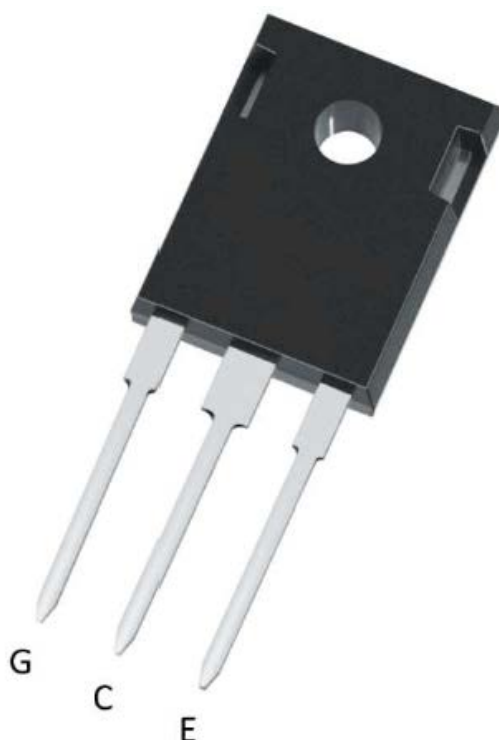
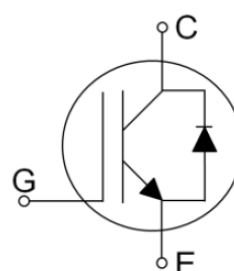


H&M-Semi Field Stop Trench IGBTs offer low switching losses, high energy efficiency and high avalanche ruggedness for soft switching applications such as inductive heating, microwave oven, etc.

$V_{CE}$	1350	V
$I_C$	25	A
$V_{CE(SAT)} I_C=25A$	2.0	V

### FEATURES

- High breakdown voltage to 1350V for improved reliability
- Trench-Stop Technology offering :
  - High speed switching
  - High ruggedness, temperature stable
  - Low  $V_{CEsat}$
  - Easy parallel switching capability due to positive temperature coefficient in  $V_{CEsat}$
- Soft current turn-off waveforms
- Enhanced avalanche capability



### APPLICATION

- Inductive cooking
- Inverterized microwave ovens
- Resonant converters
- Soft switching applications

Product	Package	Packaging
HM25N135FT	TO247	Tube

## Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-Emitter Breakdown Voltage	$V_{CE}$	1350	V
DC collector current, limited by $T_{jmax}$ $T_C = 25^{\circ}C$ $T_C = 100^{\circ}C$	$I_C$	50 25	A
Diode Forward current, limited by $T_{jmax}$ $T_C = 25^{\circ}C$ $T_C = 100^{\circ}C$	$I_F$	50 25	A
Continuous Gate-emitter voltage	$V_{GE}$	$\pm 20$	V
Transient Gate-emitter voltage	$V_{GE}$	$\pm 30$	V
Turn off safe operating area $V_{CE} \leq 1350V$ , $T_j \leq 150^{\circ}C$	-	75	A
Pulsed collector current, $V_{GE} = 15V$ , $t_p$ limited by $T_{jmax}$	$I_{CM}$	75	A
Power dissipation , $T_j = 25^{\circ}C$	$P_{tot}$	260	W
Operating junction temperature	$T_j$	$-40 \dots +150$	$^{\circ}C$
Storage temperature	$T_s$	$-55 \dots +150$	$^{\circ}C$
Soldering temperature, wave soldering 1.6mm (0.063in.) from case for 10s	-	260	$^{\circ}C$

## Thermal Resistance

Parameter	Symbol	Max. Value	Unit
IGBT thermal resistance, junction - case	$R_{\theta(j-c)}$	0.48	K/W
Diode thermal resistance, junction - case	$R_{\theta(j-c)}$	1.2	K/W
Thermal resistance, junction - ambient	$R_{\theta(j-a)}$	40	K/W

## Electrical Characteristics of the IGBT ( $T_j = 25^\circ\text{C}$ unless otherwise specified) :

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>Static</b>						
Collector-Emitter breakdown voltage	$BV_{CES}$	$V_{GE}=0V, I_C=1mA$	1350	1450	-	V
		$V_{GE}=0V, I_C=10mA$	1350	1450	-	V
Gate threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=250\mu A$	5.1	5.8	6.4	V
Collector-Emitter Saturation voltage	$V_{CE(sat)}$	$V_{GE}=15V, I_C=25A$ $T_j = 25^\circ\text{C}$	-	2.0	2.5	V
		$T_j = 150^\circ\text{C}$	-	2.5	-	V
Zero gate voltage collector current	$I_{CES}$	$V_{CE} = 1350V, V_{GE} = 0V$ $T_j = 25^\circ\text{C}$	-	<1	100	$\mu A$
		$T_j = 150^\circ\text{C}$	-	-	1000	$\mu A$
Gate-emitter leakage current	$I_{GES}$	$V_{CE} = 0V, V_{GE} = \pm 20V$	-	-	100	nA
Transconductance	$g_{fs}$	$V_{CE}=20V, I_C=25A$	-	13	-	S

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>Dynamic</b>						
Input capacitance	$C_{ies}$	$V_{CE} = 25V, V_{GE} = 0V,$ $f = 1MHz$	-	2500	-	pF
Output capacitance	$C_{oes}$		-	70	-	
Reverse transfer capacitance	$C_{res}$		-	50	-	
Gate charge	$Q_G$	$V_{CC} = 640V, I_C = 25A,$ $V_{GE} = 15V$	-	135	-	nC

## Switching Characteristic, Inductive Load

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Dynamic , at T <sub>j</sub> = 25° C						
Turn-off delay time	td <sub>(off)</sub>	V <sub>CC</sub> = 600V, I <sub>C</sub> = 25A, V <sub>GE</sub> = 0/15V, R <sub>g</sub> =10Ω	-	180	-	ns
Fall time	t <sub>f</sub>		-	40	-	ns
Turn-off energy	E <sub>off</sub>		-	0.32	-	mJ
Dynamic , at T <sub>j</sub> = 150° C						
Turn-off delay time	td <sub>(off)</sub>	V <sub>CC</sub> = 600V, I <sub>C</sub> = 25A, V <sub>GE</sub> = 0/15V, R <sub>g</sub> =10Ω	-	220	-	ns
Fall time	t <sub>f</sub>		-	90	-	ns
Turn-off energy	E <sub>off</sub>		-	0.65	-	mJ

## Electrical Characteristics of the DIODE ( $T_j = 25^\circ \text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>Dynamic</b>						
Diode Forward Voltage	$V_{FM}$	$I_F = 25A$	-	2.3	-	V
Reverse Recovery Time	$T_{rr}$	$I_F = 25A,$ $di/dt = 200A/\mu s$	-	460	-	ns
Reverse Recovery Current	$I_{rr}$		-	17	-	A
Reverse Recovery Charge	$Q_{rr}$		-	3600	-	nC

Fig. 1 FBSOA characteristics

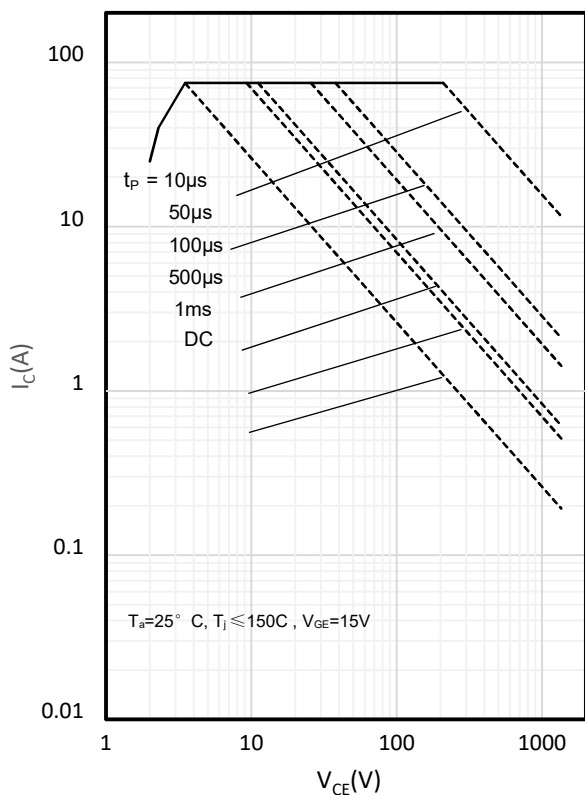


Fig. 2 Load Current vs. Frequency

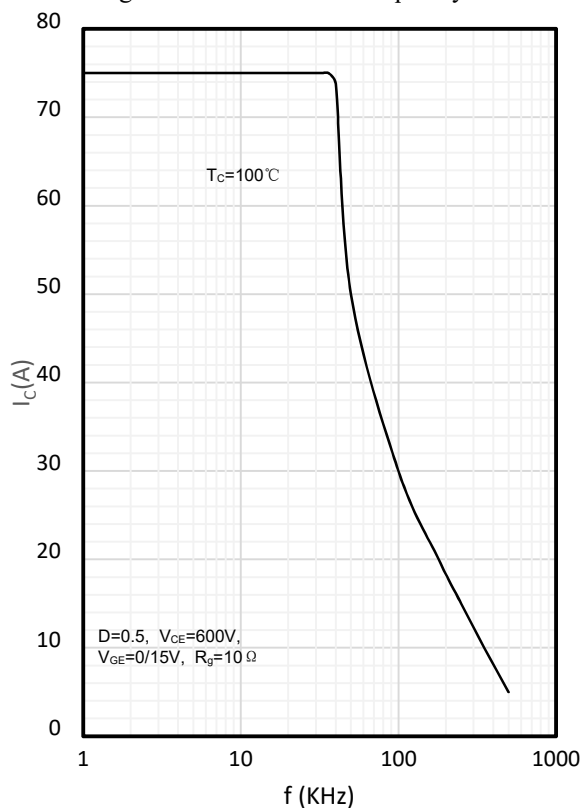


Fig. 3 Output characteristics

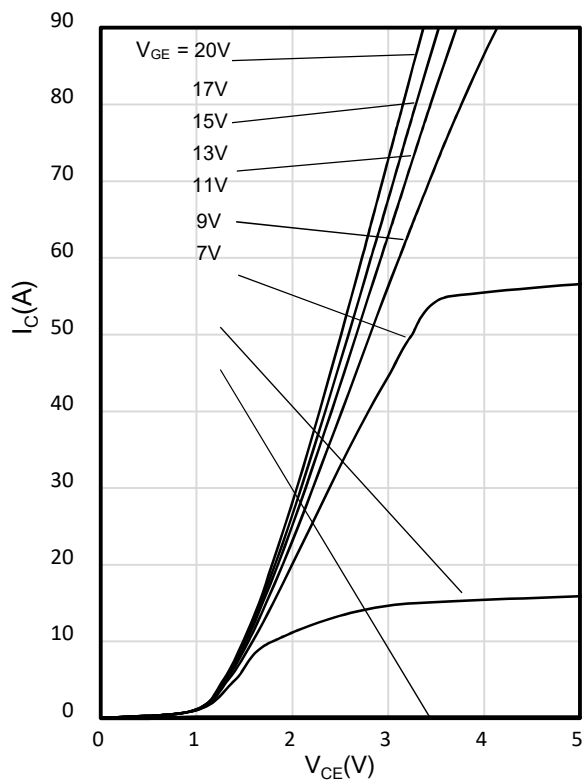


Fig. 4 Saturation voltage characteristics

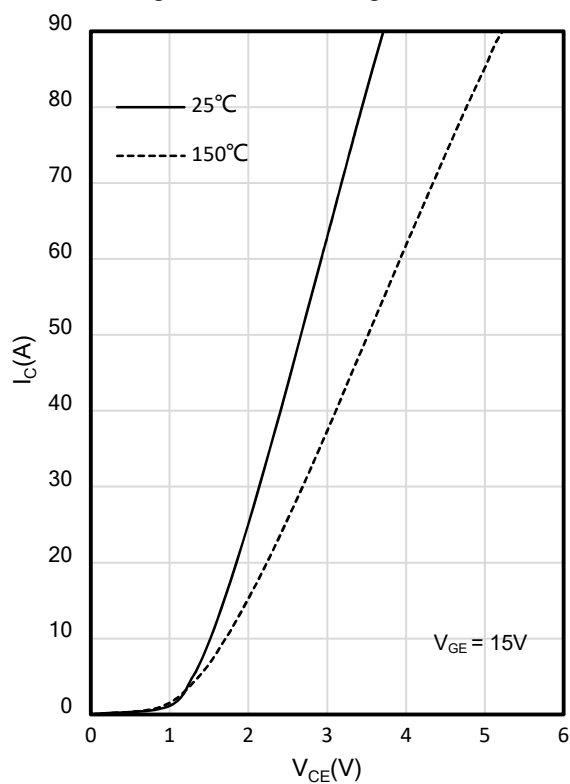


Fig. 5 Typical Saturation Voltage vs.Junction Temperature

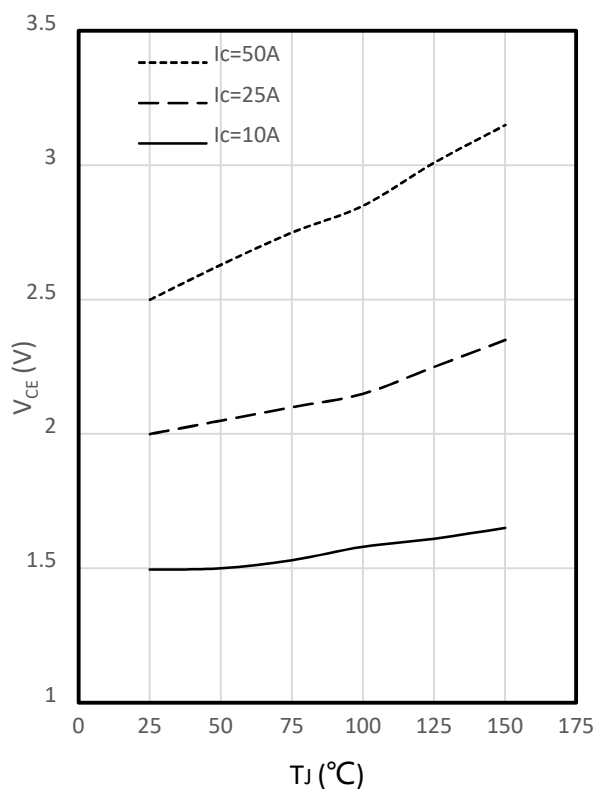


Fig. 6 Power dissipation as a function of  $T_C$

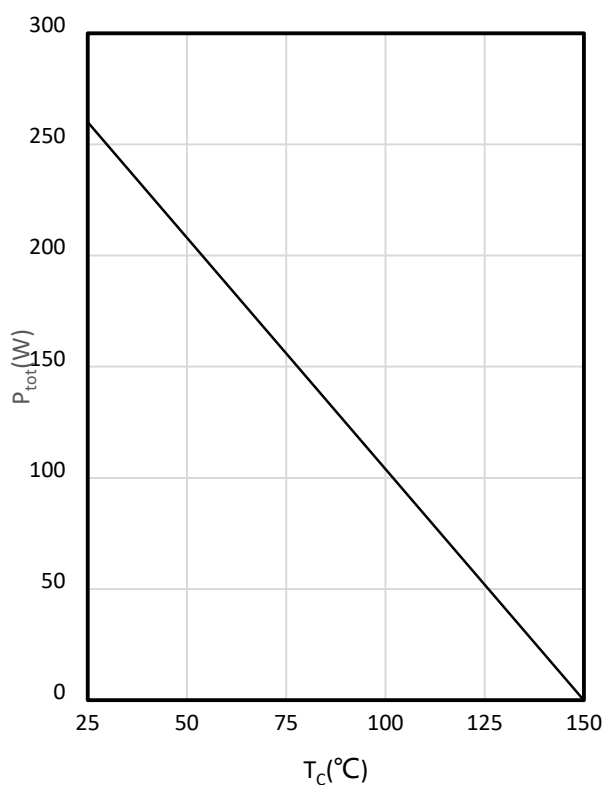


Fig. 7 collector current as a function of  $T_C$

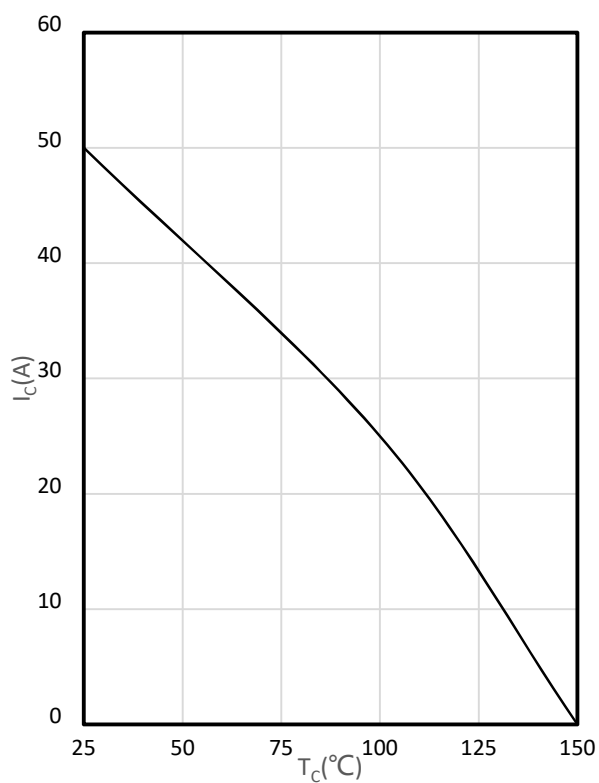


Fig. 8 Turn-off time vs. gate resistor

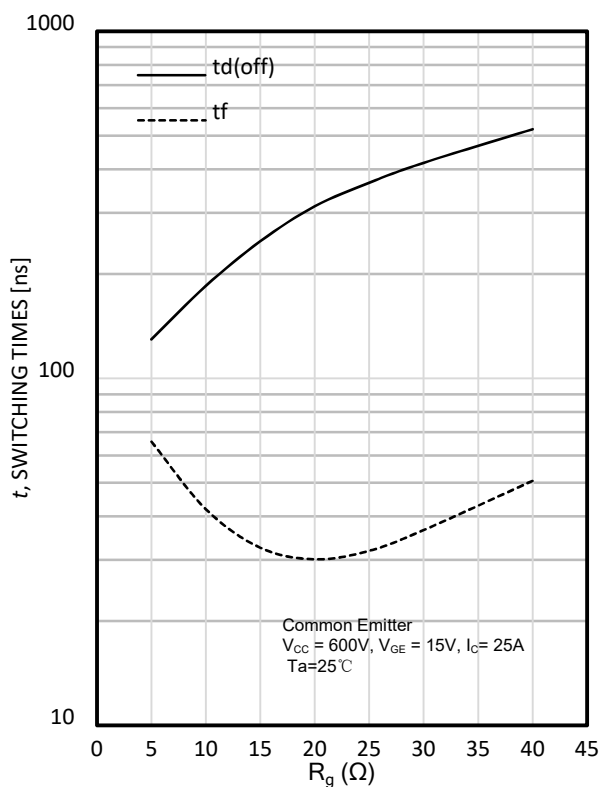


Fig. 9 Switching loss vs. gate resistor

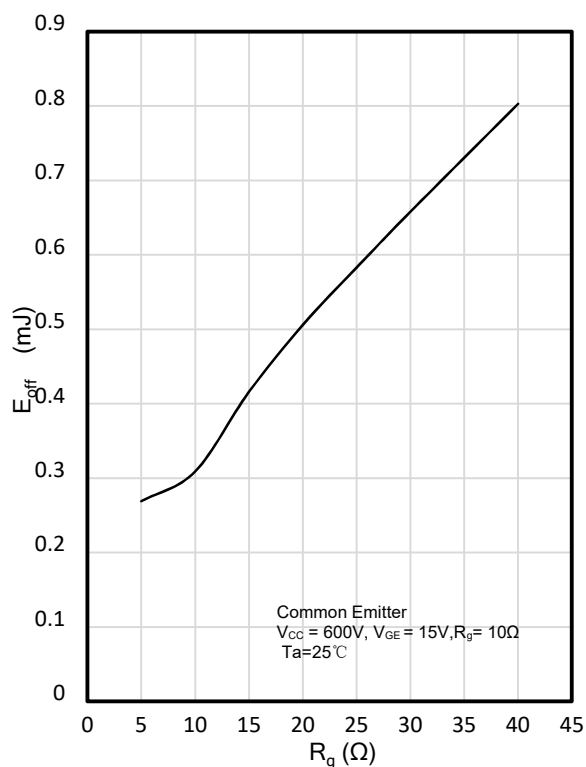


Fig. 10 Turn-off time vs. collector current

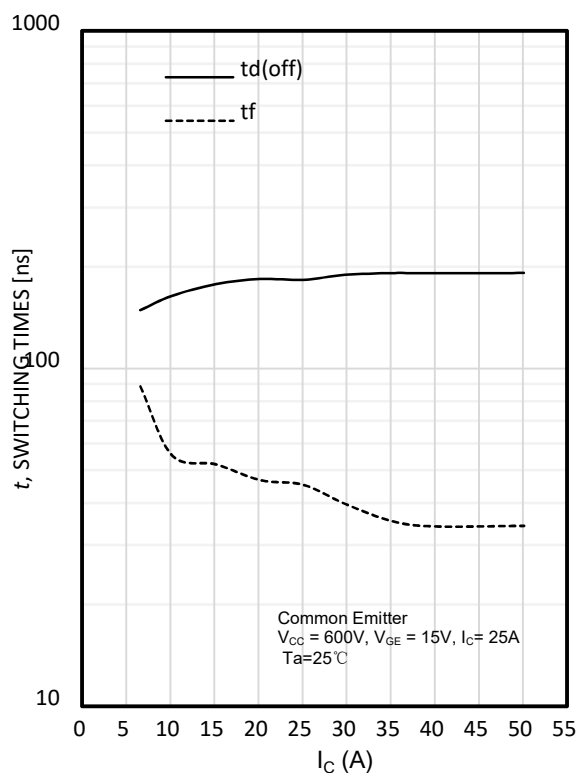


Fig. 11 Switching loss vs. collector current

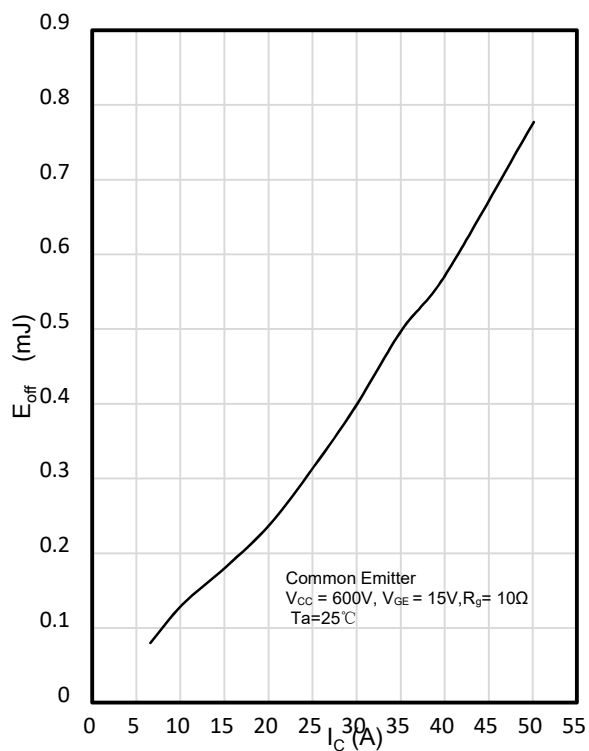


Fig. 12 Gate charge characteristics

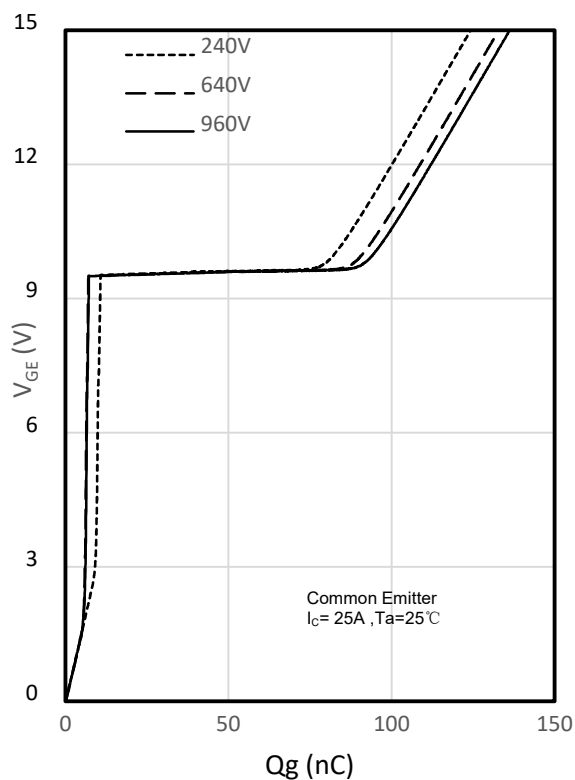


Fig. 13 Capacitance characteristics

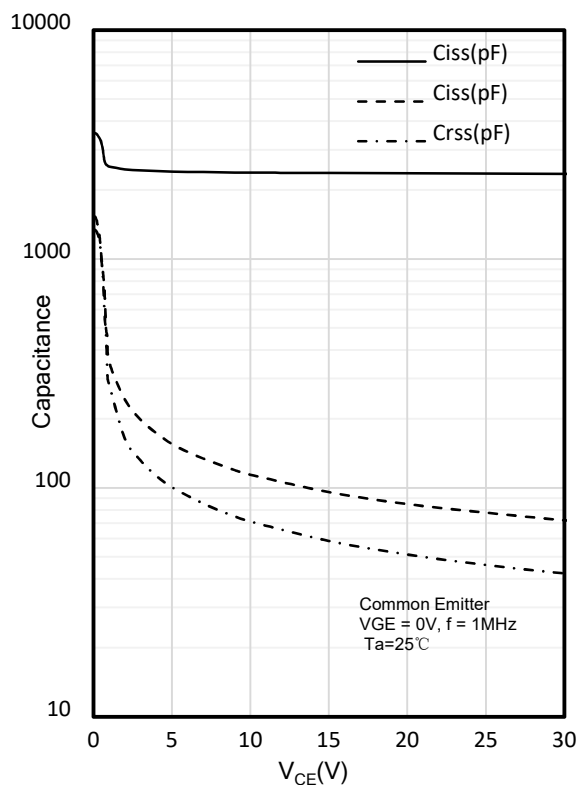


Fig. 14 Typical Diode Forward Characteristics

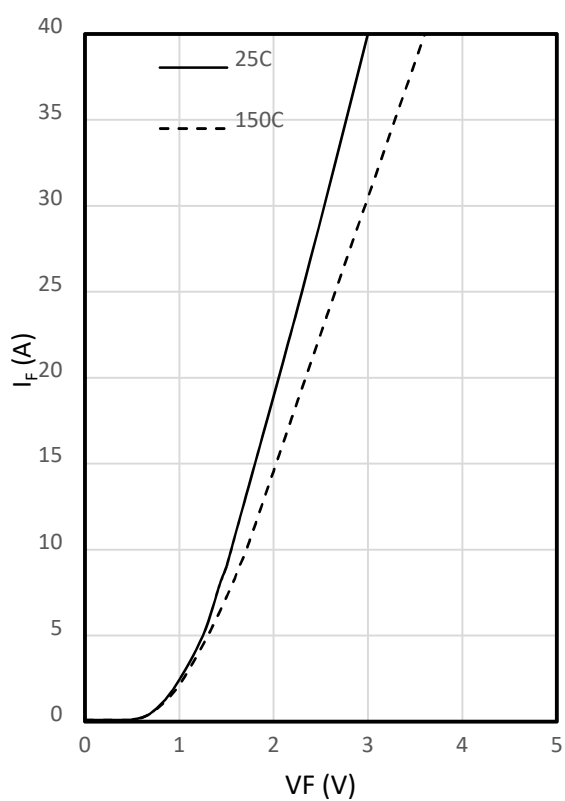
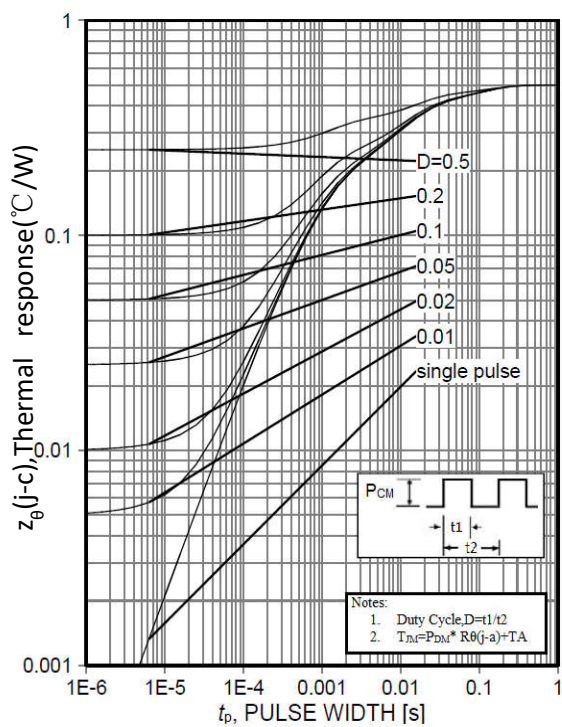
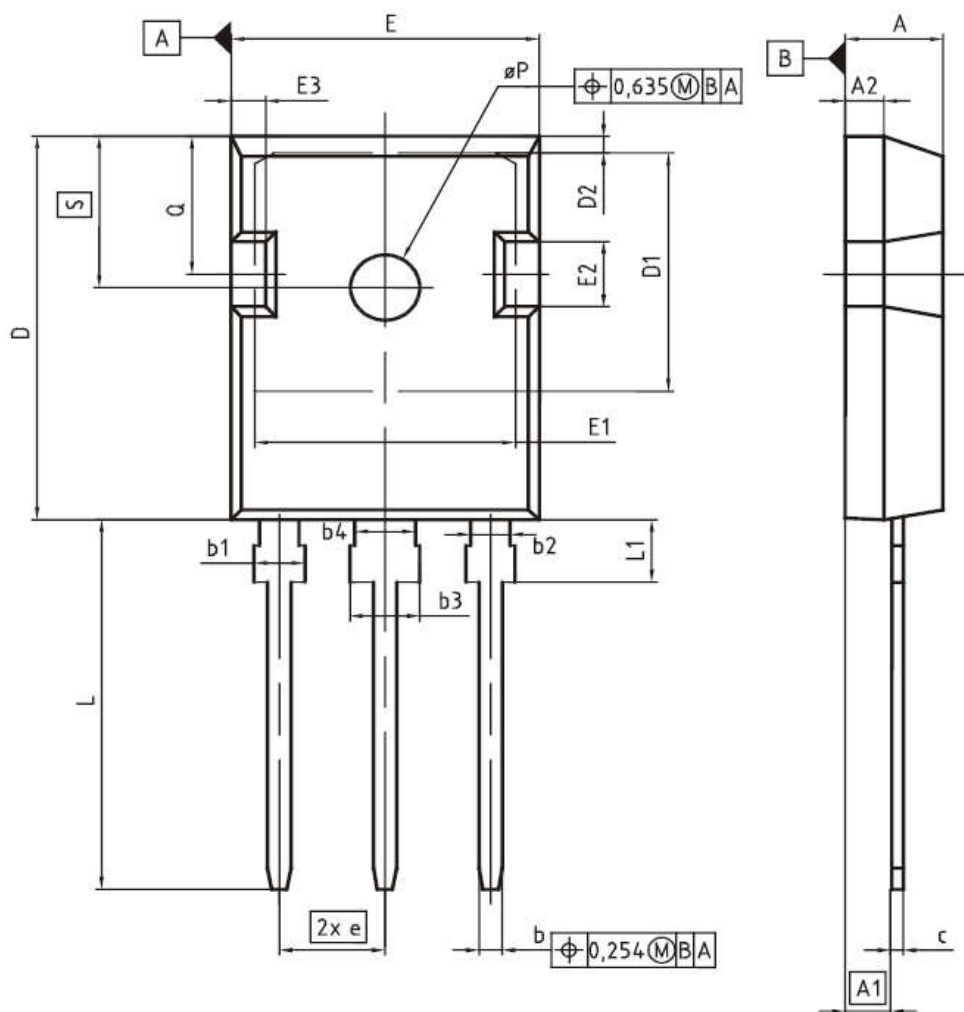


Fig. 15 IGBT Transient Thermal Impedance





## PG-TO247-3



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.83	5.21	0.190	0.205
A1	2.27	2.54	0.089	0.100
A2	1.85	2.16	0.073	0.085
b	1.07	1.33	0.042	0.052
b1	1.90	2.41	0.075	0.095
b2	1.90	2.16	0.075	0.085
b3	2.87	3.38	0.113	0.133
b4	2.87	3.13	0.113	0.123
c	0.55	0.68	0.022	0.027
D	20.80	21.10	0.819	0.831
D1	16.25	17.65	0.640	0.695
D2	0.95	1.35	0.037	0.053
E	15.70	16.13	0.618	0.635
E1	13.10	14.15	0.516	0.557
E2	3.68	5.10	0.145	0.201
E3	1.00	2.60	0.039	0.102
e	5.44 (BSC)		0.214 (BSC)	
N	3		3	
L	19.80	20.32	0.780	0.800
L1	4.10	4.47	0.161	0.176
øP	3.50	3.70	0.138	0.146
Q	5.49	6.00	0.216	0.236
S	6.04	6.30	0.238	0.248