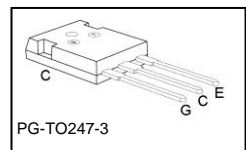
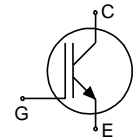


Low Loss IGBT: IGBT in TRENCHSTOP™ and Fieldstop technology



### Features:

- Very low  $V_{CE(sat)}$  1.5V (typ.)
- Maximum Junction Temperature 175°C
- Short circuit withstand time 5 $\mu$ s
- Designed for :
  - Frequency Converters
  - Uninterrupted Power Supply
- TRENCHSTOP™ and Fieldstop technology for 600V applications offers :
  - very tight parameter distribution
  - high ruggedness, temperature stable behavior
  - very high switching speed
- Positive temperature coefficient in  $V_{CE(sat)}$
- Low EMI
- Low Gate Charge
- Qualified according to JEDEC<sup>1</sup> for target applications
- Pb-free lead plating; RoHS compliant
- Complete product spectrum and PSpice Models : <http://www.infineon.com/igbt/>



Type	$V_{CE}$	$I_C$	$V_{CE(sat), T_j=25^\circ C}$	$T_{j,max}$	Marking	Package
IGW75N60T	600V	75A	1.5V	175°C	G75T60	PG-TO247-3

### Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage, $T_j \geq 25^\circ C$	$V_{CE}$	600	V
DC collector current, limited by $T_{j,max}$	$I_C$	118	A
$T_C = 25^\circ C$		85	
$T_C = 100^\circ C$		225	
Pulsed collector current, $t_p$ limited by $T_{j,max}$	$I_{C,puls}$	225	
Turn off safe operating area $V_{CE} = 600V, T_j = 175^\circ C, t_p = 1\mu s$	-	225	
Gate-emitter voltage	$V_{GE}$	$\pm 20$	V
Short circuit withstand time <sup>2)</sup>	$t_{SC}$	5	$\mu s$
$V_{GE} = 15V, V_{CC} \leq 400V, T_j \leq 150^\circ C$			
Power dissipation $T_C = 25^\circ C$	$P_{tot}$	428	W
Operating junction temperature	$T_j$	-40...+175	°C
Storage temperature	$T_{stg}$	-55...+150	
Soldering temperature, 1.6mm (0.063 in.) from case for 10s	-	260	

<sup>1</sup> J-STD-020 and JESD-022

<sup>2)</sup> Allowed number of short circuits: <1000; time between short circuits: >1s.

### Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
<b>Characteristic</b>				
IGBT thermal resistance, junction – case	$R_{thJC}$		0.35	K/W
Thermal resistance, junction – ambient	$R_{thJA}$		40	

### Electrical Characteristic, at $T_j = 25\text{ °C}$ , unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit	
			min.	Typ.	max.		
<b>Static Characteristic</b>							
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}=0V, I_C=0.2mA$	600	-	-	V	
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE} = 15V, I_C=75A$	-	1.5	2.0		
		$T_j=25\text{ °C}$	-	1.9	-		
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C=1.2mA, V_{CE}=V_{GE}$	4.1	4.9	5.7		
Zero gate voltage collector current	$I_{CES}$	$V_{CE}=600V,$ $V_{GE}=0V$	$T_j=25\text{ °C}$	-	-	40	$\mu A$
			$T_j=175\text{ °C}$	-	-	5000	
Gate-emitter leakage current	$I_{GES}$	$V_{CE}=0V, V_{GE}=20V$	-	-	100	nA	
Transconductance	$g_{fs}$	$V_{CE}=20V, I_C=75A$	-	41	-	S	
Integrated gate resistor	$R_{Gint}$		-			$\Omega$	

### Dynamic Characteristic

Input capacitance	$C_{iss}$	$V_{CE}=25V,$ $V_{GE}=0V,$ $f=1MHz$	-	4620	-	$pF$
Output capacitance	$C_{oss}$		-	288	-	
Reverse transfer capacitance	$C_{rss}$		-	137	-	
Gate charge	$Q_{Gate}$	$V_{CC}=480V, I_C=75A$ $V_{GE}=15V$	-	470	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	$L_E$		-	13	-	nH
Short circuit collector current <sup>1)</sup>	$I_{C(SC)}$	$V_{GE}=15V, t_{SC}\leq 5\mu s$ $V_{CC} = 400V,$ $T_j \leq 150\text{ °C}$	-	687.5	-	A

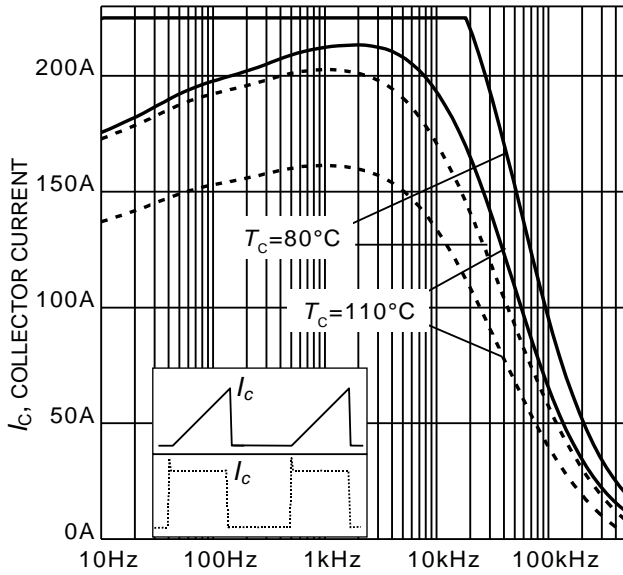
<sup>1)</sup> Allowed number of short circuits: <1000; time between short circuits: >1s.

### Switching Characteristic, Inductive Load, at $T_j=25\text{ °C}$

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
<b>IGBT Characteristic</b>						
Turn-on delay time	$t_{d(on)}$	$T_j=25\text{ °C}$ , $V_{CC}=400\text{V}$ , $I_C=75\text{A}$ , $V_{GE}=0/15\text{V}$ , $r_G=5\Omega$ , $L_\sigma=100\text{nH}$ , $C_\sigma=39\text{pF}$	-	33	-	ns
Rise time	$t_r$		-	36	-	
Turn-off delay time	$t_{d(off)}$		-	330	-	
Fall time	$t_f$		-	35	-	
Turn-on energy <sup>1)</sup>	$E_{on}$	$L_\sigma$ , $C_\sigma$ from Fig. E Energy losses include "tail" and diode reverse recovery. Diode from IKW75N60T	-	2.0	-	mJ
Turn-off energy	$E_{off}$		-	2.5	-	
Total switching energy	$E_{ts}$		-	4.5	-	

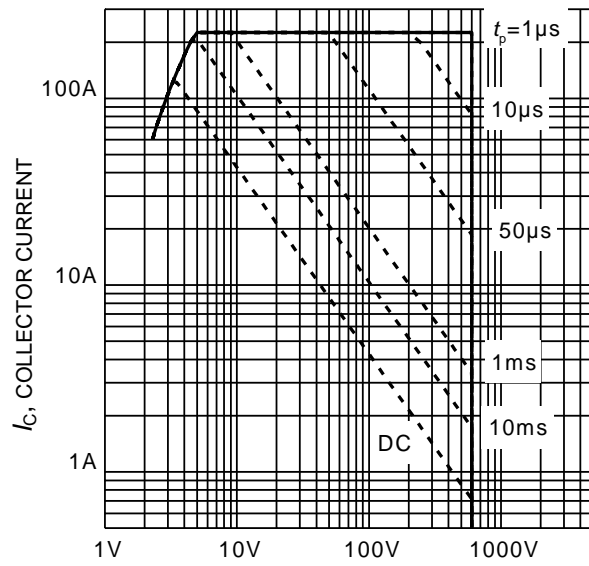
### Switching Characteristic, Inductive Load, at $T_j=175\text{ °C}$

Parameter	Symbol	Conditions	Value			Unit
			min.	Typ.	max.	
<b>IGBT Characteristic</b>						
Turn-on delay time	$t_{d(on)}$	$T_j=175\text{ °C}$ , $V_{CC}=400\text{V}$ , $I_C=75\text{A}$ , $V_{GE}=0/15\text{V}$ , $r_G=5\Omega$ , $L_\sigma=100\text{nH}$ , $C_\sigma=39\text{pF}$	-	32	-	ns
Rise time	$t_r$		-	37	-	
Turn-off delay time	$t_{d(off)}$		-	363	-	
Fall time	$t_f$		-	38	-	
Turn-on energy <sup>1)</sup>	$E_{on}$	$L_\sigma$ , $C_\sigma$ from Fig. E Energy losses include "tail" and diode reverse recovery. Diode from IKW75N60T	-	2.9	-	mJ
Turn-off energy	$E_{off}$		-	2.9	-	
Total switching energy	$E_{ts}$		-	5.8	-	



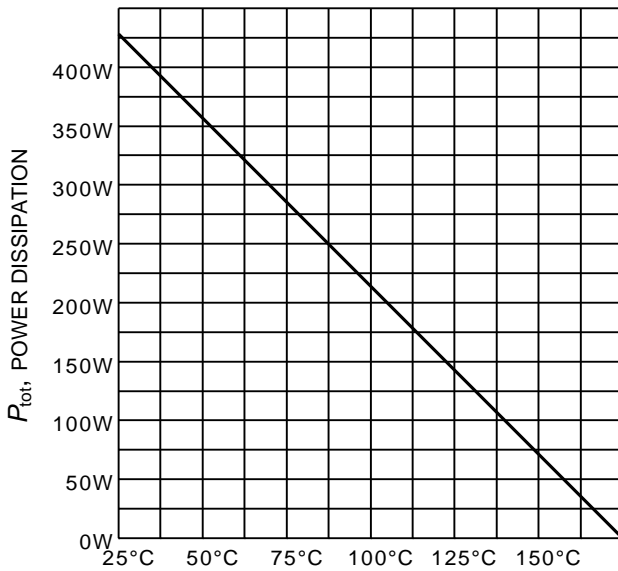
$f$ , SWITCHING FREQUENCY

**Figure 1. Collector current as a function of switching frequency**  
 ( $T_j \leq 175^\circ\text{C}$ ,  $D = 0.5$ ,  $V_{CE} = 400\text{V}$ ,  
 $V_{GE} = 0/15\text{V}$ ,  $r_G = 5\Omega$ )



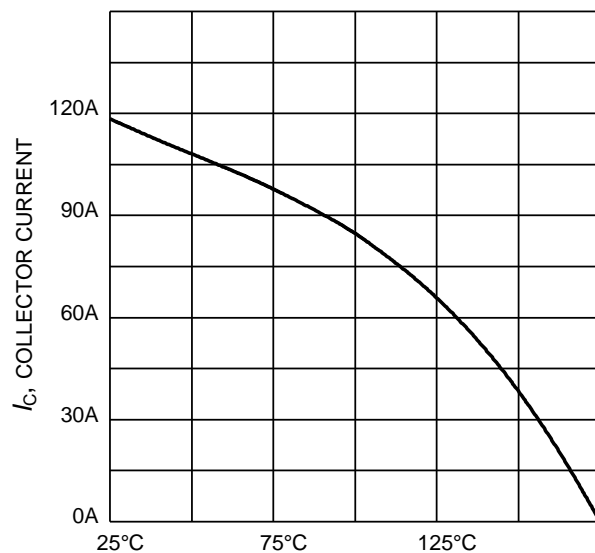
$V_{CE}$ , COLLECTOR-EMITTER VOLTAGE

**Figure 2. Safe operating area**  
 ( $D = 0$ ,  $T_C = 25^\circ\text{C}$ ,  $T_j \leq 175^\circ\text{C}$ ;  
 $V_{GE} = 0/15\text{V}$ )



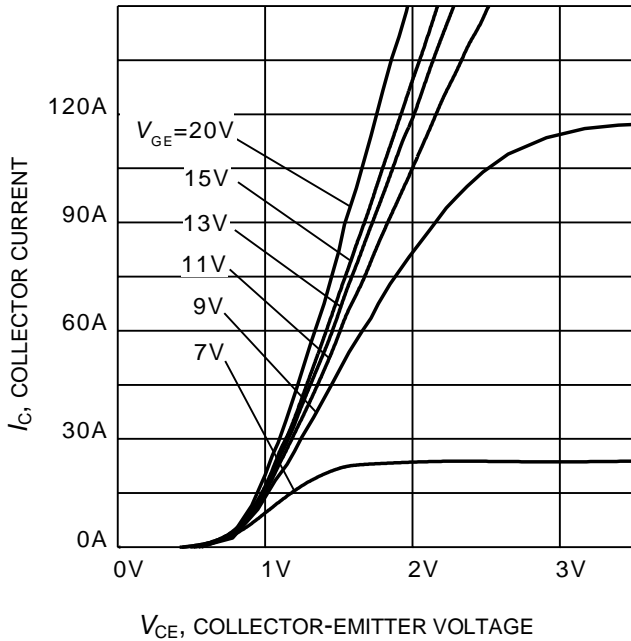
$T_C$ , CASE TEMPERATURE

**Figure 3. Power dissipation as a function of case temperature**  
 ( $T_j \leq 175^\circ\text{C}$ )

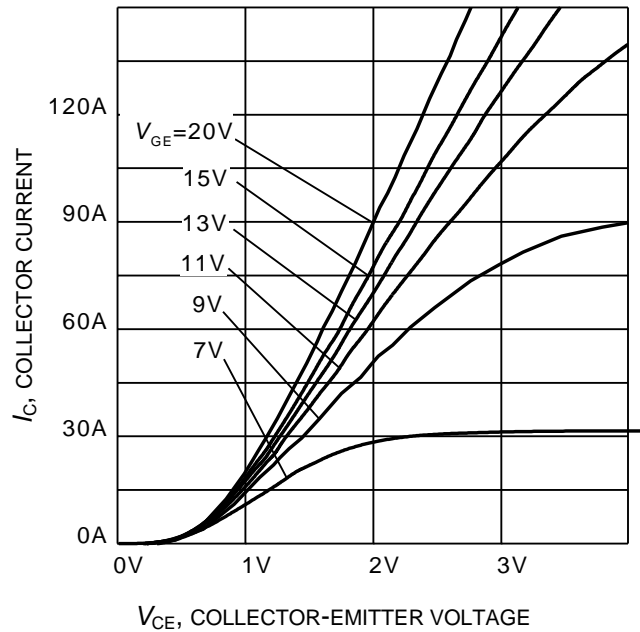


$T_C$ , CASE TEMPERATURE

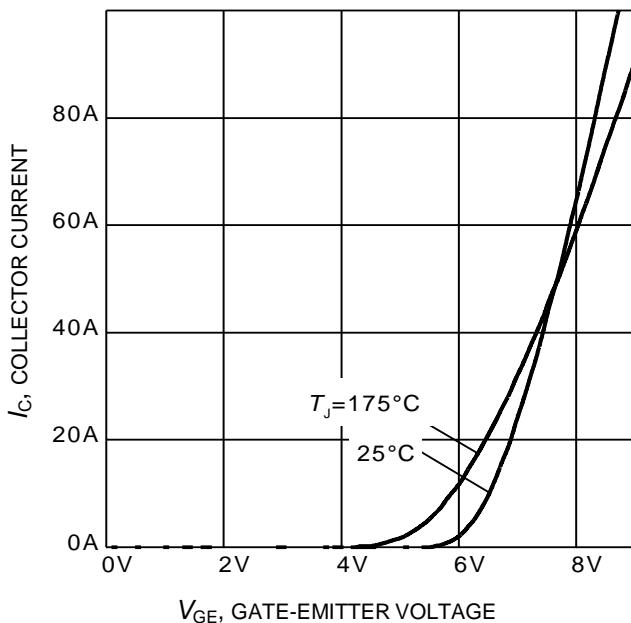
**Figure 4. DC Collector current as a function of case temperature**  
 ( $V_{GE} \geq 15\text{V}$ ,  $T_j \leq 175^\circ\text{C}$ )



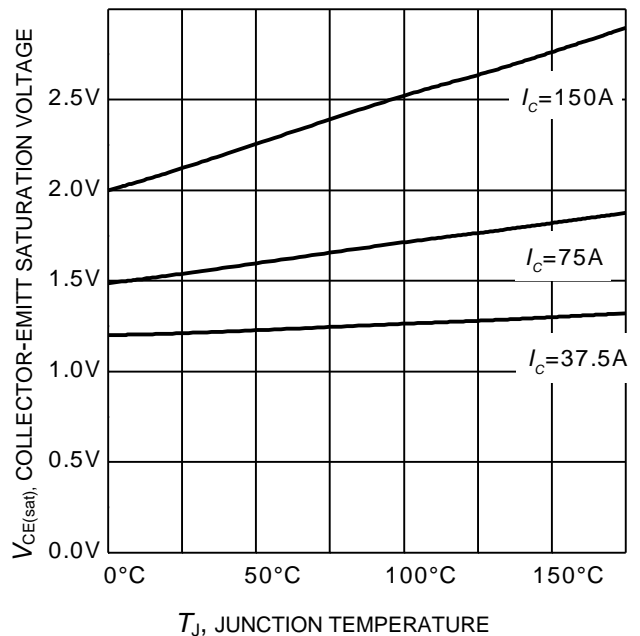
**Figure 5. Typical output characteristic**  
( $T_j = 25^\circ\text{C}$ )



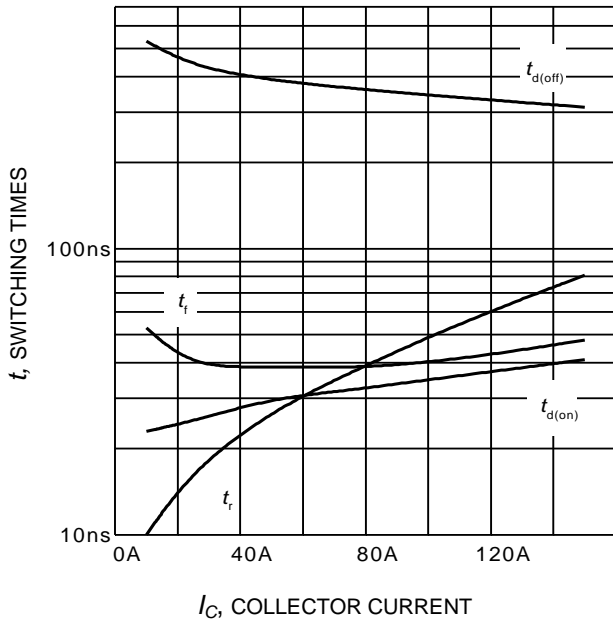
**Figure 6. Typical output characteristic**  
( $T_j = 175^\circ\text{C}$ )



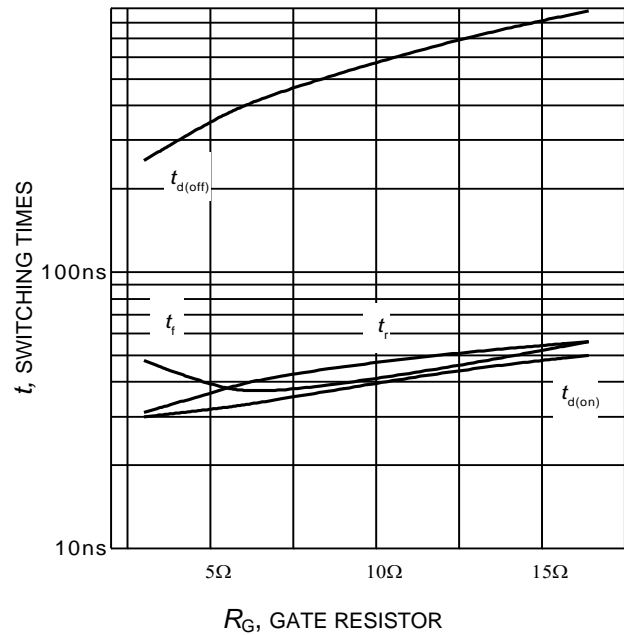
**Figure 7. Typical transfer characteristic**  
( $V_{CE} = 20\text{V}$ )



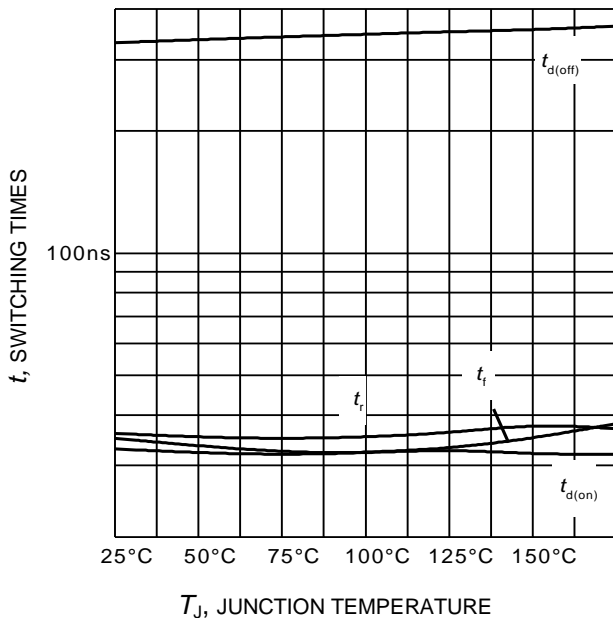
**Figure 8. Typical collector-emitter saturation voltage as a function of junction temperature**  
( $V_{GE} = 15\text{V}$ )



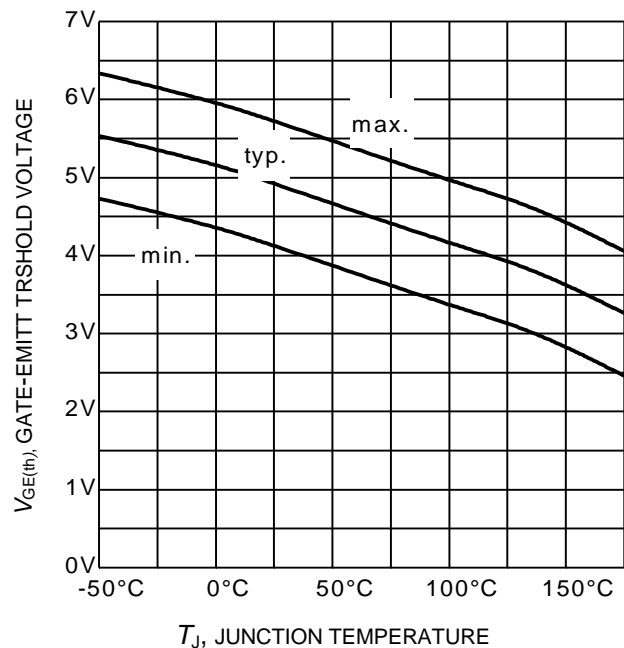
**Figure 9. Typical switching times as a function of collector current**  
 (inductive load,  $T_J=175^\circ\text{C}$ ,  
 $V_{CE} = 400\text{V}$ ,  $V_{GE} = 0/15\text{V}$ ,  $r_G = 5\Omega$ ,  
 Dynamic test circuit in Figure E)



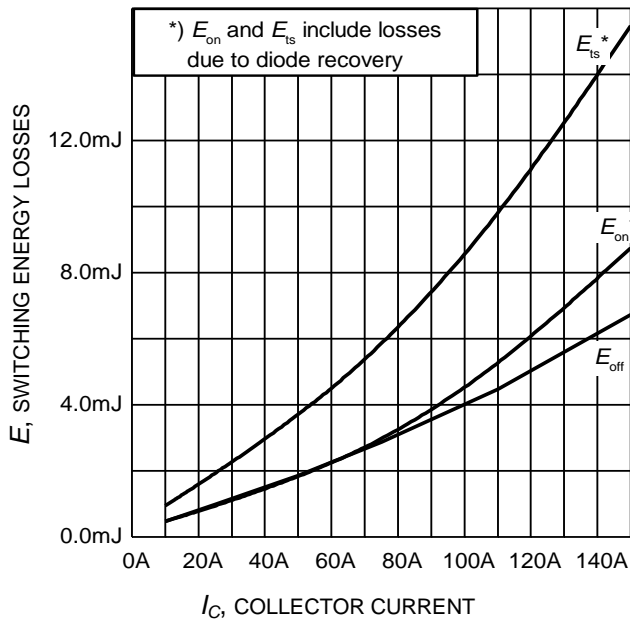
**Figure 10. Typical switching times as a function of gate resistor**  
 (inductive load,  $T_J = 175^\circ\text{C}$ ,  
 $V_{CE} = 400\text{V}$ ,  $V_{GE} = 0/15\text{V}$ ,  $I_C = 75\text{A}$ ,  
 Dynamic test circuit in Figure E)



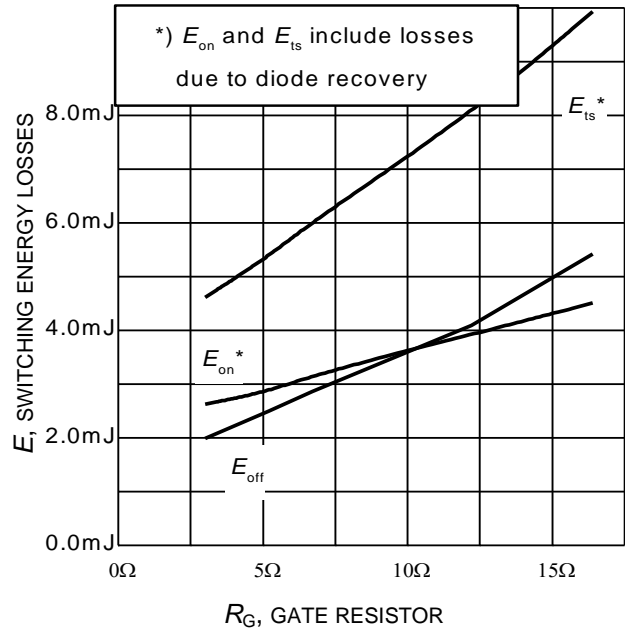
**Figure 11. Typical switching times as a function of junction temperature**  
 (inductive load,  $V_{CE} = 400\text{V}$ ,  
 $V_{GE} = 0/15\text{V}$ ,  $I_C = 75\text{A}$ ,  $r_G = 5\Omega$ ,  
 Dynamic test circuit in Figure E)



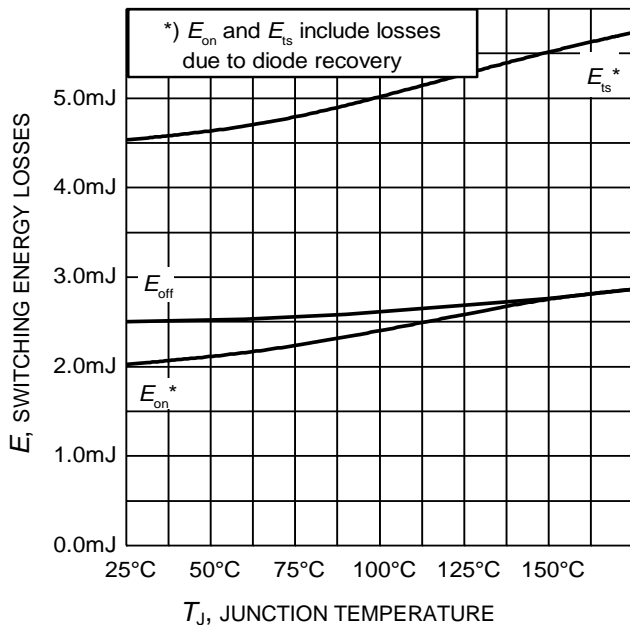
**Figure 12. Gate-emitter threshold voltage as a function of junction temperature**  
 ( $I_C = 1.2\text{mA}$ )



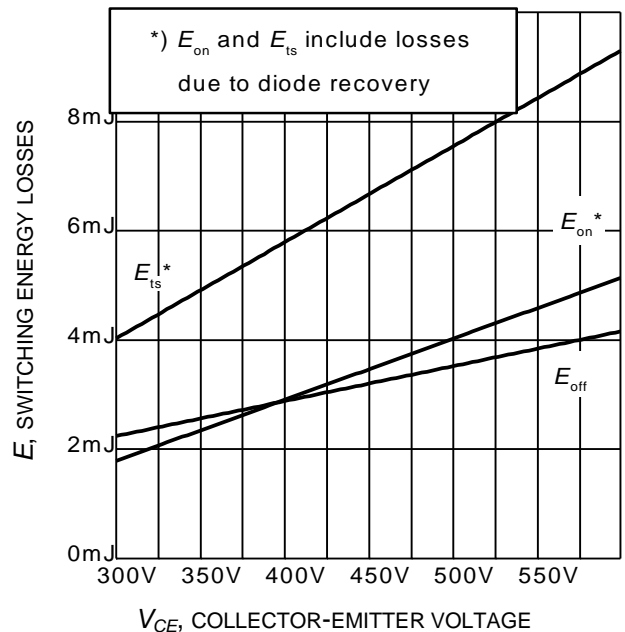
**Figure 13. Typical switching energy losses as a function of collector current**  
 (inductive load,  $T_J = 175^\circ\text{C}$ ,  $V_{CE} = 400\text{V}$ ,  $V_{GE} = 0/15\text{V}$ ,  $r_G = 5\Omega$ , Dynamic test circuit in Figure E)



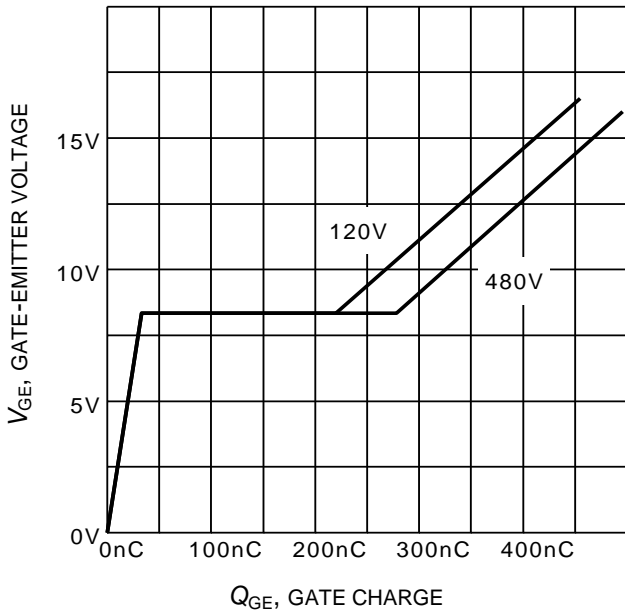
**Figure 14. Typical switching energy losses as a function of gate resistor**  
 (inductive load,  $T_J = 175^\circ\text{C}$ ,  $V_{CE} = 400\text{V}$ ,  $V_{GE} = 0/15\text{V}$ ,  $I_C = 75\text{A}$ , Dynamic test circuit in Figure E)



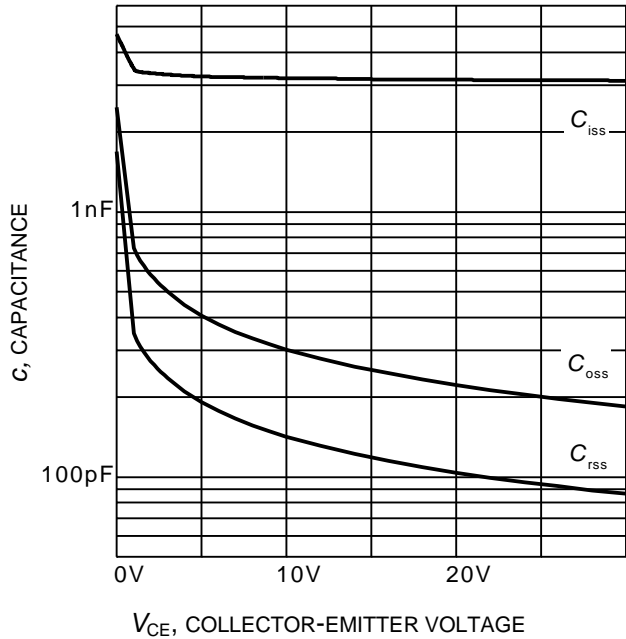
**Figure 15. Typical switching energy losses as a function of junction temperature**  
 (inductive load,  $V_{CE} = 400\text{V}$ ,  $V_{GE} = 0/15\text{V}$ ,  $I_C = 75\text{A}$ ,  $r_G = 5\Omega$ , Dynamic test circuit in Figure E)



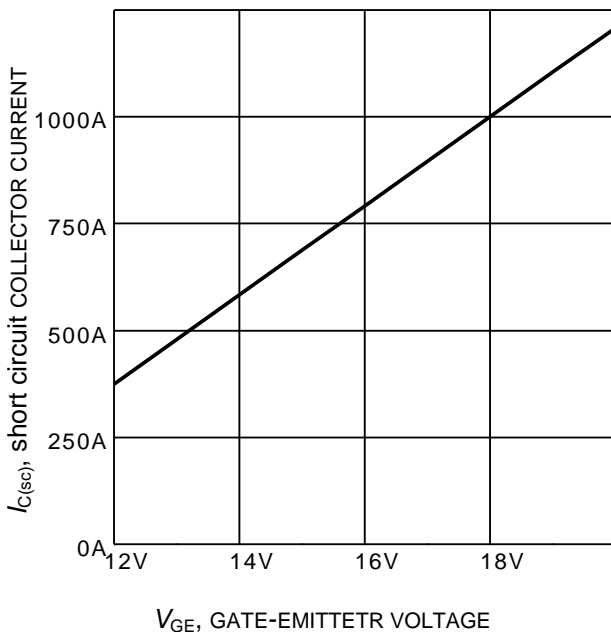
**Figure 16. Typical switching energy losses as a function of collector emitter voltage**  
 (inductive load,  $T_J = 175^\circ\text{C}$ ,  $V_{GE} = 0/15\text{V}$ ,  $I_C = 75\text{A}$ ,  $r_G = 5\Omega$ , Dynamic test circuit in Figure E)



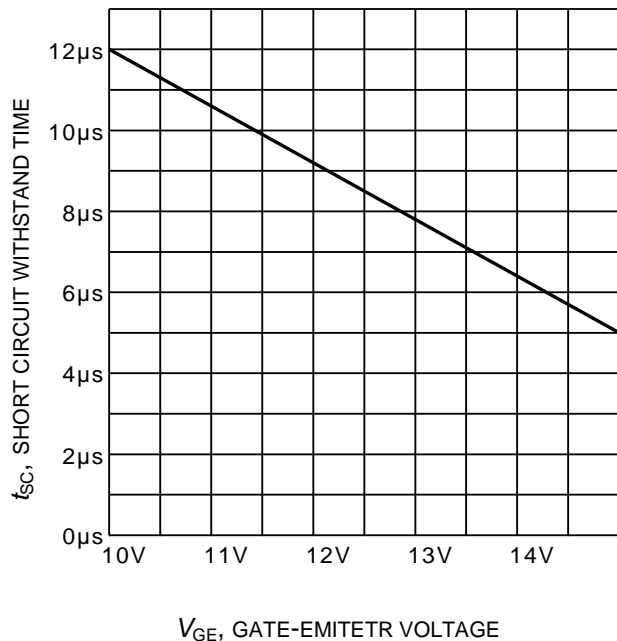
**Figure 17. Typical gate charge**  
( $I_C=75\text{ A}$ )



**Figure 18. Typical capacitance as a function of collector-emitter voltage**  
( $V_{GE}=0\text{V}$ ,  $f = 1\text{ MHz}$ )

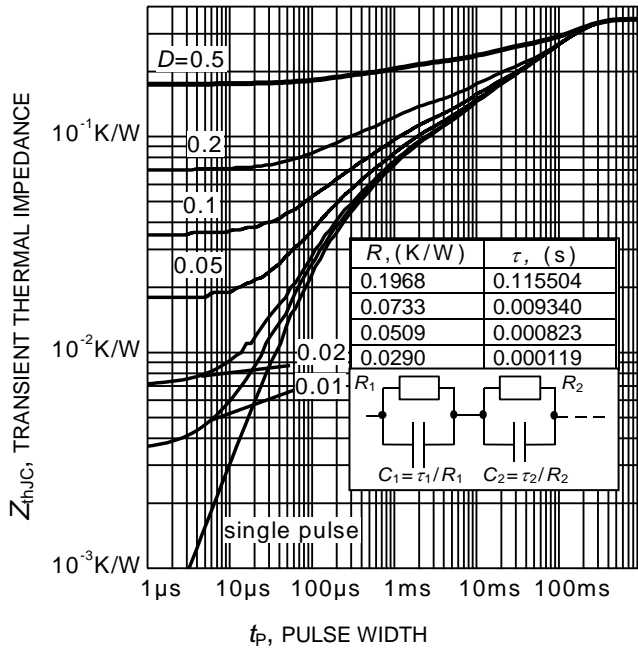


**Figure 19. Typical short circuit collector current as a function of gate-emitter voltage**  
( $V_{CE} \leq 400\text{V}$ ,  $T_J \leq 150^\circ\text{C}$ )



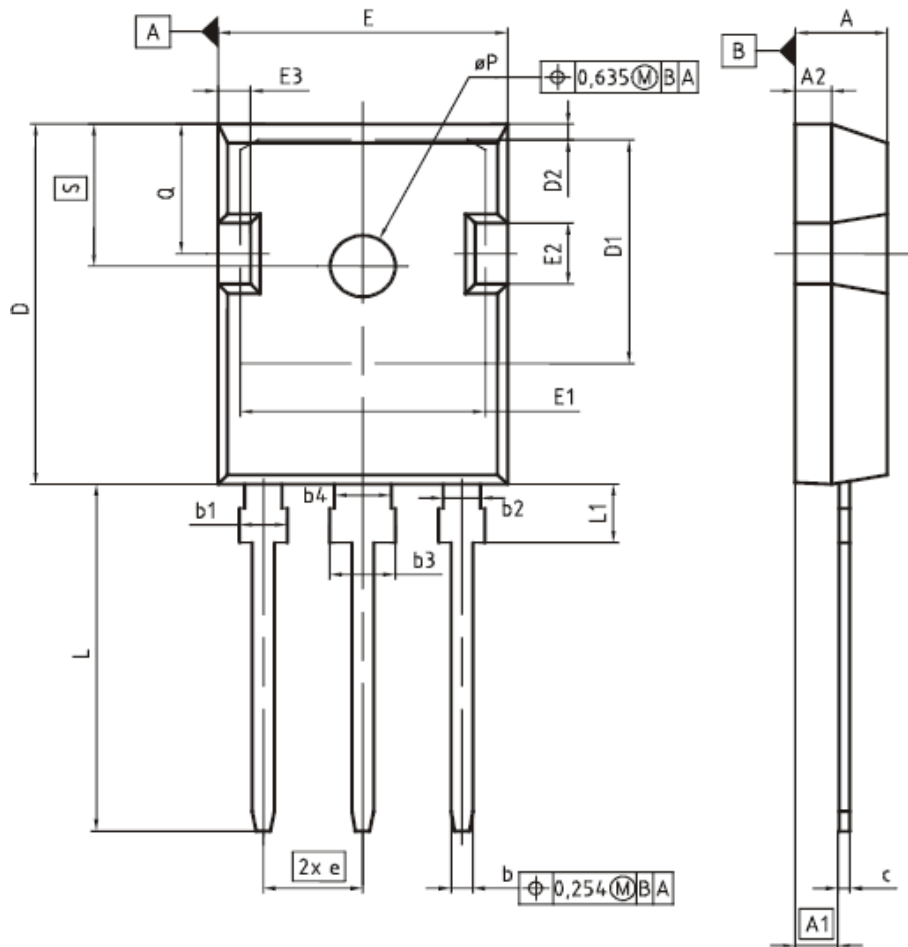
**Figure 20. Short circuit withstand time as a function of gate-emitter voltage**  
( $V_{CE}=400\text{V}$ , start at  $T_J=25^\circ\text{C}$ ,  $T_{Jmax}<150^\circ\text{C}$ )





**Figure 21. IGBT transient thermal impedance**  
 $(D = t_p / T)$

### 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	0,88	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
$\phi P$	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

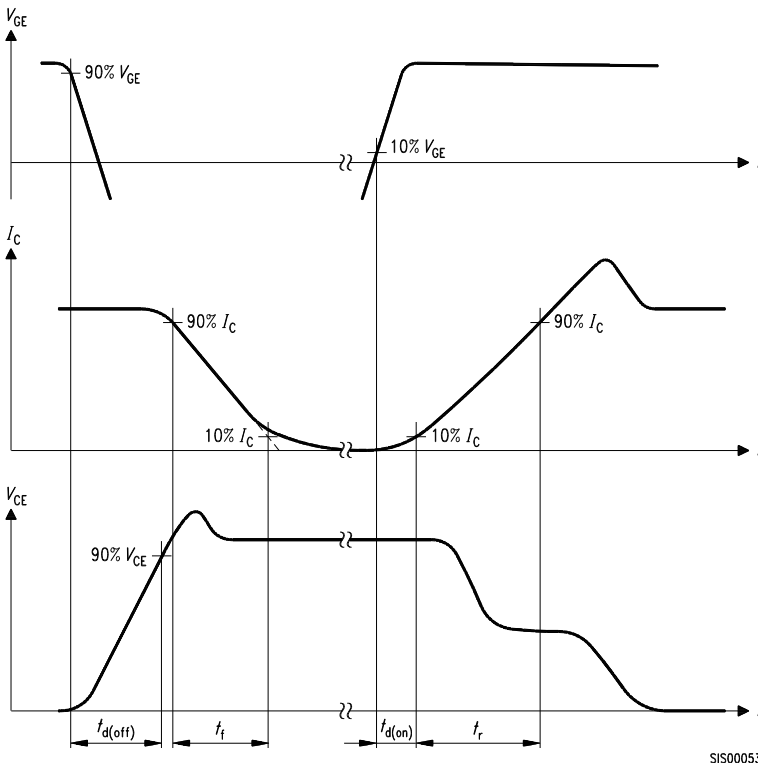
**DOCUMENT NO.**  
Z8B00003327

**SCALE**

**EUROPEAN PROJECTION**

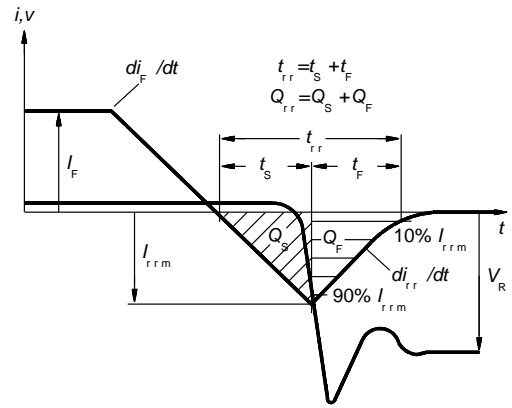
**ISSUE DATE**  
09-07-2010

**REVISION**  
05

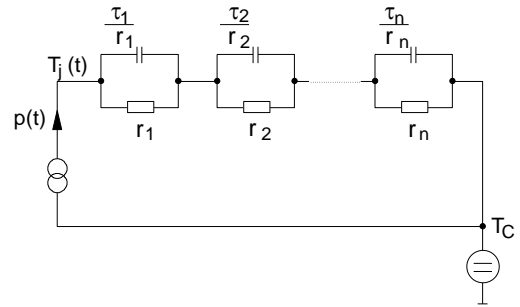


**Figure A. Definition of switching times**

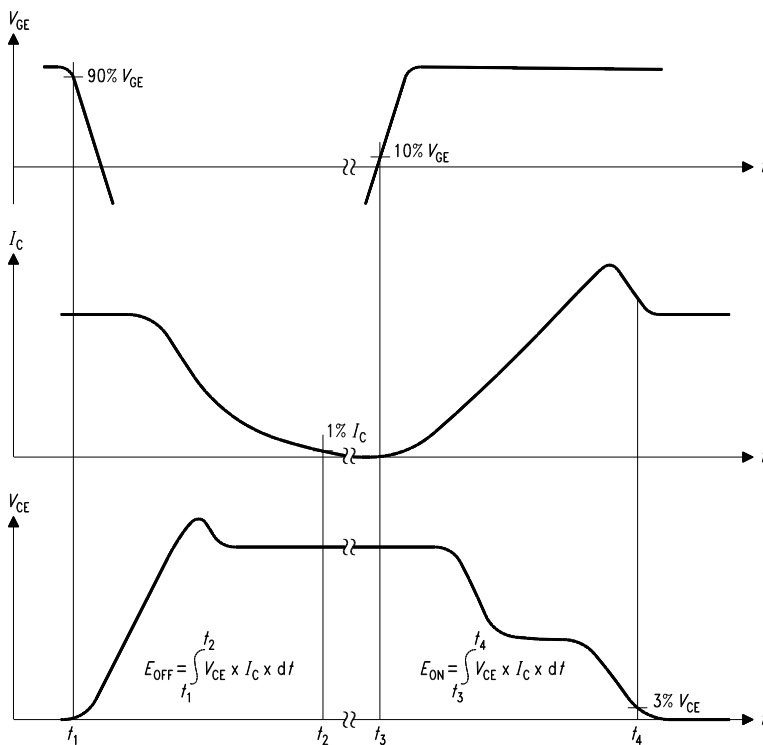
SIS00053



**Figure C. Definition of diodes switching characteristics**

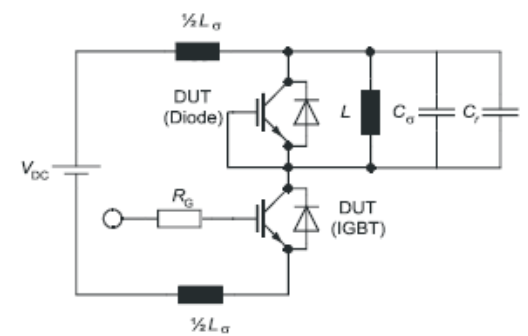


**Figure D. Thermal equivalent circuit**



**Figure B. Definition of switching losses**

SIS00050



**Figure E. Dynamic test circuit**  
Parasitic inductance  $L_\sigma$ ,  
Parasitic capacitor  $C_\sigma$ ,  
Relief capacitor  $C_r$   
(only for ZVT switching)

**Published by**  
**Infineon Technologies AG**  
**81726 München, Germany**  
**© Infineon Technologies AG 2018.**  
**All Rights Reserved.**

### **IMPORTANT NOTICE**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie"). With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

For further information on the product, technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies office ([www.infineon.com](http://www.infineon.com)).

Please note that this product is not qualified according to the AEC Q100 or AEC Q101 documents of the Automotive Electronics Council.

### **WARNINGS**

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Infineon:](#)

[IGW75N60T](#) [IGW75N60H3](#)