Product Range

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Characteristic comparison between the 1200V IGBT^3 generation E3 and T3

Optimised 1200V IGBT^3 - Chip

⇒ IGBT^3 - T3 for low power and medium power modules

* V_{CEsat} reduced by 100mV @ T_{vj} = 125°C
* reduction in turn-off losses of approx. 15%
* module name with T3: F...R12...T3

IGBT & Diode technology

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Infineon technologies

IGBT^3 and EmCon Chip manufacturing in Villach (Austria)

A long time best manufacturing experience

and best technologies experience in Power electronic.

Certificate by QS-9000

PT-, NPT-, Field Stop Technology

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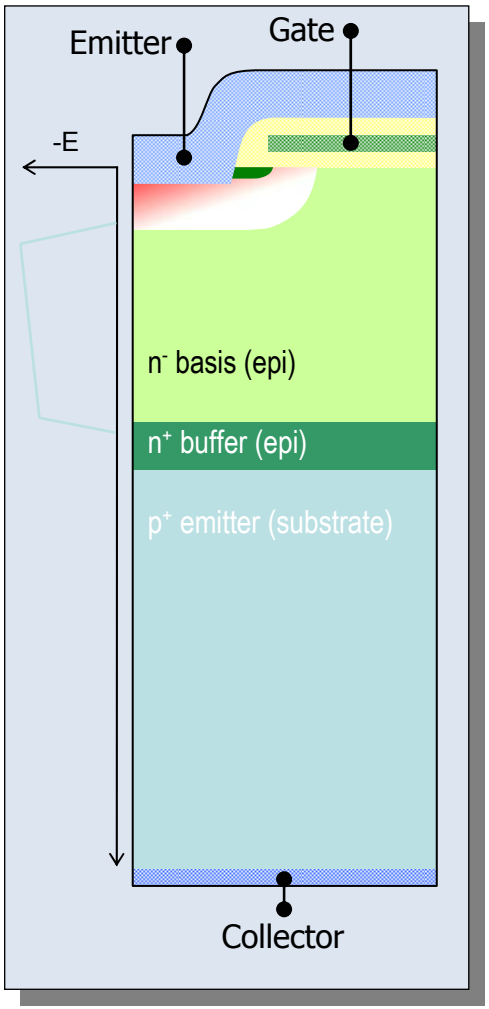
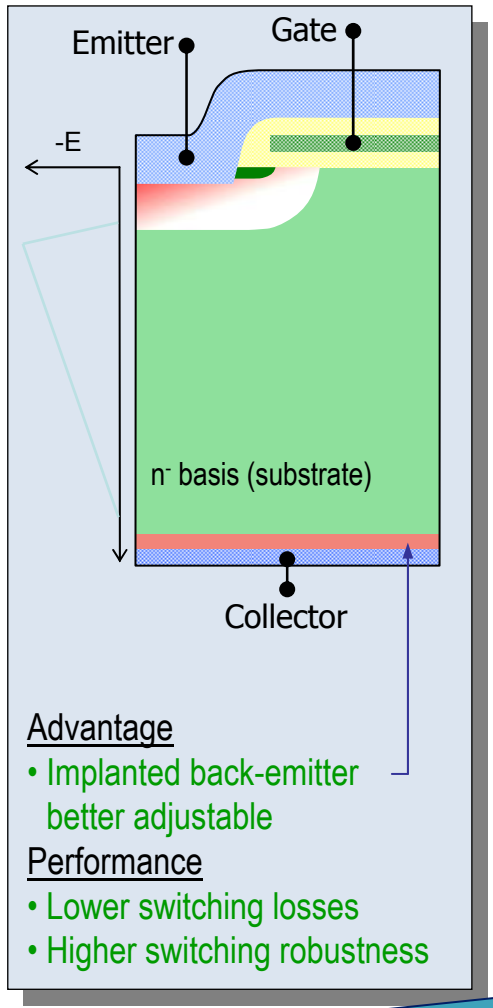
Punch Through



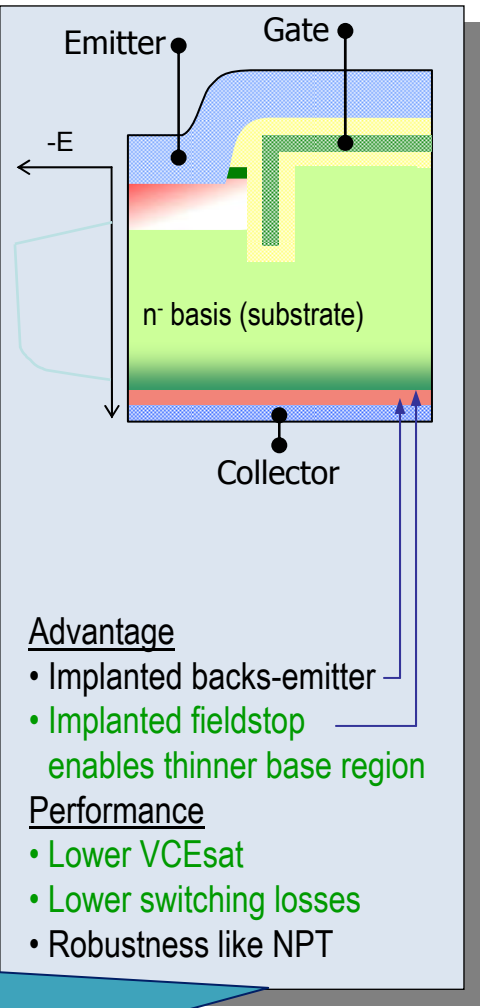
Non Punch Through



Advantage
- Implanted back-emitter better adjustable

Performance
- Lower switching losses
- Higher switching robustness

Trench + Field-Stop



Advantage
- Implanted backs-emitter
- Implanted fieldstop enables thinner base region

Performance
- Lower VCEsat
- Lower switching losses
- Robustness like NPT

Development Improvements

1200V IGBT improvements off V_{CEsat} vs. E_{sw} @125°C

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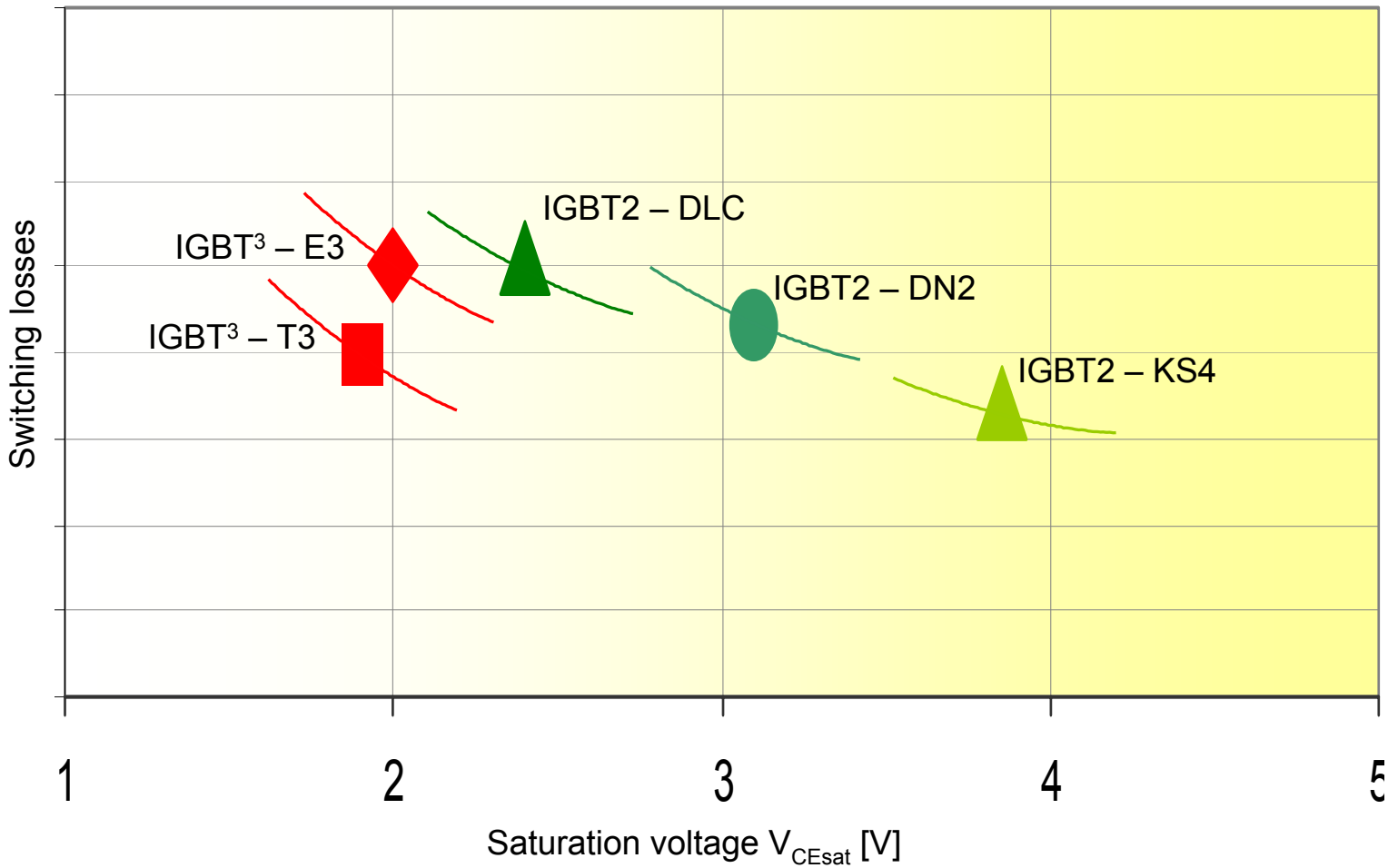

Typical Applications of 1200V Modules

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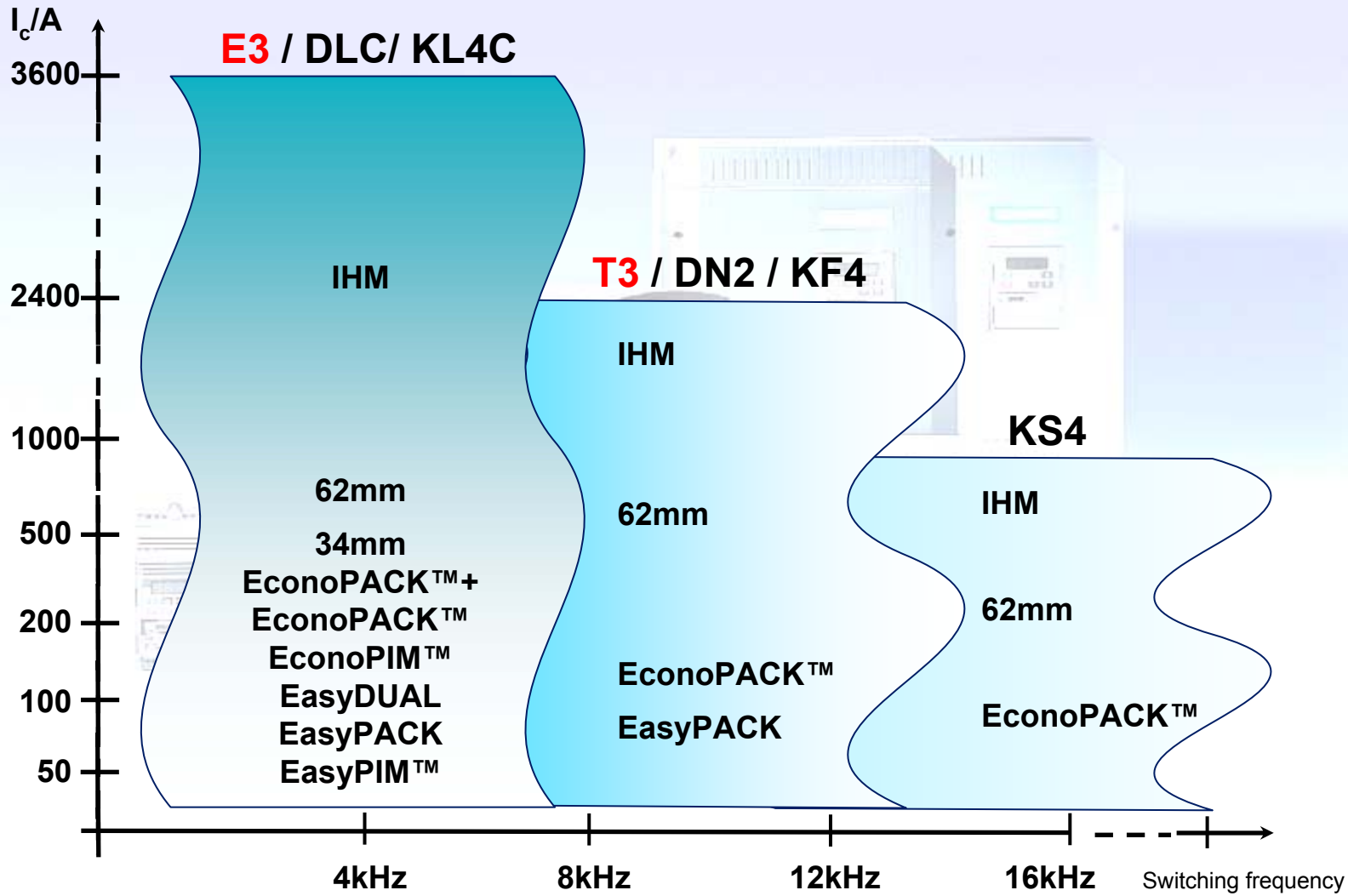

62mm – 1200V IGBT / Diode Technology

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		Standard 2Gen. DN2 / KF4	Low Loss 2Gen. DLC / KL4C	Short Tail 2Gen. KS4 FAST	IGBT³ E3	Fast IGBT³ T3 New
Technology		NPT optimised : switching - losses	NPT optimised : saturation - voltage	NPT optimised : high switching - frequency	Trench with fieldstop	Trench with fieldstop optimised : high switching - frequency
IGBT V_{cesat}(V)	**25°C**	**2,5**	**2,1**	**3,2**	**1,7**	**1,7**
	125°C	**3,1**	**2,4**	**3,85**	**2,0**	**1,9**
Diode		EmConFast / CAL	EmCon	EmConFast / CAL	EmConHE / EmConFast	EmConHE
Diode V_f (V)	**25°C**	**2,0 / 2,3**	**1,8**	**2,0 / 2,3**	**1,65 / 2,0**	**1,65**
	125°C	**1,7 / 1,8**	**1,7**	**1,7 / 1,8**	**1,65 / 1,7**	**1,65**
Switching - frequency		**4 kHz - 15 kHz**	**1 kHz - 8 kHz**	**> 15 kHz**	**1 kHz-8 kHz**	**1 kHz-15kHz**

Please find additional information in the valid application note AN2003-03 - Switching behavior and optimal driving of IGBT modules

Comparison 1200V IGBT^3 chip E3 vs. T3 static parameters (typical)

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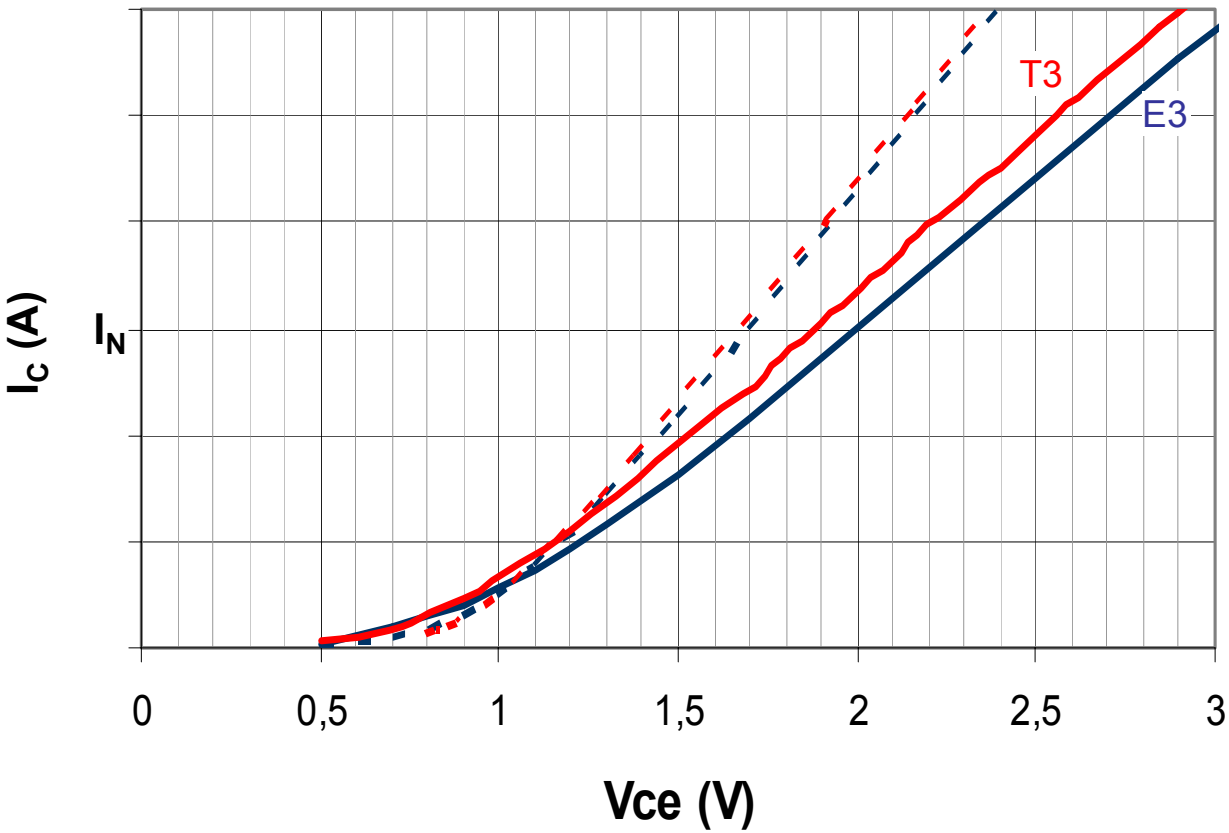
Output characteristic (typical)

$I_C = f(V_{CE})$

$V_{GE} = 15V$



$I_C = I_{Nom}$ T_{vj}=25°C
E3: $V_{CEsat,typ}$ = 1,7V
T3: $V_{CEsat,typ}$ = 1,7V

$I_C = I_{Nom}$ T_{vj}=125°C
E3: $V_{CEsat,typ}$ = 2,0V
T3: $V_{CEsat,typ}$ = 1,9V

Typical values.

Comparison 1200V IGBT^3 chip E3 – T3
Turn-on switching behavior (typical)

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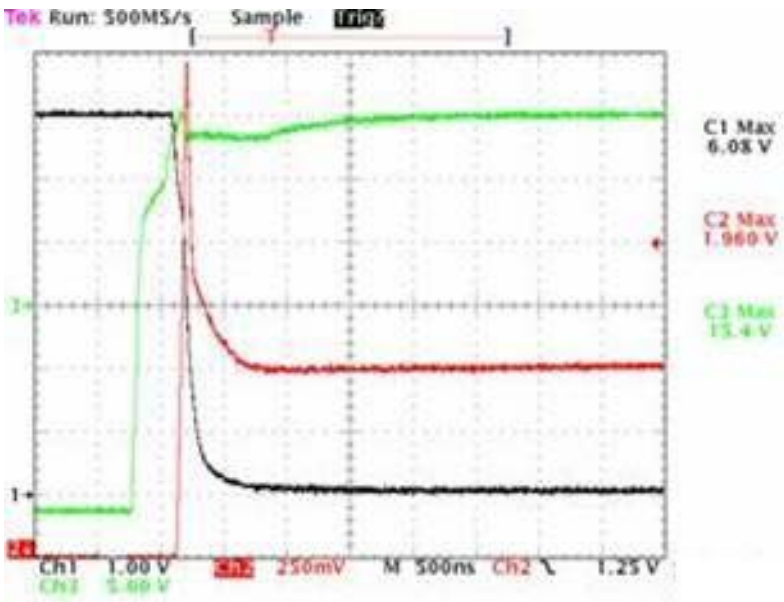
FS75R12KE3



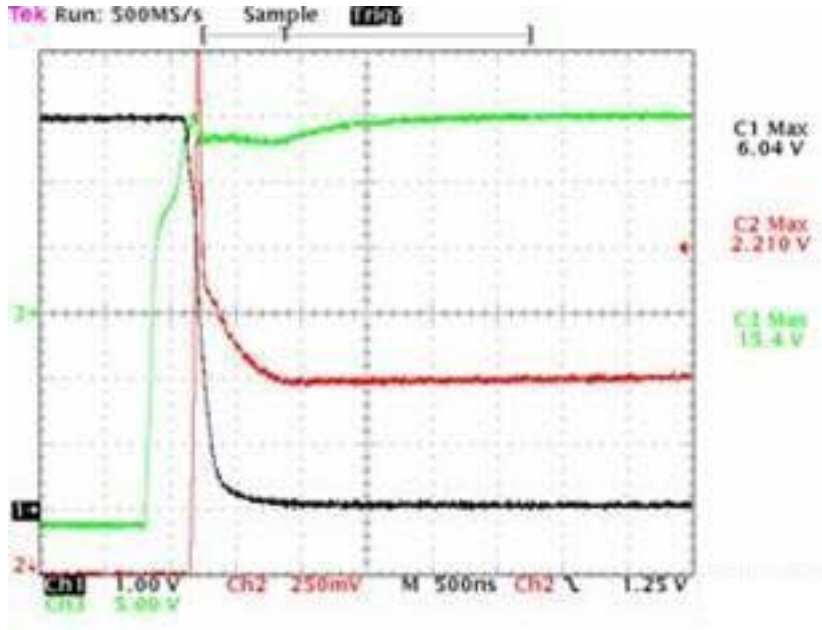
V_{CE} = 600V
I_C = 75A
T_{vj} = 125°C
R_G = R_{GNom}

E_{on} = 7,2 mJ

$^{di}/_{dt}$ = 2,4 $^{kA}/_{µs}$

$^{dv}/_{dt}$ = - 2,8 $^{kV}/_{µs}$

FS75R12KT3



V_{CE} = 600V
I_C = 75A
T_{vj} = 125°C
R_G = R_{GNom}

E_{on} = 7 mJ

$^{di}/_{dt}$ = 3,7 $^{kA}/_{µs}$

$^{dv}/_{dt}$ = - 2,9 $^{kV}/_{µs}$

All measured values are typical.

Comparison 1200V IGBT^3 chip E3 – T3
Turn on switching losses (typical)

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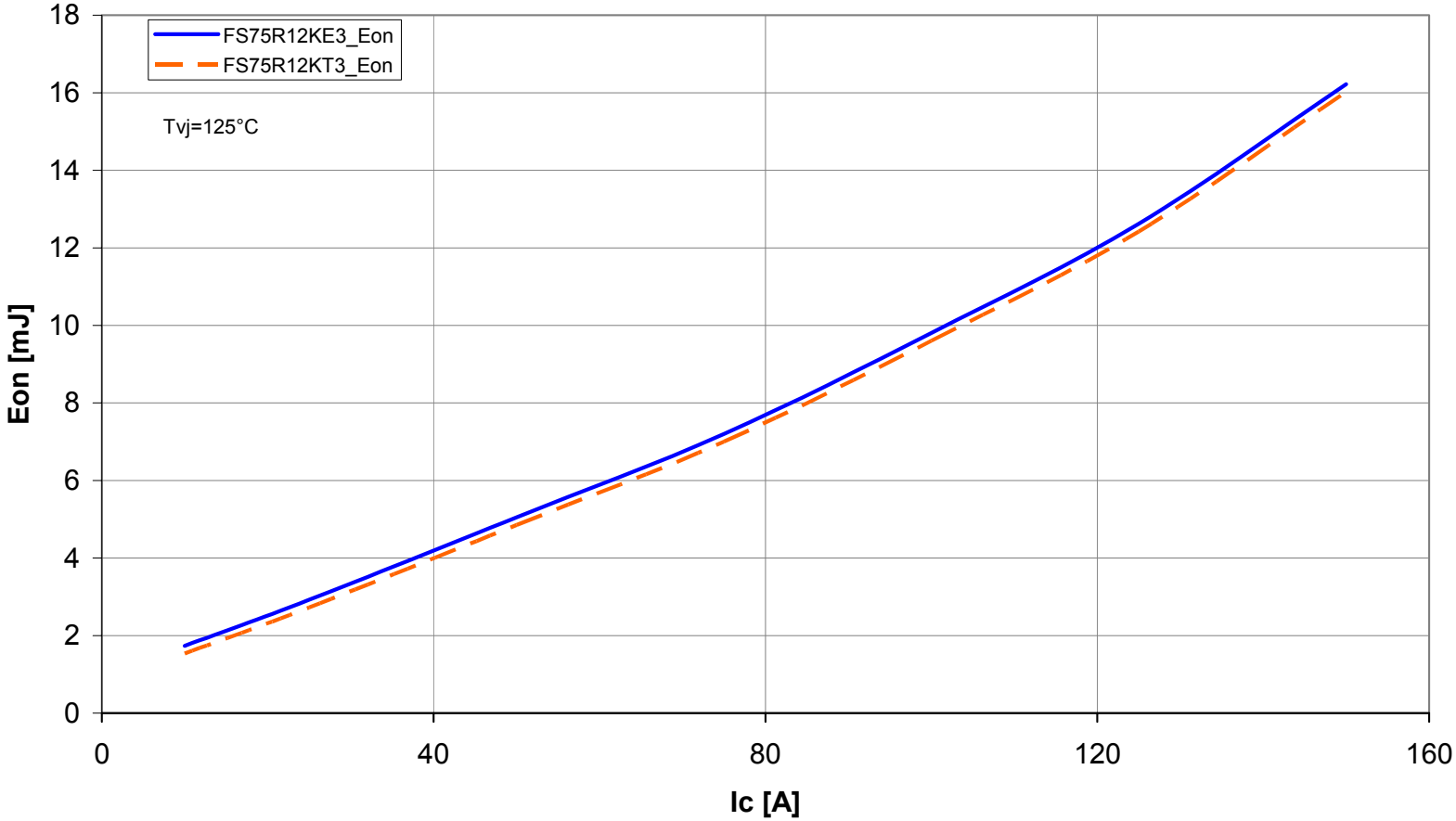

Typical values.

Comparison 1200V IGBT^3 chip E3 – T3
Turn-off switching behavior (typical)

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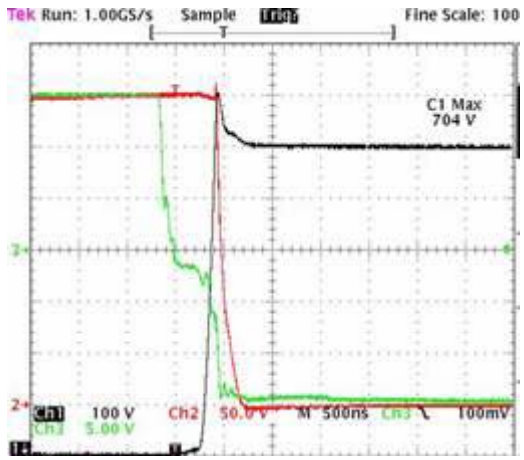
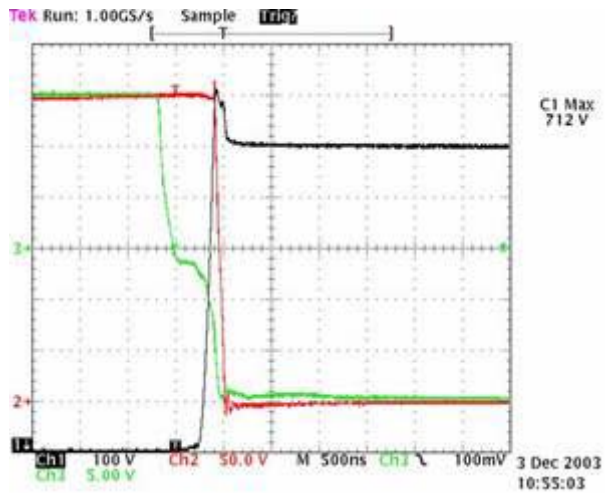
Rg=Rgnom
Vce=600V
Ic=300A
Ls=30nH

FF300R12KE3

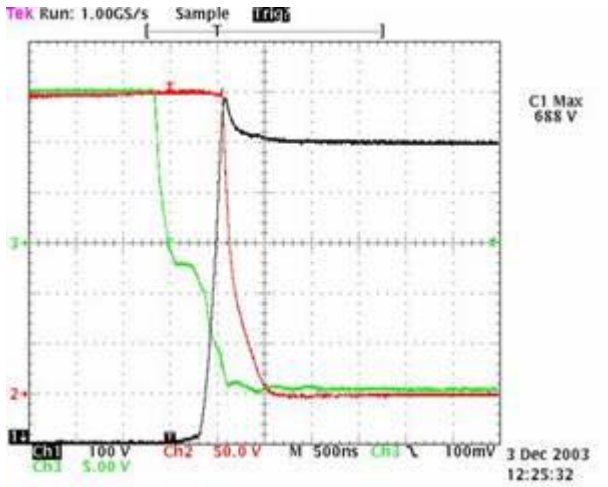
FF300R12KT3

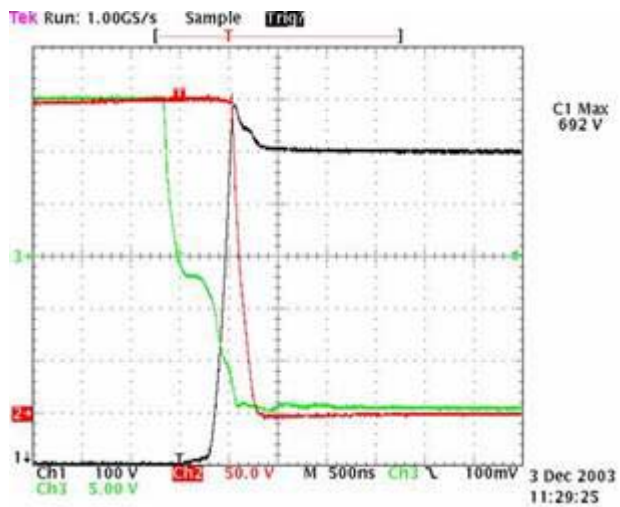
Tvj=25°C





Tvj=125°C





All measured values are typical.

Comparison 1200V IGBT^3 chip E3 – T3
Turn-off switching behavior (typical)

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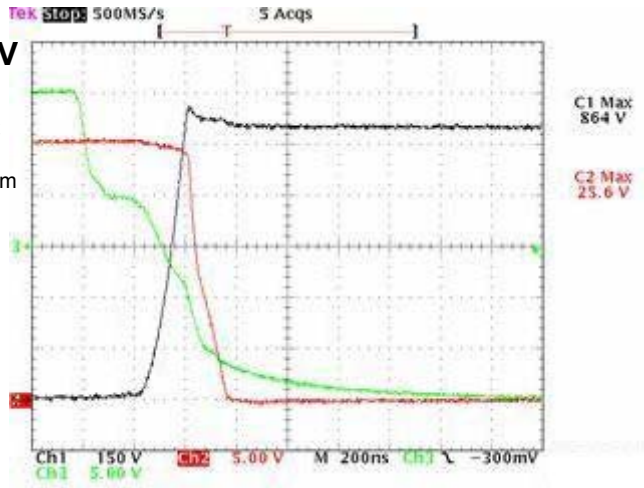
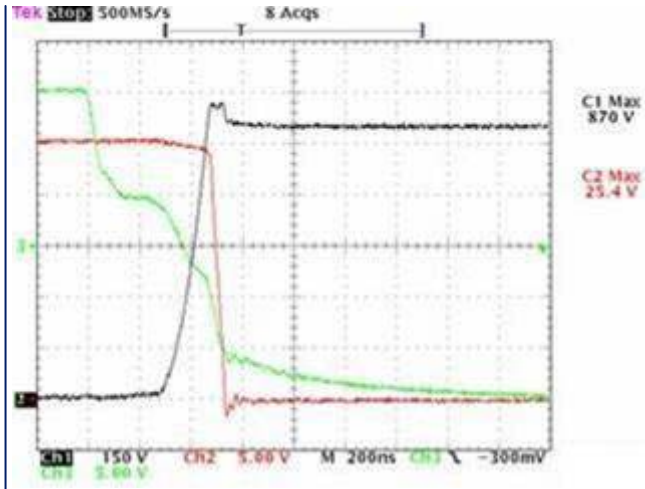
FS25R12KE3G

V_{CE} = **800V**
I_C = 25A
T_{vj} = 25°C
R_G = R_{GNom}

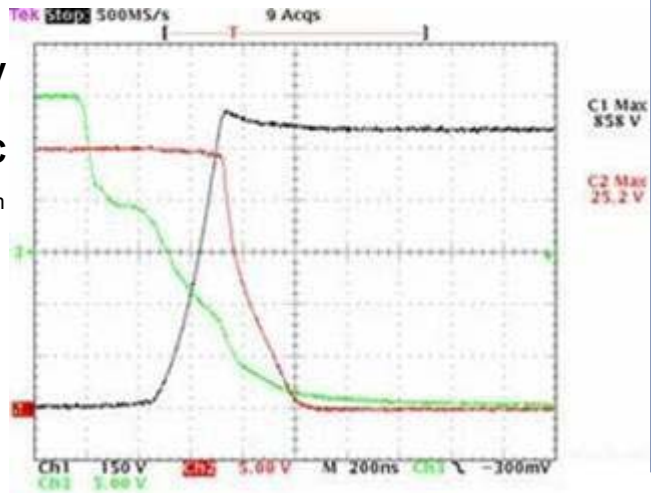


FS25R12KT3

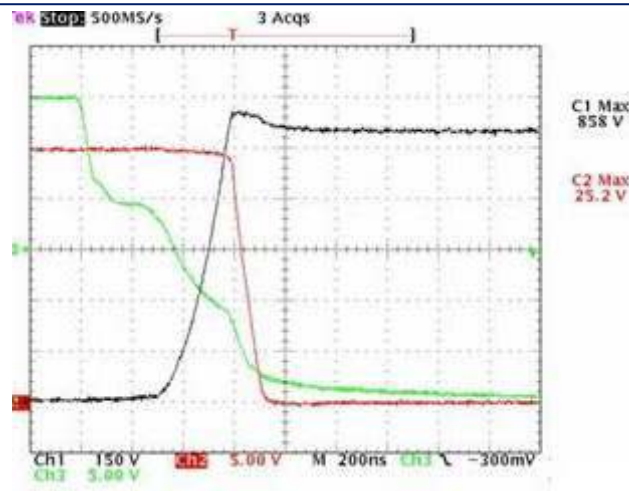
V_{CE} = **800V**
I_C = 25A
T_{vj} = 25°C
R_G = R_{GNom}



V_{CE} = **800V**
I_C = 25A
T_{vj} = 125°C
R_G = R_{GNom}



V_{CE} = **800V**
I_C = 25A
T_{vj} = 125°C
R_G = R_{GNom}



All measured values are typical.

Comparison 1200V IGBT^3 chip E3 – T3
Turn-off switching behavior (typical)

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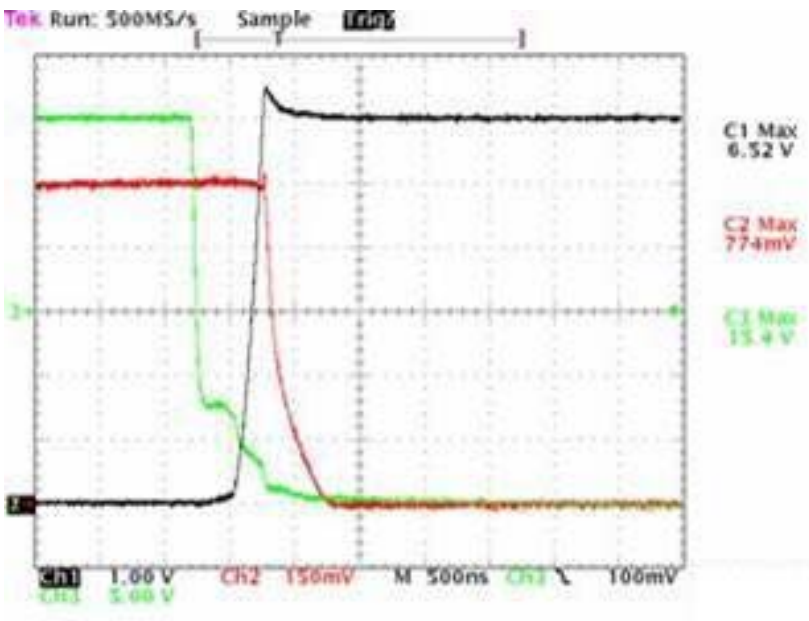
FS75R12KE3



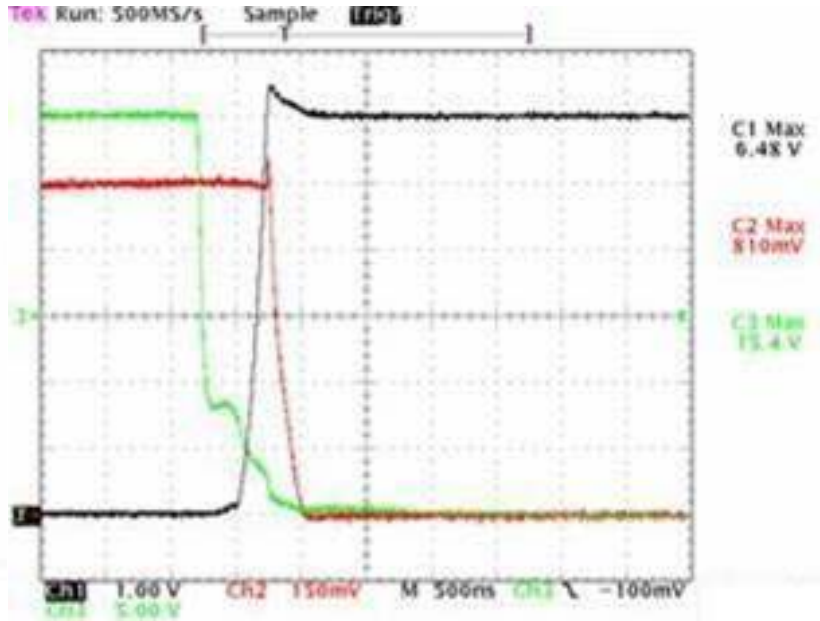
V_{CE} = 600V
I_C = 75A
T_{vj} = 125°C
R_G = R_{GNom}

E_{off} = 9,5 mJ

di/dt = - 0,39 kA/µs

dv/dt = 3,05 kV/µs

FS75R12KT3



V_{CE} = 600V
I_C = 75A
T_{vj} = 125°C
R_G = R_{GNom}

E_{off} = 8,1 mJ

di/dt = - 0,45 kA/µs

dv/dt = 3,2 kV/µs

All measured values are typical.

Comparison 1200V IGBT^3 chip E3 – T3
Turn off switching losses (typical)

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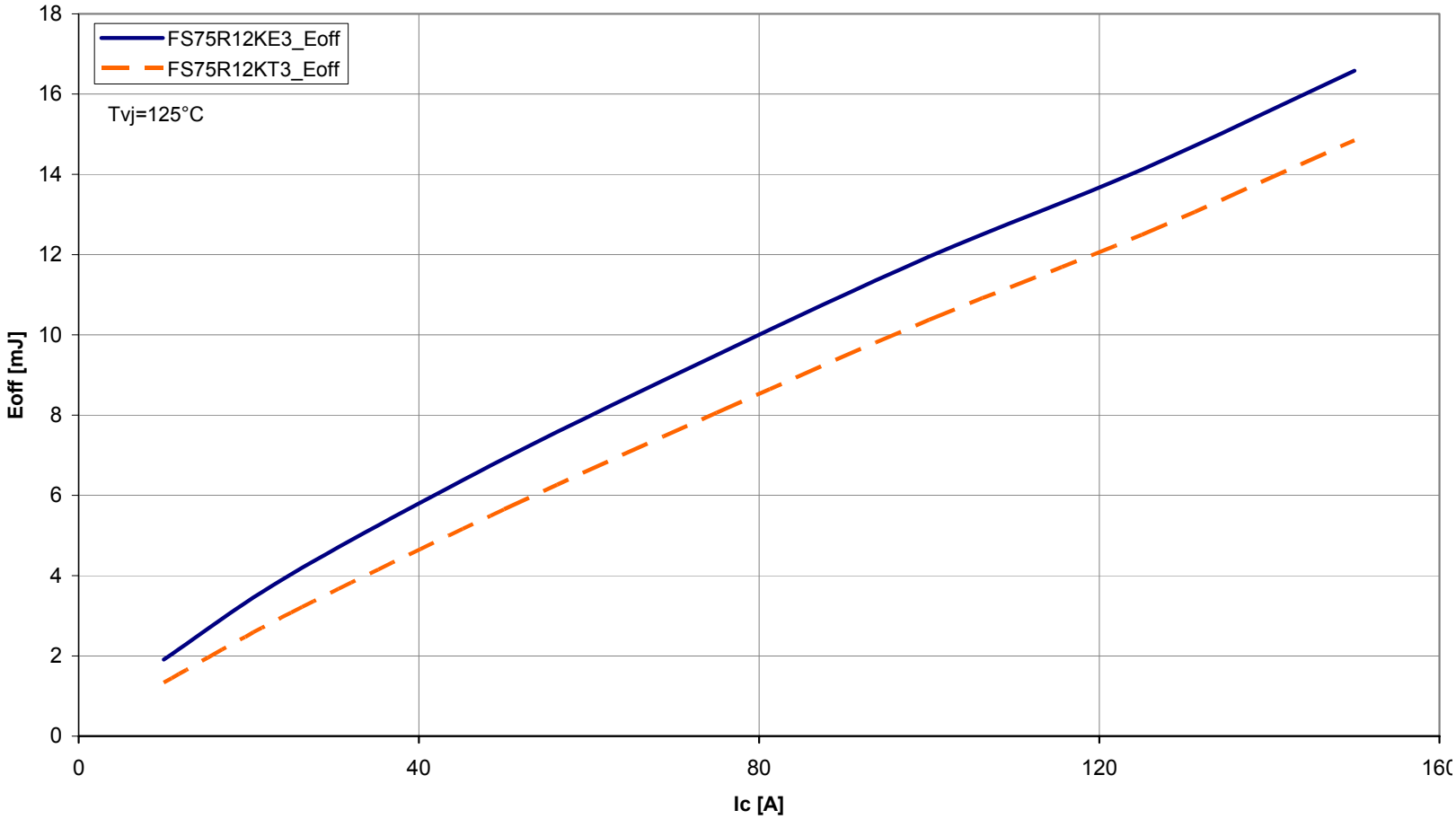

Typical values.

Comparison 1200V IGBT^3 chip E3 – T3

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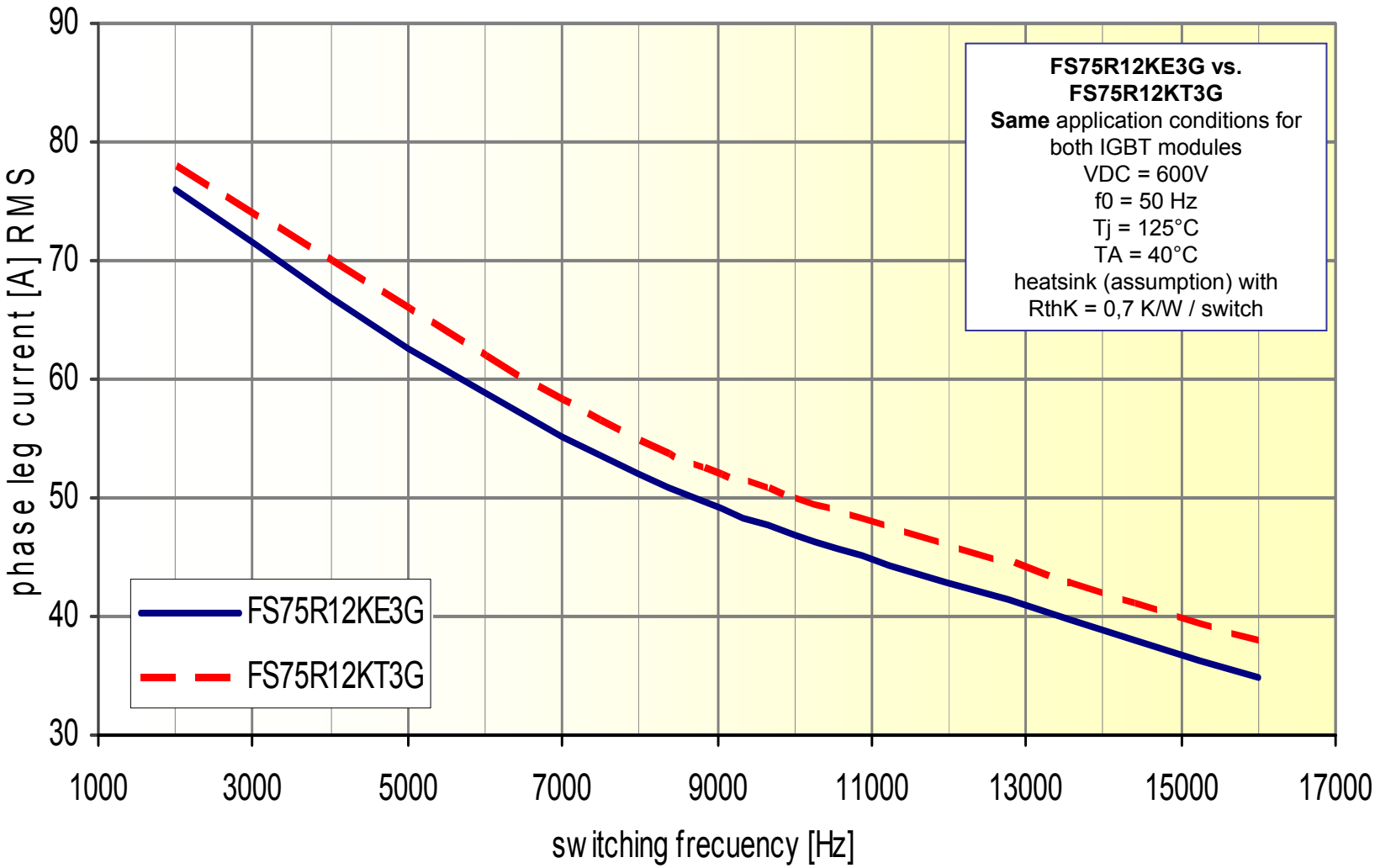

Approximated calculation by IPOSIM

Comparison 1200V IGBT^3 chip E3 – T3
Summary

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- V_{CEsat} at T_{vj} = 125°C improved by 5% (100mV) at nominal current
- E_{off} improved by 15 % at nominal conditions
- total performance improved up to 10% ($f_{sw} \leq$ 15 kHz)
- Short circuit ruggedness at $t_P \leq$ 10 µs
- Switching behaviour
  - higher di/dt and reduced softness versus E3
  - optimised inverter construction required (low stray inductance)

Product Range of IGBT^3 – T3

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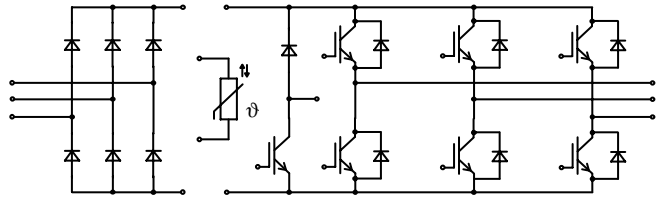
I_n	FAST IGBT³	TYPICAL PACKAGE
10A	FP10R12YT3	
15A	FP15R12YT3	
10A		
15A	FP15R12KT3	
25A	FP25R12KT3	
35A		
40A	FP40R12KT3	
35A		
40A	FP40R12KT3G	
50A	FP50R12KT3	
75A	FP75R12KT3	

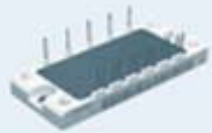
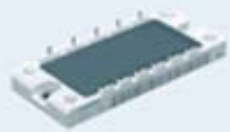


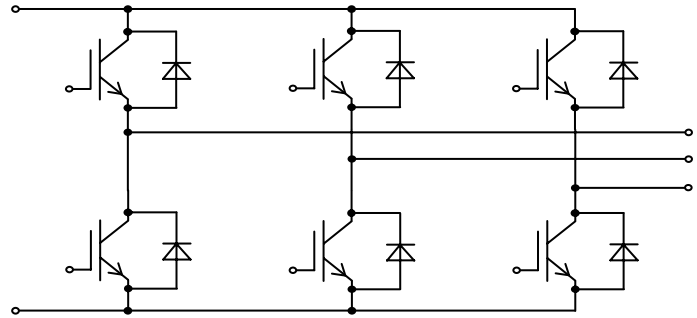
Power Intergrated Modules PIM with IGBT3 – T3 available in

- **EasyPIM™**
- **EconoPIM™**

Product Range of IGBT^3 – T3

power electronics in motion
eupec

I_n	FAST IGBT³	TYPICAL PACKAGE
10A	FS10R12YT3	
15A	FS15R12YT3	
25A	FS25R12YT3	
35A	FS35R12YT3	
50A		
10A		
15A		
25A	FS25R12KT3	
35A	FS35R12KT3	
50A	FS50R12KT3	
75A	FS75R12KT3	
50A		
75A	FS75R12KT3G	
100A	FS100R12KT3	
150A	FS150R12KT3	



SIXPACK Modules with IGBT3 – T3 available in

- **EasyPACK**
- **EconoPACK™**

Product Range of IGBT^3 – T3

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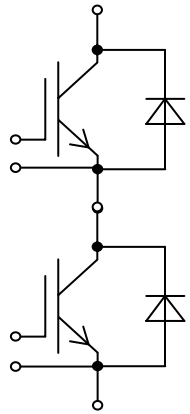
I_C A	IGBT^3 T3
150	FF 150 R12KT3G New
200	FF 200 R12KT3 New
300	FF 300 R12KT3 New
400	FF400 R12KT3 New

62 mm



Half bridge Modules with IGBT3 – T3 available in

- **62mm C-series**