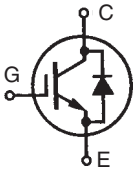
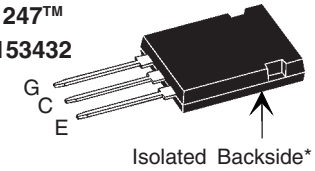
NPT³ IGBT with Diode

in ISOPLUS 247™

I_{C25} = 50 A
V_{CES} = 1200 V
$V_{CE(sat)\,typ.}$ = 2.2 V



ISOPLUS 247™
E153432



G = Gate C = Collector E = Emitter

*Patent pending

IGBT

Symbol	Conditions	Maximum Ratings	
V_{CES}	T_{VJ} = 25°C to 150°C	1200	V
V_{GES}		± 20	V
I_{C25}	T_C = 25°C	50	A
I_{C90}	T_C = 90°C	32	A
I_{CM}	V_{GE} = ±15 V; R_G = 39 Ω; T_{VJ} = 125°C	50	A
V_{CEK}	RBSOA, Clamped inductive load; L = 100 µH	V_{CES}	
t_{SC} (SCSOA)	V_{CE} = 900V; V_{GE} = ±15 V; R_G = 39 Ω; T_{VJ} = 125°C non-repetitive	10	µs
P_{tot}	T_C = 25°C	200	W

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
$V_{CE(sat)}$	I_C = 35 A; V_{GE} = 15 V; T_{VJ} = 25°C		2.2	2.8	V
	T_{VJ} = 125°C		2.6		V
$V_{GE(th)}$	I_C = 1 mA; V_{GE} = V_{CE}	4.5		6.5	V
I_{CES}	V_{CE} = V_{CES}; V_{GE} = 0 V; T_{VJ} = 25°C			0.4	mA
	T_{VJ} = 125°C		0.4		mA
I_{GES}	V_{CE} = 0 V; V_{GE} = ± 20 V			200	nA
$t_{d(on)}$	Inductive load, T_{VJ} = 125°C; V_{CE} = 600 V; I_C = 35 A; V_{GE} = ±15 V; R_G = 39 Ω		85		ns
t_r			50		ns
$t_{d(off)}$			440		ns
t_f			50		ns
E_{on}			5.4		mJ
E_{off}			2.6		mJ
C_{ies}	V_{CE} = 25 V; V_{GE} = 0 V; f = 1 MHz		2		nF
Q_{Gon}	V_{CE} = 600 V; V_{GE} = 15 V; I_C = 35 A		150		nC
R_{thJC}				0.6	K/W
R_{thCH}	with heatsink compound		0.3		K/W

Features

- NPT³ IGBT
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
  - short tail current for optimized performance in resonant circuits
- HiPerFRED™ diode
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- ISOPLUS 247™ package
  - isolated back surface
  - low coupling capacity between pins and heatsink
  - high reliability
  - industry standard outline

Applications

- single switches
- choppers with complementary free wheeling diodes
- phaselegs, H bridges, three phase bridges e.g. for
  - power supplies, UPS
  - AC, DC and SR drives
  - induction heating

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Diode

Symbol	Conditions	Maximum Ratings	
I_{F25}	T_C = 25°C	48	A
I_{F90}	T_C = 90°C	25	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 35 A; T_{VJ} = 25°C		2.5	2.9	V
	T_{VJ} = 125°C		1.9		V
I_{RM}	I_F = 30 A; di_F/dt = -1100 A/µs; T_{VJ} = 125°C; V_R = 600 V; V_{GE} = 0 V		51		A
t_{rr}			80		ns
$E_{rec(off)}$			1.8		mJ
R_{thJC}				1.2	K/W
R_{thCH}	with heatsink compound		0.6		K/W

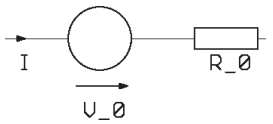
Component

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-55...+150	°C
T_{stg}		-55...+125	°C
V_{ISOL}	$I_{ISOL} \leq$ 1 mA; 50/60 Hz	2500	V~
F_C	mounting force with clip	20...120	N

Symbol	Conditions	Characteristic Values min.	typ.	max.	
C_p	coupling capacity between shorted pins and mounting tab in the case		30		pF
Weight			6		g

Equivalent Circuits for Simulation

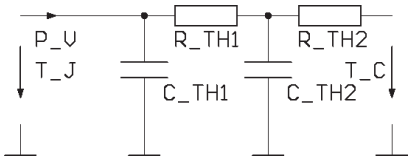
Conduction



IGBT (typ. at V_{GE} = 15 V; T_J = 125°C)
V_0 = 0.95 V; R_0 = 45 mΩ

Diode (typ. at T_J = 125°C)
V_0 = 1.26V; R_0 = 15 mΩ

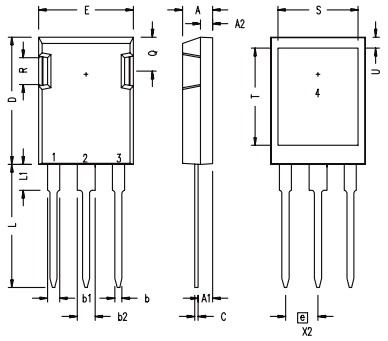
Thermal Response



IGBT
C_{th1} = 0.067 J/K; R_{th1} = 0.108 K/W
C_{th2} = 0.175 J/K; R_{th2} = 0.491 K/W

Diode
C_{th1} = 0.039 J/K; R_{th1} = 0.311 K/W
C_{th2} = 0.090 J/K; R_{th2} = 0.889 K/W

ISOPLUS 247 OUTLINE



1 Gate, 2 Drain (Collector)
3 Source (Emitter)
4 no connection

Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.83	5.21	.190	.205
A_1	2.29	2.54	.090	.100
A_2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b_1	1.91	2.13	.075	.084
b_2	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	.244
R	4.32	4.83	.170	.190
S	13.21	13.72	.520	.540
T	15.75	16.26	.620	.640
U	1.65	3.03	.065	.080

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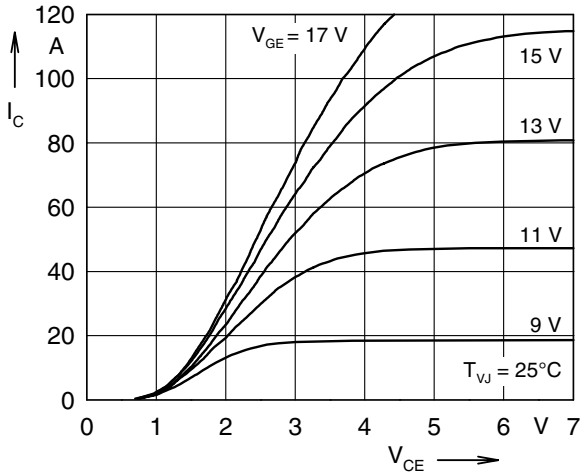

Fig. 1 Typ. output characteristics

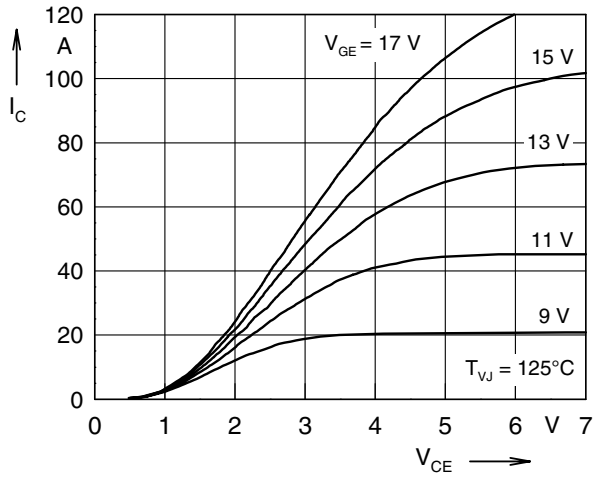

Fig. 2 Typ. output characteristics

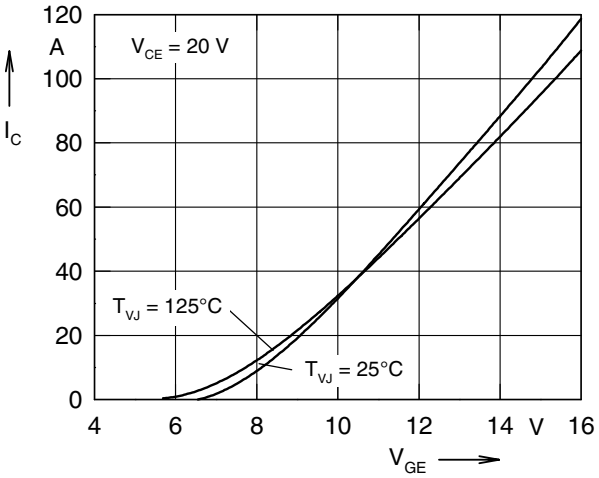

Fig. 3 Typ. transfer characteristics

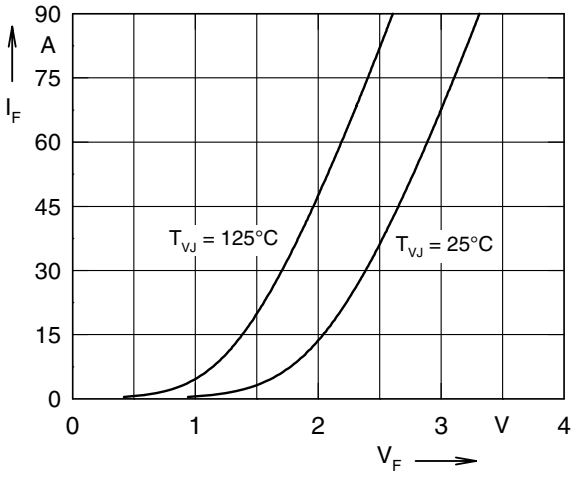

Fig. 4 Typ. forward characteristics of free wheeling diode

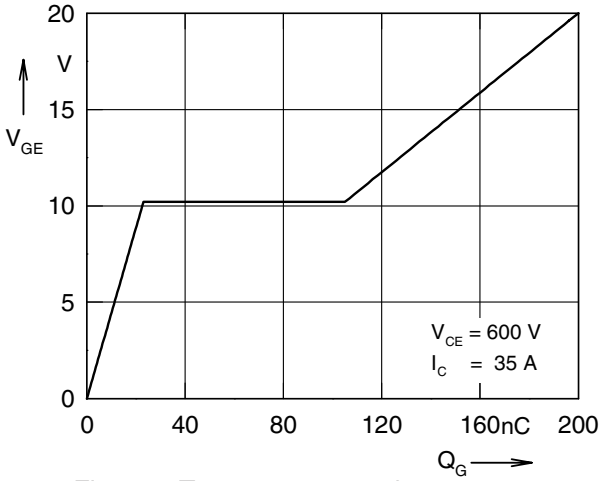

Fig. 5 Typ. turn on gate charge

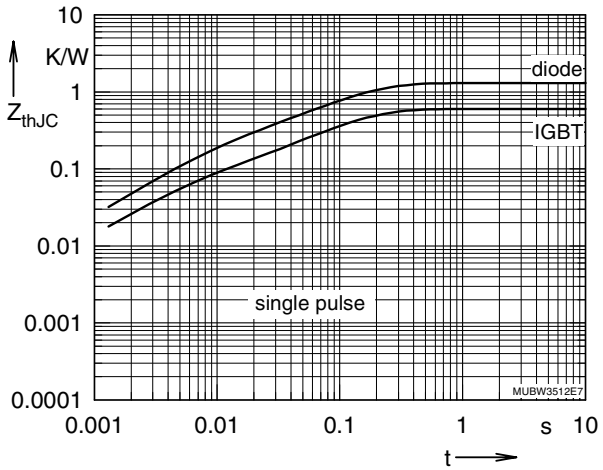

Fig. 6 Typ. transient thermal impedance

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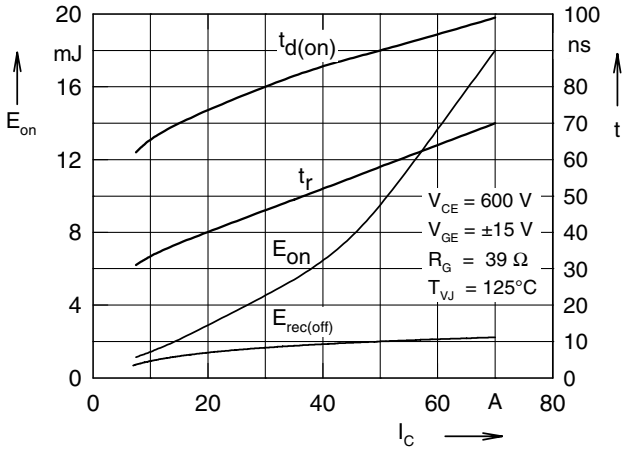

Fig. 7 Typ. turn on energy and switching times versus collector current

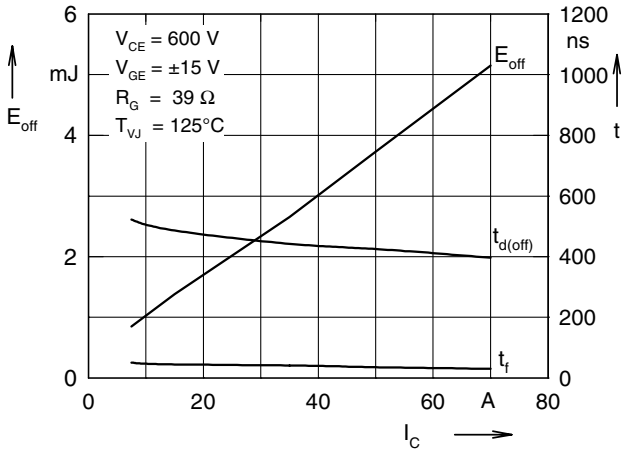

Fig. 8 Typ. turn off energy and switching times versus collector current

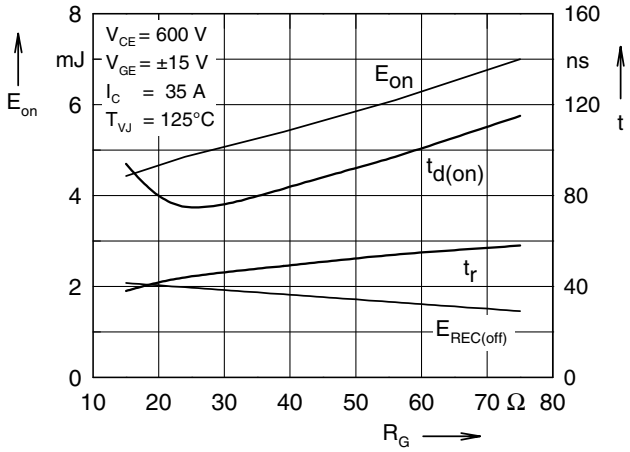

Fig. 9 Typ. turn on energy and switching times versus gate resistor

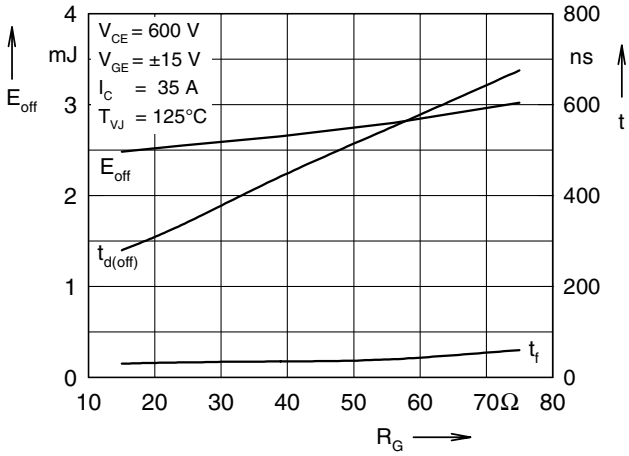

Fig.10 Typ. turn off energy and switching times versus gate resistor

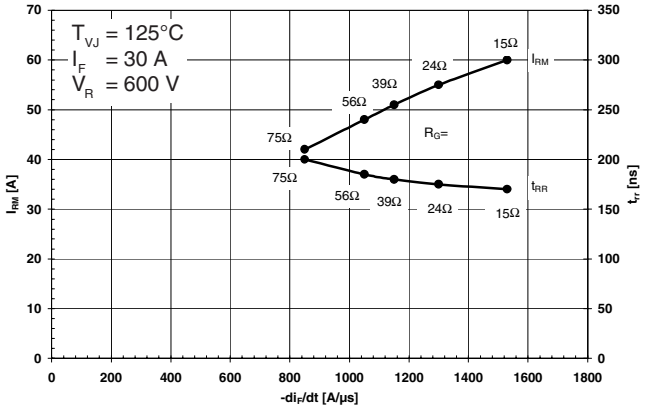

Fig. 11 Typ. turn off characteristics of free wheeling diode

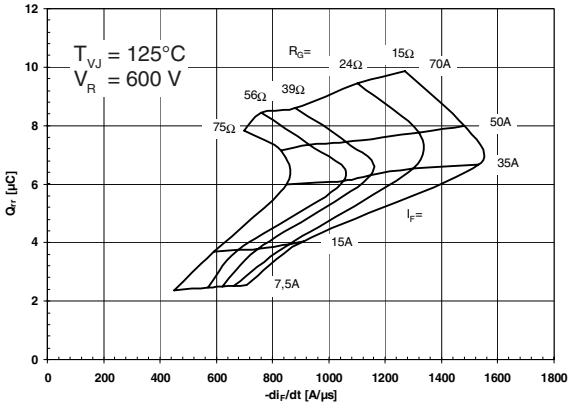

Fig. 12 Typ. turn off characteristics of free wheeling diode

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