

$V_{CES}$	1800V
$I_C (100^\circ\text{C})$	40A
$V_{CE(sat)} (Typ.)$	2.2V
$P_D$	535W

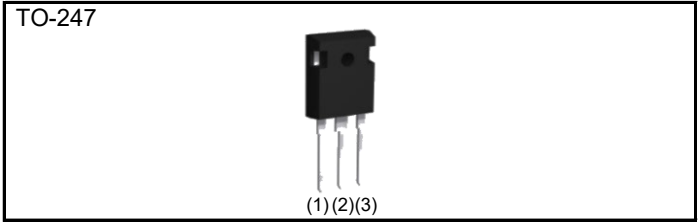
#### ●Features

- 1) Low Collector - Emitter Saturation Voltage
- 2) High Speed Switching
- 3) Low Switching Loss & Soft Switching
- 4) Monolithic Body Diode  
with Low Forward Voltage
- 5) Pb - free Lead Plating ; RoHS Compliant

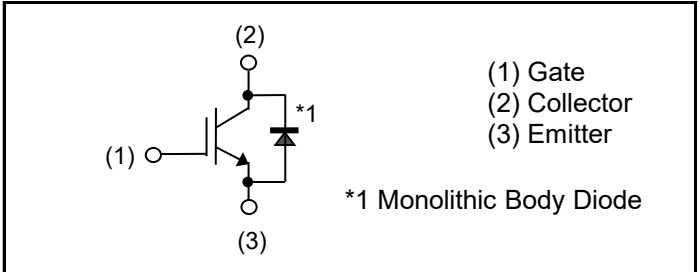
#### ●Application

Voltage - resonance Inverter  
Welding  
IH

#### ●Outline



#### ●Inner Circuit



#### ●Absolute Maximum Ratings (at $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Collector - Emitter Voltage	$V_{CES}$	1800	V
Gate - Emitter Voltage	$V_{GES}$	$\pm 30$	V
Collector Current	$T_C = 25^\circ\text{C}$	$I_C$	80 A
	$T_C = 100^\circ\text{C}$	$I_C$	40 A
Pulsed Collector Current	$I_{CP}^{*1}$	120	A
Diode Forward Current	$T_C = 25^\circ\text{C}$	$I_F$	80 A
	$T_C = 100^\circ\text{C}$	$I_F$	40 A
Diode Pulsed Forward Current	$I_{FP}^{*1}$	80	A
Power Dissipation	$T_C = 25^\circ\text{C}$	$P_D$	535 W
	$T_C = 100^\circ\text{C}$	$P_D$	267 W
Operating Junction Temperature	$T_j$	-40 to +175	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +175	$^\circ\text{C}$

\*1 Pulse width limited by  $T_{jmax}$ .

### ●Thermal Resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal Resistance IGBT Junction - Case	$R_{\theta(j-c)}$	-	-	0.28	°C/W
Thermal Resistance Diode Junction - Case	$R_{\theta(j-c)}$	-	-	0.28	°C/W

### ●IGBT Electrical Characteristics (at $T_j = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Collector - Emitter Breakdown Voltage	$BV_{CES}$	$I_C = 10\mu\text{A}, V_{GE} = 0\text{V}$	1800	-	-	V
Collector Cut - off Current	$I_{CES}$	$V_{CE} = 1860\text{V}, V_{GE} = 0\text{V}$	-	-	10	$\mu\text{A}$
Gate - Emitter Leakage Current	$I_{GES}$	$V_{GE} = \pm 30\text{V}, V_{CE} = 0\text{V}$	-	-	$\pm 200$	nA
Gate - Emitter Threshold Voltage	$V_{GE(th)}$	$V_{CE} = 5\text{V}, I_C = 120.7\text{mA}$	5.0	6.0	7.0	V
Collector - Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 40\text{A}, V_{GE} = 15\text{V}$	-	2.2	5.0	V
		$T_j = 25^\circ\text{C}$	-	2.9	-	
		$T_j = 175^\circ\text{C}$	-			

**●IGBT Electrical Characteristics (at  $T_j = 25^\circ\text{C}$  unless otherwise specified)**

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input Capacitance	$C_{ies}$	$V_{CE} = 30\text{V}$	-	9550	-	pF
Output Capacitance	$C_{oes}$	$V_{GE} = 0\text{V}$	-	115	-	
Reverse transfer Capacitance	$C_{res}$	$f = 1\text{MHz}$	-	102	-	
Total Gate Charge	$Q_g$	$V_{CE} = 600\text{V}$	-	468	-	nC
Gate - Emitter Charge	$Q_{ge}$	$I_C = 40\text{A}$	-	93	-	
Gate - Collector Charge	$Q_{gc}$	$V_{GE} = 15\text{V}$	-	155	-	
Turn - on Delay Time	$t_{d(on)}$	$I_C = 40\text{A}, V_{CC} = 600\text{V},$ $V_{GE} = 15\text{V}, R_G = 10\Omega,$ $T_j = 25^\circ\text{C}$ Inductive Load * $E_{on}$ include diode reverse recovery	-	80	-	ns
Rise Time	$t_r$		-	53	-	
Turn - off Delay Time	$t_{d(off)}$		-	565	-	
Fall Time	$t_f$		-	55	-	
Turn - on Switching Loss	$E_{on}$		-	1.85	-	mJ
Turn - off Switching Loss	$E_{off}$		-	1.60	2.15	
Turn - on Delay Time	$t_{d(on)}$	$I_C = 40\text{A}, V_{CC} = 600\text{V},$ $V_{GE} = 15\text{V}, R_G = 10\Omega,$ $T_j = 175^\circ\text{C}$ Inductive Load * $E_{on}$ include diode reverse recovery	-	68	-	ns
Rise Time	$t_r$		-	52	-	
Turn - off Delay Time	$t_{d(off)}$		-	670	-	
Fall Time	$t_f$		-	55	-	
Turn - on Switching Loss	$E_{on}$		-	1.95	-	mJ
Turn - off Switching Loss	$E_{off}$		-	2.00	-	

**●FRD Electrical Characteristics** (at  $T_j = 25^\circ\text{C}$  unless otherwise specified)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	$V_F$	$I_F = 40\text{A}, V_{GE} = 0\text{V}$				
		$T_j = 25^\circ\text{C}$	-	1.8	2.3	V
		$T_j = 175^\circ\text{C}$	-	2.4	-	

●Electrical Characteristic Curves

Fig.1 Power Dissipation vs. Case Temperature

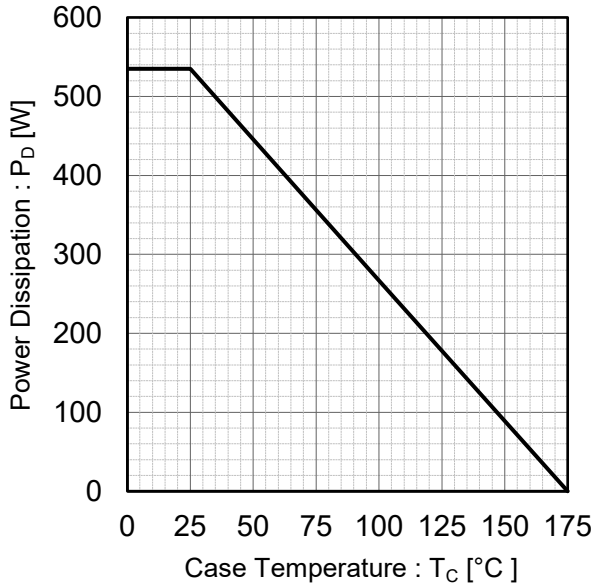


Fig.2 Collector Current vs. Case Temperature

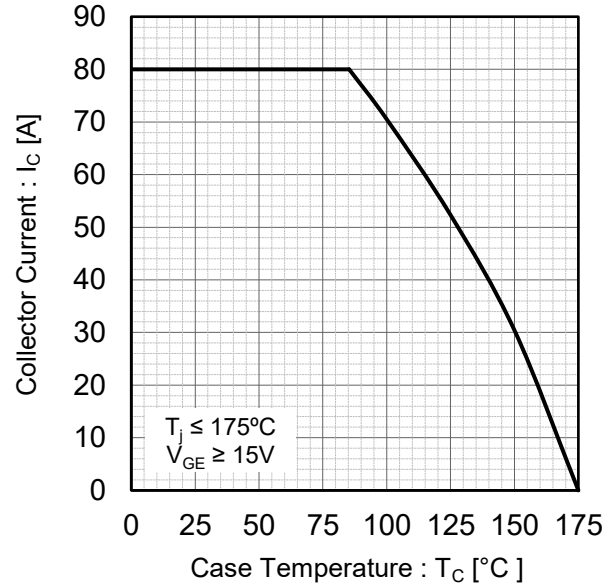


Fig.3 Forward Bias Safe Operating Area

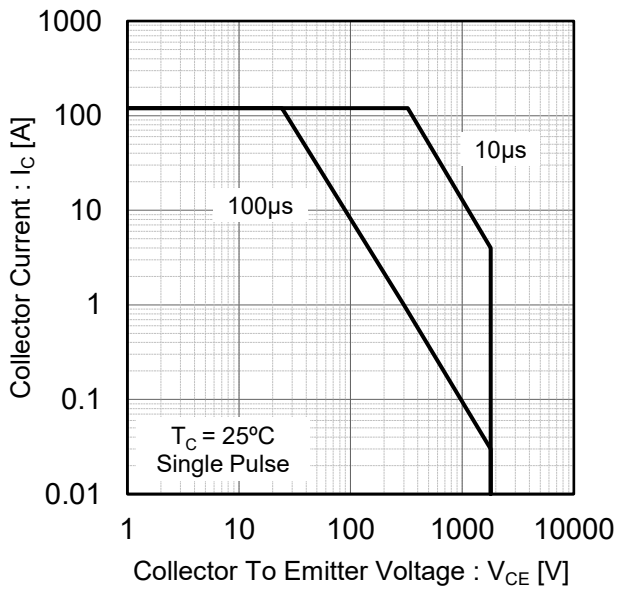
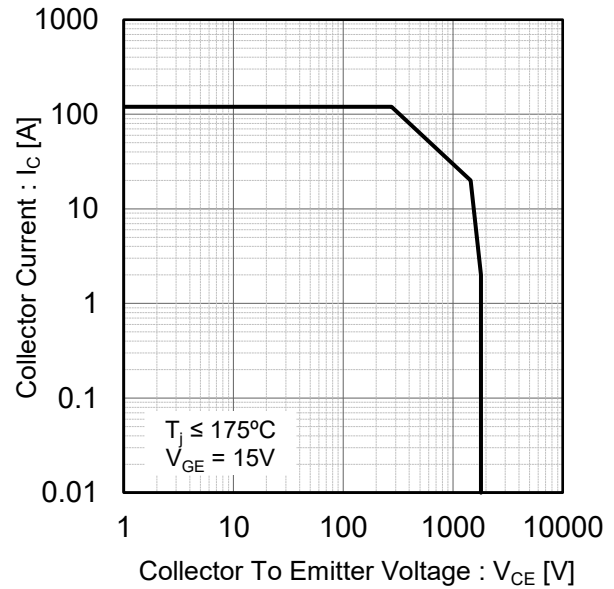


Fig.4 Reverse Bias Safe Operating Area



●Electrical Characteristic Curves

Fig.5 Typical Output Characteristics

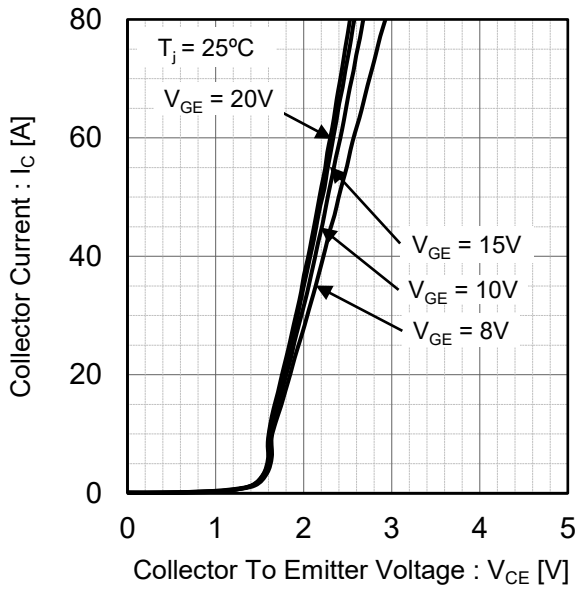


Fig.6 Typical Output Characteristics

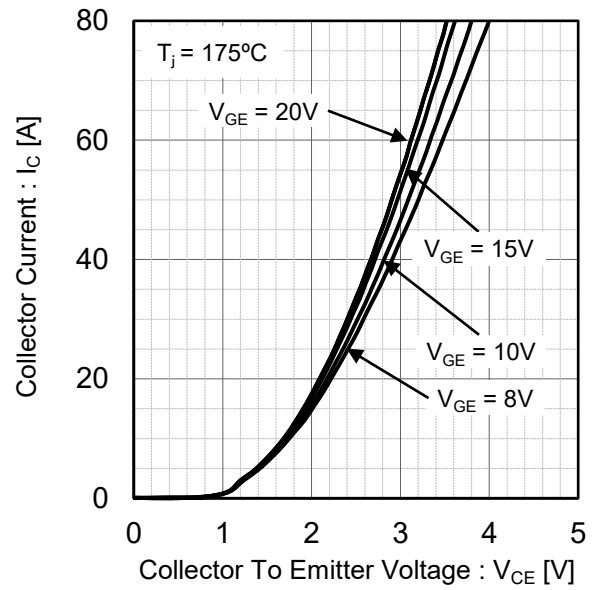


Fig.7 Typical Transfer Characteristics

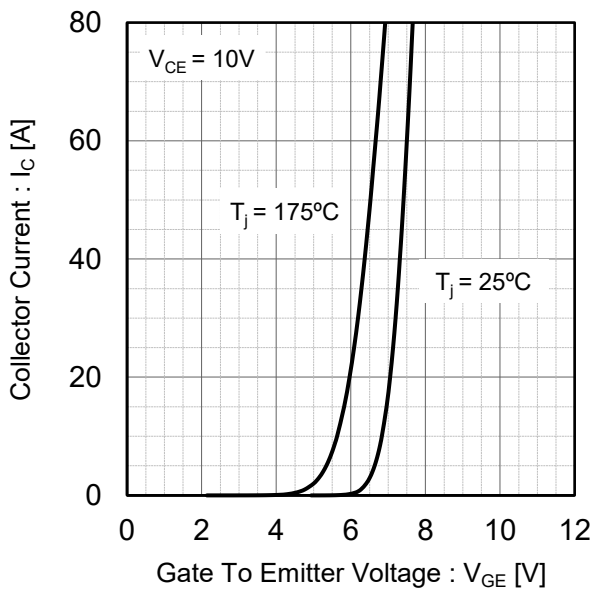
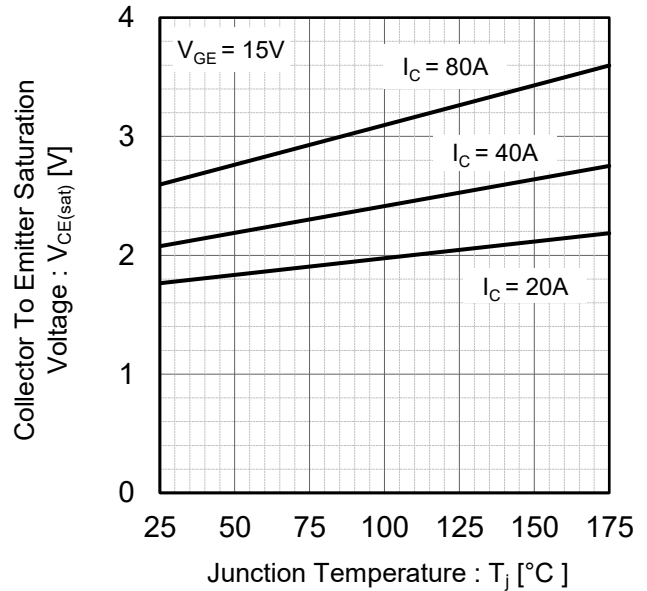


Fig.8 Typical Collector to Emitter Saturation Voltage vs. Junction Temperature



●Electrical Characteristic Curves

Fig.9 Typical Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage

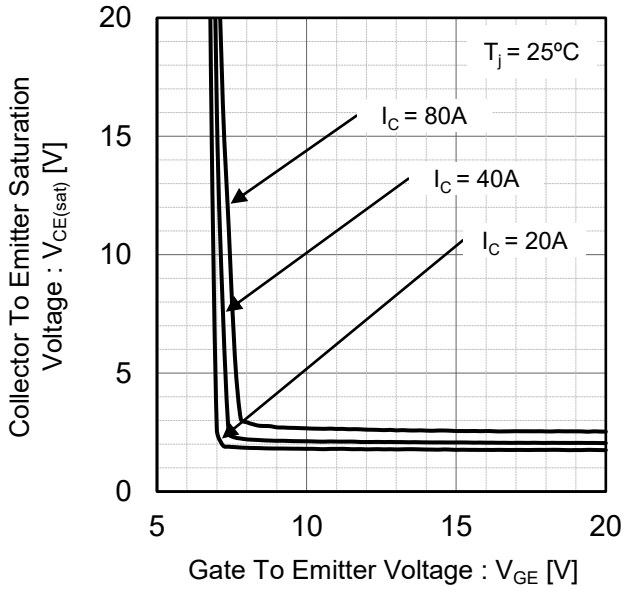


Fig.10 Typical Collector to Emitter Saturation Voltage vs. Gate to Emitter Voltage

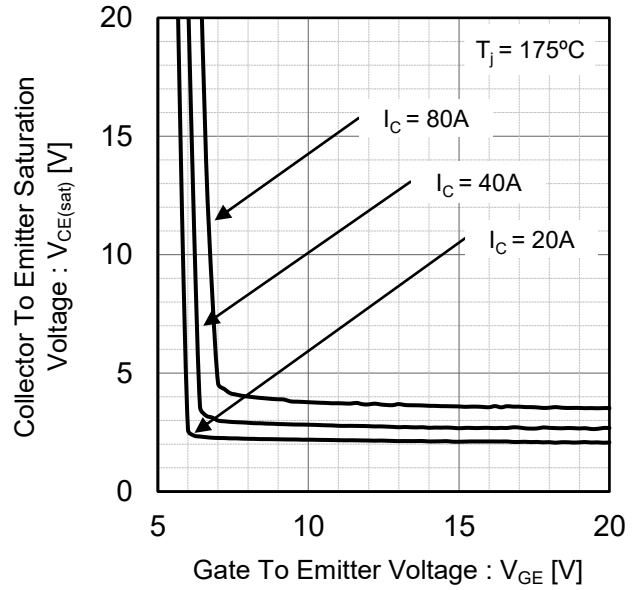


Fig.11 Typical Switching Time vs. Collector Current

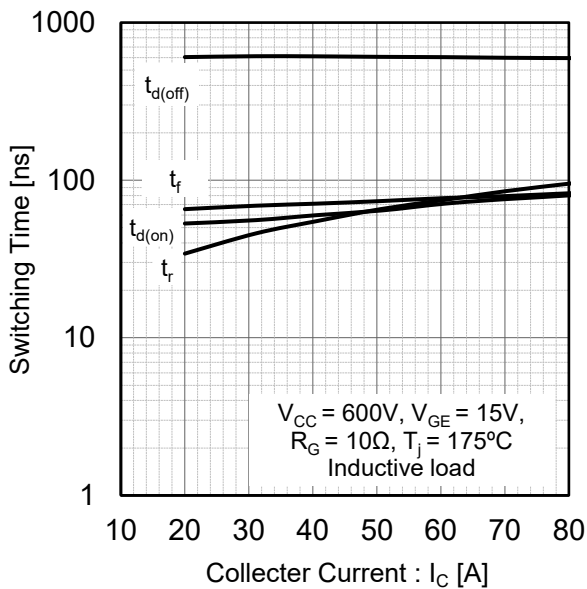
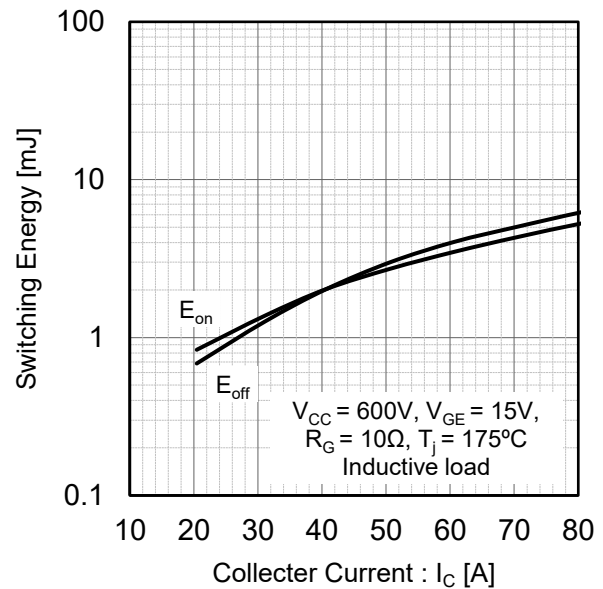


Fig.12 Typical Switching Energy Losses vs. Collector Current



●Electrical Characteristic Curves

Fig.13 Typical Capacitance vs. Collector to Emitter Voltage

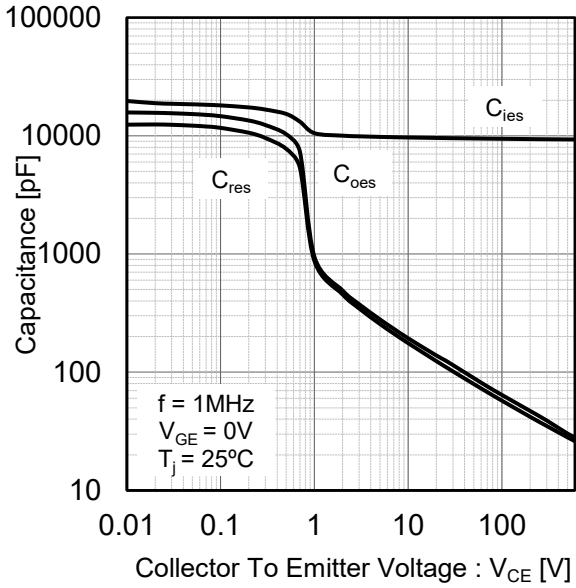


Fig.14 Typical Gate Charge

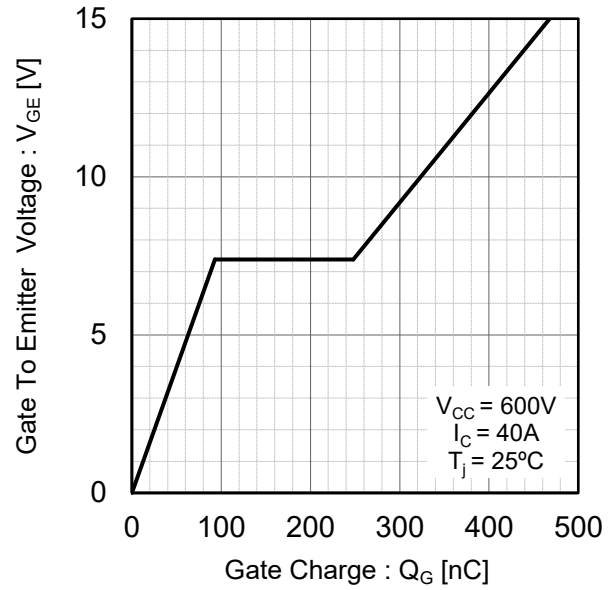
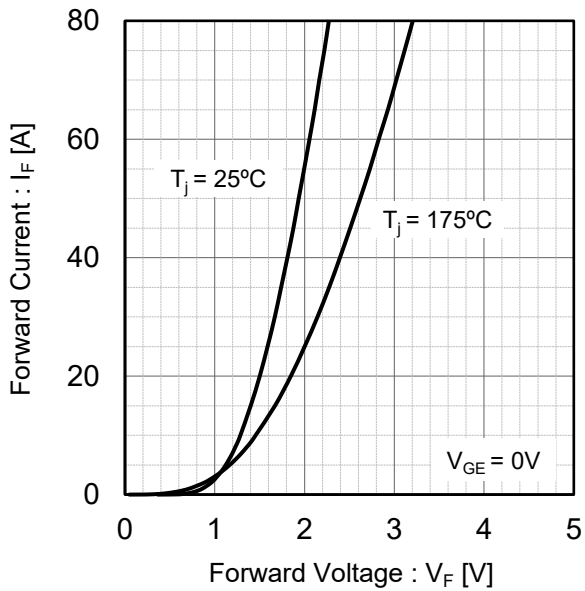


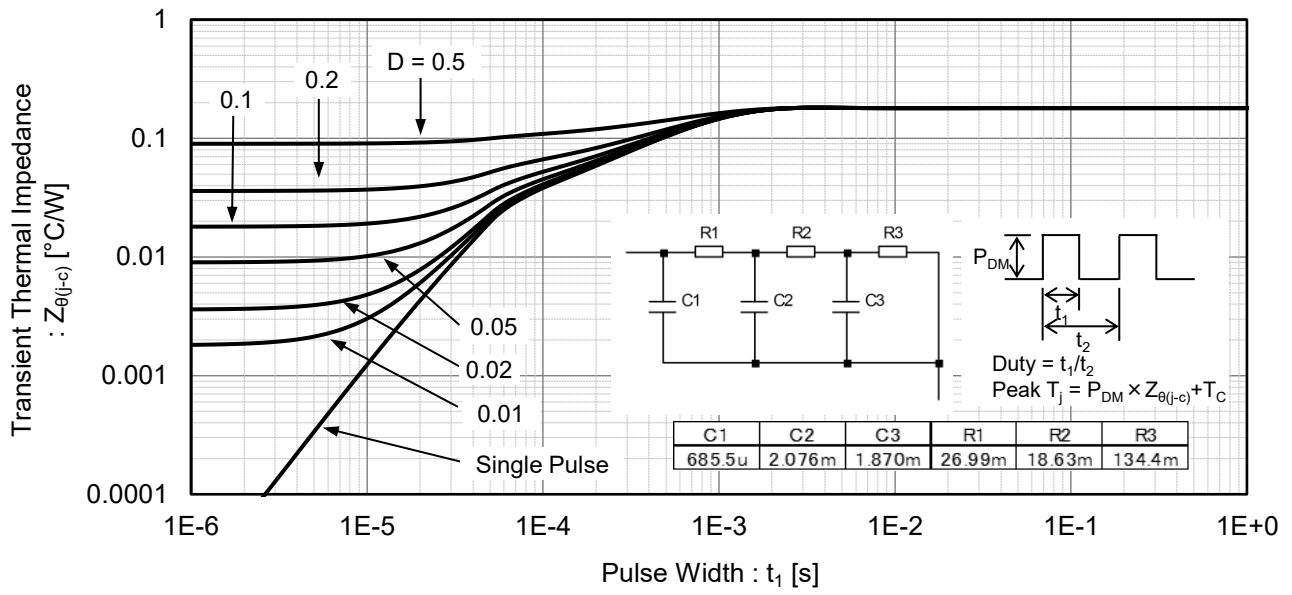
Fig.15 Typical Diode Forward Current vs. Forward Voltage





●Electrical Characteristic Curves

Fig.16 Typical Transient Thermal Impedance



● Inductive Load Switching Circuit and Waveform

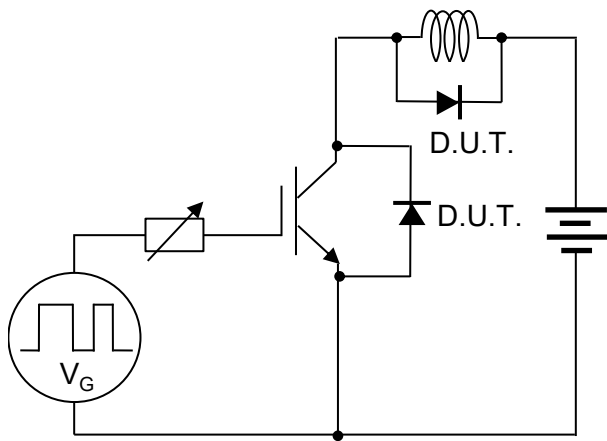


Fig.17 Inductive Load Circuit

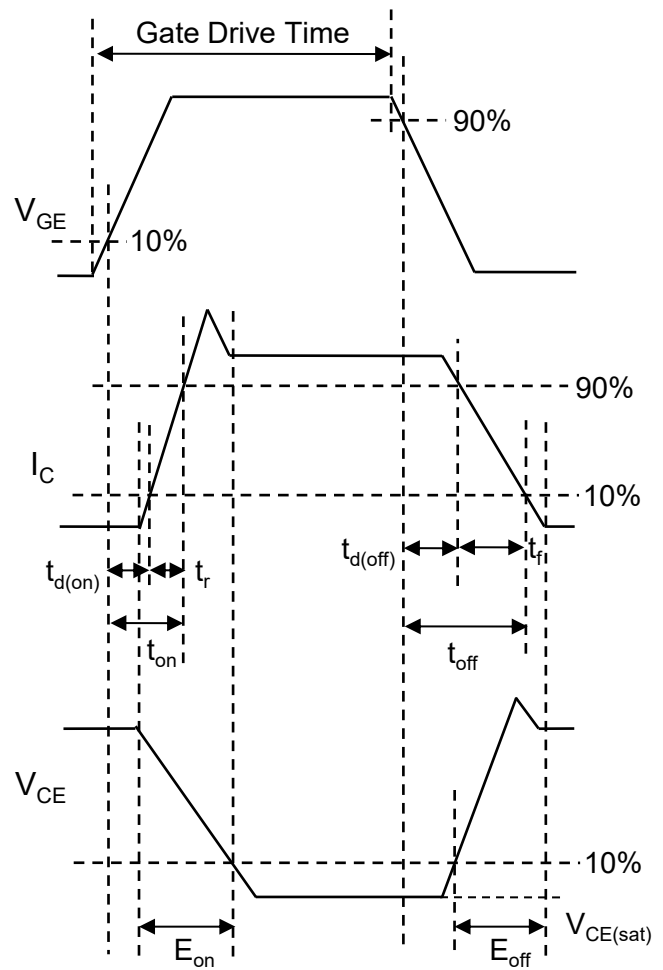


Fig.18 Inductive Load Waveform