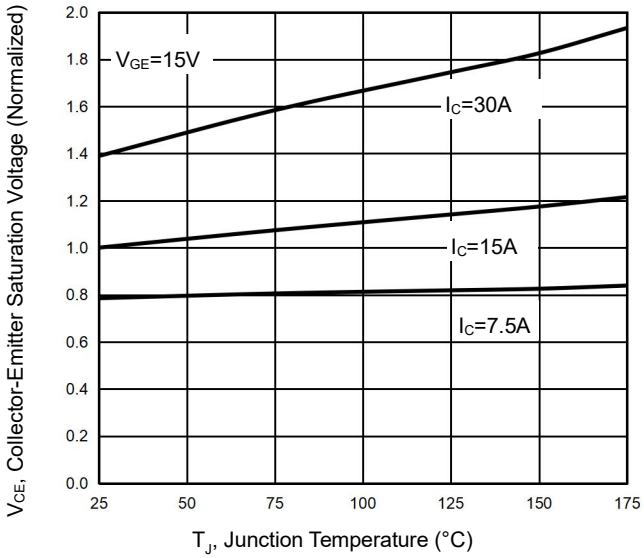


Figure 4 Saturation Voltage vs. V_{GE}

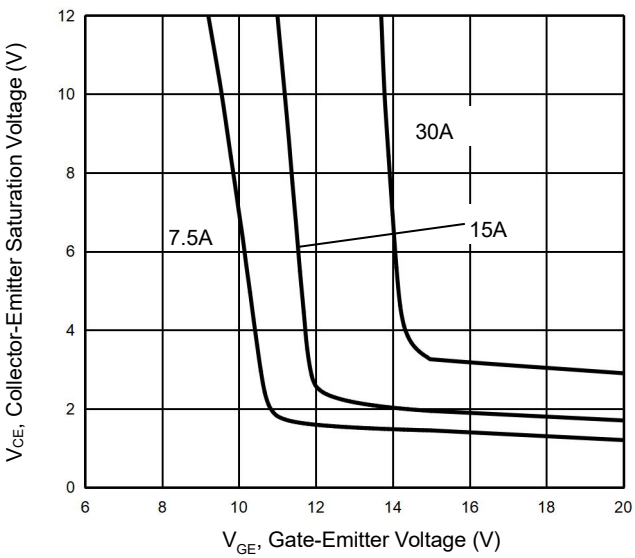


Figure 5 Capacitance Characteristics

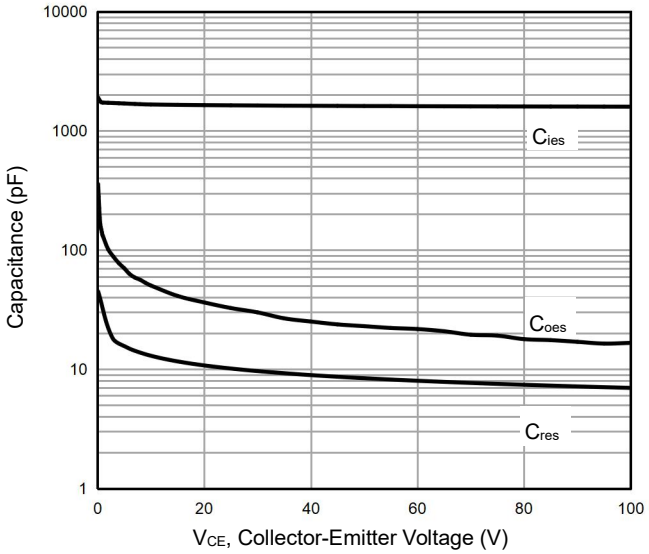
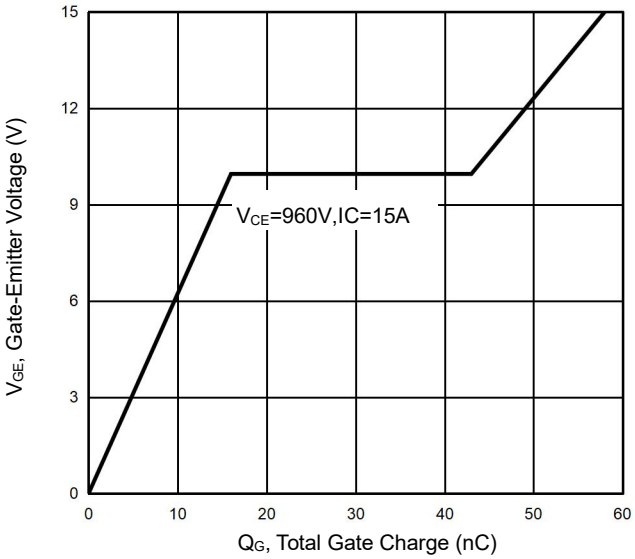


Figure 6 Gate Charge Wave Form



Typical Electrical and Thermal Characteristics

Figure 7 Forward Characteristics

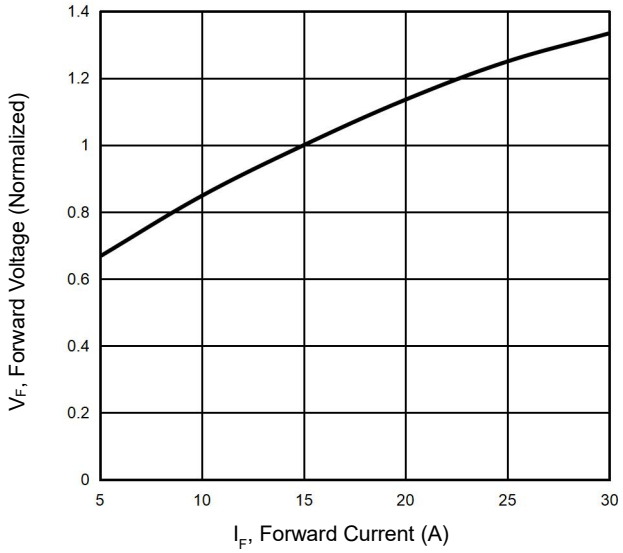


Figure 8 Typical Collector-Emitter Saturation Voltage as a function of Collector Current

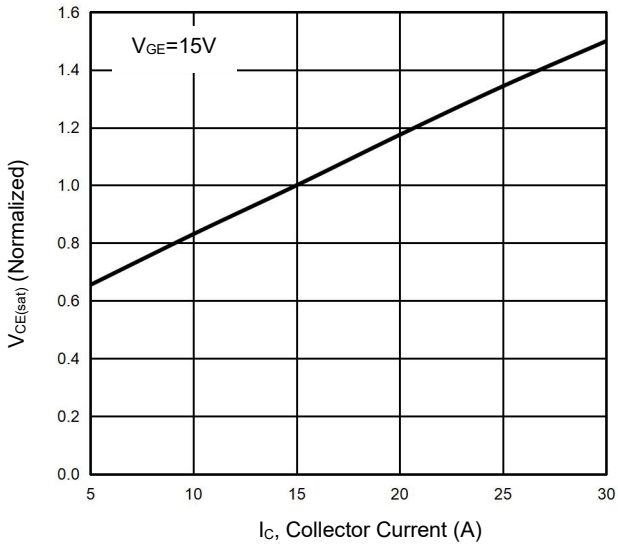


Figure 9 P_{tot} vs. Case Temperature

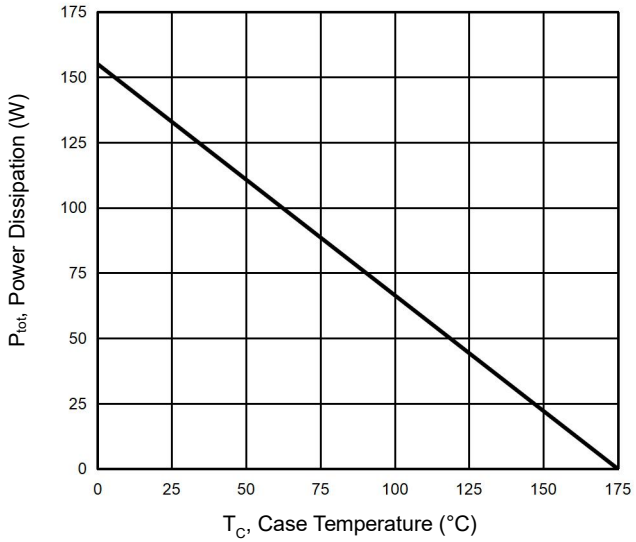


Figure 10 I_C vs. Temperature

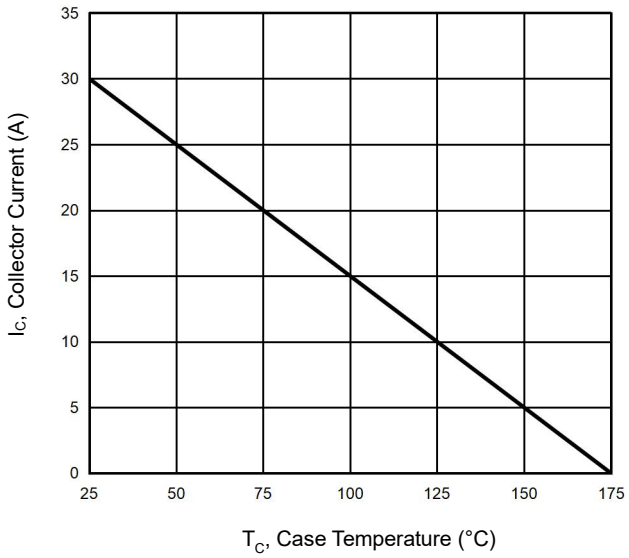


Figure 11 Gate-Emitter Threshold Voltage as a Function of Junction Temperature

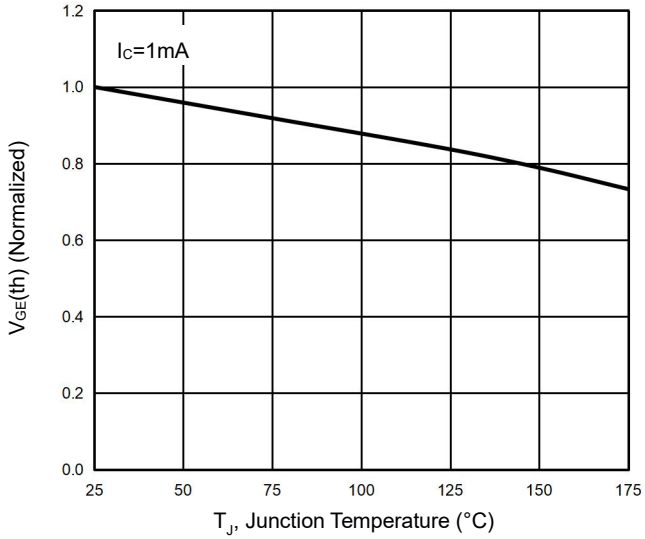
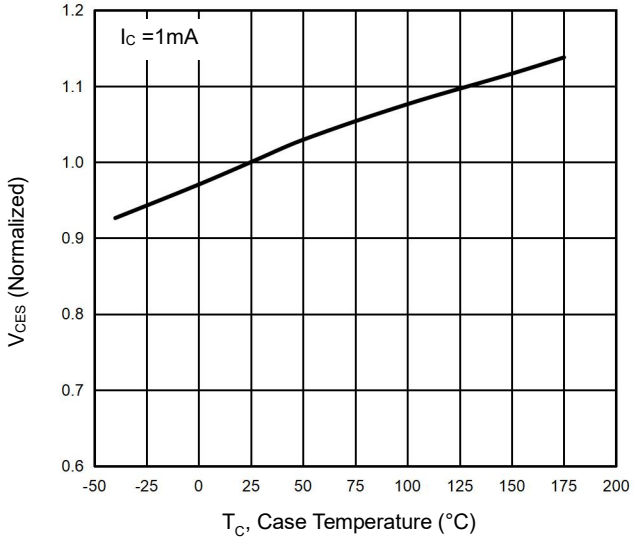
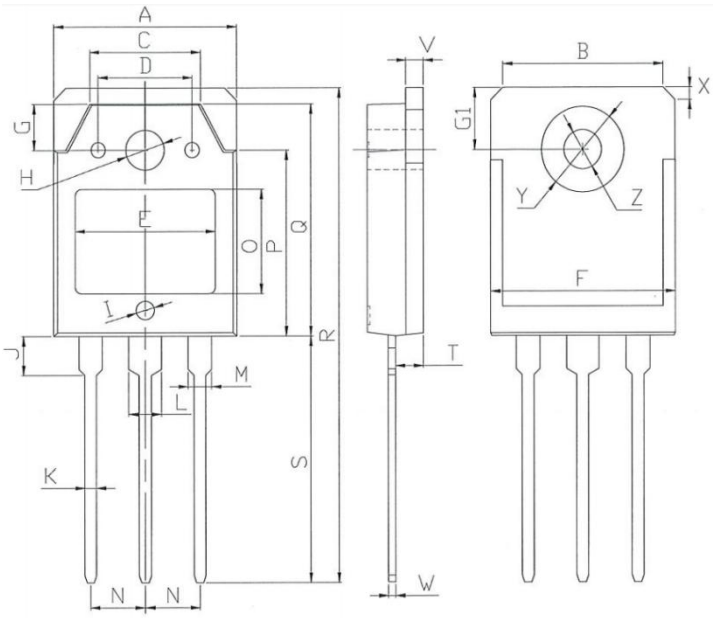


Figure 12 V_{CES} vs. Case Temperature



TO-3P-3L-L Package Information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	15.40	15.80	0.61	0.62
B	13.40	13.80	0.53	0.54
C	9.30	9.70	0.37	0.38
D	7.80	8.20	0.31	0.32
E	11.65	12.05	0.46	0.47
F	15.45	15.85	0.61	0.62
G	3.60	4.00	0.14	0.16
G1	4.80	5.20	0.19	0.20
H	3.30	3.70	0.13	0.15
I	1.30	1.70	0.05	0.07
J	3.00	3.40	0.12	0.13
K	0.90	1.10	0.04	0.05
L	3.00	3.20	0.12	0.13
M	2.00	2.20	0.08	0.09
N	5.25	5.65	0.21	0.22
O	8.20	8.60	0.32	0.34
P	13.70	14.10	0.54	0.56
Q	18.50	18.90	0.73	0.74
R	39.50	40.50	1.56	1.59
S	19.70	20.30	0.78	0.80
T	2.20	2.60	0.09	0.10
V	1.40	1.60	0.06	0.07
W	0.50	0.70	0.02	0.03
X	1.50	2.10	0.06	0.08
Y	6.80	7.20	0.27	0.28
Z	3.00	3.40	0.12	0.13

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