DFI50FB12P3H2

1200V/50A 6 Units IGBT Module

Description

The DFI50FB12P3H2 offer lower losses and higher energy for application such as motor drive、inverter and soft switching applications.

Features

- 1200V50A, $V_{CE(sat)(typ.)}$ =1.65V
- Lower losses and higher energy
- Excellent short-circuit capability

Applications

- Motor drive
- Inverter
- Welding machines
- UPS

Circuit diagram

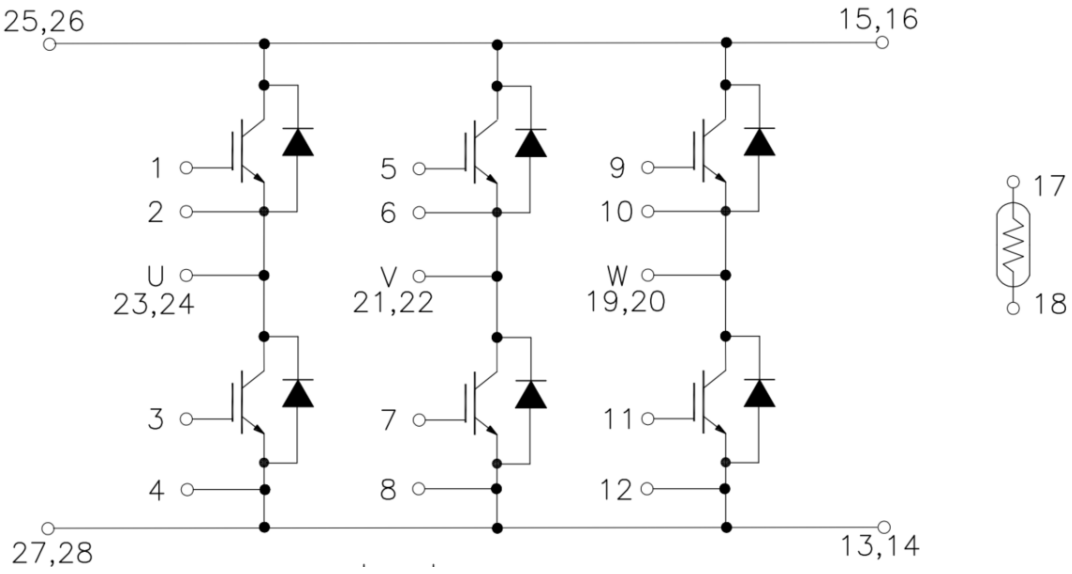

Figure 1. Out drawing & circuit diagram for DFI50FB12P3H2

Pin Configuration and Marking Information

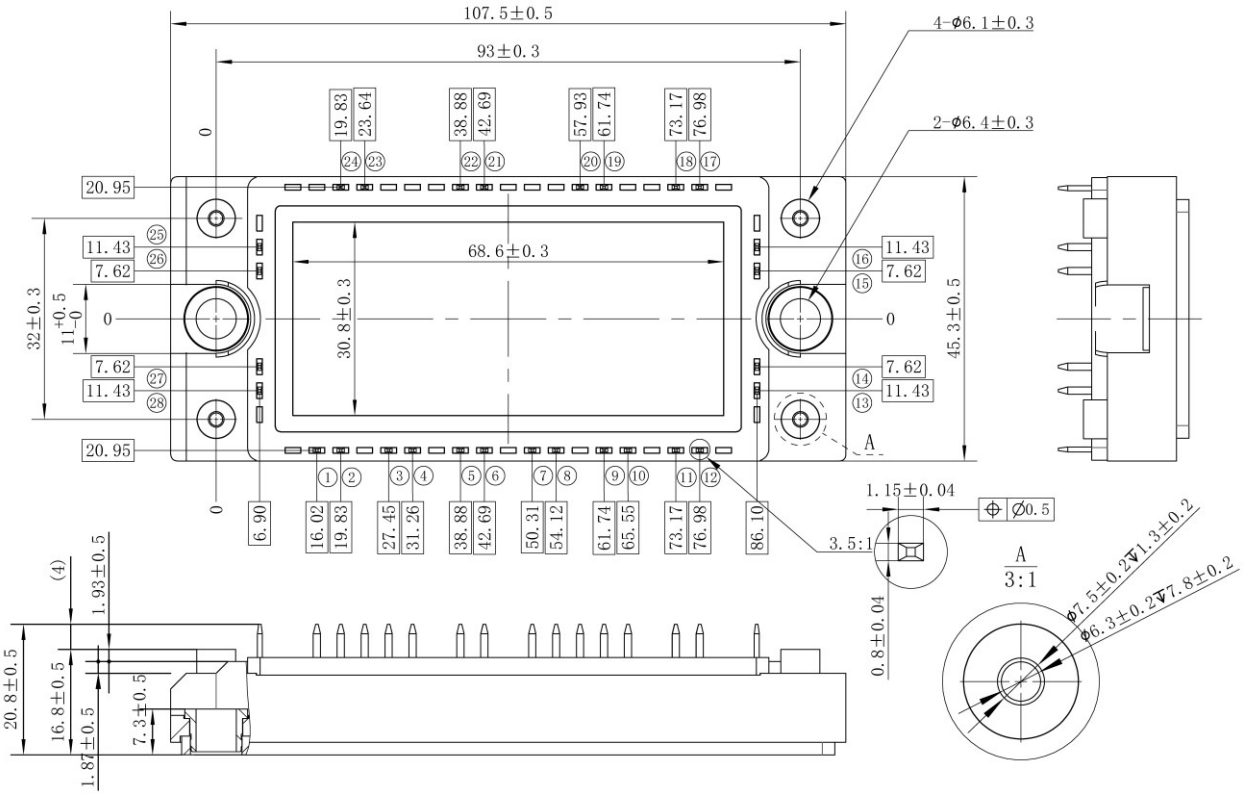

Figure 2. Pin configuration

Module

Parameter	Conditions	Value	Unit
Isolation Voltage	RMS, f = 50Hz, t =1min	2.5	KV
CTI	-	>200	-
Module lead resistance, terminals – chip	T_C =25°C	0.8	mΩ
Mounting torque for module mounting	M5	3 to 6	Nm
Weight	-	175	g

Maximum Ratings (IGBT, Freewheeling Diode ,T_j =25°C unless otherwise specified)

Symbol	Parameter	Conditions	Ratings	Unit
V_{CES}	Collector-Emitter Voltage	G-E Short	1200	V
V_{GES}	Gate-Emitter Voltage	C-E Short	±20V	V
I_C	DC Continuous Collector Current	T_C =110°C	50	A
I_{CM}	Pulse Collector Current	t_p =1ms, Note1	100	A
P_C	Maximum Power Dissipation	T_C =25°C, T_j =175°C(IGBT)	357	W
I_F	Diode forward Current	-	50	A
I_{FRM}	Repetitive peak forward Current	t_p =1ms, Note1	100	A
t_{sc}	Short Circuit Withstand Time	V_{GE} =15V, V_{CE} =600V, T_j =150°C	10	us
T_{jmax}	Max junction temperature	-	175	°C
T_{jop}	Operating junction temperature	-	-40 to 150	°C
T_{stg}	Storage temperature	-	-40 to 125	°C

Note1: Pulse width limited by maximum junction temperature

NTC characteristics

Symbol	Parameter	Condition	Value			Unit
			Min.	Typ.	Max.	
R_{25}	Resistance	T_C =25°C	-	5	-	kΩ
ΔR/R	Deviation of R100	T_C =100°C, R_{100} =493Ω	-5	-	5	%
P_{25}	Power dissipation	T_C =25°C	-	-	20	mW
$B_{25/50}$	B-value	R2 = R25 exp [$B_{25/50}$(1/T2 - 1/(298,15 K))]	-	3375	-	K
$B_{25/80}$	B-value	R2 = R25 exp [$B_{25/80}$(1/T2 - 1/(298,15 K))]	-	3411	-	K
$B_{25/100}$	B-value	R2 = R25 exp [$B_{25/100}$(1/T2 - 1/(298,15 K))]	-	3433	-	K

IGBT Electrical characteristics (T_j =25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C =50A, V_{GE} =15V	T_j =25°C	-	1.65	-	V
			T_j =125°C	-	1.95	-	V
			T_j =150°C	-	2.00	-	V
$V_{GE(th)}$	Gate-Emitter threshold Voltage	I_C =2.8mA, V_{CE} =V_{GE}		5.0	5.8	6.5	V
Q_G	Gate charge	V_{GE} = -15V to +15V		-	320	-	nC
R_{Gint}	Internal gate resistor	f =1M	T_j =25°C	-	0	-	Ω
C_{ies}	Input Capacitance	V_{CE} =25V, V_{GE} =0V, f =1MHz	T_j =25°C	-	3.50	-	nF
C_{oes}	Output Capacitance			-	0.45	-	nF
C_{res}	Reverse transfer Capacitance			-	0.28	-	nF
I_{CES}	Collector- Emitter Cut off Current	V_{CE} =1200V, V_{GE} =0V	T_j =25°C	-	-	1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} =20V, V_{CE} =0V	T_j =25°C	-	-	200	nA
$t_{d(on)}$	Turn-on delay time	V_{CC} =600V, I_C =50A, V_{GE} =+15V/-8V, R_{Gon} = R_{Goff} =15Ω, Inductive load	T_j =25°C	-	72	-	ns
			T_j =125°C	-	64	-	
			T_j =150°C	-	64	-	
t_r	Rise time		T_j =25°C	-	20	-	ns
			T_j =125°C	-	24	-	
			T_j =150°C	-	26	-	
$t_{d(off)}$	Turn-off delay time		T_j =25°C	-	147	-	ns
			T_j =125°C	-	155	-	
			T_j =150°C	-	164	-	
t_f	Fall time		T_j =25°C	-	279	-	ns
			T_j =125°C	-	297	-	
			T_j=150°C	-	385	-	
E_{on}	Turn-on power dissipation		T_j =25°C	-	2.59	-	mJ
			T_j =125°C	-	3.91	-	
			T_j =150°C	-	4.13	-	
E_{off}	Turn-off power dissipation		T_j =25°C	-	4.20	-	mJ
			T_j =125°C	-	6.06	-	
			T_j =150°C	-	6.27	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (IGBT)			-	0.42	-	°C /W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.20	-	°C /W

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m・K and thickness is 50um.

Freewheeling Diode Electrical characteristics (T_j=25°C unless otherwise specified, chip)

Symbol	Item	Condition		Value			Unit
				Min.	Typ.	Max.	
V_F	Diode Forward Voltage	I_F =50A, V_{GE} =0V	T_j=25°C	-	1.63	-	V
			T_j=125°C	-	1.50	-	
			T_j=150°C	-	1.45	-	
t_{rr}	Diode Reverse Recovery Time	(Switch side) V_{CC}=600V, I_C=50A V_{GE}=+15V/-8V R_{Gon}= R_{Goff}=15Ω (FRD side) V_{rr}=600V, I_F=50A V_{GE}=+15V/-8V Inductive load switching operation	T_j=25°C		245		ns
			T_j=125°C	-	392	-	
			T_j=150°C		434		
I_{RM}	Peak reverse recovery Current		T_j=25°C	-	62	-	A
			T_j=125°C	-	65	-	
			T_j=150°C	-	67	-	
Q_{rr}	Recovered charge		T_j=25°C	-	5.03	-	uC
			T_j=125°C	-	9.44	-	
			T_j=150°C	-	10.98	-	
E_{rr}	Reverse recovered energy		T_j=25°C	-	2.17	-	mJ
			T_j=125°C	-	4.19	-	
			T_j=150°C	-	4.86	-	
$R_{th(j-c)}$	Thermal Resistance, Junction to Case (Diode)			-	0.60	-	°C/W
$R_{th(c-s)}$	Thermal Resistance, Case to sink (Conductive Grease applied) , Note1			-	0.30	-	°C/W

Note1: Assumes Thermal Conductivity of grease is 2.8 W/m・K and thickness is 50um.

Test Conditions

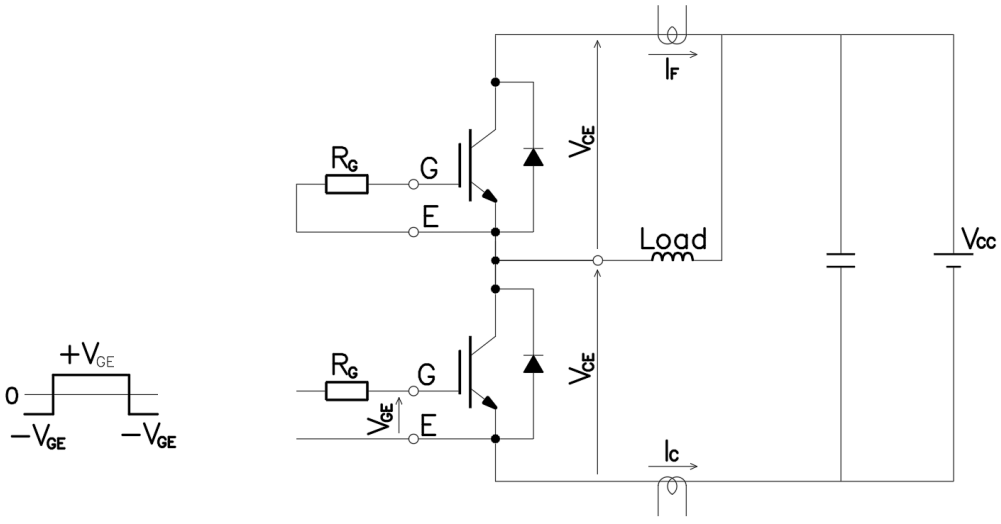

Figure 3. Switching time measure circuit

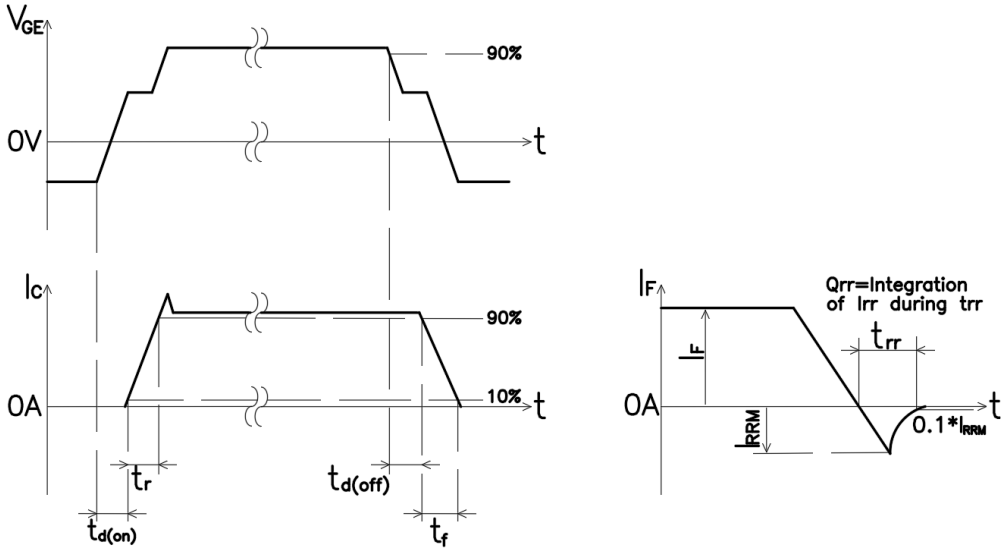

Figure 4. Switching time definition

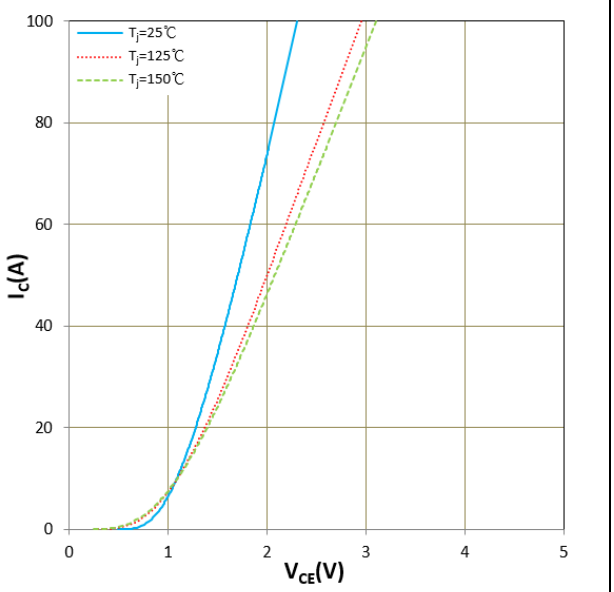

Figure 5. Ic vs V_{CE}
V_{GE}=15V

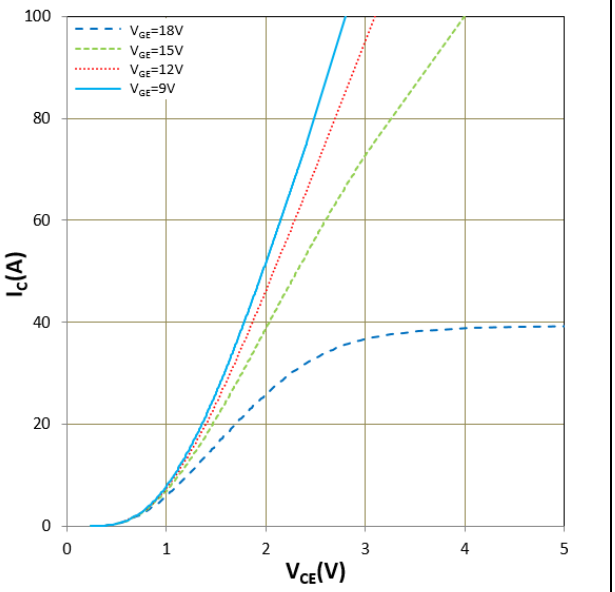

Figure 6. Ic vs V_{CE}
T_j=150°C

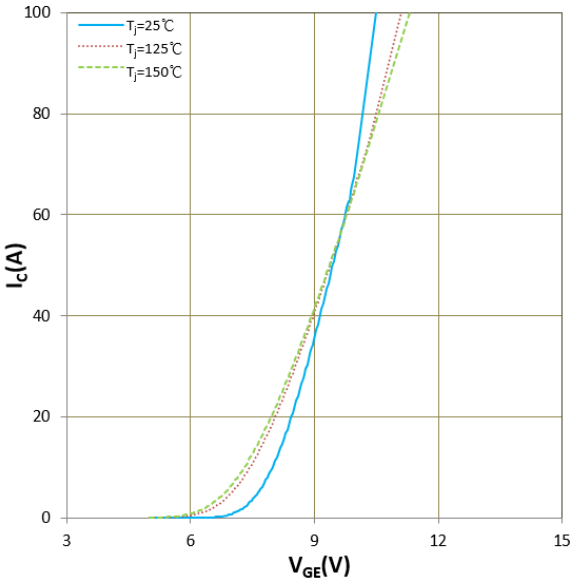

Figure 7. Ic vs V_{GE}
V_{CE} =20V

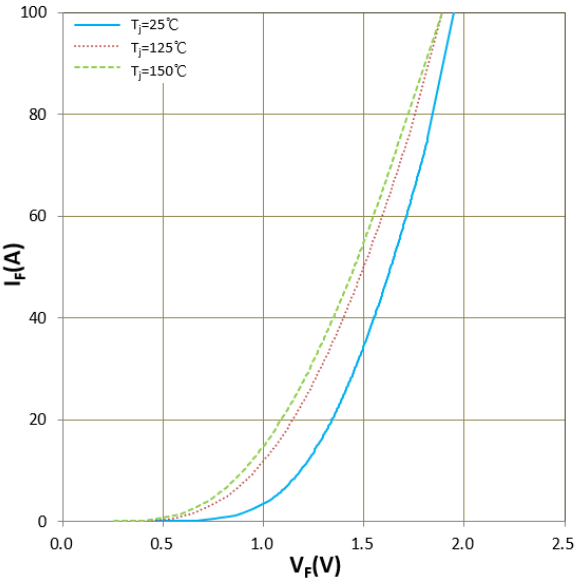

Figure 8. I_F vs V_F

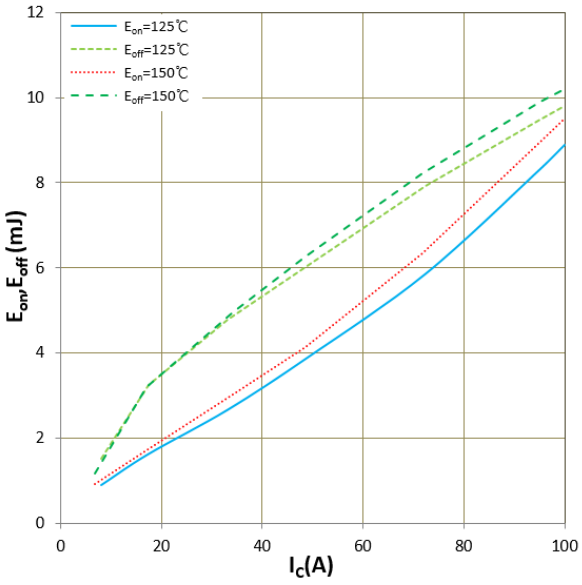

Figure 9. E_{on}, E_{off} vs I_C(Typ)
V_{CC} =600V, V_{GE} =+15V/-8V, R_{Gon} = R_{Goff} =10Ω
Inductive Load

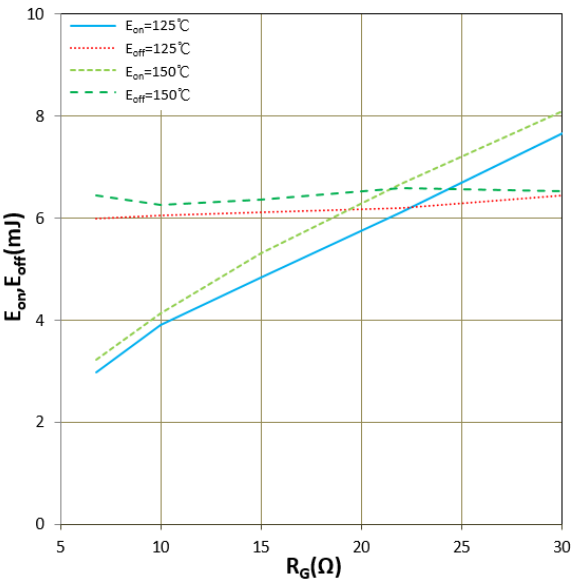

Figure 10. E_{on}, E_{off} vs R_G(Typ)
V_{CC}=600V, V_{GE} =+15V/-8V, I_C = 50A
Inductive Load

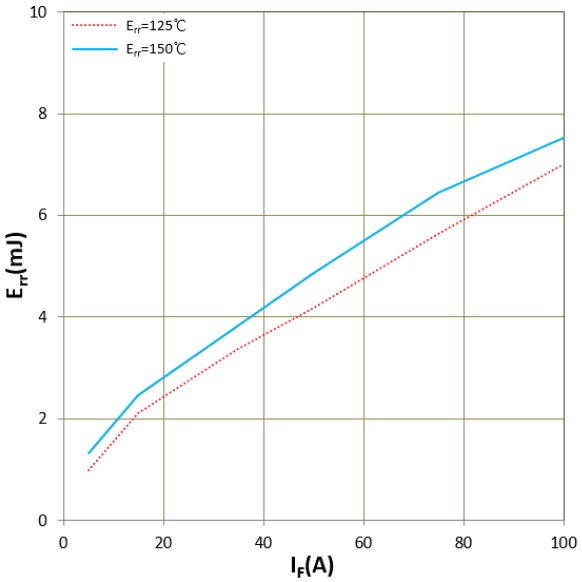

Figure 11. E_{rr} vs I_F(Typ)
V_{CC}=600V, V_{GE}=+15V/-8V, R_{Gon} = R_{Goff}=10Ω
Inductive Load

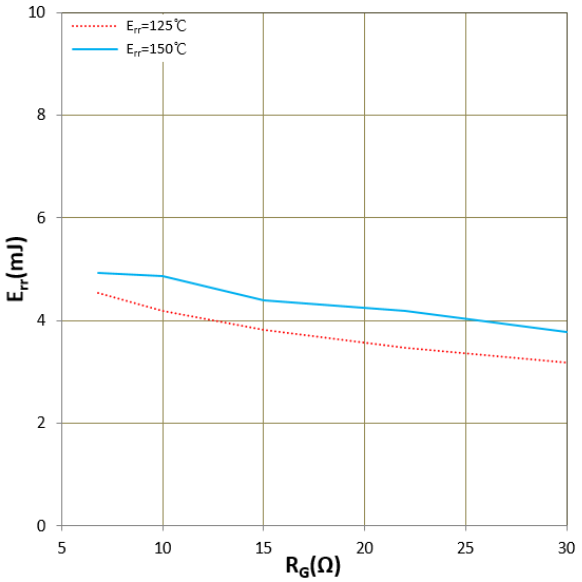

Figure 12. Err vs R_G(Typ)
V_{CC}=600V, V_{GE}=+15V/-8V, I_F=50A
Inductive Load

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