

# IPD Protect

## IGBT 20A/1350V RC-H5 technology with driver IC

### Features

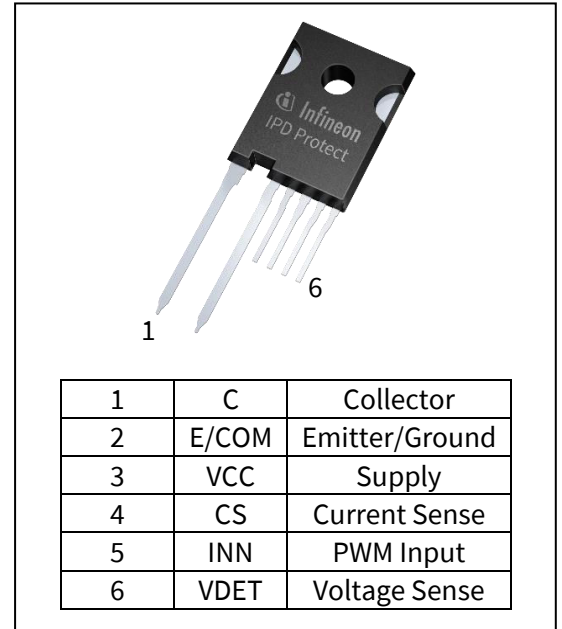
- Reverse conducting IGBT with monolithic body diode designed for soft commutation
- Integrated Driver with
  - Over-voltage and over-current protection
  - Active clamp control circuit
  - Programmable over-voltage threshold
  - Programmable cycle-by-cycle over-current threshold
  - Integrated gate drive with 2 level turn-on current
  - Temperature warning
  - Over-temperature protection
  - VCC UVLO
  - Integrated ESD protection and latch immunity on all pins
- Qualified for industrial applications according to the relevant tests of JEDEC47/20/22
- PG-TO247-6 package
- <http://www.infineon.com/IPD-Protect>

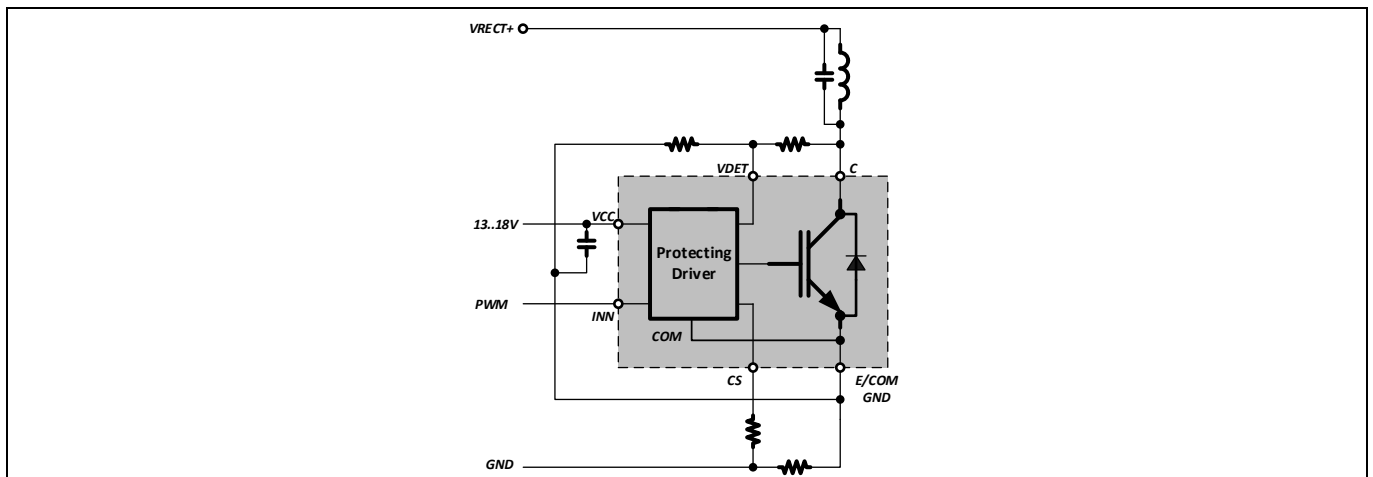
### Applications

- Induction cooking

### Description

The IPD (Integrated Power Device) Protect includes an IGBT with Gate Driver IC in a TO247 6-pin package for induction cooking applications. Its innovative concepts provide protection against over-voltage, over-current, and over-temperature. Additional features include a unique active clamp control, fault condition notification, and a special two levels turn-on Gate driving that reduces significantly the typical high startup peak current. These integrated protection functions provide a simple and robust solution with increased overall system reliability.





**Figure 1 Typical Application**

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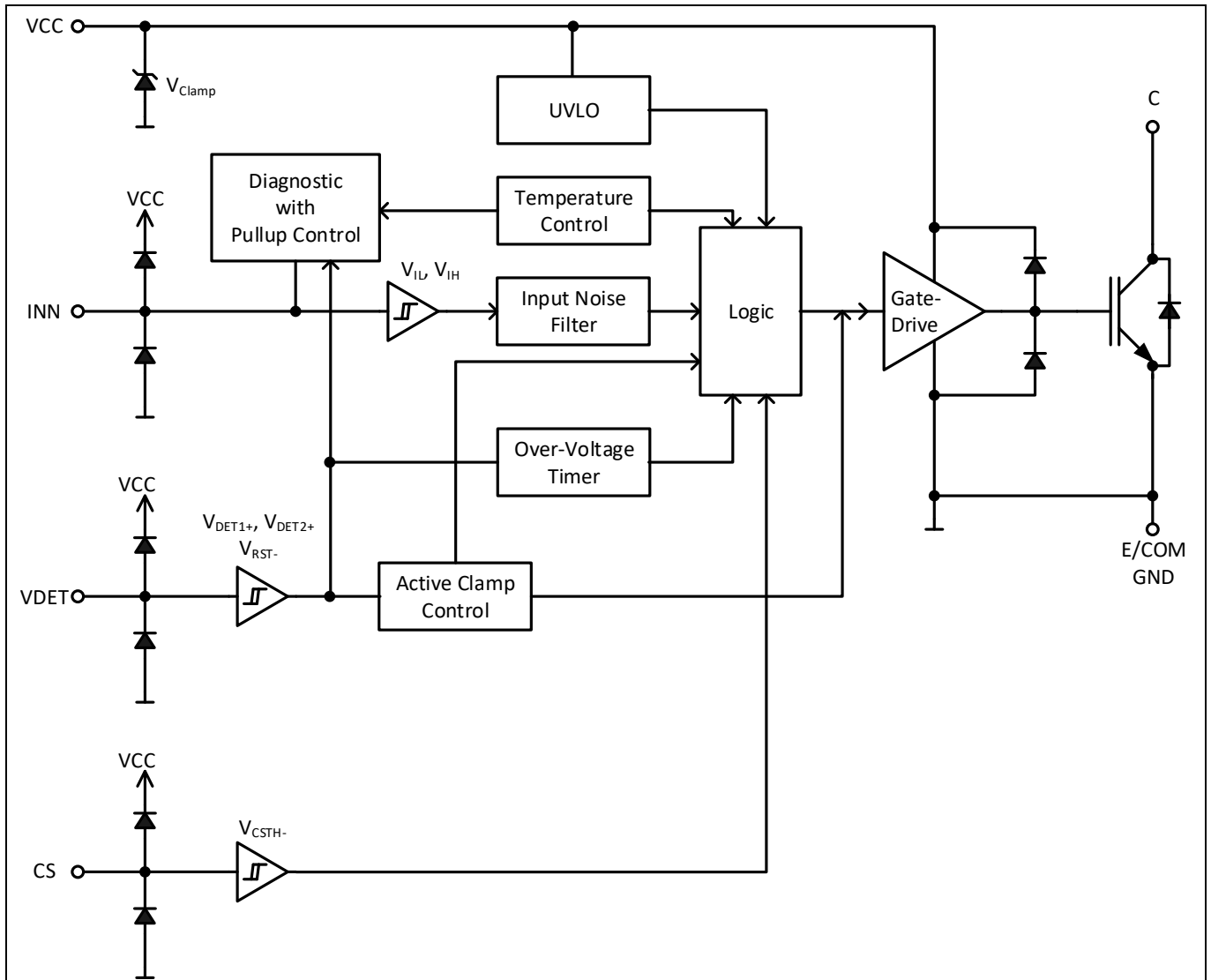
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**1 Block Diagram**



**Figure 2 Block Diagram of IEWS20R5135IPB**

State Diagram

2 State Diagram

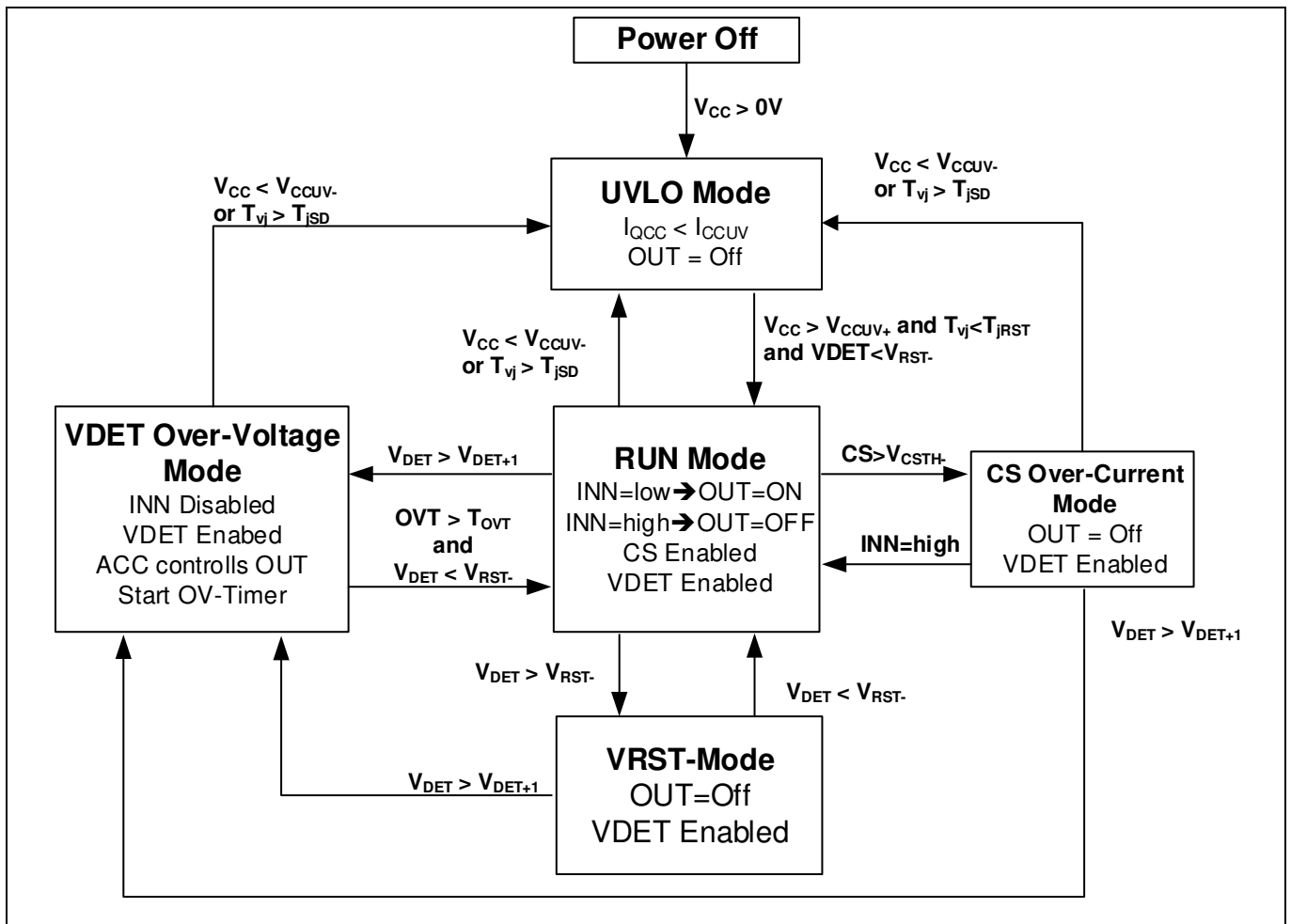


Figure 3 State diagram of IEWS20R5135IPB

### 3 Electrical Parameters Driver

#### 3.1 Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM, all currents are defined positive into any pin.

**Table 1 Absolute Maximum Ratings**

Parameter	Symbol	Min.	Max.	Unit	Test Conditions
VDET pin voltage	$V_{DET}$	-0.3	$V_{CLAMP}^1$	V	
VCC pin voltage	$V_{CC}$				
CS pin voltage	$C_S$				
INN pin voltage	$I_{NN}$	-0.3	5	V	
Junction temperature	$T_{vj}$	-40	150	°C	
Storage temperature	$T_S$				
ESD capability	$V_{ESD}$		750	V	Charged Devices Model (CDM) <sup>2</sup>
ESD capability	$V_{ESD}$		2.0	KV	Human Body Model (HBM) <sup>3</sup>

#### 3.2 Recommended Operating Conditions

For proper operation the device should be used within the recommended conditions. ( $T_A=25^\circ\text{C}$ )

**Table 2 Recommended Operating Conditions**

Parameter	Symbol	Min.	Max.	Unit
VDET pin voltage	$V_{DET}$	-0.3	20	V
VCC pin voltage	$V_{CC}$			
CS pin voltage	$C_S$			
INN pin voltage	$I_{NN}$	-0.3	5	V
Junction temperature	$T_{vj}$	-40	125	°C

<sup>1</sup>This IC contains a 25V voltage clamp structure between the VCC and COM pins. Please note that this pin should not be driven by a DC, low impedance power source greater than the  $V_{CLAMP}$  specified in the Electrical Characteristics section.

<sup>2</sup>According to the JESD22-C101 CDM standard

<sup>3</sup>According to the JESD22-A114 Rev. F standard

### 3.3 Electrical Characteristics

$V_{CC}=15.0V$ ,  $T_A = 25\text{ }^\circ\text{C}$  unless otherwise specified. All parameters are referenced to COM.

**Table 3 VCC Characteristics**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
$V_{CC}$ rising UVLO threshold	$V_{CCUV+}$	13.0	13.5	14.0	V	
$V_{CC}$ falling UVLO threshold	$V_{CCUV-}$	12.0	12.5	13.0		
$V_{CC}$ supply current during UVLO	$I_{CCUV}$	---	200	---	$\mu\text{A}$	$V_{CC}=V_{CCUV-}-0.5V$
$V_{CC}$ quiescent supply current	$I_{QCC}$	---	3000	---		
$V_{CC}$ internal Zener clamp voltage	$V_{CLAMP}$	---	25	---	V	$I_{CC}=5\text{mA}$

**Table 4 CS Characteristics**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Over-current threshold voltage	$V_{CSTH-}$	-5%	-0.2	+5%	V	
Over-current detection internal blank time	$t_{CSBLK}$	3.5	---	4.5	$\mu\text{s}$	
Over-current detection propagation delay	$t_{CS}$	---	50	---	ns	

**Table 5 VDET Characteristics**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Over-voltage rising threshold voltage 1	$V_{DET+1}$	-3%	3.91	+3%	V	Figure 8 + Figure 9
Over-voltage rising threshold voltage 2	$V_{DET+2}$	-3%	4.36	+3%		
Restart falling threshold voltage	$V_{RST-}$	-3%	1.37	+3%		
Over-voltage clamping time 1	$t_{clamp1}$	4.25	5.0	5.75	$\mu\text{s}$	
Over-voltage blank timer	$t_{OVT}$	3	---	---	ms	
Over-voltage blanking time @ turn-off IGBT	$t_{VDETBLK}$	---	1200	---	ns	

**Table 6 Temperature Warning / Shutdown**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Conditions
Junction temperature warning	$T_{vjTW}$	---	75	---	$^\circ\text{C}$	
Junction temperature thermal shutdown	$T_{vjSD}$	---	150	---		
Junction temperature thermal reset	$T_{vjRST}$	---	75	---		

**Table 7 INN / OUT Characteristics**

Parameter	Symbol	Min.	Typ	Max.	Unit	Test Conditions
Logic "0" input voltage (OUT = HI)	$V_{IL}$	---	---	0.8	V	Figure C
Logic "1" input voltage (OUT = LO)	$V_{IH}$	2.0	---	---		
INN pullup-voltage → no fault	$V_{IPUnf}$	2.10	2.50	2.90		
INN pullup-voltage → temp warning	$V_{IPUtw}$	4.00	4.50	5.00		
INN voltage → over-voltage detection or over-temp shut-down	$V_{IPUov}$	---	---	0.5		
Turn-on filter time	$t_{ONfilter}$	340	400	460	ns	
Turn-off filter time	$t_{OFFfilter}$	1275	1700	2200		
Logic "0" input bias current	$I_{IN-}$	---	-500	---	$\mu A$	$V_{NN}=0V$

## 4 Electrical Parameters IGBT

### 4.1 Absolute Maximum Ratings

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

**Table 8 Absolute Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage, $T_{vj} \geq 25^{\circ}\text{C}$	$V_{CE}$	1350	V
DC collector current, limited by $T_{vjmax}$ $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$	$I_C$	40.0 20.0	A
Pulsed collector current, $t_p$ limited by $T_{vjmax}$	$I_{Cpuls}$	60	A
Turn off safe operating area ( $V_{CE} \leq 1350\text{V}$ , $T_{vj} \leq 175^{\circ}\text{C}$ , $t_p = 1\mu\text{s}$ )	-	60	A
Diode forward current, limited by $T_{vjmax}$ $T_C = 25^{\circ}\text{C}$ $T_C = 100^{\circ}\text{C}$	$I_F$	40.0 20.0	A
Diode pulsed current, $t_p$ limited by $T_{vjmax}$	$I_{Fpuls}$	60.0	A
Gate-emitter voltage Transient Gate-emitter voltage ( $t_p \leq 10\mu\text{s}$ , $D < 0.010$ )	$V_{GE}$	$\pm 20$ $\pm 25$	V
Power dissipation $T_C = 25^{\circ}\text{C}$ Power dissipation $T_C = 100^{\circ}\text{C}$	$P_{tot}$	288.0 144.0	W
Virtual junction temperature	$T_{vj}$	-40...+175	$^{\circ}\text{C}$
Operating junction temperature <sup>1</sup>	$T_{vj,op}$	-40...+150	$^{\circ}\text{C}$
Storage temperature	$T_{stg}$	-40...+150	$^{\circ}\text{C}$
Soldering temperature, 1.6mm (0.063 in.) from case for 10s	-	260	$^{\circ}\text{C}$
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm
ESD capability Charged Devices Model (CDM) <sup>2</sup>	$V_{ESD}$	750	V
ESD capability Human Body Model (HBM) <sup>3</sup>	$V_{ESD}$	2.0	KV

**Table 9 Thermal Resistance**

Parameter	Symbol	Value	Unit
IGBT thermal resistance, junction – case	$R_{th(j-c)}$	0.52	K/W
Diode thermal resistance, junction – case	$R_{th(j-c)}$	0.52	K/W
Thermal resistance, junction – ambient	$R_{th(j-a)}$	40	K/W

<sup>1</sup>Limited by  $T_{vj,max}$  of the driver  $I_C$ .

<sup>2</sup>According to the JESD22-C101 CDM standard

<sup>3</sup>According to the JESD22-A114 Rev. F standard



## 4.2 Electrical Characteristics

At  $T_{vj}=25^{\circ}\text{C}$  and  $V_{cc}=15\text{V}$ , unless otherwise specified

**Table 10 Static Characteristic**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$I_{NN}=\text{open}$ , $I_C=0.5\text{mA}$	1350	-	-	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{IN}=0\text{V}$ , $I_C=20\text{A}$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	- - -	1.65 1.85 1.90	1.85 - -	
Diode forward voltage	$V_F$	$I_{NN}=\text{open}$ $I_F=20\text{A}$ $T_{vj}=25^{\circ}\text{C}$ $T_{vj}=125^{\circ}\text{C}$ $T_{vj}=150^{\circ}\text{C}$	- - -	1.71 1.85 1.97	1.90 - -	
Transconductance	$g_{fs}$	$V_{CE}=20\text{V}$ , $I_C=20\text{A}$	-	15.8	-	

**Table 11 Switching Characteristics, Inductive Load at  $T_{vj}=25^{\circ}\text{C}$**

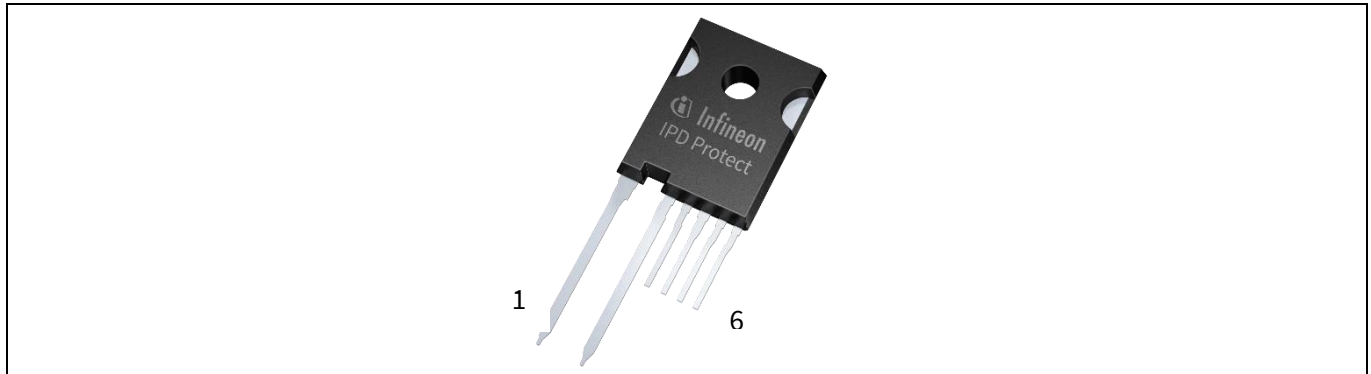
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-on propagation time	$t_{PD,on}$	$V_{DC}=600\text{V}$ , $I_C=20.0\text{A}$	-	668	-	ns
Turn-off propagation time	$t_{PD,off}$	$I_{NN}=\text{open}/0\text{V}$	-	2034	-	ns
Fall time	$t_f$	$L_{\sigma}=175\text{nH}$ , $C_{\sigma}=40\text{pF}$	-	83	-	ns
Turn-off energy	$E_{off}$	$L_{\sigma}$ , $C_{\sigma}$ from Fig. F Energy losses include "tail".	-	1.2	-	mJ
Turn-off energy, soft switching	$E_{off,soft}$	$dV_{CE}/dt = 67\text{V}/\mu\text{s}$ From Fig. F Energy losses include "tail".	-	0.26	-	mJ

**Table 12 Switching Characteristics, Inductive Load at  $T_{vj}=150^{\circ}\text{C}$**

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-on propagation time	$t_{PD,on}$	$V_{DC}=600\text{V}$ , $I_C=20.0\text{A}$	-	705	-	ns
Turn-off propagation time	$t_{PD,off}$	$I_{NN}=\text{open}/0\text{V}$	-	2257	-	ns
Fall time	$t_f$	$L_{\sigma}=175\text{nH}$ , $C_{\sigma}=40\text{pF}$	-	231	-	ns
Turn-off energy	$E_{off}$	$L_{\sigma}$ , $C_{\sigma}$ from Fig. F Energy losses include "tail".	-	2.2	-	mJ
Turn-off energy, soft switching	$E_{off,soft}$	$dV_{CE}/dt = 67\text{V}/\mu\text{s}$ From Fig. F Energy losses include "tail".	-	0.40	-	mJ

## 5 Pin Configuration, Description and Functionality

### 5.1 Pin Configuration and Description



**Figure 4 Pin Configuration**

**Table 13 Pin Description**

Pin	Symbol	Description
1	C	Collector of IGBT
2	E/COM	Emitter of IGBT, ground connection for the driver
3	VCC	Supply-voltage of the driver
4	CS	Current-limitation input
5	INN	PWM input (low active) / Diagnostic output
6	VDET	Over-voltage detection input

### 5.2 IGBT connect pins (C, E/COM)

A RC-H5 IGBT is integrated into the TO247-6pin package. The chip includes a powerful monolithic body diode for soft commutation. The TRENCHSTOP™ technology offers

- Very tight parameter distribution
- High ruggedness and temperature stable behavior
- LOW  $V_{CEsat}$
- Low EMI

### 5.3 VCC and COM

VCC is the voltage supply for the logic and the driver output stage. All inputs and outputs are referenced to COM. The undervoltage lockout circuit enables the device to operate at power on when a typical supply voltage higher than  $V_{CCUV+}$  is present. Please see section 3.3 “VCC Characteristics” for further information.

### 5.4 Current limitation input (CS)

The integrated cycle by cycle current limitation, given in the next figure, offers independent of the external control and input-voltage level, a voltage limitation across the IGBT. The negative current sense threshold ( $V_{CSTH}$ ) has the big advantage that the current sense resistor is not in the gate-drive loop. When the INN-input is switched to COM, the IGBT is turned on from the driver and the current-sense input gets enabled after a delay of  $t_{CSBLK}$ , to avoid mis-triggering during NZVS (Non Zero Voltage Switching) conditions. Once enabled, the voltage at the CS-pin gets monitored and when the current sense threshold is reached the IGBT turns off immediately, independent from the signal at the INN-input. A resistor of 1kOhm should be placed in series to the CS input to limit currents through the internal ESD-diodes due to transients.

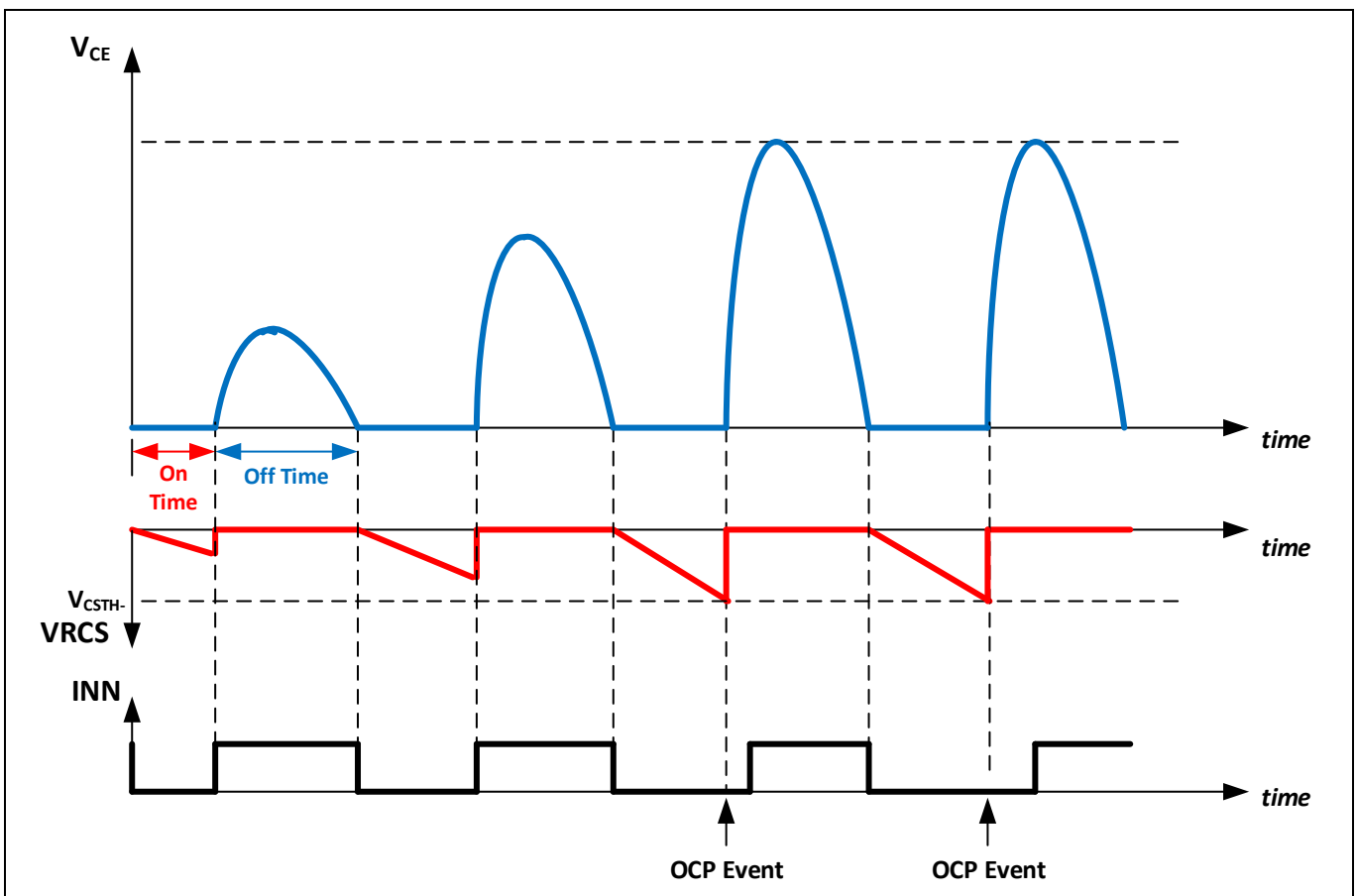


Figure 5 Cycle by cycle current limitation

### 5.5 PWM input / Diagnostic output (INN)

The INN pin is a multifunctional pin. It acts as an input to control the ON-time of the IGBT and during the OFF-time, the diagnostic block controls the pull-up voltage level according to the status (see Table 14 & Figure 8). To control the turn-on of the IGBT an open drain output should be connected to the INN pin. The Schmitt trigger input is such to guarantee compatibility down to 3.3V controller. The input Schmitt trigger and noise filter provide beneficial noise rejection to short input pulses according to Figure 6 and Figure 10.

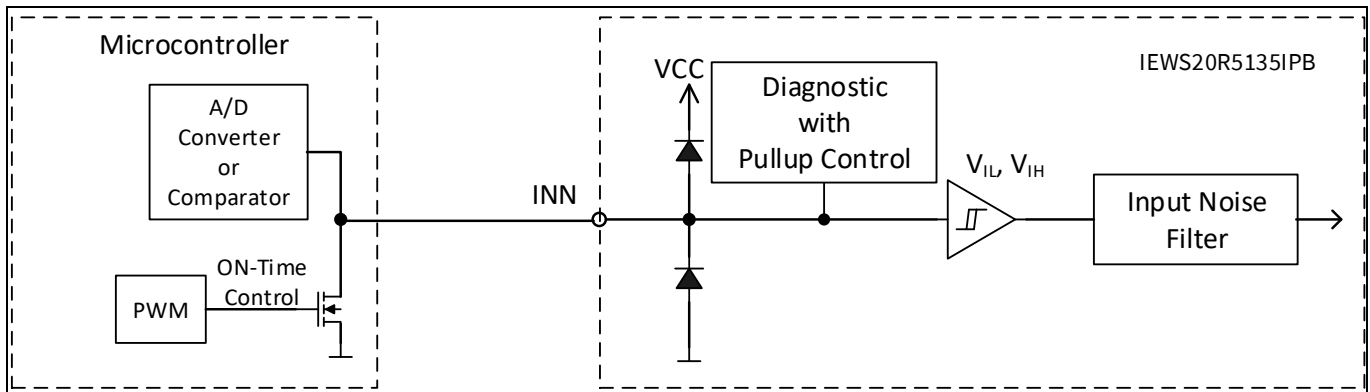


Figure 6 INN internal structure

Table 14 INN Diagnostic Pullup-Levels

Status	Pull-up Level (INN)
UVLO	<0,5V
No Fault	2,10V – 2,90V
OT-Warning	4V – 5V
OV-Detection	<0,5V
OT-Warning + OV-Detection	<0,5V (OV dominates)
OT-Shut-Down	<0,5V

## 5.6 Over-voltage detection input (VDET)

The integrated active clamp control level can be programmed on the VDET input with the resistor divider R1, R2 (Figure 7). After fixing R1, R2 can be calculated with the following equation:

$$R_2 = \frac{R_1}{\frac{V_{clamp1}}{V_{DET+1}} - 1}$$

$V_{clamp}$  = programmed clamping level

$V_{DET+1}$  = internal  $V_{DET+1}$  threshold

When the voltage at VDET goes above the internal threshold of  $V_{DET+1}$ , the Active Clamp Control (ACC) takes over and turns on the IGBT in order to regulate the voltage at VDET to  $V_{DET+1}$  and therefore the collector voltage to the programmed level  $V_{clamp1}$ . After the time  $T_{clamp1}$  the internal clamping level is increased by 11%. The ACC stay's active until the voltage at VDET drops below  $V_{DET+1}$  within  $T_{clamp1}$  or below  $V_{DET2+}$  after  $T_{clamp1}$ . A third internal threshold at  $V_{DET}$  ( $V_{RST-}$ ) takes care, that the IGBT is not turned on at a too high voltage level. Therefore the driver stay's disabled until the VDET voltage drops below  $V_{RST-}$ . The restart level ( $V_{RST-}$ ) can be calculated with following equation:

$$V_{RST} = V_{clamp1} * \frac{V_{RST-}}{V_{DET+1}}$$

In normal operation the  $V_{RST-}$  threshold is also active and blocks the turn-on of the IGBT until the VDET voltage falls below  $V_{RST-}$ , but the INN is not switched to GND compared to the OV-detection mode (Table 15). If the INN is switched to GND from the control system when the  $V_{CE} > V_{RST-}$  the complete cycle is skipped (see Figure 9).

# IPD Protect

## IGBT 20A/1350V RC-H5 technology with driver IC

### Pin Configuration, Description and Functionality

For short clamp situations, which can occur for example when the vessel is removed from the cooking surface, an over-voltage timer (OVT) is triggered in parallel. The OVT disables the driver for the over-voltage blank time so that the connected microcontroller has time to recognize and to react on the situation.

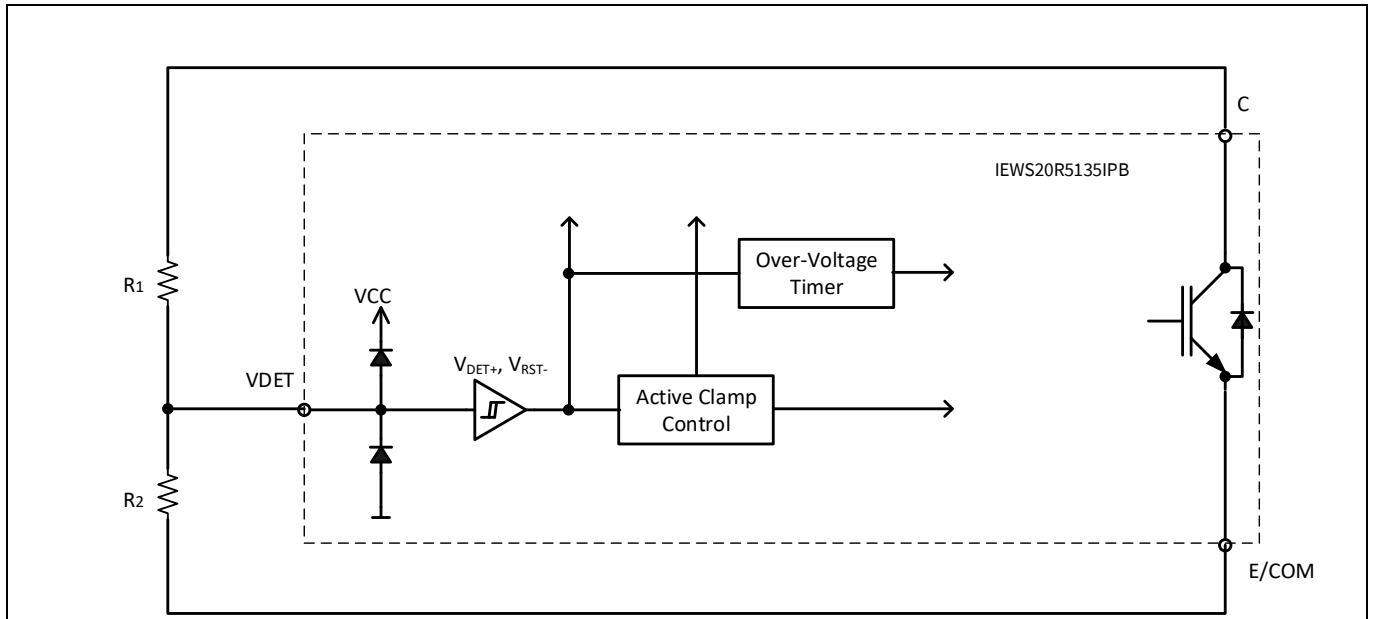


Figure 7 Active Clamp Control setting

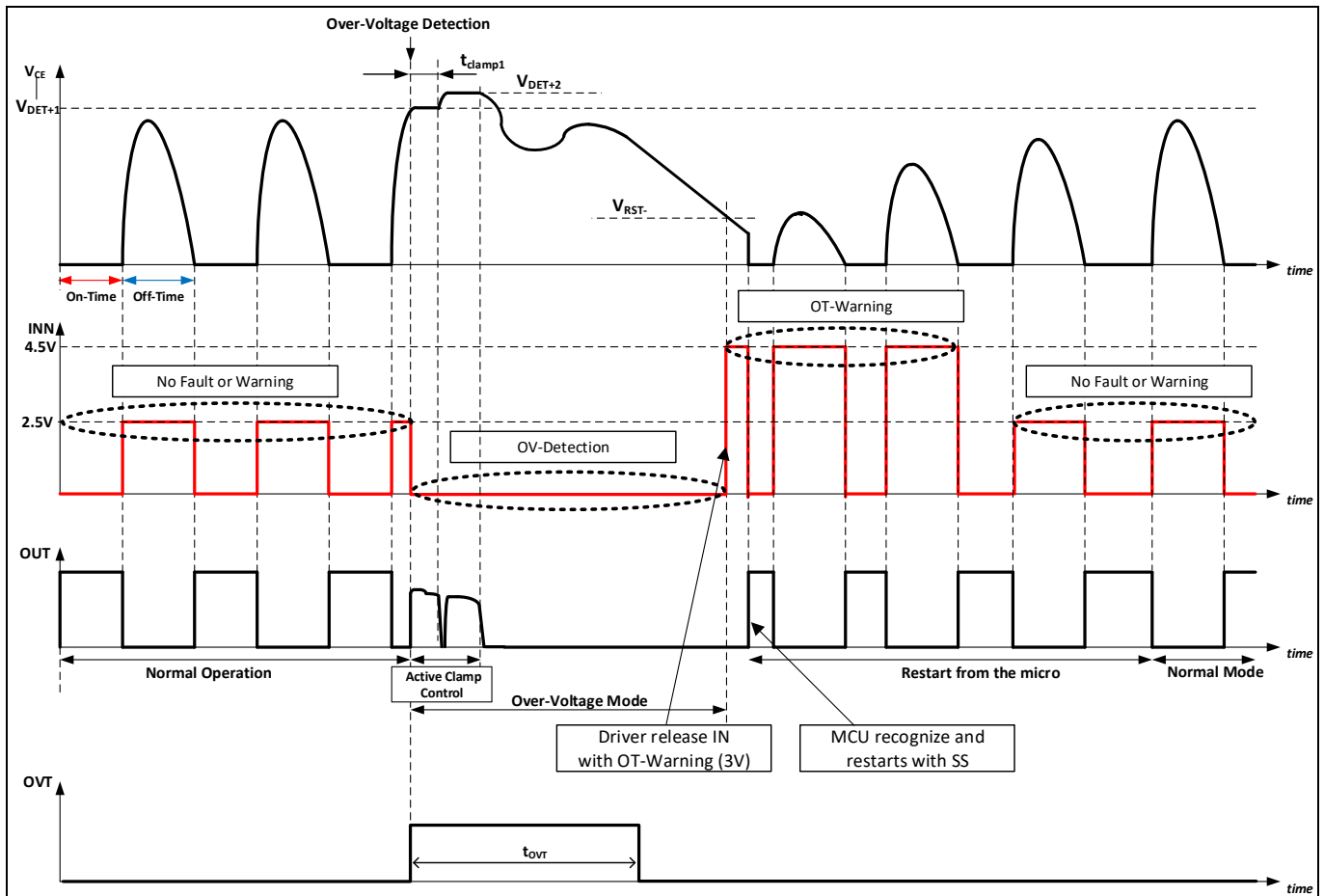


Figure 8 Active Clamp Control timing & Diagnostic

# IPD Protect

## IGBT 20A/1350V RC-H5 technology with driver IC

### Pin Configuration, Description and Functionality

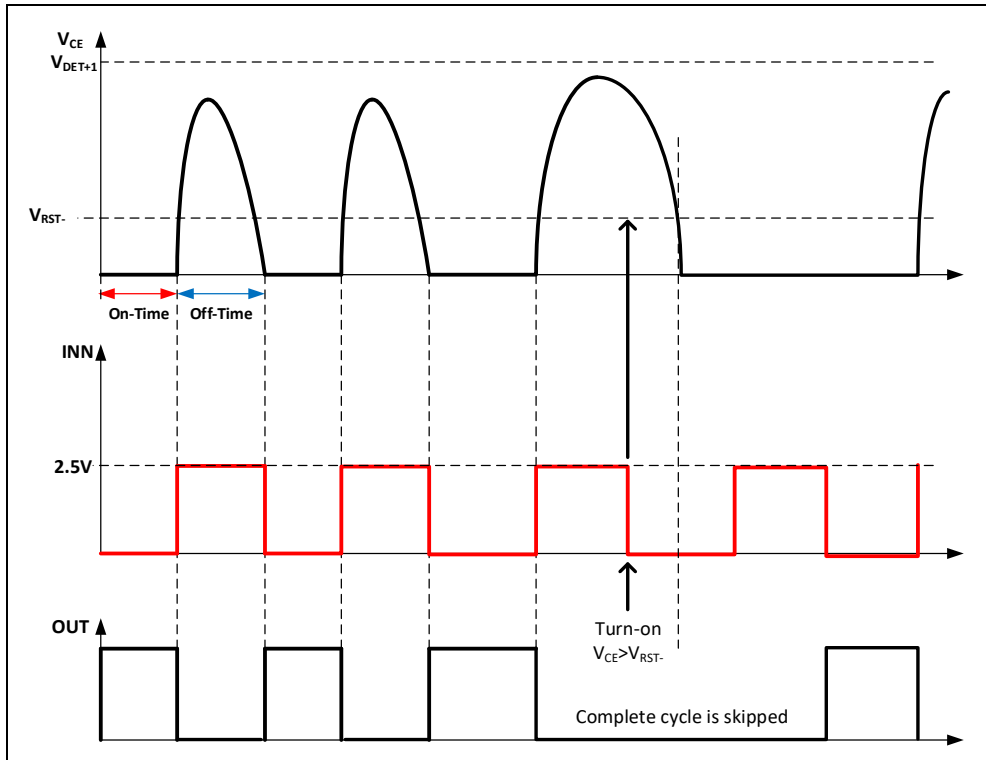


Figure 9 Function turn-on, if  $V_{CE} > V_{RST}$ .

Timing Diagrams

## 6 Timing Diagrams

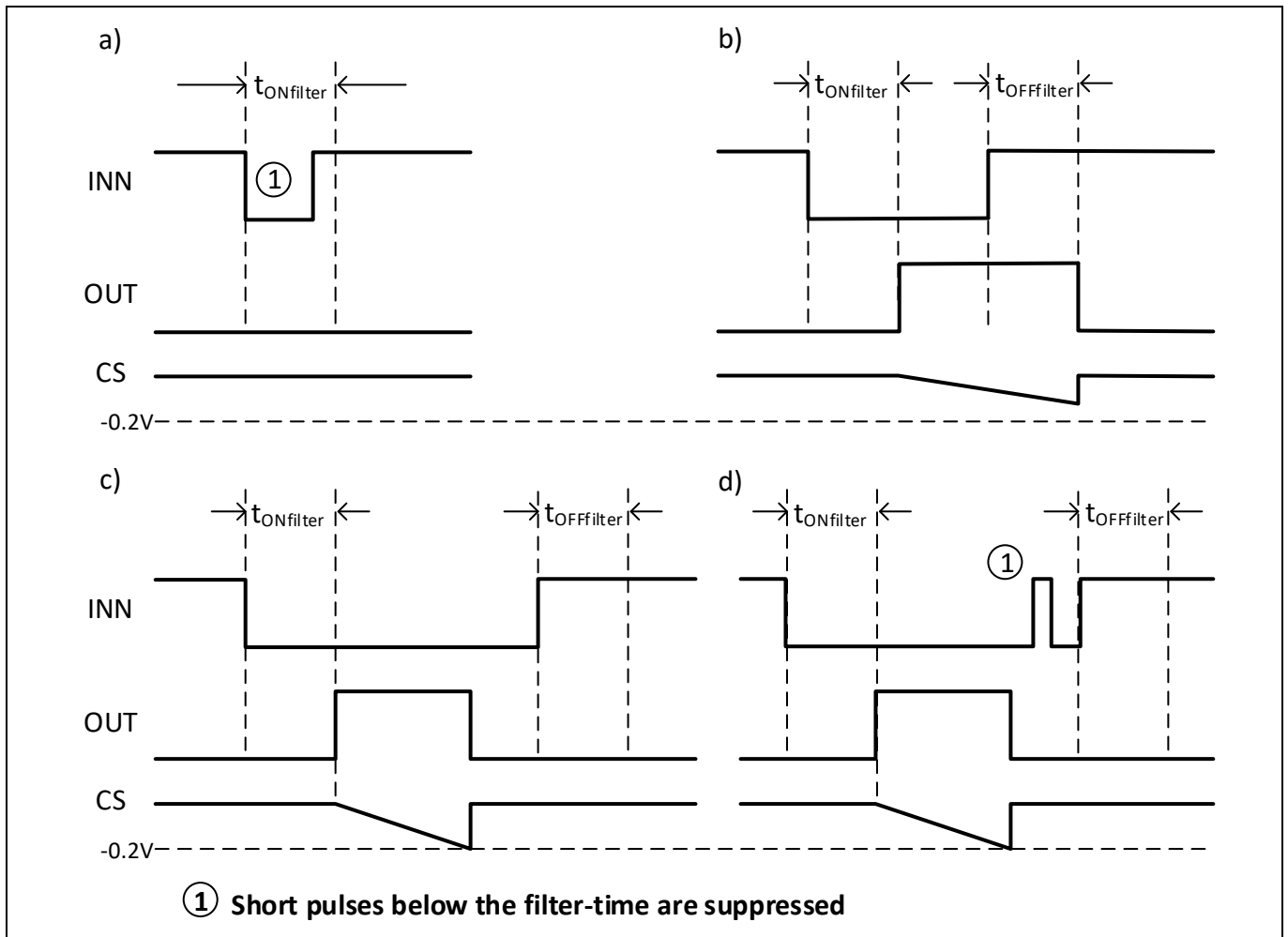


Figure 10 Input Noise Filter

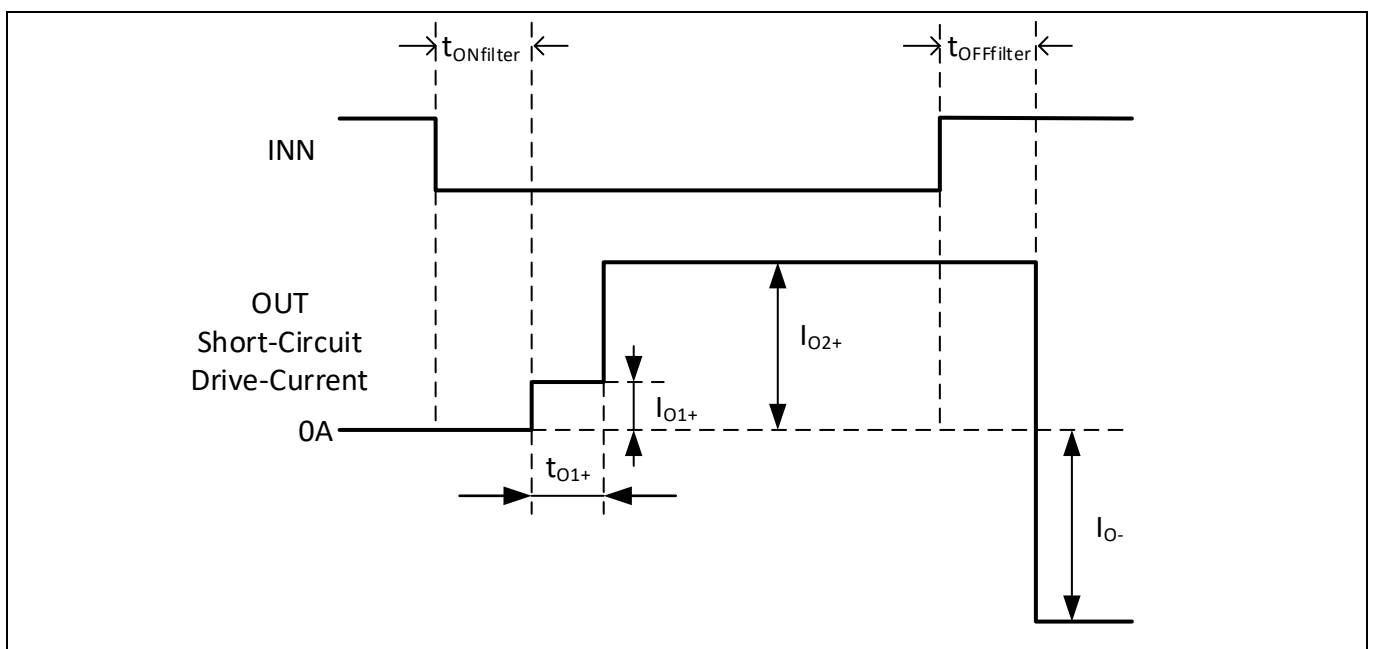


Figure 11 OUT Short-Circuit Drive-Current



## 7 Electrical Characteristics Diagrams

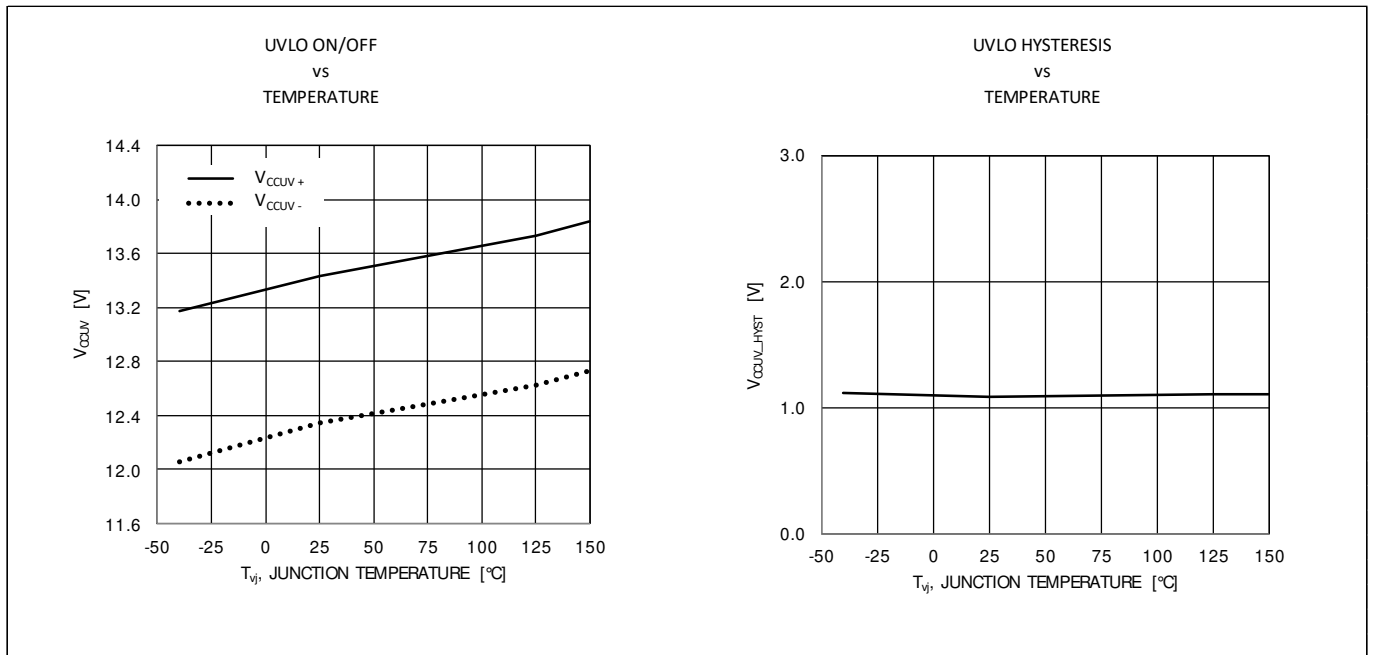


Figure 12. Undervoltage Lockout

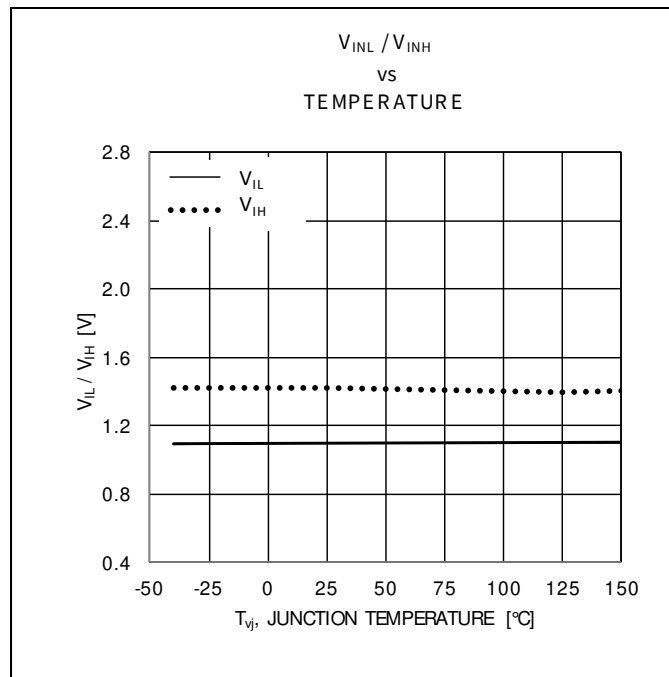
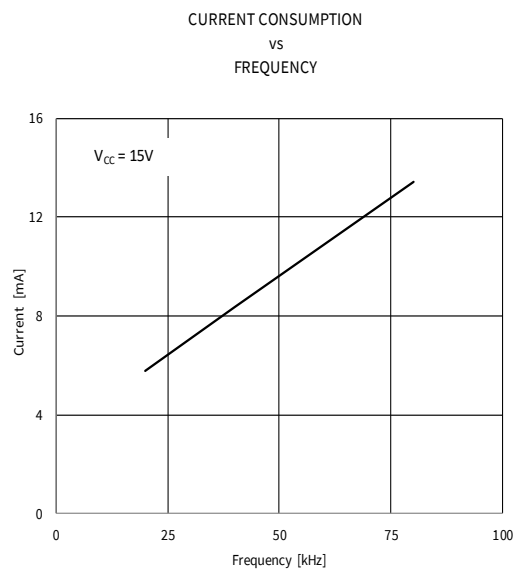
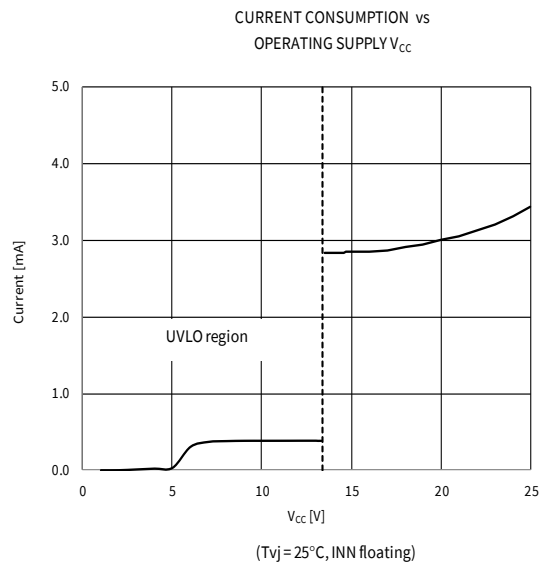
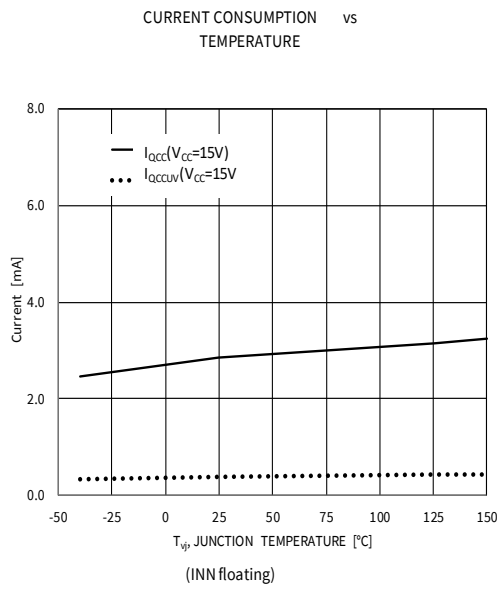


Figure 13. Input Voltage Characteristic

Electrical Characteristics Diagrams



Electrical Characteristics Diagrams

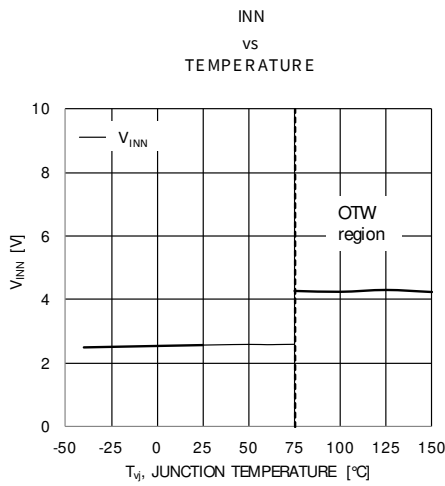


Figure 15. INN vs T<sub>j</sub>

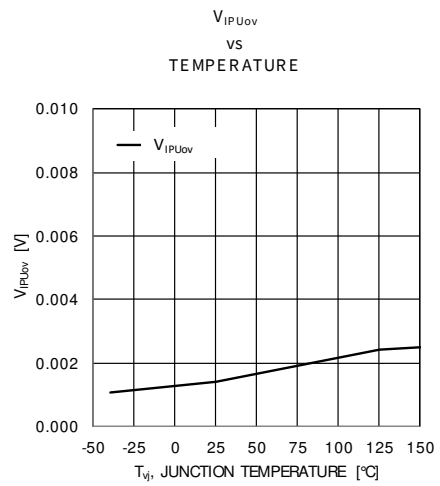


Figure 16. V<sub>IPUov</sub> vs T<sub>j</sub>

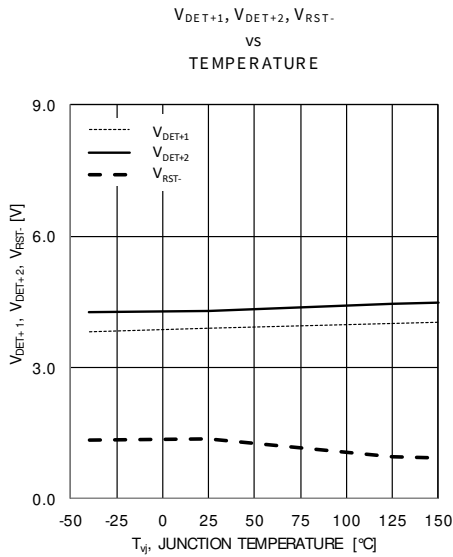


Figure 17. V<sub>DET+1</sub>, V<sub>DET+2</sub>, V<sub>RST-</sub> vs T<sub>j</sub>

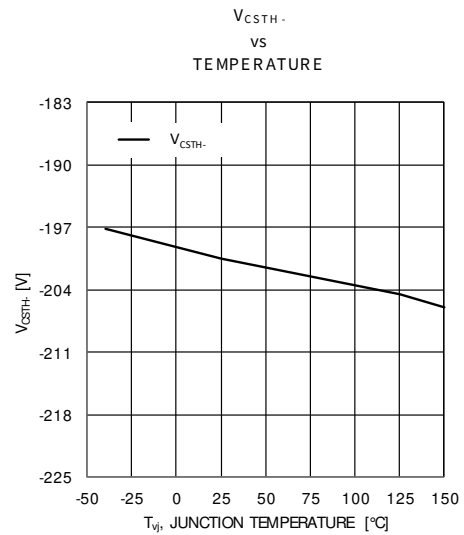


Figure 18. V<sub>CSTH-</sub> vs T<sub>j</sub>

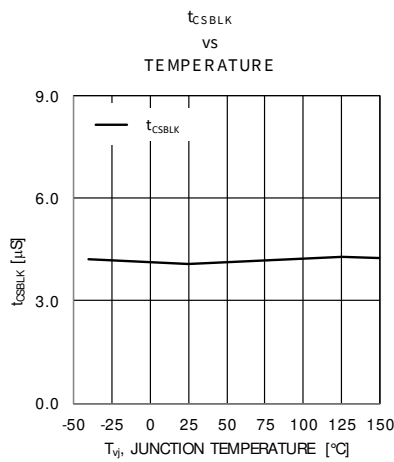
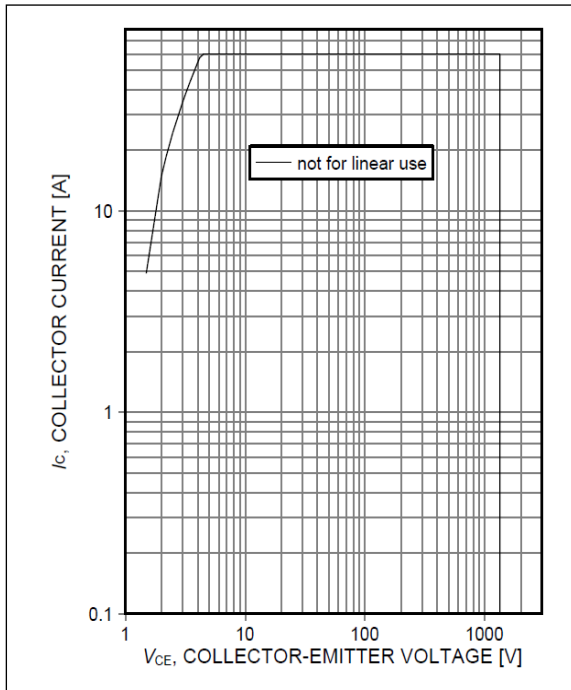
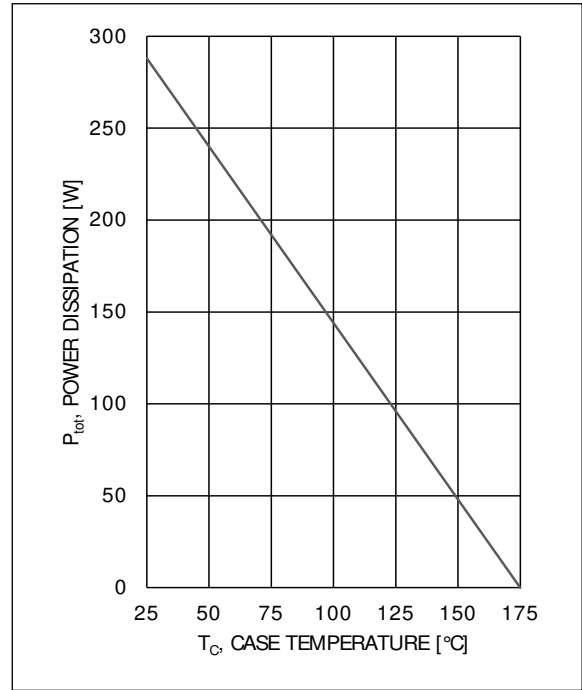


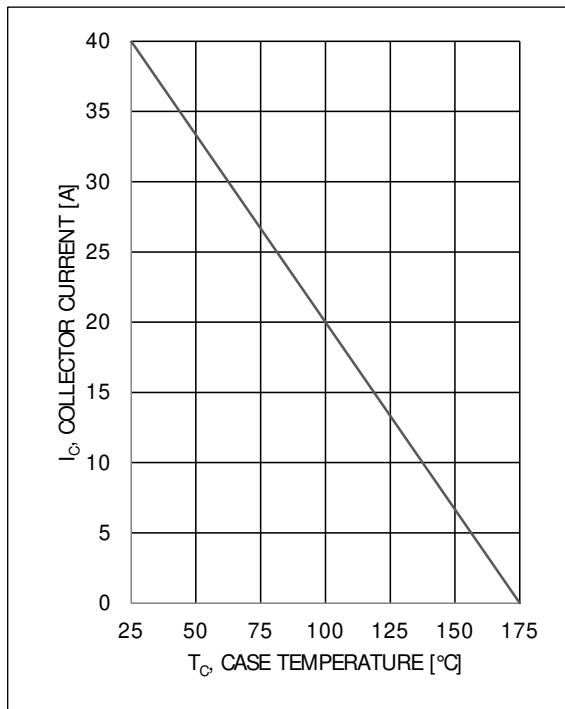
Figure 19. t<sub>CSBLK</sub> vs T<sub>j</sub>



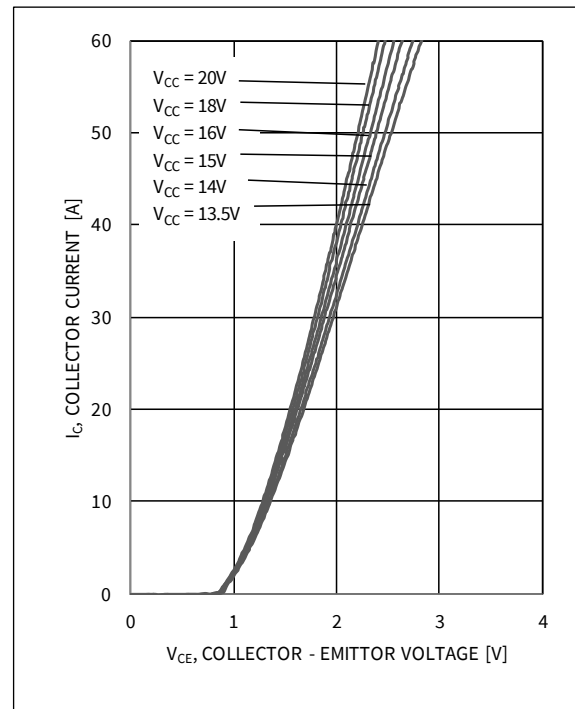
**Figure 20. Safe operating area**  
( $D=0$ ,  $T_C=25^\circ\text{C}$ ,  $T_{vj}=175^\circ\text{C}$ ;  $V_{CC}=15\text{V}$ ,  $t_p=1\mu\text{s}$ )



**Figure 21. Power dissipation as a function of case temperature**  
( $T_{vj} \leq 175^\circ\text{C}$ )



**Figure 22. Collector current as a function of case temperature**  
( $V_{CC} \geq 15\text{V}$ ,  $T_{vj} \leq 175^\circ\text{C}$ ;  $t_p=1\mu\text{s}$ )



**Figure 23. Typical output characteristic**  
( $T_{vj}=25^\circ\text{C}$ )

Electrical Characteristics Diagrams

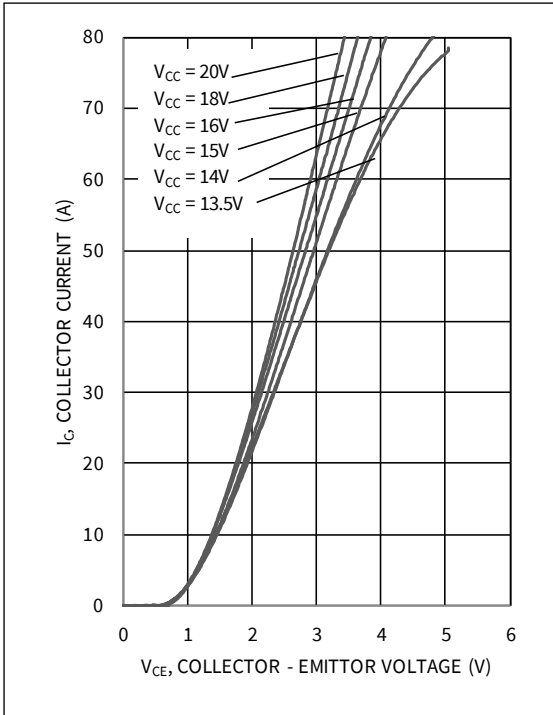


Figure 24. Typical output characteristic  
( $T_{vj}=150^\circ\text{C}$ )

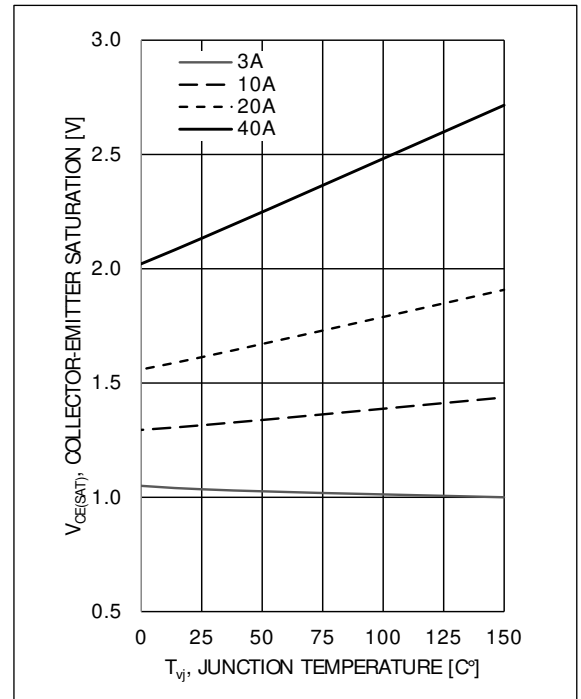


Figure 25. Typical collector-emitter saturation voltage as a function of junction temperature  
( $V_{CC}=15\text{V}$ )

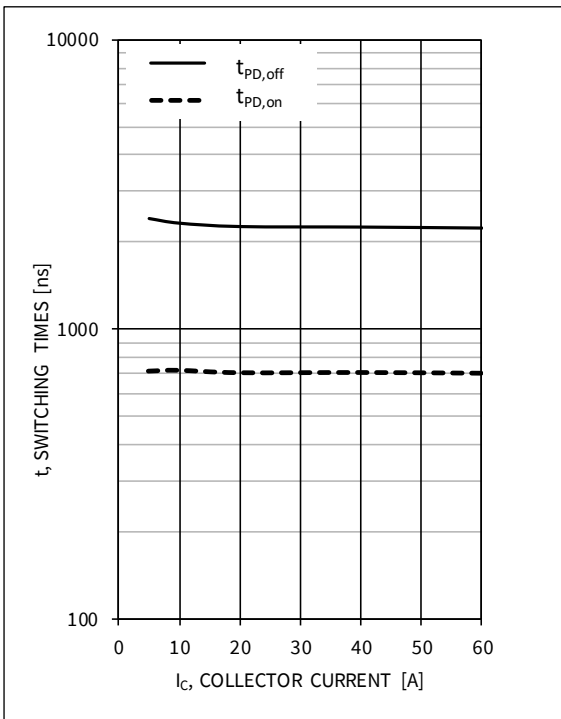


Figure 26. Typical switching times as a function of collector current  
(inductive load,  $T_{vj}=150^\circ\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{CC}=15$ , dynamic test circuit in Figure F)

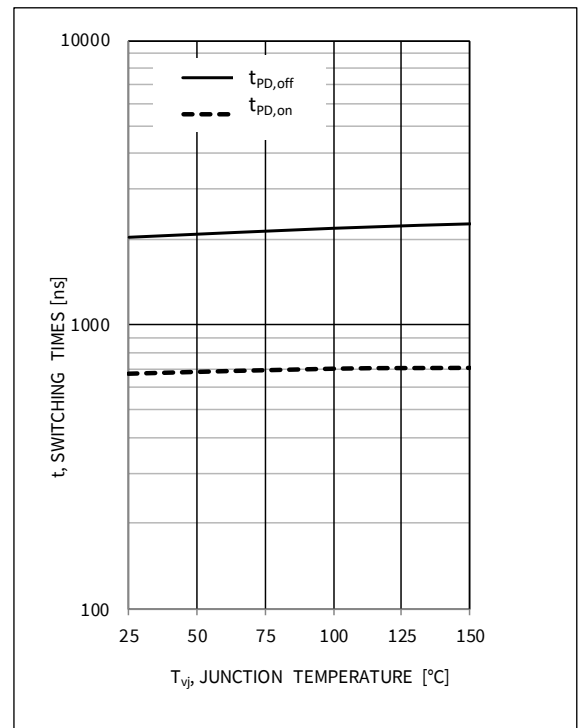
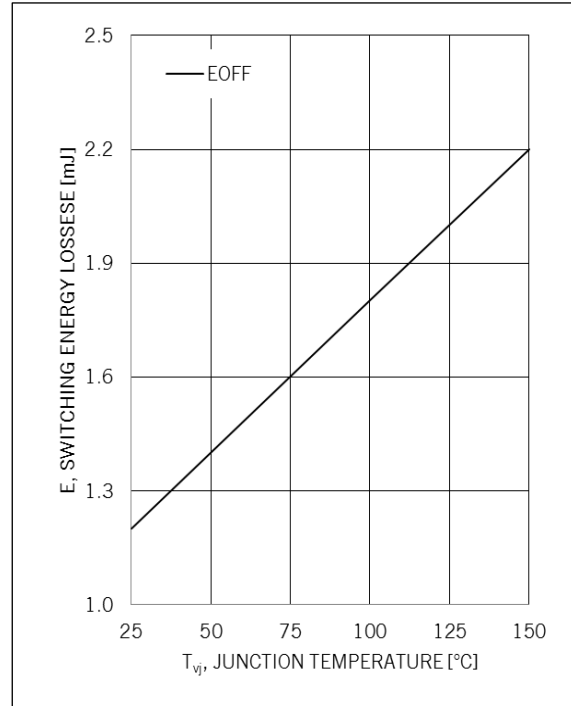
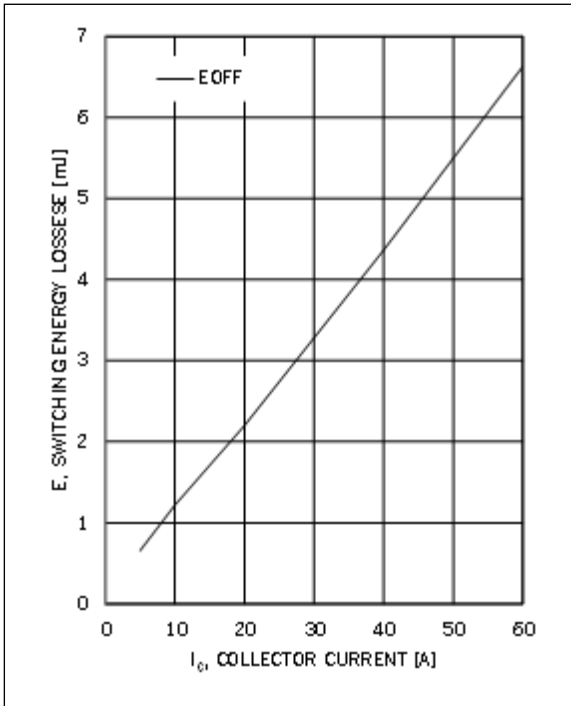


Figure 27. Typical switching times as a function of junction temperature  
(inductive load,  $V_{CE}=600\text{V}$ ,  $V_{CC}=15\text{V}$ ,  $I_C=20\text{A}$ , Dynamic test circuit in Figure F)

# IPD Protect

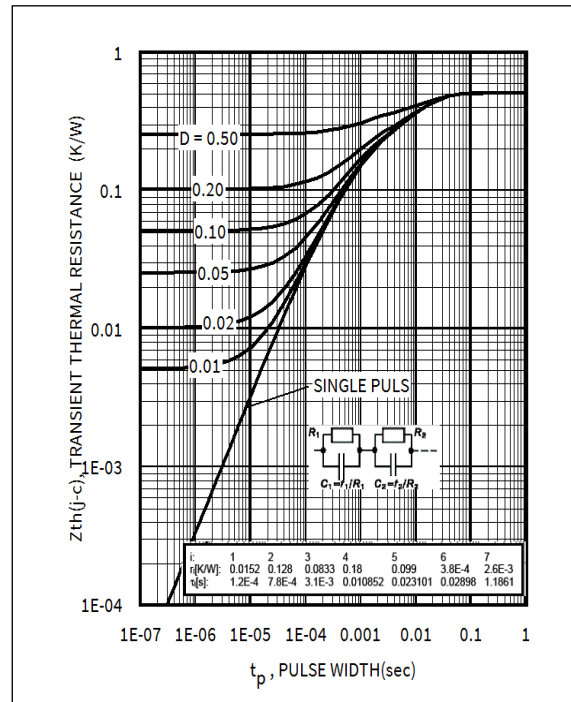
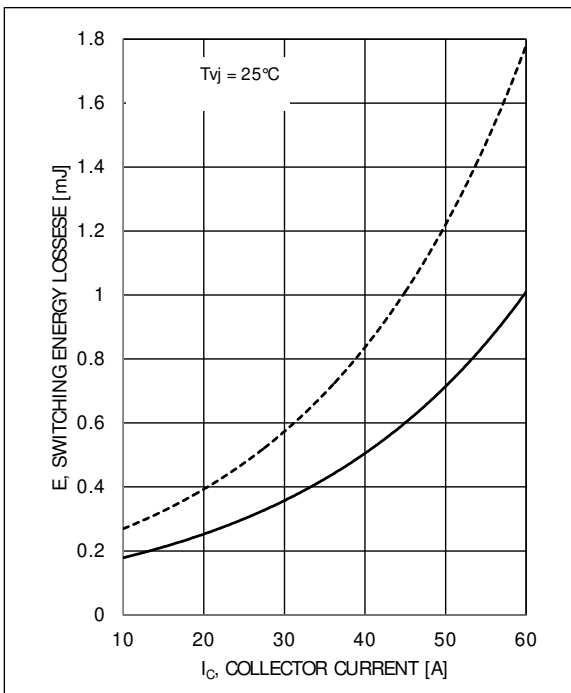
## IGBT 20A/1350V RC-H5 technology with driver IC

### Electrical Characteristics Diagrams



**Figure 28. Typical switching energy losses as a function of collector current**  
 (inductive load,  $T_{vj}=150^{\circ}\text{C}$ ,  $V_{CE}=600\text{V}$ ,  $V_{CC}=15\text{V}$ , Dynamic test circuit in Figure F)

**Figure 29. Typical switching energy losses as a function of junction temperature**  
 (inductive load,  $V_{CE}=600\text{V}$ ,  $V_{CC}=15\text{V}$ ,  $I_c=20\text{A}$ , Dynamic test circuit in Figure F)



**Figure 30. Typical turn off switching energy loss for soft switching**  
 (Inductive load,  $V_{CE}=600\text{V}$ ,  $V_{CC}=15\text{V}$ , Dynamic test circuit in Figure F)

**Figure 31. IGBT transient thermal impedance**  
 ( $D=t_p/T$ )

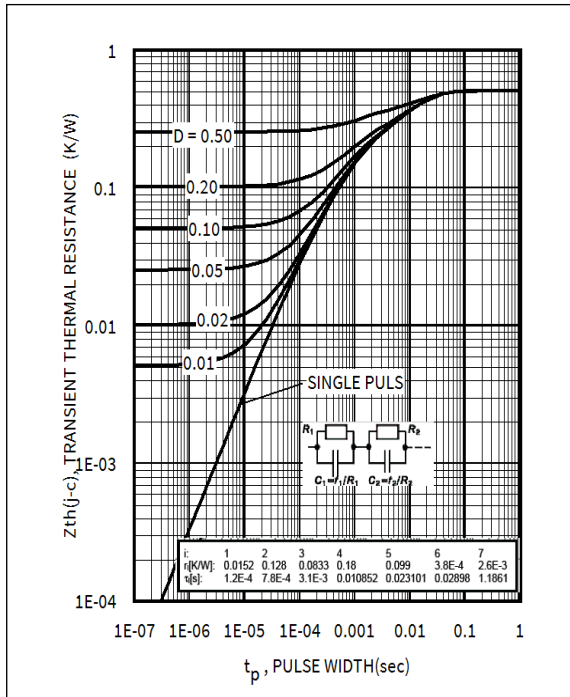


Figure 32. Diode transient thermal impedance as a function of pulse width  
 ( $D=t_p/T$ )

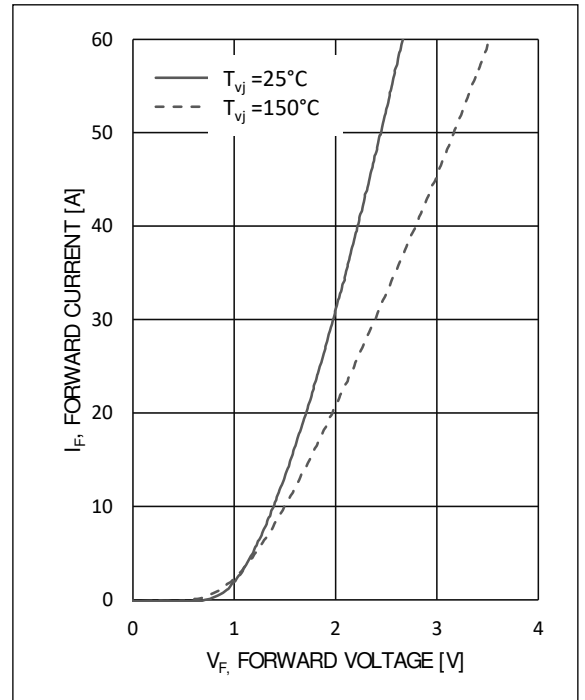


Figure 33. Typical diode forward current as a function of forward voltage

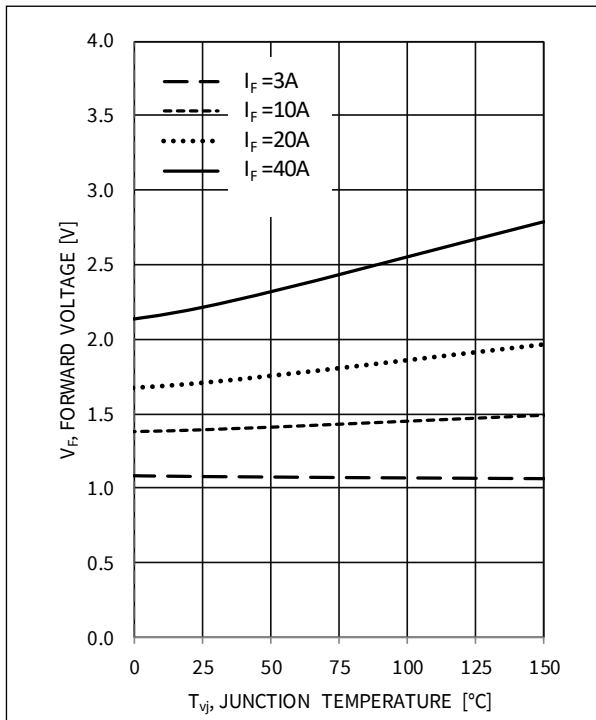


Figure 34. Typical diode forward voltage as a function of junction temperature

## 8 Test Conditions

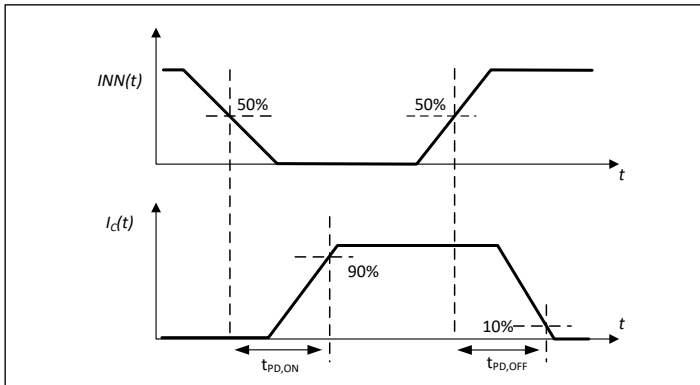


Figure A. Definition of switching times

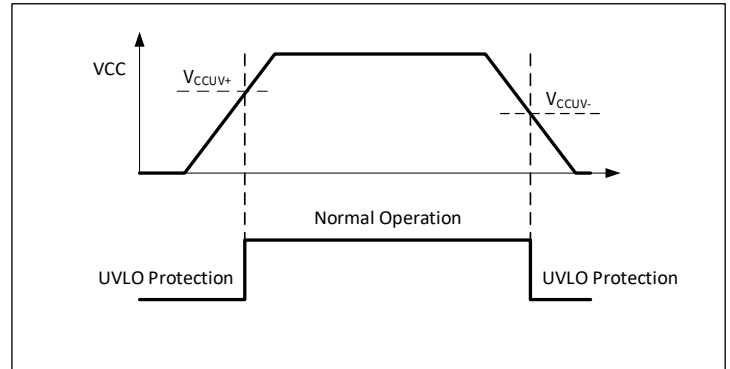


Figure D. UVLO Protection

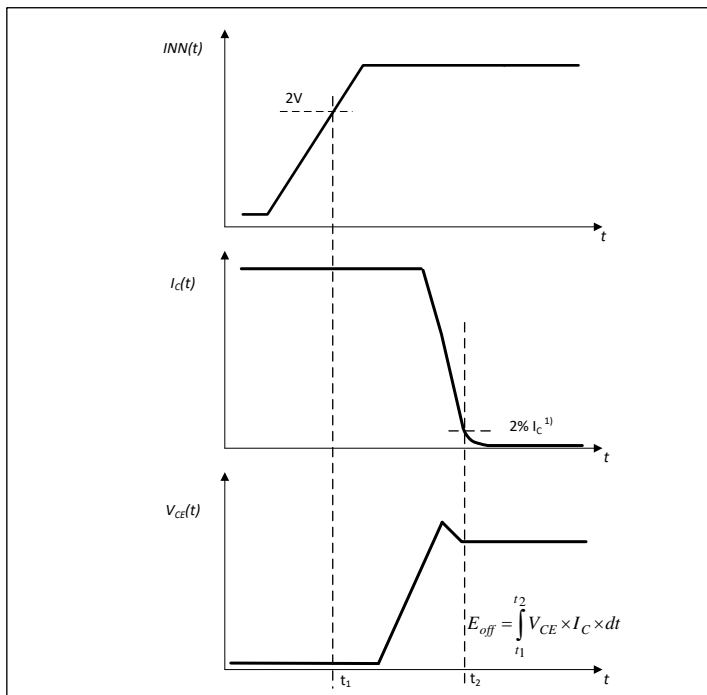


Figure B. Definition of switching losses

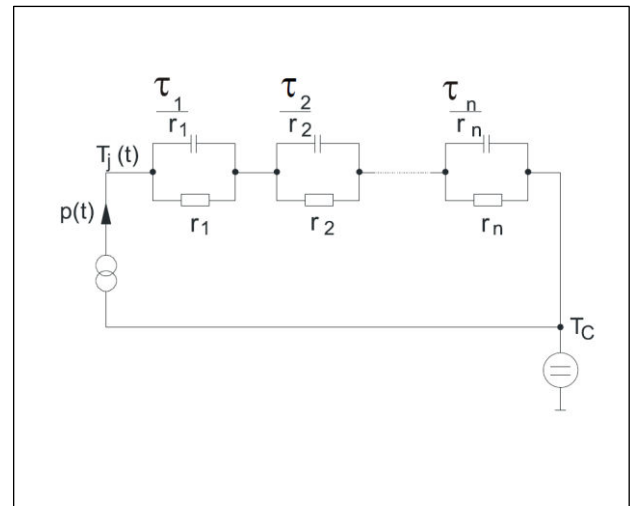


Figure E. Thermal equivalent circuit

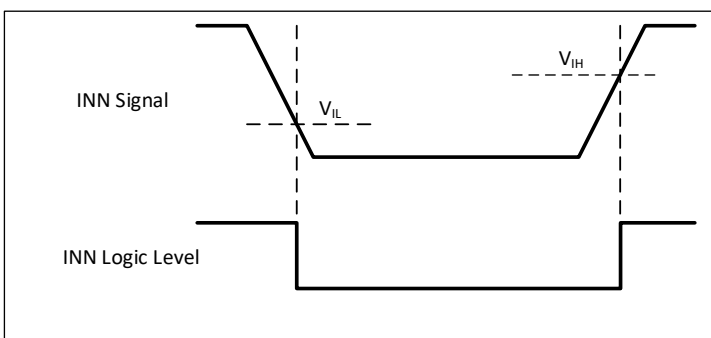


Figure C. INN Thresholds

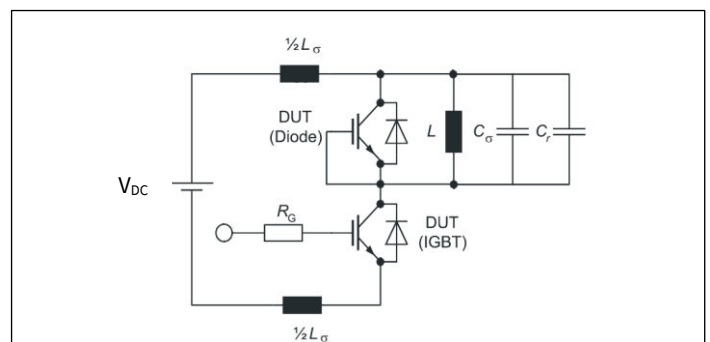


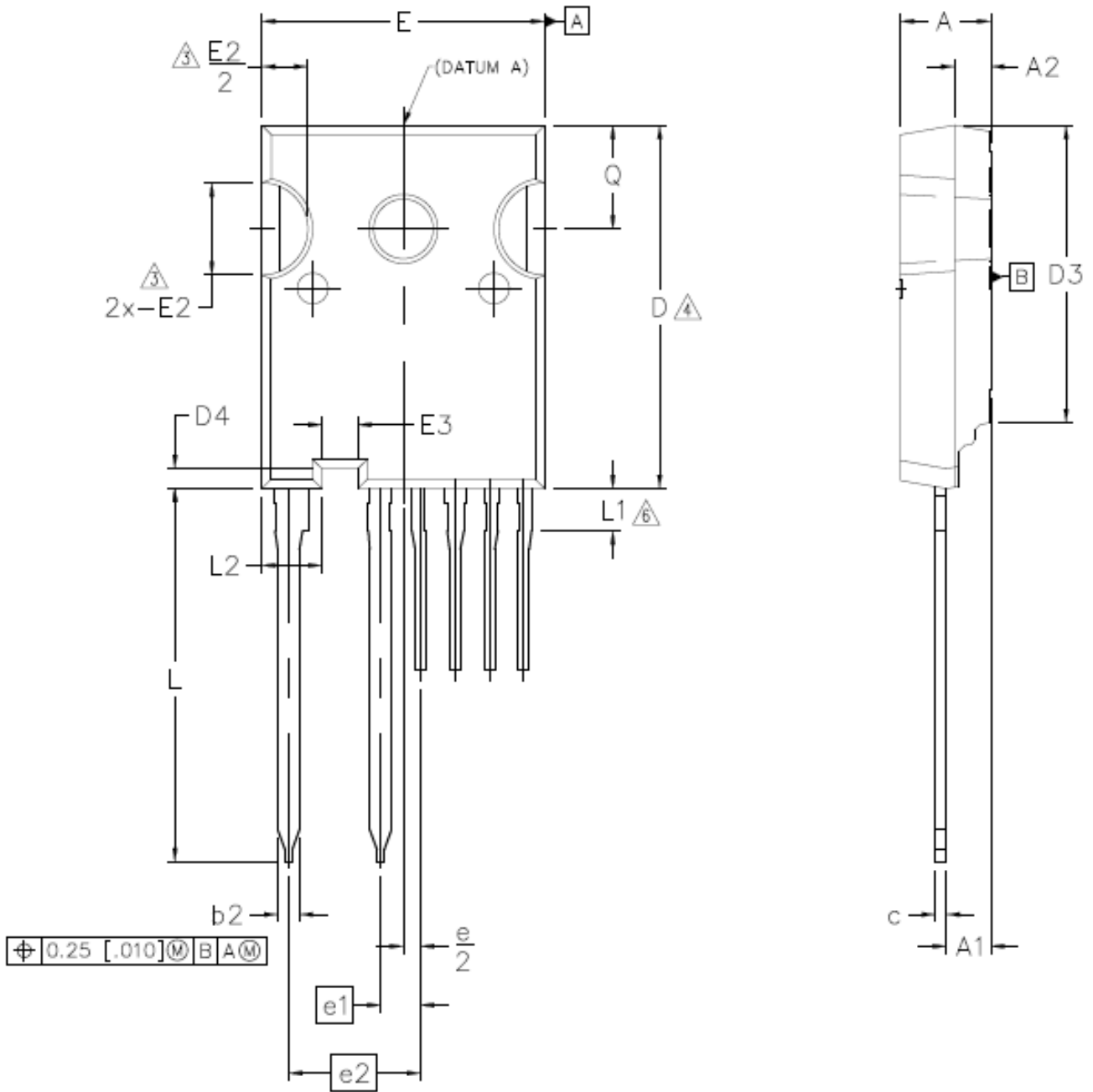
Figure F. Dynamic test circuit

<sup>1</sup> For soft switching is 1%  $I_C$ .



9 Package Drawing

PG-TO247-6



Package Dimensions

9.1 Package Dimensions

NOTES:

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M 1994.
2. DIMENSIONS ARE SHOWN IN MILLIMETERS
3. CONTOUR OF SLOT OPTIONAL.
4. DIMENSION DOES NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.13 [,.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS D1 & E1.
6. LEAD FINISH UNCONTROLLED IN L1.
7.  $\phi P$  TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5 ° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF .154 INCH.
8. A1 MEASUREMENT IS LOCATED AT 2.33 MM FROM THE PACKAGE EDGE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	.183	.209	
A1	2.15	2.70	.085	.106	8
A2	1.50	2.50	.059	.098	
b	0.45	0.80	.018	.031	
b2	0.90	1.50	.035	.059	
c	0.45	0.90	.018	.035	
D	19.70	20.70	.776	.815	4
D1	12.20	–	.480	–	5
D2	1.00	1.80	.040	.071	
D3	16.00	17.00	.630	.670	
D4	0.90	1.30	.035	.051	4
E	15.30	15.90	.602	.626	4
E1	12.20	–	.480	–	5
E2	4.70	5.50	.185	.216	
E3	1.80	2.20	.071	.087	4
e	1.90	BSC	.075	BSC	
e1	2.20	BSC	.087	BSC	
e2	7.28	BSC	.287	BSC	
$\phi k$	0.25		.010		
L	19.80	21.00	.780	.827	
L1	2.03	2.64	.080	.104	6
L2	3.00	3.60	.118	.142	4
L4	9.40	10.60	.370	.417	
$\phi P$	3.48	3.76	.137	.148	4
$\phi P1$	–	7.39	–	.291	
Q	5.40	6.20	.212	.244	
S	5.72	BSC	.225	BSC	

**Revision History****Revision: 2020-01-22, Rev.2.2**

<b>Revision</b>	<b>Date</b>	<b>Subjects (major changes since last revision)</b>
2.0	2018-06-28	Final Datasheet
2.1	28-05-2019	Revised version
2.2	22-01-2020	Product name change
2.3	24-04-2020	Correction of acronym 'IPD' in page 1, correction of minor typos

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