

IGBT

High speed DuoPack: IGBT in Trench and Fieldstop technology with soft, fast recovery anti-parallel diode

IKW75N60H3

600V high speed switching series third generation

Datasheet

Industrial & Multimarket

High speed IGBT in Trench and Fieldstop technology

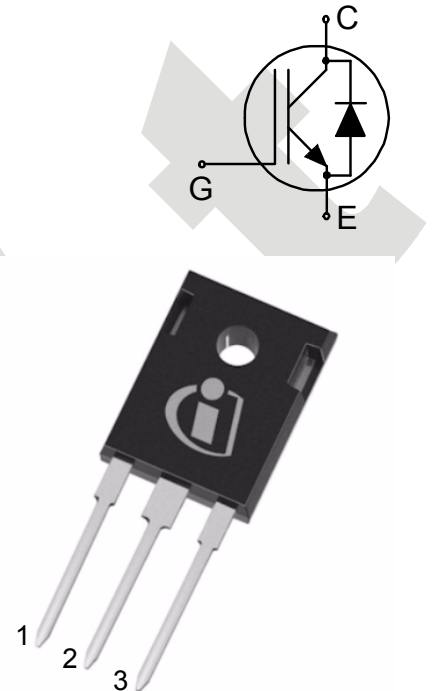
Features:

TRENCHSTOP™ technology offering

- very low V_{CEsat}
- low EMI
- maximum junction temperature 175°C
- qualified according to JEDEC for target applications
- Pb-free lead plating; RoHS compliant
- complete product spectrum and PSpice Models:
<http://www.infineon.com/igbt/>

Applications:

- uninterruptible power supplies
- welding converters
- converters with high switching frequency



Key Performance and Package Parameters

Type	V_{CE}	I_C	V_{CEsat} , $T_{vj}=25^\circ\text{C}$	T_{vjmax}	Marking	Package
IKW75N60H3	600V	75A	1.85V	175°C	K75H603	PG-TO247-3

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Maximum ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CE}	600	V
DC collector current, limited by T_{vjmax} $T_C = 25^\circ\text{C}$ value limited by bondwire $T_C = 100^\circ\text{C}$	I_C	80.0 75.0	A
Pulsed collector current, t_p limited by T_{vjmax}	I_{Cpuls}	225.0	A
Turn off safe operating area $V_{CE} \leq 600\text{V}$, $T_{vj} \leq 175^\circ\text{C}$	-	225.0	A
Diode forward current, limited by T_{vjmax} $T_C = 25^\circ\text{C}$ value limited by bondwire $T_C = 100^\circ\text{C}$	I_F	80.0 50.0	A
Diode pulsed current, t_p limited by T_{vjmax}	I_{Fpuls}	150.0	A
Gate-emitter voltage	V_{GE}	± 20	V
Short circuit withstand time $V_{GE} = 15.0\text{V}$, $V_{CC} \leq 400\text{V}$ Allowed number of short circuits < 1000 Time between short circuits: $\geq 1.0\text{s}$ $T_{vj} = 150^\circ\text{C}$	t_{SC}	5	μs
Power dissipation $T_C = 25^\circ\text{C}$	P_{tot}	428.0	W
Operating junction temperature	T_{vj}	$-40 \dots +175$	$^\circ\text{C}$
Storage temperature	T_{stg}	$-55 \dots +150$	$^\circ\text{C}$
Soldering temperature, wave soldering 1.6 mm (0.063 in.) from case for 10s		260	$^\circ\text{C}$
Mounting torque, M3 screw Maximum of mounting processes: 3	M	0.6	Nm

Thermal Resistance

Parameter	Symbol	Conditions	Max. Value	Unit
Characteristic				
IGBT thermal resistance, junction - case	$R_{th(j-c)}$		0.35	K/W
Diode thermal resistance, junction - case	$R_{th(j-c)}$		0.80	K/W
Thermal resistance junction - ambient	$R_{th(j-a)}$		40	K/W

Electrical Characteristic, at $T_{vj} = 25^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Static Characteristic						
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE} = 0V, I_C = 2.00mA$	600	-	-	V
Collector-emitter saturation voltage	V_{CEsat}	$V_{GE} = 15.0V, I_C = 75.0A$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 125^{\circ}C$ $T_{vj} = 175^{\circ}C$	- - -	1.85 2.10 2.25	2.30 - -	V
Diode forward voltage	V_F	$V_{GE} = 0V, I_F = 50.0A$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 125^{\circ}C$ $T_{vj} = 175^{\circ}C$	- - -	1.65 1.65 1.65	2.05 - -	V
Gate-emitter threshold voltage	$V_{GE(th)}$	$I_C = 1.20mA, V_{CE} = V_{GE}$	4.1	5.1	5.7	V
Zero gate voltage collector current	I_{CES}	$V_{CE} = 600V, V_{GE} = 0V$ $T_{vj} = 25^{\circ}C$ $T_{vj} = 175^{\circ}C$	- -	- -	40.0 1000.0	μA
Gate-emitter leakage current	I_{GES}	$V_{CE} = 0V, V_{GE} = 20V$	-	-	100	nA
Transconductance	g_{fs}	$V_{CE} = 20V, I_C = 75.0A$	-	41.0	-	S

Electrical Characteristic, at $T_{vj} = 25^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
Dynamic Characteristic						
Input capacitance	C_{ies}	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	-	4620	-	pF
Output capacitance	C_{oes}		-	288	-	
Reverse transfer capacitance	C_{res}		-	137	-	
Gate charge	Q_G	$V_{CC} = 480V, I_C = 50.0A, V_{GE} = 15V$	-	470.0	-	nC
Internal emitter inductance measured 5mm (0.197 in.) from case	L_E		-	13.0	-	nH
Short circuit collector current Max. 1000 short circuits Time between short circuits: $\geq 1.0s$	$I_{C(SC)}$	$V_{GE} = 15.0V, V_{CC} \leq 400V, t_{SC} \leq 5\mu s, T_{vj} = 150^{\circ}C$	-	490	-	A

Switching Characteristic, Inductive Load, at $T_{vj} = 25^{\circ}\text{C}$

Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	
IGBT Characteristic						
Turn-on delay time	$t_{d(on)}$	$T_{vj} = 25^{\circ}\text{C}$, $V_{CC} = 400\text{V}$, $I_C = 75.0\text{A}$, $V_{GE} = 0.0/15.0\text{V}$, $r_G = 5.0\Omega$, $L_{\sigma} = 90\text{nH}$, $C_{\sigma} = 50\text{pF}$ L_{σ} , C_{σ} from Fig. E Energy losses include “tail” and diode reverse recovery.	-	30	-	ns
Rise time	t_r		-	50	-	ns
Turn-off delay time	$t_{d(off)}$		-	265	-	ns
Fall time	t_f		-	45	-	ns
Turn-on energy	E_{on}		-	2.00	-	mJ
Turn-off energy	E_{off}		-	1.70	-	mJ
Total switching energy	E_{ts}		-	3.70	-	mJ

Diode reverse recovery time	t_{rr}	$T_{vj} = 25^{\circ}\text{C},$ $V_R = 400\text{V},$ $I_F = 50.0\text{A},$ $di_F/dt = 800\text{A}/\mu\text{s}$	-	180	-	ns
Diode reverse recovery charge	Q_{rr}		-	1.80	-	μC
Diode peak reverse recovery current	I_{rrm}		-	18.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-350	-	$\text{A}/\mu\text{s}$

Switching Characteristic, Inductive Load, at $T_{vj} = 175^{\circ}\text{C}$

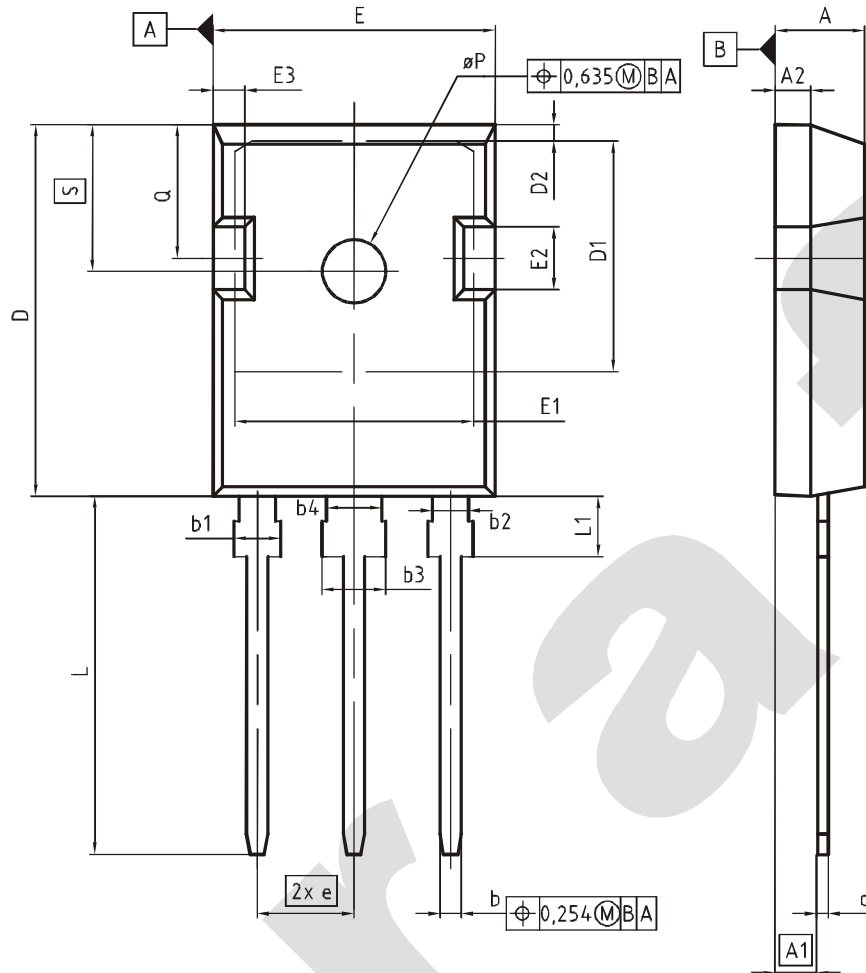
Parameter	Symbol	Conditions	Value			Unit
			min.	typ.	max.	

IGBT Characteristic

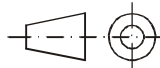
Turn-on delay time	$t_{d(on)}$	$T_{vj} = 175^{\circ}\text{C},$ $V_{CC} = 400\text{V}, I_C = 75.0\text{A},$ $V_{GE} = 0.0/15.0\text{V},$ $r_G = 5.0\Omega, L_{\sigma} = 90\text{nH},$ $C_{\sigma} = 50\text{pF}$ Energy losses include "tail" and diode reverse recovery.	-	30	-	ns
Rise time	t_r		-	45	-	ns
Turn-off delay time	$t_{d(off)}$		-	305	-	ns
Fall time	t_f		-	27	-	ns
Turn-on energy	E_{on}		-	2.30	-	mJ
Turn-off energy	E_{off}		-	2.00	-	mJ
Total switching energy	E_{ts}		-	4.30	-	mJ

Diode reverse recovery time	t_{rr}	$T_{vj} = 175^{\circ}\text{C},$ $V_R = 400\text{V},$ $I_F = 50.0\text{A},$ $di_F/dt = 800\text{A}/\mu\text{s}$	-	280	-	ns
Diode reverse recovery charge	Q_{rr}		-	4.40	-	μC
Diode peak reverse recovery current	I_{rrm}		-	28.0	-	A
Diode peak rate of fall of reverse recovery current during t_b	di_{rr}/dt		-	-350	-	$\text{A}/\mu\text{s}$

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

DOCUMENT NO. Z8B00003327
SCALE 0 5 5 7.5mm
EUROPEAN PROJECTION 
ISSUE DATE 09-07-2010
REVISION 05

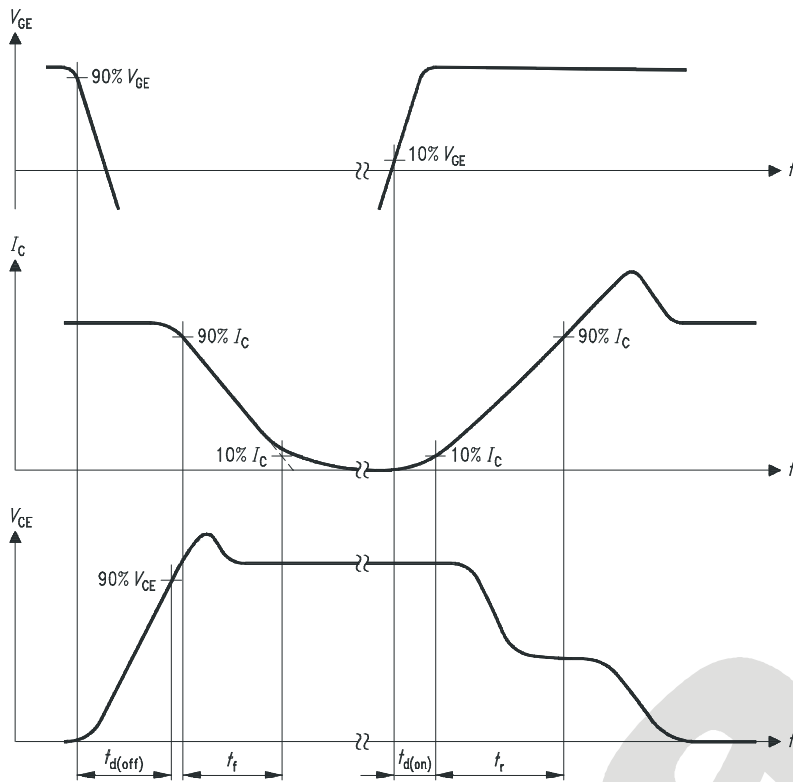


Figure A. Definition of switching times

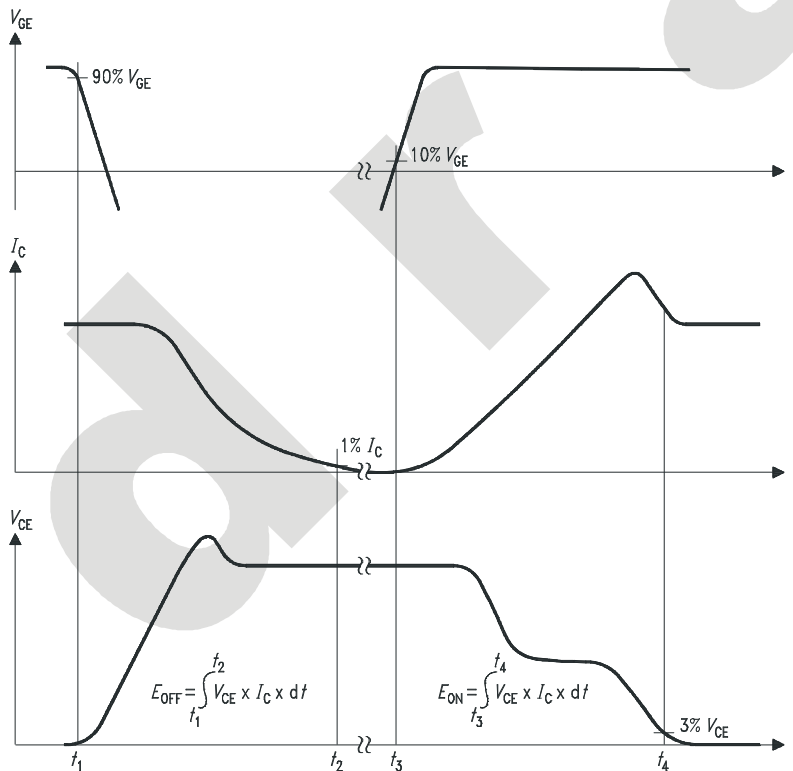


Figure B. Definition of switching losses

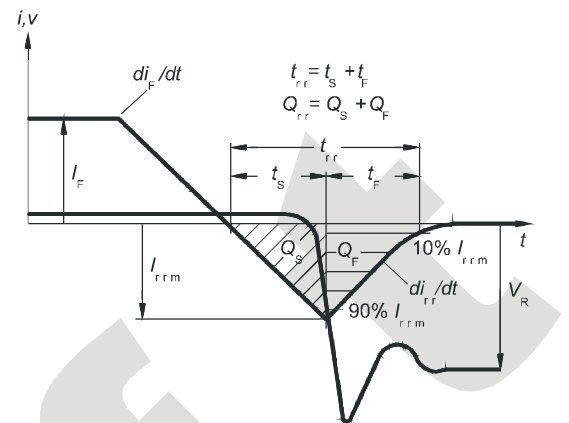


Figure C. Definition of diodes switching characteristics

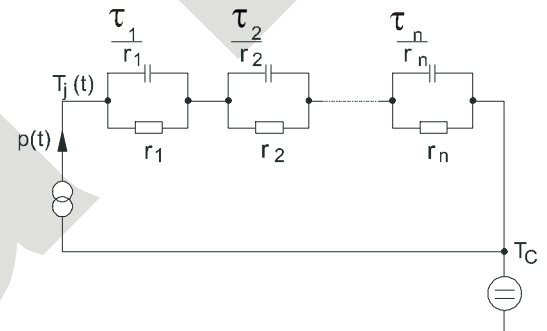


Figure D. Thermal equivalent circuit

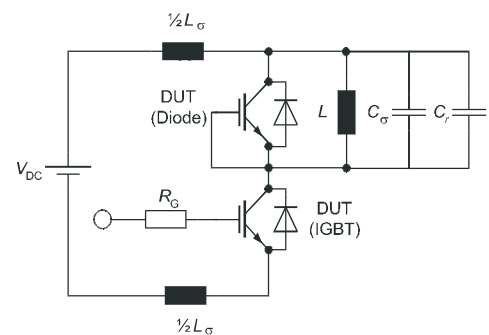


Figure E. Dynamic test circuit

Parasitic inductance L_σ ,
Parasitic capacitor C_σ ,
Relief capacitor C_r
(only for ZVT switching)

Revision History

IKW75N60H3

Revision: 2011-08-17, Rev. 0.1

Previous Revision

Revision	Date	Subjects (major changes since last revision)
0.1	-	-

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