

1MBI1600VC-170E

IGBT Modules

IGBT MODULE (V series) 1700V / 1600A / 1 in one package

■ Features

- High speed switching
- Voltage drive
- Low Inductance module structure

■ Applications

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial machines, such as Welding machines



■ Maximum Ratings and Characteristics

● Absolute Maximum Ratings (at Tc=25°C unless otherwise specified)

Items	Symbols	Conditions	Maximum ratings	Units
Collector-Emitter voltage	V_{CES}		1700	V
Gate-Emitter voltage	V_{GES}		±20	V
Collector current	I_c	Continuous	Tc=25°C 2400	A
	I_{cp}	1ms	Tc=100°C 1600	
	- I_c		3200	
	- I_{cp}	1ms	1600	
Collector power dissipation	P_c	1 device	3200	W
Junction temperature	T_j		11700	°C
Operating junction temperature (under switching conditions)	T_{jop}		175	
Storage temperature	T_{slg}		150	
Isolation voltage	Between terminal and copper base (*1) V_{iso}	AC : 1min.	-40 ~ +150	VAC
Screw torque (*2)	Mounting	M6	4000	Nm
	Main Terminals	M8	5.75	
	Sense Terminals	M4	10	
			2.5	

Note *1: All terminals should be connected together when isolation test will be done.

Note *2: Recommendable Value :

Mounting 4.25~5.75 Nm (M6) , Main Terminals 8~10 Nm (M8) , Sense Terminals 1.7~2.5 Nm (M4)

● Electrical characteristics (at T_j = 25°C unless otherwise specified)

Items	Symbols	Conditions		Characteristics			Units
				min.	typ.	max.	
Zero gate voltage collector current	I _{CES}	V _{GE} = 0V, V _{CE} = 1700V		-	-	1.0	mA
Gate-Emitter leakage current	I _{GES}	V _{CE} = 0V, V _{GE} =±20V		-	-	3200	nA
Gate-Emitter threshold voltage	V _{GE(th)}	V _{CE} = 20V, I _c = 1600mA		6.0	6.5	7.0	V
Collector-Emitter	V _{CE(sat)} (main terminal)	V _{GE} =15V I _c = 1600A	T _J =25°C	-	2.21	2.49	V
			T _J =125°C	-	2.61	-	
			T _J =150°C	-	2.66	-	
	V _{CE(sat)} (chip)		T _J =25°C	-	2.00	2.25	
			T _J =125°C	-	2.40	-	
			T _J =150°C	-	2.45	-	
Internal gate resistance	Int R _g			-	1.09	-	Ω
Input capacitance	C _{ies}	V _{CE} =10V, V _{GE} =0V, f=1MHz		-	158	-	nF
Turn-on	t _{on}	V _{CC} = 900V, I _c = 1600A		-	2.28	-	μs
	t _r	L _m = 56nH, V _{GE} =±15V, T _J =125°C		-	0.87	-	
Turn-off	t _{off}	R _{gon} = 1.4 Ω		-	2.17	-	
	t _f	R _{goff} = 0.6 Ω		-	0.40	-	
Forward on voltage	V _F (main terminal)	V _{GE} =0V I _F = 1600A	T _J =25°C	-	2.02	2.40	V
			T _J =125°C	-	2.22	-	
			T _J =150°C	-	2.19	-	
	V _F (chip)		T _J =25°C	-	1.80	2.15	
			T _J =125°C	-	2.00	-	
			T _J =150°C	-	1.98	-	
Reverse recovery time	t _{rr}	I _F = 1600A, T _J =125°C		-	0.43	-	μs
Lead resistance, terminal-chip	R lead			-	0.134	-	mΩ

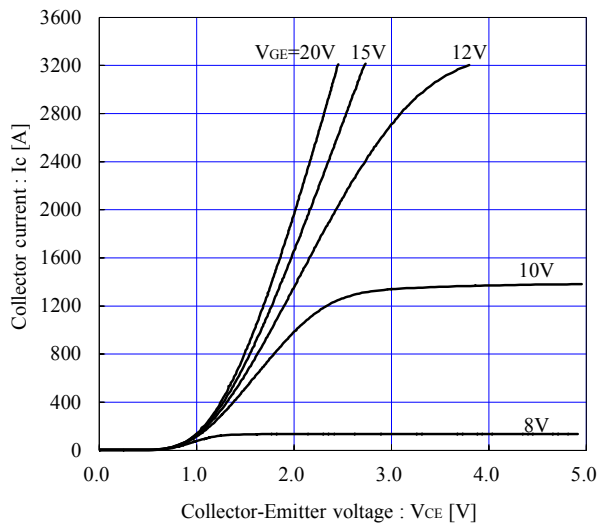
● Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	R _{th(j-c)}	IGBT	-	-	0.013	°C/W
		FWD	-	-	0.023	
Contact thermal resistance (*3)	R _{th(c-f)}	with Thermal Compound	-	0.006	-	

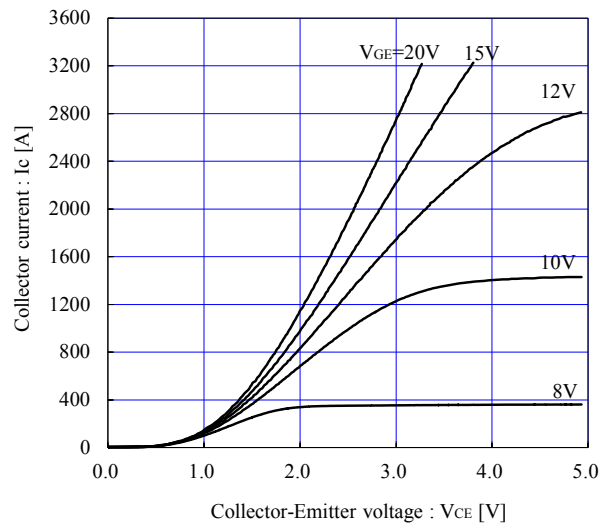
Note *3: This is the value which is defined mounting on the additional cooling fin with thermal compound.

■ Characteristics (Representative)

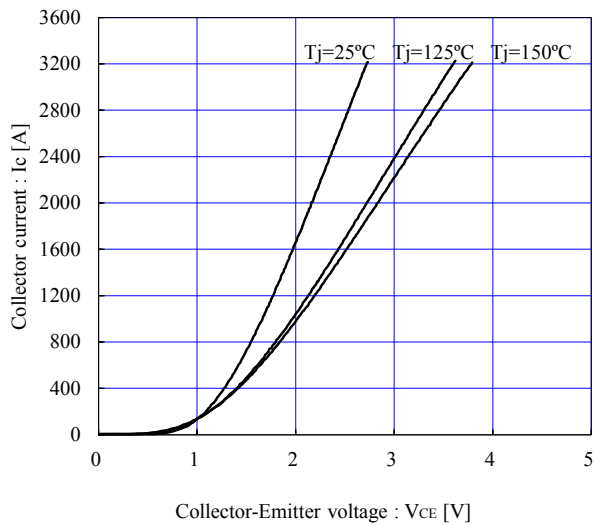
Collector current vs. Collector-Emmitter voltage (typ.)
T_j=25°C, chip



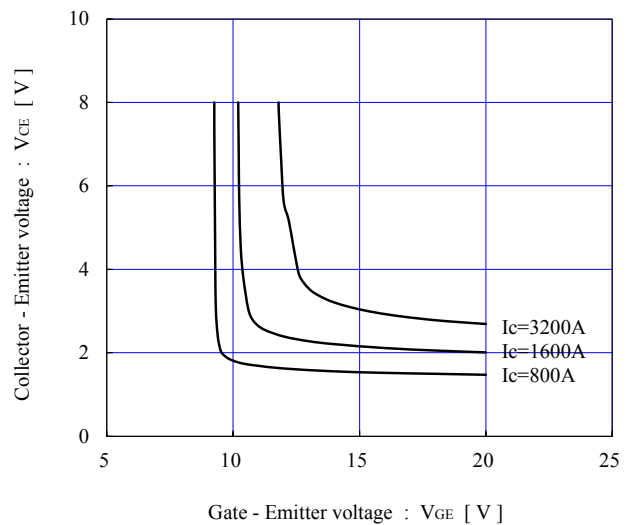
Collector current vs. Collector-Emmitter voltage (typ.)
T_j= 150°C, chip



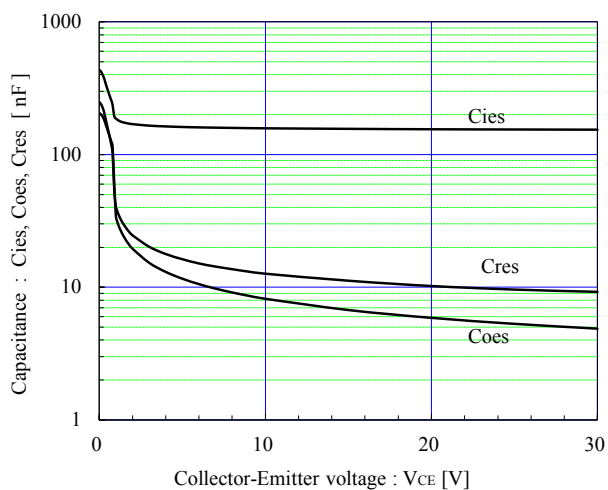
Collector current vs. Collector-Emmitter voltage (typ.)
V_{GE}=+15V, chip



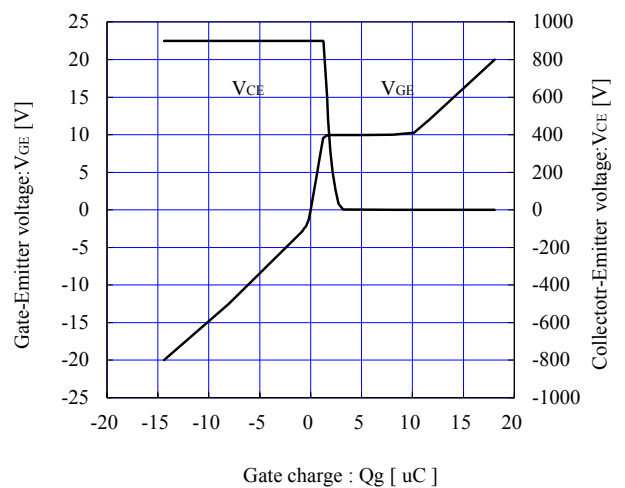
Collector-Emmitter voltage vs. Gate-Emmitter voltage (typ.)
T_j=25°C, chip



Capacitance vs. Collector-Emmitter voltage (typ.)
V_{GE}=0V, f= 1MHz, T_j= 25°C

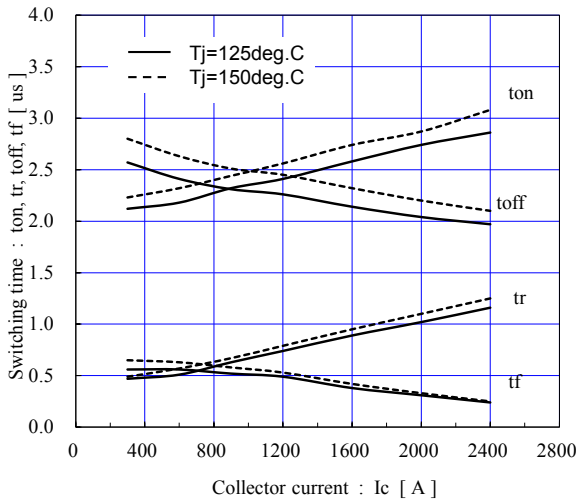


Dynamic Gate charge (typ.)
T_j= 25°C



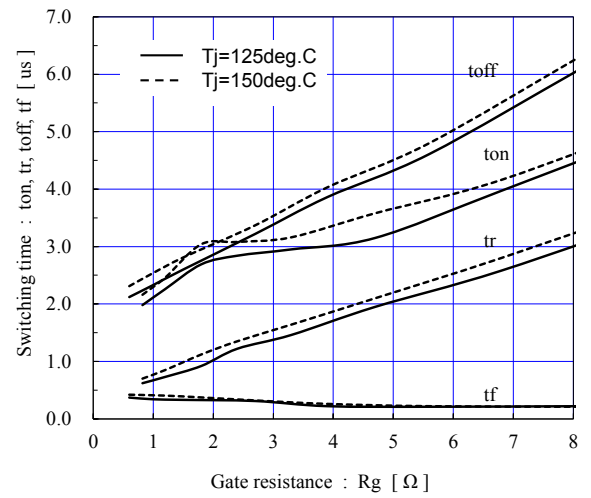
Switching time vs. Collector current (typ.)

$V_{cc}=900V$, $V_{GE}=\pm 15V$, $R_{gon}=1.4\Omega$, $R_{goff}=0.6\Omega$



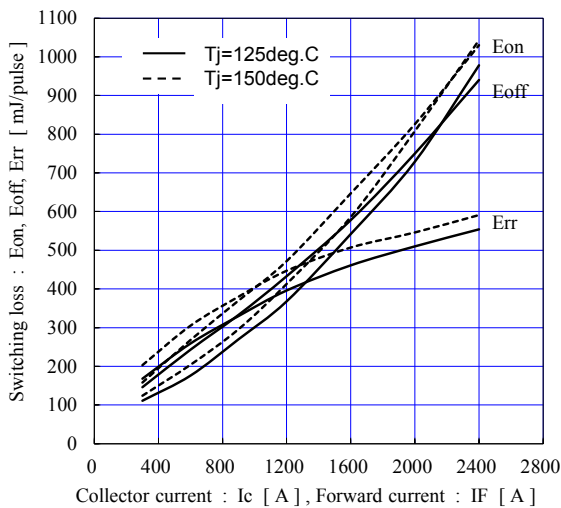
Switching time vs. Gate resistance (typ.)

$V_{cc}=900V$, $I_c=1600A$, $V_{GE}=\pm 15V$



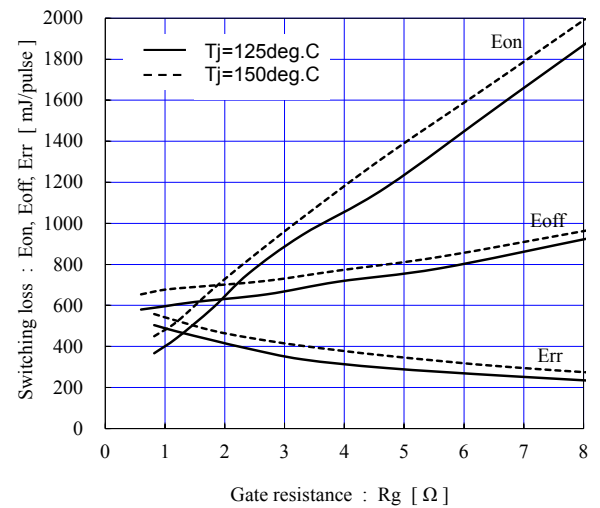
Switching loss vs. Collector current (typ.)

$V_{cc}=900V$, $V_{GE}=\pm 15V$, $R_{gon}=1.4\Omega$, $R_{goff}=0.6\Omega$



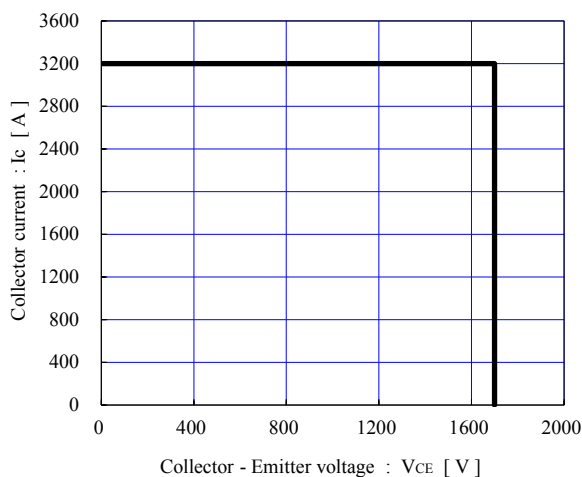
Switching loss vs. Gate resistance (typ.)

$V_{cc}=900V$, $I_c=1600A$, $V_{GE}=\pm 15V$

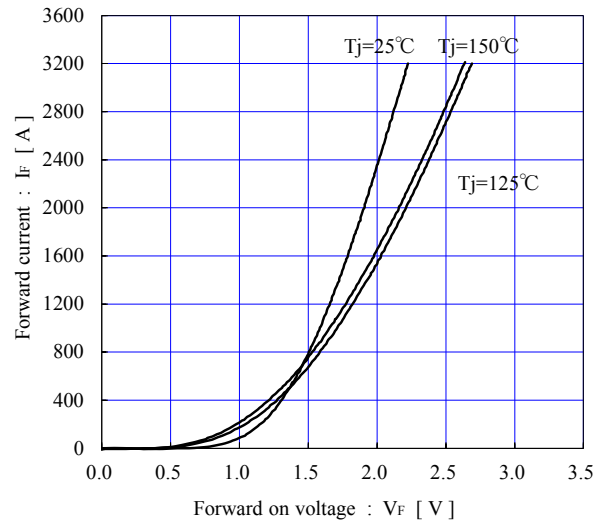


Reverse bias safe operating area (max.)

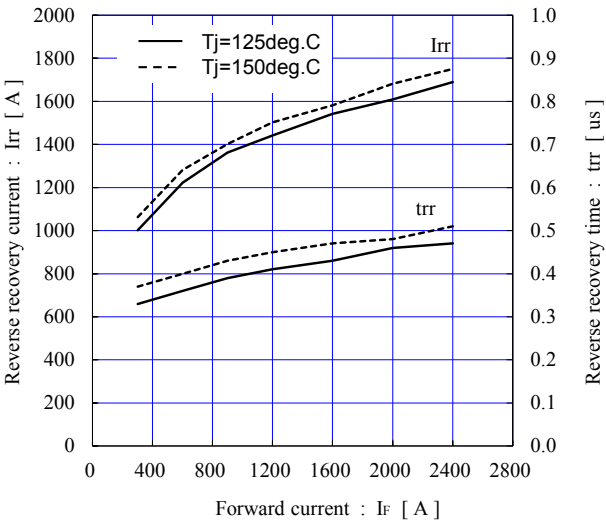
$\pm V_{GE}=15V$, $T_j = 150^\circ C$ / chip



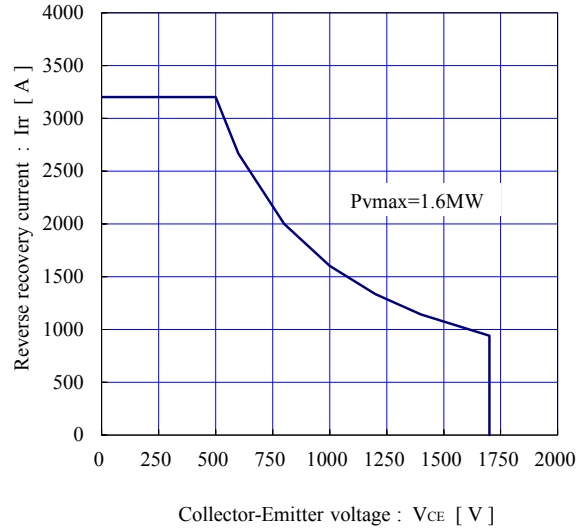
Forward current vs. Forward on voltage (typ.)
chip



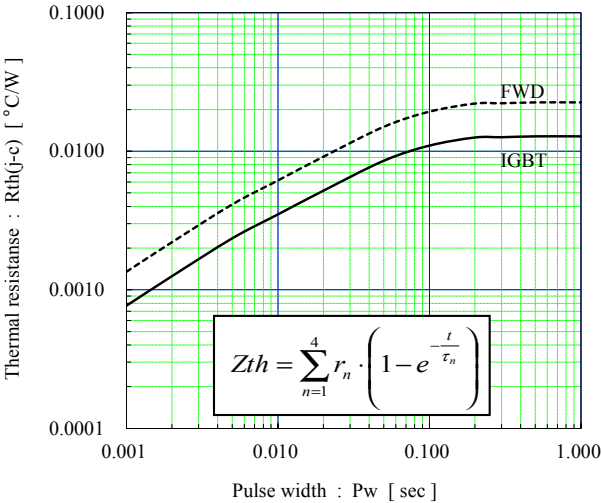
Reverse recovery characteristics (typ.)
V_{CC}=900V, V_{GE}=±15V, R_{gon}=1.4Ω



FWD safe operating area (max.)
T_j=150°C / sence terminals

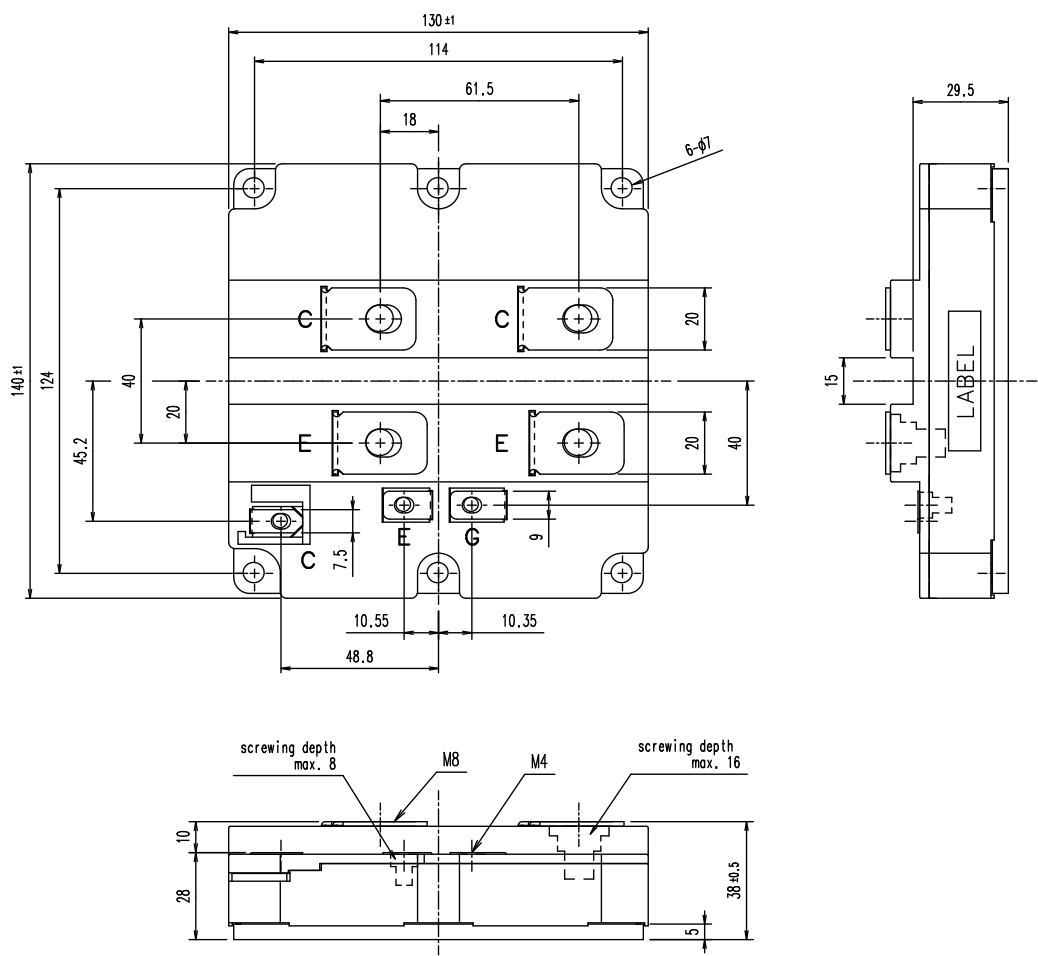


Transient thermal resistance (max.)

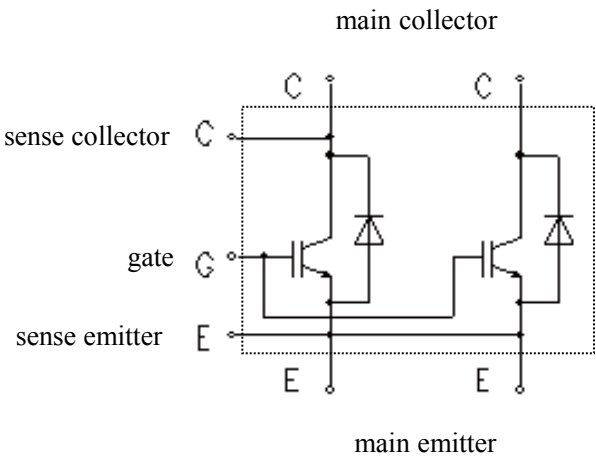


	IGBT	FWD
r1	0.00242	0.00329
r2	0.00423	0.00806
r3	0.00339	0.00620
r4	0.00275	0.00496
τ1	0.0057	0.0036
τ2	0.0479	0.0446
τ3	0.0574	0.0562
τ4	0.0741	0.0716

Outline Drawings, mm



Equivalent Circuit Schematic



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